Quarterly Bulletin

BANK OF ENGLAND

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Foreword

The Bank faces significant challenges in assessing the current strengths and vulnerabilities of our economy. Monitoring and analysing economic and financial market activity play an important role in that assessment. This edition of the *Quarterly Bulletin* presents a number of articles that highlight various aspects of this process of monitoring and evaluating the state of the economy.

The *Bulletin* begins, as usual, by examining developments in financial markets. The *Markets and operations* article reviews developments in financial markets covering the period between the previous *Bulletin* and 20 May 2011. There were a number of significant events within this period, including the continuing political tensions in North Africa and the Middle East, and the Japanese earthquake and tsunami. But despite that backdrop, financial markets generally continued to operate normally with little sign of excessive volatility. In the euro area, uncertainty about how some member countries will resolve the fiscal challenges that they face heightened, with the yields on government bonds in Greece, Portugal and Ireland rising sharply relative to those in Germany. In a number of commodity markets prices fell sharply in early May, having risen earlier in the review period. Weaker-than-expected activity data contributed to financial market participants pushing out their expectations for the date at which Bank Rate would increase.

One issue central to the Monetary Policy Committee's current deliberations is the risk that the sustained period of above-target inflation might cause expectations of inflation to drift upwards and become ingrained in price and wage-setting behaviour. This edition of the *Quarterly Bulletin* presents two articles on this issue.

The first outlines a framework for monitoring inflation expectations to assess both the extent to which they remain well anchored to the inflation target and whether inflation expectations are affecting wage and price-setting behaviour. Using that framework, the current data suggest that long-term inflation expectations remain reasonably well anchored to the target. The signals regarding short and medium-term inflation expectations are more mixed, but there are few signs that they have become significantly de-anchored. And, even with short-term inflation expectations remaining elevated, there is little evidence as yet that they are becoming entrenched in wage and price-setting behaviour. But because inflation expectations cannot be observed directly and there are significant uncertainties surrounding the different indicators used, this risk can be assessed only imperfectly and it remains a key area of concern for the Committee.

The accompanying article looks at some international evidence on inflation expectations during sustained periods in which inflation has deviated from target. It suggests that during such periods, short and medium-term inflation expectations have tended to drift in the direction of the deviation from target. Recent movements in UK inflation expectations have been more mixed, moving both upwards and downwards, reflecting volatility in inflation and in measures of inflation expectations.

The effectiveness of monetary policy relies on the public's awareness and understanding of the policy framework. In order to gauge the extent of this understanding, the Bank conducts a regular survey on attitudes to monetary policy and satisfaction with the Bank. The article in this edition presents the findings from recent surveys and suggests that the public's awareness of the monetary policy framework remains high and has changed little over the past year. Even so, the level of satisfaction with the way the Bank sets monetary policy has deteriorated since mid-2010.

The Bank's Market Intelligence programme plays an integral role in providing information to support the Bank's two core purposes — monetary and financial stability. Information gathered from market contacts provides insights into a variety of rapidly evolving markets. One such market, the foreign exchange market, plays a vital role in the efficient functioning of our economy. The article in this edition draws on this intelligence, as well as economic theory and market data, to examine this market with particular focus on its use by non-bank market participants. It focuses on two of the main reasons why market participants use the foreign exchange market — to hedge themselves against currency exposures arising from their underlying business, and to seek additional profits by trading in the foreign exchange market itself. The majority of foreign exchange activity is reported to be related to hedging behaviour, with the non-financial corporate sector almost exclusively using the market for this purpose.

Two further articles analyse data issues in more detail. One examines housing equity withdrawal (HEW) which turned negative in 2008, for the first time since the 1990s. A common interpretation of this recent pattern has been that households have been paying down debt more quickly than in the past. But as the article explains, the move from positive to negative HEW appears largely to be the result of the weakness in housing market transactions; the pace of repayments is little changed. The other article discusses a novel source of data derived from the increasing and widespread use of the internet — data on the volume of online searches. The article evaluates features of these new data and explores the potential for assessing the current level of economic activity. It uses some simple illustrative models to show that internet search data can contain valuable signals about the state of both labour and housing markets in the United Kingdom.

This edition also includes a review of the work of the London Foreign Exchange Joint Standing Committee during 2010. The Committee was established in 1973, under the auspices of the Bank of England, as a forum for bankers 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 contents page, with links to the articles in PDF, is available at
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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.

Recent economic and financial developments

Markets and operations

This article reviews developments in sterling financial markets, including the Bank's official operations, between the 2011 Q1 *Quarterly Bulletin* and 20 May 2011.[1] The article also summarises market intelligence on selected topical issues relating to market functioning.

Sterling financial markets

Overview

Financial markets have remained resilient in the face of a number of significant events over the review period. These included continued political tensions in the Middle East and North Africa, ongoing concerns about the sustainability of fiscal positions in some euro-area periphery countries and the Japanese earthquake and tsunami.

In the United Kingdom, weaker-than-expected activity data contributed to expectations for the timing of an increase in Bank Rate being pushed back.

Fiscal developments continued to be a key influence on international sovereign bond markets. In the US Treasury market there was little lasting market reaction to Standard & Poor's announcement of a revision to its outlook for the US sovereign credit rating from stable to negative. But uncertainty persisted about how some euro-area member countries will resolve the fiscal challenges that they face. Government bond yields in Greece, Portugal and Ireland rose sharply relative to those in Germany; movements for other member countries were more muted over the review period.

Commodity prices fell sharply in early May, broadly reversing the increases earlier in the review period, and, in some cases, ending the period lower.

Recent developments in sterling capital markets
Monetary policy and short-term interest rates
The Bank of England's Monetary Policy Committee (MPC) maintained Bank Rate at 0.5% and the stock of purchased assets at £200 billion.

UK CPI inflation remained above target with significant month-to-month variation during the review period. But weaker-than-expected activity data contributed to market participants pushing back their expectations for the timing of an increase in Bank Rate. Consistent with this, forward sterling

overnight index swap (OIS) rates fell across the curve (**Chart 1**). According to this measure, market participants expect the MPC to have raised Bank Rate by 25 basis points by February 2012, about seven months later than at the time of the previous *Bulletin*.

Chart 1 Instantaneous forward interest rates derived from OIS contracts[a]
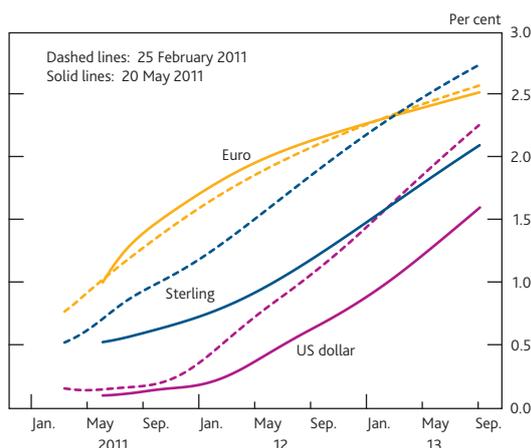
Sources: Bloomberg and Bank calculations.

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

A Reuters poll released after the review period showed that a majority of the economists surveyed believed that the MPC was most likely to raise Bank Rate in 2011 Q4. That was a quarter later than at the time of the 2011 Q1 *Bulletin*.

Option-implied volatility of three-month Libor — a measure of near-term interest rate uncertainty — fell over the review period, reversing the increase in late 2010 (**Chart 2**).

Elsewhere, in the United States, the Federal Open Market Committee (FOMC) confirmed that it would complete its planned $600 billion asset purchase programme by the end of 2011 Q2. US forward OIS rates fell over the review period, which contacts attributed to both weaker-than-expected data

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

Chart 2 Volatility of three-month Libor implied by options on Libor futures
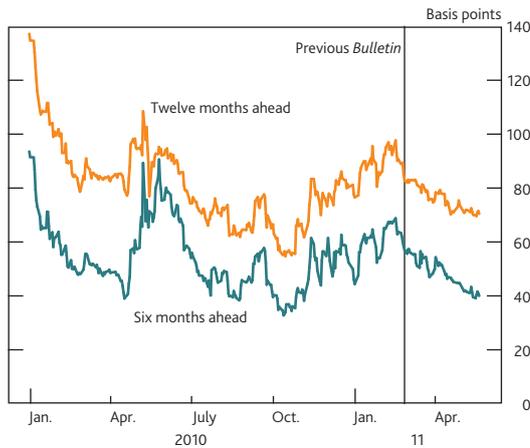
Sources: Bloomberg, British Bankers' Association, NYSE Liffe and Bank calculations.

Chart 3 International nominal government bond forward yield curves[a]

Source: Bank calculations.

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

Chart 4 International five-year nominal government bond yields, five years forward[a]

Source: Bank calculations.

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

and statements by policymakers (**Chart 1**). In line with market expectations, the European Central Bank (ECB) raised its main refinancing rate by 25 basis points in April, to 1.25%. Euro-area OIS rates were little changed over the review period.

At the short end of the money market curve, UK overnight interest rates traded at or around Bank Rate throughout the review period (a new sterling secured overnight interest rate — the repurchase overnight index average (RONIA) — is described on pages 97–98). In the United States, overnight interest rates fell relative to the interest rate paid on reserves held at the Federal Reserve. Contacts attributed this to a change in policy by the Federal Deposit Insurance Corporation, which included a change in the base on which bank deposit insurance fees are charged from domestic deposits to a measure that includes banks' reserves balances. In the euro area, the euro overnight index average (EONIA) traded closer to the ECB's main refinancing rate than during the previous review period. Contacts attributed this to lower aggregate liquidity held by euro-area banks over and above that necessary to meet reserve requirements.

Long-term interest rates

Nominal forward interest rates derived from government bond yields fell across the yield curve in the United Kingdom and the United States (**Chart 3**). In the euro area, longer-dated forward interest rates also fell, but there was little change at shorter horizons. In the United Kingdom and the United States, contacts attributed the changes at shorter horizons to the revised path for policy expectations.

Five-year interest rates, five years forward, which should be less affected by cyclical developments, fell (**Chart 4**). In the United Kingdom, this largely reflected a decline in implied inflation towards the end of the period, whereas in the United States and the euro area it was attributable mainly to a decline in real interest rates.
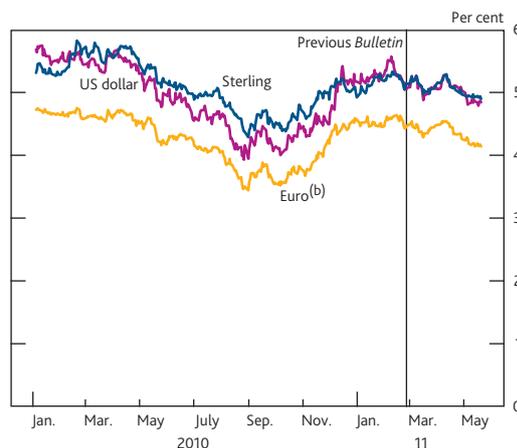
In the US Treasury market there was little lasting reaction to Standard & Poor's announcement of a revision to its outlook for the US sovereign credit rating from stable to negative. Concerns about fiscal developments continued, however, to be a key influence on bond yields of some euro-area periphery economies.

Over the review period, the yield spreads of Greek, Irish and Portuguese bonds over German bonds (bunds) rose sharply (**Chart 5**). On 6 April, the Portuguese Government informed the European Commission of its intention to ask for the activation of financial support mechanisms. This was largely expected by market participants, but there was uncertainty around the extent and form of the support mechanism. And market participants have increasingly focused on whether the existing support package for Greece will prove to be sufficient given the economic backdrop. Market participants have, however, appeared to differentiate

Operations within the sterling monetary framework and other market operations

Over the review period, the level of reserves continued to be determined by (i) the stock of reserves injected via the Asset Purchase Facility (APF), (ii) the level of reserves supplied by long-term repo open market operations (OMOs), and (iii) the net impact of other sterling ('autonomous factor') flows across the Bank's balance sheet. The box on pages 90–91 provides more detail on the APF. This box describes the Bank's operations within the sterling monetary framework over the review period, and other market operations.

Operational Standing Facilities

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

Indexed long-term repo OMOs

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

The Bank offered £5 billion via three-month ILTR operations on both 15 March 2011 and 12 April 2011, and £2.5 billion via a six-month operation on 17 May 2011 (**Table 1**). Two out of the three operations were uncovered, with the three-month April operation recording the lowest cover since the launch of ILTRs in June 2010.

The stop-out spread — the difference between clearing spreads for wider and narrow collateral — is an indicator of potential stresses in the market. In the March operation, this spread was similar to the previous three-month operations. But the stop-out spread in the April operation was the lowest in a three-month operation to date, at 18 basis points.

The proportion of the three-month funds allocated to wider collateral in the March and April operations fell compared with those held in December and January, from an average of 19% to 7%.

Table 1 Indexed long-term repo operations

	Total	Collateral set summary	
		Narrow	Wider
15 March 2011 (three-month maturity)			
On offer (£ millions)	5,000		
Total bids received (£ millions)[a]	5,525	5,255	270
Amount allocated (£ millions)	5,000	4,730	270
Cover	1.11	1.05	0.05
Clearing spread above Bank Rate (basis points)		0	22
Stop-out spread (basis points)[b]	22		
12 April 2011 (three-month maturity)			
On offer (£ millions)	5,000		
Total bids received (£ millions)[a]	3,535	3,250	285
Amount allocated (£ millions)	3,535	3,250	285
Cover	0.71	0.65	0.06
Clearing spread above Bank Rate (basis points)		1	19
Stop-out spread (basis points)[b]	18		
17 May 2011 (six-month maturity)			
On offer (£ millions)	2,500		
Total bids received (£ millions)[a]	2,435	2,335	100
Amount allocated (£ millions)	2,360	2,335	25
Cover	0.97	0.93	0.04
Clearing spread above Bank Rate (basis points)		0	16
Stop-out spread (basis points)[b]	16		

(a) Due to the treatment of paired bids, the sum of bids received by collateral set may not equal total bids received.
(b) Difference between clearing spreads for wider and narrow collateral.

The six-month operation on 17 May had a higher cover ratio than the February ILTR, but remained uncovered, with a cover ratio of 0.97. The May ILTR produced the lowest stop-out spread to date, at 16 basis points. This compares with an average of 50 basis points across previous six-month ILTRs. The proportion of reserves allocated against wider collateral in May was the lowest to date at 1%, down from 51% in February. This in part reflected the significantly smaller number of bids received against wider collateral.

Reserves provided via ILTRs during the review period were more than offset by the maturity of the previous long-term repo and ILTR operations. Consequently, the stock of liquidity provided through longer-term operations declined.

The box on page 93 summarises some of the results from the first twelve months of ILTR operations.

Discount Window Facility

The Discount Window Facility (DWF) is a permanent facility to provide liquidity insurance to the banking system. It allows eligible banks to borrow gilts against a wide range of collateral. On 5 April 2011, the Bank announced that the average daily amount outstanding in the 30-day DWF between 1 October and 31 December 2010 was £0 million. The Bank also announced that the average daily amount outstanding in the

364-day DWF between 1 October and 31 December 2009 was £0 million.

In accordance with the announcement on 30 November 2010, the Bank started accepting loan portfolios as eligible collateral in the DWF from April 2011.[1]

Other operations
Special Liquidity Scheme
The Special Liquidity Scheme (SLS) was introduced in April 2008 to improve the liquidity position of the banking system by allowing banks and building societies to swap their high-quality mortgage-backed and other securities for UK Treasury bills for up to three years. The Scheme was designed to finance part of the overhang of illiquid assets on banks' balance sheets by exchanging them temporarily for more easily tradable assets.

When the drawdown period for the SLS closed at the end of January 2009, £185 billion of UK Treasury bills had been lent under the SLS. In order to prevent a refinancing 'cliff', the Bank has held bilateral discussions with all users of the Scheme to ensure that there are plans in place to reduce their use of the Scheme in a smooth fashion. The impact of these repayment plans are shown in aggregate in **Chart A**, along with the repayment profile based on counterparties' contractual repayment obligations at end-2009 Q4, and the profile of actual repayments to date. By end-May 2011, £148 billion had been repaid, compared with £94 billion at end-February 2011.

Chart A Aggregate SLS repayment profiles
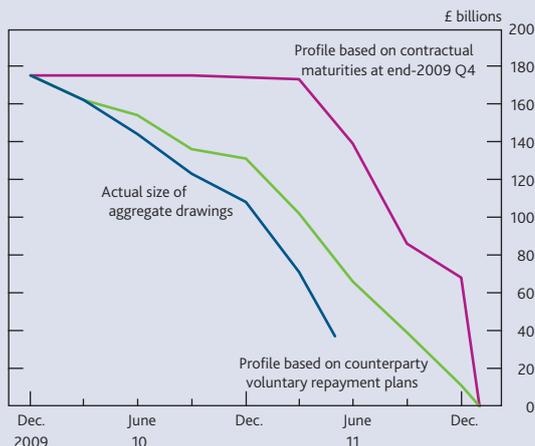
US dollar repo operations
In response to renewed strains in the short-term funding market for US dollars, from 11 May 2010 the Bank, in concert with other central banks, reintroduced weekly fixed-rate tenders with a seven-day maturity to offer US dollar liquidity. As of 20 May 2011, there had been no use of the Bank's facility.

Foreign exchange intervention
On 18 March 2011, G7 Finance Ministers and Central Bank Governors announced that, in response to the appreciation of the yen following the earthquake and tsunami in Japan, and at the request of the Japanese authorities, the authorities of Canada, the United Kingdom, the United States, and the European Central Bank would join with Japan in concerted intervention in foreign exchange markets.[2] On 18 March 2011, the Bank, under instruction from HM Treasury, and using the United Kingdom's official foreign exchange reserves, sold yen and purchased sterling in the foreign exchange market to give effect to the G7 Finance Ministers' communiqué.

Bank of England balance sheet: capital portfolio
The Bank holds an investment portfolio that is approximately the same size as its capital and reserves (net of equity holdings, for example in the Bank for International Settlements, and the Bank's physical assets), together with aggregate cash ratio deposits. The portfolio consists of sterling-denominated securities. Securities purchased by the Bank for this portfolio are normally held to maturity; nevertheless sales may be made from time to time, reflecting for example, risk management, liquidity management or changes in investment policy.

As of 20 May 2011 the portfolio included around £3.4 billion of gilts and £0.5 billion of other debt securities. Over the period from 26 February 2011 to 20 May 2011, gilt purchases were conducted in accordance with the quarterly announcements on 4 January 2011 and 1 April 2011.

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(1) Further details are in the Market Notice available at
    www.bankofengland.co.uk/markets/marketnotice101130dwf.pdf.
(2) Further details are in the HM Treasury press release available at
    www.hm-treasury.gov.uk/int_g7_intervention.htm.

Asset purchases[1]

The Bank did not undertake any Asset Purchase Facility (APF) gilt purchases over the review period. As a result, the stock of gilts held by the APF in terms of the amount paid to sellers remained at £198.3 billion.[2]

Purchases of high-quality private sector assets financed by the issuance of Treasury bills and the Debt Management Office's (DMO's) cash management operations continued, in line with the arrangements announced on 29 January 2009.[3]

Table 1 summarises operations under the APF over the review period by type of asset.

Corporate bonds

The Bank continued to offer to purchase and sell corporate bonds via the Corporate Bond Secondary Market Scheme. Reflecting the improvement in the corporate bond market since the Scheme was introduced, the Bank announced in late 2010 that it would adapt its reserve pricing to permit relatively more sales of bonds in the future. The Scheme continues to serve a useful role as a backstop, particularly during periods of market uncertainty.

Over the review period, activity in the Bank's auctions continued to be driven by broader market conditions. Sales of corporate bonds rose, while purchases fell, and so as of

19 May 2011 the Bank's portfolio totalled £1,153 million, compared to £1,304 million at the end of the previous review period. Market contacts suggested that this pattern of usage of the Scheme predominantly reflected more positive market sentiment and continued limited new issuance.

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. On 15 November 2010, the Bank provided twelve months' notice of its intention to withdraw this scheme, reflecting a sustained improvement in the sterling commercial paper market.

Average spreads on sterling-denominated CP over the review period were broadly stable and remain well below the levels seen in early 2009. Usage of the APF Commercial Paper Facility remained at £0 million over the period.

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 that support economic activity in the United Kingdom.[4] The Bank announced on 15 November 2010 that it had made a programme eligible for this facility. This programme has since issued SCP to the APF.

Table 1 APF transactions by type (£ millions)

Week ending[a]	Commercial paper	Secured commercial paper	Gilts	Corporate bond Purchases	Corporate bond Sales	Total[b]
24 February 2011[c][d]	0	25	198,275	1,304		199,605
3 March 2011	0	0	0	0	0	0
10 March 2011	0	0	0	0	5	-5
17 March 2011	0	30	0	17	0	47
24 March 2011	0	0	0	5	2	3
31 March 2011	0	0	0	0	3	-3
7 April 2011	0	0	0	0	29	-29
14 April 2011	0	0	0	2	20	-18
21 April 2011	0	30	0	0	19	11
28 April 2011	0	0	0	0	15	-15
5 May 2011	0	0	0	0	0	0
12 May 2011	0	30	0	0	51	-21
19 May 2011	0	30	0	0	29	1
Total financed by a deposit from the DMO[d][e]	–	30	–	261		291
Total financed by central bank reserves[d][e]	–	–	198,275	892		199,167
Total asset purchases[d][e]	–	30	198,275	1,153		199,458

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

Gilt lending facility[5]

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 2011, a daily average of £1,476 million of gilts were lent as part of the gilt lending facility. This was an increase from an average of £1,241 million in the previous quarter. The increase in the amount of gilts lent to the DMO resulted from an apparent shortage of particular gilts, which meant that market participants chose to borrow from the DMO rather than obtain the gilts in the market.

(1) The data cut-off for this box is 19 May 2011, unless otherwise stated. For further discussion on asset purchases see the *Asset Purchase Facility Quarterly Report* available at www.bankofengland.co.uk/publications/other/markets/apf/quarterlyreport.htm.
(2) Further details of individual operations are available at www.bankofengland.co.uk/markets/apf/gilts/results.htm.
(3) The APF was initially authorised to purchase private sector assets financed by Treasury bills and the DMO's cash management operations. Its remit was extended to enable the Facility to be used as a monetary policy tool on 3 March 2009. All purchases of assets between 6 March 2009 and 4 February 2010 were financed by central bank reserves. Since 4 February 2010 all purchases have been financed by the issuance of Treasury bills and the DMO's cash management operations.
(4) The SCP facility is described in more detail in the Market Notice available at www.bankofengland.co.uk/markets/marketnotice090730.pdf.
(5) For more details on the gilt lending facility, see the box 'Gilt lending facility' in the *Bank of England Quarterly Bulletin*, Vol. 50, No. 4, page 253.

Chart 5 Selected European ten-year government bond spreads[a]
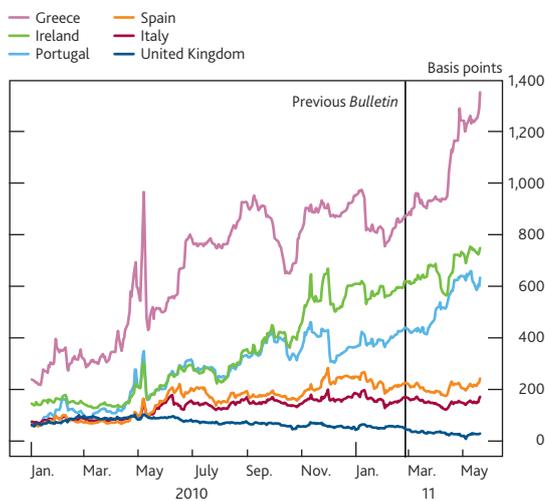
Sources: Bloomberg and Bank calculations.

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

Chart 6 Term issuance by the major UK lenders in public markets[a]
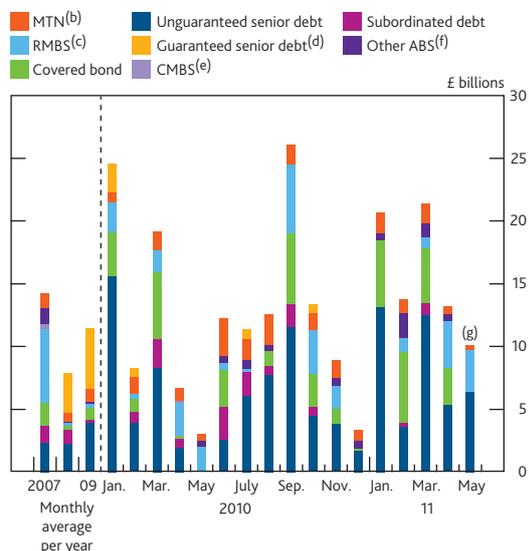
Sources: Bank of England, Dealogic and Bank calculations.

(a) Includes debt issued by Banco Santander, Bank of Ireland, Barclays, Co-operative Financial Services, HSBC, Lloyds Banking Group, National Australia Bank, Nationwide, Northern Rock and RBS. Term issuance refers here to securities with an original contractual maturity or earliest call date of at least 18 months. It includes subordinated lower Tier 2 and Tier 3 capital instruments with debt features.
(b) Medium-term notes.
(c) Residential mortgage-backed securities.
(d) Senior debt issued under HM Treasury's Credit Guarantee Scheme.
(e) Commercial mortgage-backed securities.
(f) Asset-backed securities.
(g) Data are up to 20 May 2011.

between bonds issued by those countries perceived to be most vulnerable and those issued by Spain and Italy, where movements in government bond spreads have been more muted.

In the United Kingdom, gilt yields fell relative to bunds. Market contacts attributed this to changes in near-term interest rate expectations.

Bank funding markets

Bank funding markets remained resilient. From the start of March to the end of the review period, UK banks issued £45 billion of debt in public markets (**Chart 6**). This compares to a combined issuance of £29 billion over those three months in 2010. Contacts reported, however, that issuance had been tempered somewhat, in part reflecting banks being less willing to issue during the periods of heightened uncertainty associated with both the earthquake and tsunami in Japan, and the ongoing political turmoil in the Middle East and North Africa.

Banks continued to use part of the funding raised to reduce their use of the Bank's Special Liquidity Scheme (SLS) (see the box on pages 88–89).

The unsecured market remains a major source of funding for the UK banking sector. The majority of this funding continues to be in the form of short-dated floating-rate instruments, although there were some signs of a lengthening in maturities over the review period. There was also a pickup in euro-denominated issuance since the previous *Bulletin*. Contacts attributed this in part to a desire by banks to diversify issuance away from the US dollar markets on which they had relied earlier in the year. But contacts also noted an increased appetite for euro-denominated debt among investors following the decision by the Irish Government not to impose

write-downs onto senior debt holders. In the secondary market there appeared to be little immediate reaction following Moody's announcement that it would review its assumptions for the level of government and central bank support it assumes when rating senior debt of UK banks. Subsequent to the review period, Moody's announced rating reviews, outlook changes and rating affirmations for a number of UK financial institutions.

Covered bond issuance continued to be an important source of funding for banks, particularly for those with limited access to unsecured funding. According to contacts, investors were attracted by the spreads on covered bonds, which were, on average, similar to those on unsecured issuance, but offered recourse to the underlying pool of assets in addition to recourse to the issuer. Furthermore, regulatory developments had made covered bonds a more attractive investment for insurance companies. Contacts continued to note, however, that increased covered bond issuance meant that unsecured creditors had recourse to a progressively smaller proportion of a bank's balance sheet in the event of a bank resolution, which may affect the ability of banks to access unsecured funding during times of stress.

Primary market activity in asset-backed securities remained low. Contacts noted, however, that the first UK commercial mortgage-backed security (CMBS) since the financial crisis is being marketed to investors. Developments in the primary market for UK CMBS are reviewed on pages 96–97.

Five-year UK bank credit default swap (CDS) premia, one indicator of long-term funding costs, ended the review period little changed (**Chart 7**). The spread of short-term interbank borrowing rates relative to OIS rates, an indicator of short-term bank funding conditions, rose slightly for sterling

Chart 8 Three-month Libor-OIS spreads[a]
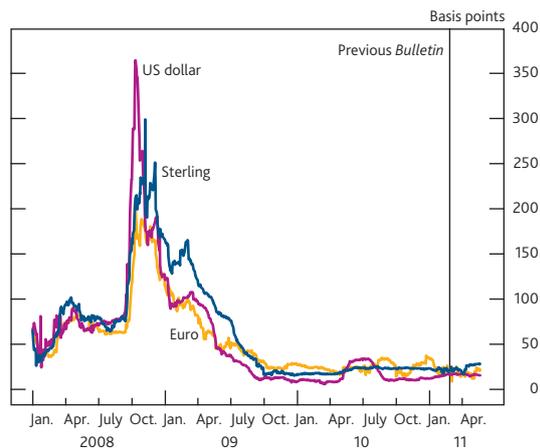
Sources: Bloomberg, British Bankers' Association and Bank calculations.

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

but remained close to the levels that have prevailed since late 2009 (**Chart 8**).

Corporate capital markets

Equity prices in the United Kingdom and in the United States ended the review period little changed, but fell by 2.6% in the euro area (**Chart 9**). These changes, however, mask a sharp fall in equity prices in mid-March, following the Japanese earthquake and tsunami and amid heightened political tensions in the Middle East and North Africa. The Japanese equity market fell by almost 18% in the immediate aftermath of the disaster and ended the review period around 12% lower. The falls in equity prices were accompanied by a rise in option-implied equity volatility, a forward-looking measure of uncertainty, although this fell back subsequently (**Chart 10**). Later in the review period, better-than-expected first quarter

Chart 7 Selected international banks' CDS premia[a]

Source: Markit Group Limited.

(a) Unweighted averages of five-year, senior CDS prices.
(b) Average of Bank of America, Citi, Goldman Sachs, JPMorgan Chase & Co. and Morgan Stanley.
(c) Average of Barclays, HSBC, Lloyds Banking Group, RBS and Standard Chartered.
(d) Average of BBVA, BNP Paribas, Crédit Agricole, Credit Suisse, Deutsche Bank, Santander, Société Générale, UBS and UniCredit.

Chart 9 International equity indices[a][b]
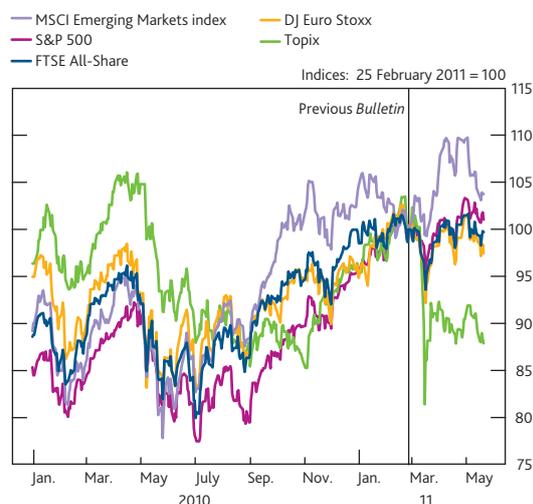
Sources: Bloomberg and Bank calculations.

(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 Bank's indexed long-term repo operations

Background

The Bank revised the design of its long-term repo operations in June 2010.[1] At the time the new auction design was introduced, the Bank announced that it would confirm the operational framework after a period of observing the functioning of the new operations.

The primary objective of the indexed long-term repo (ILTR) operations is to provide liquidity insurance without distorting commercial banks' incentives for prudent liquidity management, and while minimising the risks being taken by the Bank. To date, the Bank has offered ILTRs on a monthly basis with two £5 billion auctions with a three-month maturity and one £2.5 billion auction with a six-month maturity offered in each calendar quarter.

The new operations allow participants to bid against two distinct sets of collateral known as 'narrow collateral' and 'wider collateral' with the split of lending between the two sets determined as part of the auction.

This box reviews some of the results from the first twelve operations held between June 2010 and May 2011.

Operational features

The ILTRs operate a uniform price allocation method. This means that every successful bidder on a given collateral set pays the same price (the clearing rate). This should mean that participants face little incentive to alter their bids based on assumptions about other participants' likely behaviour. It is difficult to establish the extent to which the change to a uniform price allocation mechanism has affected participants' bidding strategies. Moreover, this may be more easily observable in stressed circumstances when the value placed on longer-term liquidity is likely to be more variable across participants.

In addition to submitting individual bids against each collateral set, participants may choose to submit 'paired bids', consisting of a single nominal amount and two spreads at which the participant is willing to borrow against the delivery of narrow and wider collateral respectively. This increases the likelihood that participants will succeed in raising a specific quantity of liquidity while avoiding any risk of overallotment. There has been limited use of this new feature to date.

Auction results

On average, there has been greater demand relative to the amount on offer in the auctions with a six-month maturity. Counterparties suggest that this in part reflected the attractiveness of securing longer-term liquidity resulting from the need to comply with new regulatory liquidity requirements and, particularly in the initial operations, the relative scarcity of longer-maturity market funding.

Cover (the ratio of total bids to the amount on offer) has averaged 1.21 and 1.50 across three-month and six-month operations respectively. The average level of cover across operations of the same maturity was higher during the first six months of operations. Contacts suggested that the reduced level of participation in the second six months reflected the increased availability of longer-term liquidity in the market.

With the exception of the May six-month ILTR auction, which produced the lowest clearing spread on wider collateral across auctions to date (**Chart A**) — clearing spreads for wider collateral in six-month auctions have been well above clearing spreads in the three-month auctions. In general, clearing spreads across auctions were close to market price indicators for the same maturity.

Chart A ILTR allocation and clearing spreads
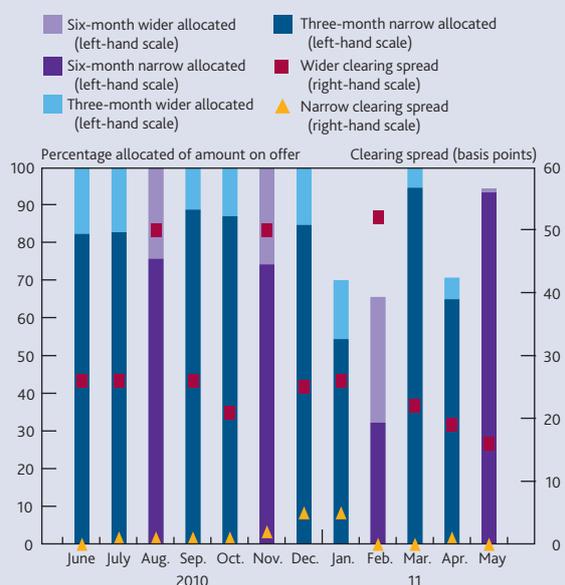
Operational framework

The Bank has previously stated that it could adjust the frequency, size or maturity of ILTRs in light of evidence of system-wide stress, including as revealed by demand in previous auctions. The majority of bids in ILTRs to date have been against narrow collateral, while the pattern of bids received and broader indicators of market conditions have not been indicative of market-wide stress. Reflecting this, the Bank made no changes to these parameters over the period. But the Bank will keep these parameters under review in light of market conditions and revealed demand in future operations.

Based on the operations to date, the Bank is satisfied that the operational framework outlined in the Market Notice of 15 June 2010 meets the policy objectives of the ILTRs.[2]

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(1) For further details see 'The Bank's new indexed long-term repo operations', in the 2010 Q2 *Bank of England Quarterly Bulletin*, pages 90–91.
(2) Available at www.bankofengland.co.uk/markets/marketnotice100615.pdf.

Chart 10 Six-month option-implied volatility for international equity indices
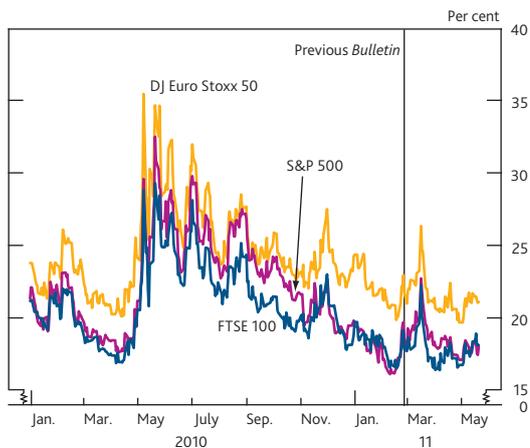
Sources: Bloomberg, Chicago Mercantile Exchange, NYSE Liffe and Bank calculations.

corporate earnings supported a recovery in UK, US and euro-area equity prices.

The changes in equity prices over the review period also masked divergences between different sectors, with the oil and gas sector among the worst performing. The falls in the oil and gas sector coincided with sharp falls in commodity prices in early May (**Chart 11**). For example, the S&P GSCI index for energy commodities fell by more than 10%, reversing earlier gains to end the review period little changed. Industrial metals ended the review period 7% lower and the price of silver fell by almost 30% in the three weeks from its peak at the end of April. Contacts attributed the falls to a number of factors, including weaker-than-expected activity data and associated concerns about the strength of the global recovery.

Chart 11 Selected commodity price indices(a)
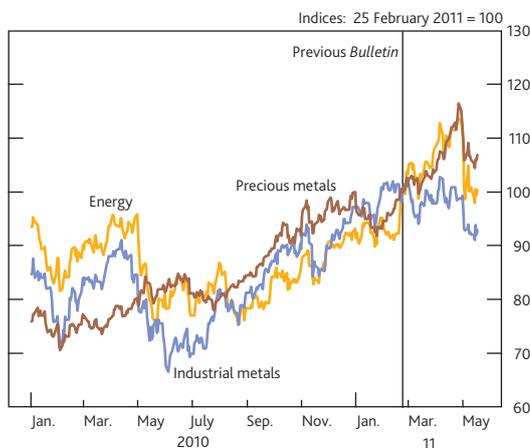
Source: Standard & Poor's.

(a) Series refer to S&P GSCI total return indices.

Spreads on investment-grade corporate bonds denominated in sterling and US dollar were broadly stable during the review period, while euro-denominated bond spreads continued to

narrow (**Chart 12**). Contacts largely attributed such resilience in the face of the aforementioned events to the abundance of liquidity, but noted that the strength of corporate balance sheets also played a role. Spreads on sterling and euro-denominated investment-grade bonds remained, however, above their pre-crisis long-term averages.

Chart 12 International investment-grade, non-financial corporate bond spreads(a)(b)
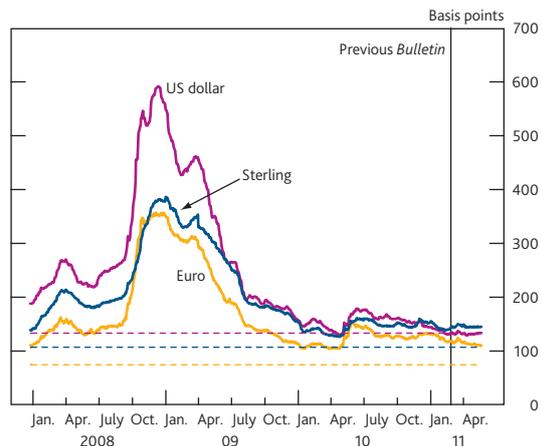
Sources: Bank of America/Merrill Lynch and Bank calculations.

(a) Option-adjusted spreads over government bond yields.
(b) Dashed lines: 1997–2007 averages.

International high-yield bond spreads were also little changed since the previous *Bulletin*. As global issuance of high-yield bonds reached record levels in the year to date, some contacts thought that high-yield bond prices were supported by investors seeking to maintain returns in a low-yield environment, particularly in the United States. This was consistent with continued strong inflows into high-yield bond mutual funds over the review period, although the pace had recently moderated relative to levels earlier in 2011 (**Chart 13**).

Chart 13 Net inflows into global high-yield bond mutual funds
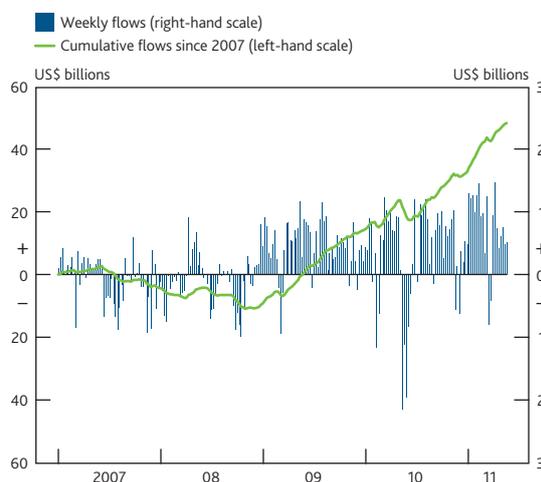
Source: Emerging Portfolio Fund Research.

UK private non-financial corporations (PNFCs) continued to rely on the corporate bond market as an important source of funding, with cumulative gross issuance in the year to date above its average between 2003 and 2008 (**Chart 14**).

Chart 14 Cumulative gross bond issuance by UK PNFCs[a]
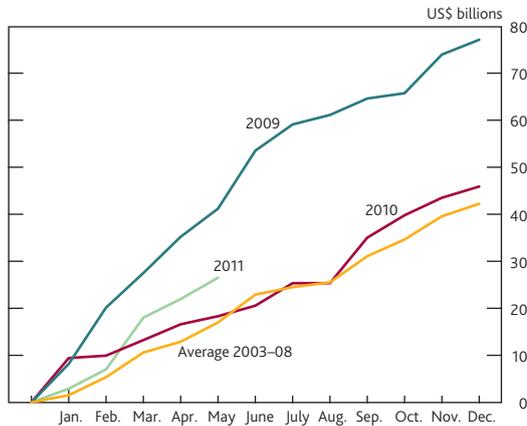
Sources: Dealogic and Bank calculations.

(a) Includes medium-term notes.

In the United States, increasing mergers and acquisitions activity has been reported as supporting bond issuance. There have also been signs of a relaxation in credit standards, especially in the leveraged loan market. These include an increase in the proportion of so-called 'covenant-lite' loans, which provide less protection to lenders, and the issuance of debt to pay special dividends, so-called 'dividend recapitalisations'.

In contrast, contacts reported that the proceeds of bond issuance in Europe continued to be used mostly to refinance maturing debt. Consistent with this, aggregate net bond issuance by UK PNFCs over the past 18 months has been

Chart 15 Net capital market issuance by UK PNFCs[a]
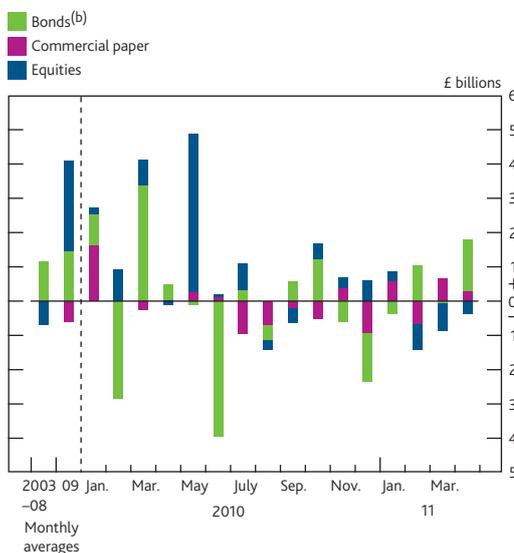
(a) Non seasonally adjusted.
(b) Includes stand alone and programme bonds.

below its monthly average between 2003 and 2008, although it has increased somewhat in recent months (**Chart 15**). Net equity issuance turned negative as gross issuance remained subdued and share buyback activity picked up. Contacts attributed the recent increase in share buybacks to a reduction in uncertainty about future cash requirements, although buyback activity remains well below pre-crisis levels.

Foreign exchange

The sterling exchange rate index (ERI) remained within the relatively narrow band in which it has traded since the start of 2010 (**Chart 16**). Over the review period, sterling depreciated by 2% against the euro. This was partly offset by a 1% appreciation against the US dollar, leaving the sterling ERI 1% below its level at the start of the period.

Chart 16 Cumulative changes in sterling ERI and bilateral exchange rates since 4 January 2010
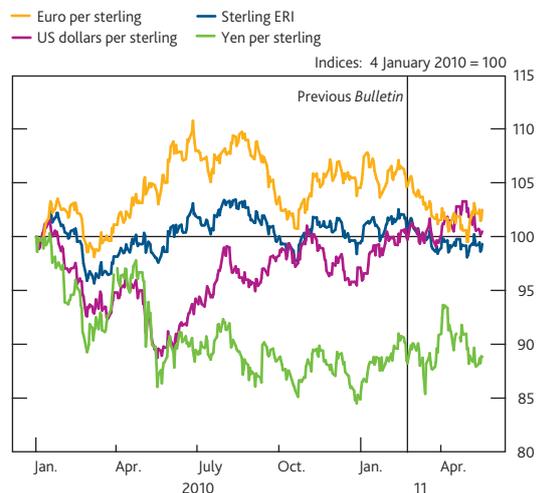
Sources: Bloomberg and Bank calculations.

At the end of the review period, the changes in sterling bilateral exchange rates since the previous *Bulletin* were broadly consistent with changes in relative interest rates (**Chart 17**). Moreover, the euro-sterling exchange rate closely tracked movements in relative interest rates throughout the review period.

Market-based measures of forward-looking uncertainty about the sterling-euro and sterling-US dollar bilateral exchange rates were little changed over the review period (**Chart 18**). But they did rise for the sterling-yen exchange rate, triggered by uncertainty about the economic impacts of the earthquake and tsunami in Japan. The yen appreciated sharply immediately following these events, which contacts attributed to expectations that Japanese insurance companies would repatriate assets to meet claims. But the yen subsequently depreciated following an announcement by G7 Finance Ministers of a co-ordinated intervention in foreign exchange markets (this is described in the box on pages 88–89). Over the review period as a whole, the yen ERI fell by around 1%.

Chart 17 Implied contribution of interest rate 'news' to cumulative changes in sterling bilateral exchange rates since the previous *Bulletin*(a)
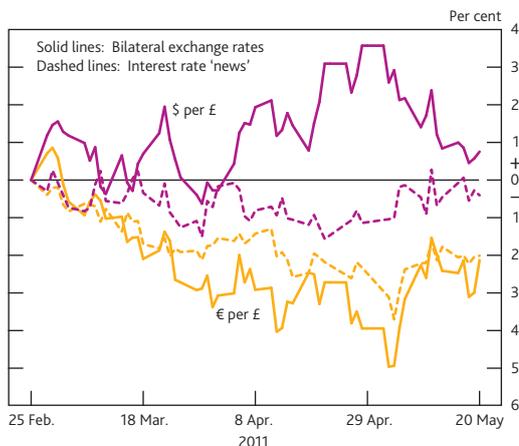
Source: Bank calculations.

(a) For more information on the analytics required to isolate the impact of interest rate 'news' on exchange rates, see Brigden, A, Martin, B and Salmon, C (1997), 'Decomposing exchange rate movements according to the uncovered interest rate parity condition', *Bank of England Quarterly Bulletin*, November, pages 377–89.

Chart 18 Three-month option-implied volatility of foreign exchange rates
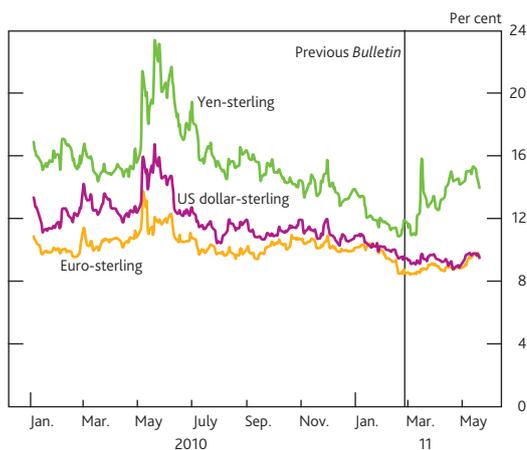
Sources: Bloomberg and Bank calculations.

Market intelligence on developments in market structure

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

Based on intelligence of this kind, this section first reviews developments in the primary market for UK commercial mortgage-backed securities (CMBS). It then describes a new sterling secured overnight interest rate — the repurchase overnight index average (RONIA).

The UK commercial mortgage-backed securities market

A commercial mortgage-backed security (CMBS) is a debt instrument where the payment of interest depends on the cash flow generated by a single or a pool of commercial mortgage loans. CMBS are typically issued in tranches, with each tranche providing a different level of credit protection.

In common with other securitisation markets, the CMBS market has been severely impacted by the financial crisis: there has been no issuance of a CMBS secured on UK commercial property since August 2007, although contacts reported that one new transaction is being marketed to investors.[1] By contrast, in the United States, contacts reported that there was CMBS issuance of around $12 billion in 2010, and they expect $35 billion–$45 billion of issuance in 2011, albeit these amounts are well below the issuance levels of 2006 and 2007.

Contacts partly attributed the lack of UK CMBS issuance to the high level of yields required by investors, which in recent years has often made new issuance uneconomic. Contacts have also noted some features of the UK CMBS market that have made new issuance more difficult than in the United States. These features are described below.

UK and US CMBS

The US CMBS market originated in the 1990s and is said to be around $600 billion in size. The market grew rapidly in the years before the financial crisis; contacts reported issuance of more than $200 billion in 2007. The financial crisis then led to the effective closure of the market before it reopened last year.

According to contacts, a typical US CMBS contains rarely less than 30 loans and often more than 100 loans. The diversification provided by a large number of loans means that investors are less exposed to the performance of each individual loan, thereby increasing the homogeneity of US CMBS. Furthermore, in the United States, borrowers are often willing to accept long-term loans that are difficult or expensive to repay early. This helps US CMBS to be structured as a long-dated fixed-coupon instrument that is attractive to long-term investors such as insurance companies and pension funds.

(1) In the United Kingdom, some corporates have issued long-dated fixed-rate bonds secured on real estate as part of sale and leaseback transactions. However, market participants tend to regard these transactions as a form of corporate debt, rather than CMBS.

The amount of outstanding CMBS secured on UK commercial property is said to be around £35 billion. Most of this was issued in 2005, 2006 and the early part of 2007. According to contacts, there are a number of key features that distinguish UK CMBS from US CMBS. For example, the smaller size of the UK commercial property market means that a UK CMBS will typically only contain a few loans, resulting in little diversification for investors. Another difference is that UK CMBS are normally shorter-dated floating-rate instruments, as this structure has previously been attractive to both borrowers and investors.

Challenges facing the UK CMBS market

The structure of UK CMBS means that in the past the market has had a different kind of investor base to US CMBS. In fact, before the financial crisis, the largest buyers of UK CMBS were banks and off balance sheet investment vehicles. Since the financial crisis, this investor base has largely disappeared. Contacts cited this as one of the reasons why the UK market has been slow to reopen.

Contacts also highlighted a range of features that have caused problems with pre-crisis UK CMBS issuance. One example cited is the absence of a common legal structure and the associated lack of certainty over how problems — such as situations where the underlying loans have missed interest payments or cannot be refinanced — will be resolved. In addition, in some cases, transaction documentation has been found to contain mistakes. Contacts also noted that the lack of diversification in a typical UK CMBS means that it is especially important for investors to conduct a detailed analysis of the underlying loans. Information on this is, however, often said to be difficult to obtain.

The faster recovery of the US market is reported in part to reflect its more established nature. Contacts also noted that, in the United States, non-bank financial institutions such as insurance companies have been direct lenders in commercial real estate for some time. This is said to open up an investor base that is already familiar with the risks inherent in commercial property debt. Many investors are also attracted by the long-dated fixed-rate format of US CMBS.

The outlook for the UK CMBS market

Contacts reported that for the UK CMBS market to successfully reopen, issuers will need to address the concerns raised by investors and expect new CMBS to be simpler, more transparent and display higher underwriting standards than some pre-crisis transactions. In this vein, the Commercial Real Estate Finance Council (CREFC) — an industry trade association — has set up a committee to consider common standards.

Overall, contacts expected the UK CMBS market to reopen in 2011 with insurance companies, pension funds and asset managers seen as likely to be among investors. But volumes are likely to be much smaller than prior to the financial crisis; most contacts suggested that total issuance of around £1 billion during 2011 would be seen as a positive start.

Repurchase overnight index average (RONIA)

The Wholesale Markets Brokers' Association (WMBA) has started to publish a new sterling secured overnight interest rate index — the repurchase overnight index average (RONIA).[1] Prior to this, data on traded overnight secured interest rates had only been visible to those with access to data from brokers, primarily market participants. RONIA therefore provides transparency on the volumes and the interest rates at which overnight secured transactions take place. The Bank values this transparency because secured overnight interest rates form part of the transmission mechanism of monetary policy.

The RONIA fixing is the weighted average interest rate of all secured (ie repo) sterling overnight cash transactions of a certain type. The only eligible transactions are those conducted via brokers using CREST's delivery-by-value mechanism, a way of borrowing sterling cash against gilt collateral. RONIA represents the secured analogue of the sterling overnight index average (SONIA) fixing, which captures unsecured overnight interest rates and is also published by the WMBA.

Interest rates and trading volumes

Chart 19 shows RONIA fixings alongside the SONIA fixings and Bank Rate. This shows that RONIA and SONIA have tended to move closely together. Differences between the SONIA (unsecured) and RONIA (secured) interest rates might in part reflect collateral effects; for example, a shortage of collateral putting downward pressure on secured interest rates.

Chart 19 SONIA and RONIA fixings, and Bank Rate
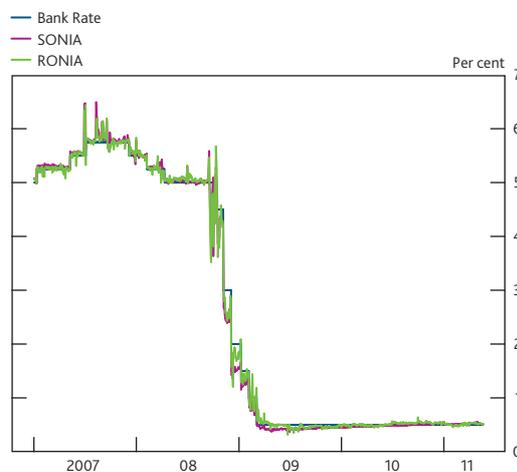
Source: Wholesale Markets Brokers' Association.

(1) See www.wmba.org.uk. The WMBA has also made available a time series of the data going back to the start of 2007.

As well as the weighted average interest rate, the WMBA also publishes the volume of trades transacted at each interest rate. RONIA volumes have, on average, remained around the levels that prevailed during the financial crisis, whereas unsecured trading volumes have fallen over the past few years (**Chart 20**).

Derivative instruments

As well as providing transparency, a published RONIA fixing also facilitates the possible creation of derivative products linked to secured overnight interest rates. Just as there are overnight index swaps (OIS) referenced to SONIA, contacts have suggested that the publication of the RONIA fixing could lead to OIS referenced to RONIA. As well as possibly providing a better way of hedging the interest rate risk on repo transactions, such RONIA swaps would also offer an alternative way of gauging market expectations of the path of Bank Rate.

Chart 20 SONIA and RONIA volumes (28-day moving average)
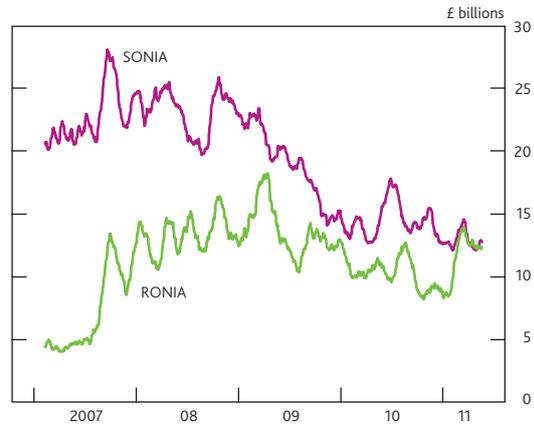
Source: Wholesale Markets Brokers' Association.

Research and analysis

Assessing the risk to inflation from inflation expectations

By Clare Macallan and Tim Taylor of the Bank's Monetary Assessment and Strategy Division and Tom O'Grady of the Bank's Structural Economic Analysis Division.[1]

Inflation expectations play an important role in the transmission mechanism of monetary policy. There is a risk that the periods of above-target CPI inflation in the past three years might cause inflation expectations to drift upwards. That might make inflation itself more persistent, via changes in price and wage-setting behaviour. And so, other things being equal, returning inflation to target would require tighter monetary policy. This article provides a framework that can be used to monitor the risk to inflation from inflation expectations. While recent developments provide few signs that the risk is materialising, the imperfect nature of data mean that the risk can be assessed only imperfectly.

Introduction

Over the past three years, inflation, measured by the annual change in the consumer prices index (CPI), has frequently been more than 1 percentage point above the 2% target set by the Government and has averaged 3.2% during that period (**Chart 1**). The elevated rate of inflation reflects the temporary effects of a number of factors including: increases in food and energy prices; higher import prices following the substantial depreciation in sterling; and increases in the standard rate of VAT. The outlook is highly uncertain, but the Monetary Policy Committee (MPC) judges that inflation is likely to remain elevated throughout the remainder of 2011, before falling back during 2012 as the temporary effects wane and downward pressure from spare capacity persists.[2]

There is a risk that recent high inflation outturns might prompt households, companies and financial market participants to

expect inflation to persist above the target. That might happen if they believe that the MPC has become more tolerant of deviations of inflation from target in the near term than is in fact the case. Or individuals might have doubts about the willingness or ability of the MPC to return inflation to target in the medium term. In either case, expectations of inflation would have become less well anchored by the monetary policy framework.

If inflation expectations were to become less well anchored, inflation itself might become more persistent. That might occur through a change in price-setting or wage-setting behaviour. For example, if companies were to believe that inflation would remain above the target for longer, then they might raise the prices of the goods and services that they produce by more, or more frequently, than they otherwise would. And they might become more willing to grant increases in wages, because they would expect to be able to raise the prices that they charge their customers. An increase in the persistence of inflation, other things being equal, would mean that returning inflation to target would require the MPC to tighten monetary policy by more than it otherwise would.

This article discusses how a range of indicators may be used to monitor inflation expectations and price and wage-setting behaviour. The first section explains why it would be costly if inflation expectations were to become less well anchored. The second and third sections explain how various indicators can be used to assess the extent to which inflation expectations remain

Chart 1 Inflation
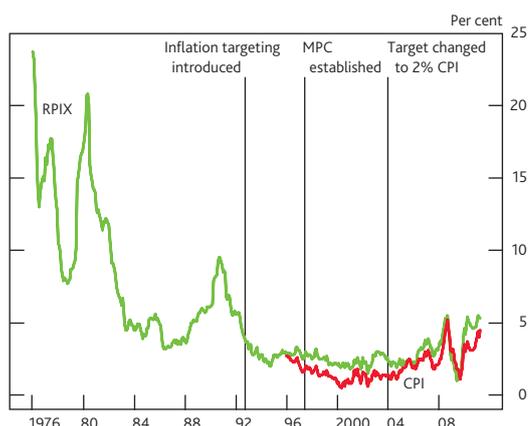
anchored by the monetary policy framework. And the fourth and fifth sections discuss various indicators that might be symptomatic of inflation expectations making inflation more persistent via changes in price and wage-setting behaviour.

At the end of each section, recent developments in these indicators are reviewed, to assess whether inflation expectations appear to have become less well anchored in the past year. The latest data suggest that long-term inflation expectations remain anchored by the monetary policy framework. And, although evidence from shorter-term inflation expectations is more mixed, there are few signs that inflation expectations have affected price or wage-setting behaviour. But the imperfect nature of data and uncertainty surrounding the metrics used, mean that the analysis below cannot indicate with certainty the extent to which inflation expectations remain anchored: the presence or absence of evidence is suggestive at best. Monitoring and assessing these indicators therefore remain a key area of focus for the MPC. An accompanying article in this edition of the *Bulletin* on pages 111–15, examines what might be learnt from movements in inflation expectations during past episodes of sustained off-target inflation across a range of inflation-targeting countries (Corder and Eckloff (2011)).

Inflation expectations and the monetary policy framework

The Bank of England's monetary policy objective is to meet the Government's inflation target.[1] But the policy remit recognises that, in practice, unforeseen events are likely to cause inflation to depart from the target and that attempts to prevent such movements in inflation might generate undesirable volatility in output. Consequently, the MPC sets monetary policy so that inflation will return to target in the medium term.

The MPC is able to meet its monetary policy objective more easily when inflation expectations are anchored by the monetary policy framework. If inflation expectations are anchored, in the sense that deviations of inflation from target are expected to be transitory, then companies and households are likely to set prices and wages in a way that will help to limit the extent to which any deviation in inflation persists. Conversely, if inflation expectations were to become less well anchored, deviations of inflation from target might trigger changes in price-setting and wage-setting behaviour that make those deviations more persistent. If inflation was to rise above target, that would mean that the MPC would have to tighten monetary policy by more than it otherwise would do to return inflation to target, other things being equal, which would result in a lower level of demand. The box on page 102 explains in more detail how inflation expectations may be formed and what it means for them to be anchored.

Assessing whether long-term inflation expectations remain anchored

If individuals' expectations about inflation in the long term were to become less well anchored to the inflation target, then that might become apparent in at least one of three ways. First, the level of long-term inflation expectations might move away from the target. Second, long-term inflation expectations might become more responsive to developments in the economy. And third, uncertainty about future inflation might increase. This section discusses how different indicators might point to these symptoms materialising and reviews the latest data to assess whether long-term inflation expectations have become less well anchored to the target.

The level of long-term inflation expectations
A range of data provides information about the level of inflation expected by different groups, such as households, professional forecasters and financial market participants, in the longer term. For example, surveys of households and professional forecasters ask respondents about expected inflation. And instruments traded in financial markets, such as inflation swaps or conventional and index-linked bonds, can give an indication of the long-term rate of inflation expected by financial market participants.

These different indicators have relative advantages and disadvantages for assessing whether long-term expectations remain anchored. Although the inflation expectations of households are likely to have an important influence on the extent to which the risk from inflation expectations materialises, for example because of the role they may play in wage negotiations, survey estimates are difficult to interpret. It is not clear what measure of inflation households have in mind when answering the questions.[2] And most of the surveys have only a short backrun of data, which makes it difficult to assess what level of reported inflation expectations would be consistent with inflation being close to target in the long term. Surveys of professional forecasters might provide a more clear-cut or timely signal that inflation expectations have moved away from target, because the questions ask specifically about CPI inflation and professionals' expectations may lead those of households.[3] But few of the measures go beyond four years ahead. Estimates of inflation expectations

(1) Subject to that, the Bank is also tasked with supporting the Government's economic objectives, including those for growth and employment. The MPC seeks to achieve its objectives by setting the level of Bank Rate and, since March 2009, by purchasing assets financed by the issuance of central bank reserves.
(2) None of the surveys of households reference a specific inflation measure. For example, the Bank/GfK NOP survey asks households what they expect to happen to 'prices in the shops generally'.
(3) For example, Carroll (2003) shows that households may use information about the forecasts of professionals in forming their inflation expectations. Surveys of professionals might also provide a more reliable indication of long-term inflation expectations than those of households, because professionals may devote more time and effort to forecasting inflation, with reputational or financial concerns giving them stronger incentives to provide a considered response.

How inflation expectations may be formed and what it means for them to be anchored

This box describes how households, companies and financial markets might form their expectations about inflation in an economy with an inflation-targeting Monetary Policy Committee (MPC), and explains what it means for inflation expectations to be anchored.

It is common in economic models to assume that individuals form expectations about future inflation using a full set of information on the state of the economy and a full knowledge of how the economy operates. Under so-called 'rational' or 'model-consistent' expectations, individuals also know the inflation target objective of the MPC and understand how it reacts to economic developments. Assuming that the MPC shares the same information and view of how the economy operates, then individuals' expectations about future inflation match the path along which the MPC chooses to return inflation to target. In that sense, expectations can be said to be 'anchored'.

In practice the costs of forming expectations in this way, such as the time and effort required to collect and process information and to understand how the economy works, are very likely to exceed the benefits of doing so for most individuals.

To avoid these costs, people may instead use simple rules of thumb to inform their expectations. There are various rules that individuals might use. For example, individuals might expect inflation to be always at target, or to remain at its current value. Individuals may also switch between using different rules, depending on how well each has performed at forecasting inflation in the past (Brazier *et al* (2008)).

There are other ways in which expectations may be formed, which lie somewhere in between 'rational' expectations and simple rules of thumb. For example, individuals might reduce the costs of forming 'rational' expectations by acquiring and processing new information only infrequently. That might mean that only a proportion of all individuals may update their information each period, as in the 'sticky information' model of Mankiw and Reis (2002). Or individuals might rely on the media to process new information, rather than doing so themselves (Carroll (2003)). Alternatively, while individuals may not have complete knowledge of how the economy works, they might learn about the state and structure of the economy from their recent experiences (Evans and Honkapohja (2001)). That could include learning about the objectives of the MPC: either its target for inflation and/or its tolerance of deviations from that target.

However they are formed, inflation expectations could be defined as being anchored if they are consistent with the MPC's inflation-targeting remit. That is to say, whatever process drives expectations, it should embody the expectation, with a reasonable degree of confidence, that inflation will return to target in the medium term and remain there.

The propensity for inflation expectations to remain anchored is likely to depend both on the way in which they are formed and on past outturns of inflation. As noted above, 'rationality' implies that inflation expectations are always anchored when the MPC pursues a remit to stabilise inflation. That is in part because its objectives, by assumption, are fully understood.

If inflation is close to target for an extended period — as it was in the first ten years of the MPC — then other, simpler, models of expectation formation are likely to deliver expectations that are anchored. For example, if individuals form expectations using a simple rule of thumb based on past inflation, it seems likely that a long sequence of inflation outturns close to target would become embedded such that inflation is always expected to return to target in the medium term.

But a persistent deviation of inflation from target might cause inflation expectations to become less well anchored. For example, if individuals use their recent experiences to learn about the objectives of the MPC, that might prompt them to change their beliefs about the MPC's ability or willingness to bring inflation back to target in the medium term, or to think that the policy committee would return inflation to target more slowly than in the past. So a persistent deviation would become embedded in inflation expectations at least until inflation returned to target. In all cases, expectations of inflation would have become less well anchored.

derived from financial market instruments are available at longer horizons. But these estimates may be influenced by factors other than inflation expectations. For example, prices may be affected by market-specific factors, such as liquidity.[1] And yields on nominal financial instruments will include a premium to compensate investors for uncertainty about future inflation, which may vary over time.

The responsiveness of long-term inflation expectations to news

If long-term inflation expectations were to become less well anchored to the target, they may become more responsive to developments in the economy. In an environment of well-anchored inflation expectations, long-term expectations should not respond systematically to data outturns, because those outturns have little bearing on inflation several years ahead. But if individuals question the extent to which the MPC will allow developments to have a persistent effect on inflation, then they may revise their long-term expectations in response to news about inflation and the wider economy.

Although the argument holds for any type of economic news, a simple indicator to monitor is how implied measures of inflation expectations derived from financial instruments change in response to information about contemporaneous CPI inflation (Gürkaynak *et al* (2006)).[2] Similarly, a de-anchoring might also become evident in an increase in the responsiveness of implied measures of longer-term inflation expectations to changes in shorter-term measures. If individuals believe that developments that affect inflation in the shorter term will also have an effect on inflation in the longer term, that would tend to increase the correlation between changes in shorter-term and in long-term expectations. That said, changes in the correlation might also reflect variations in liquidity in the markets for short and long-maturity instruments.

Uncertainty about inflation in the long term

Even if central expectations of long-term inflation do not change, individuals may become less certain about how the MPC will react to current or future developments in the economy that push inflation away from target. That uncertainty might manifest itself either in greater disagreement across individuals about what inflation is likely to be in the future, or in greater uncertainty for any one individual about the range of possible outcomes.[3]

But uncertainty about future inflation may change even if long-term expectations remain anchored, because individuals may change their views about the size and persistence of shocks that are likely to affect the economy in the future. For example, following the financial crisis, individuals may believe that further shocks are more likely to occur. That re-evaluation of expected future disturbances might cause them to become

more uncertain about the prospects for inflation, even if their beliefs about the monetary policy framework do not change.

A range of indicators can be used to monitor uncertainty. Measures of dispersion of inflation expectations, such as the interquartile range, derived from surveys of households and professional forecasters, provide evidence on differences in views across individuals. The Bank of England's survey of forecasters provides evidence on the extent of individual uncertainty because it asks each forecaster to attach specific probabilities to a range of different outcomes for future inflation. Options prices, which can be used to estimate the weight that market participants collectively attach to different future inflation outturns, are likely to contain information about both: they will be influenced by the uncertainty of any one individual trading in the options market and by the variation in views between different market participants.

Have long-term inflation expectations become less well anchored recently?

Movements in most measures of longer-term inflation expectations do not appear to suggest that expectations have become less well anchored to the target in the past year (**Table A**). Although two of the three survey estimates of households' long-term expectations have picked up a little in that period, all three are within 1 percentage point of their historical averages. And the expectations of most professional forecasters appear to have been broadly stable around the 2% target in the past twelve months. Implied measures of long-term inflation expectations derived from financial markets have fallen in the past year: although the levels of these estimates remain somewhat higher than the 2% target, that is likely to be because these measures include a premium to compensate investors for the uncertainty surrounding future inflation.

In financial markets, there are few signs that implied measures of long-term inflation expectations have become more responsive to developments in the economy in the past year. Between 2004 and 2007, when inflation was around target on average, implied measures of long-term inflation expectations derived from gilt yields — referred to as long-term inflation breakevens — tended to respond very little to news about contemporaneous CPI on the day of publication of the data (**Chart 2**). And there is no evidence that a positive correlation has emerged in the most recent twelve-month period.[4]

(1) Another market-specific factor is demand from pension funds for index-linked cash flows, which has probably pushed up estimates of inflation expectations derived from financial market instruments since 2006. For more information, see McGrath and Windle (2006).

(2) Financial market data are available at a daily frequency. That makes it easier to isolate the effect of news on implied measures of inflation expectations derived from financial market instruments than, say, on survey-based estimates of households' inflation expectations, which are available at a monthly frequency at best.

(3) For more information on how measures of uncertainty and disagreement are related, see Boero *et al* (2008).

(4) The results are the same when looking at the reaction of implied measures of long-term inflation expectations over two days, rather than just one, and when using measures derived from swaps, rather than gilts.

Table A Measures of expected long-term inflation

	Time horizon	Start of data	Series average (per cent)	May 2011 (unless otherwise indicated) (per cent)	Change over preceding twelve months (percentage points)
Surveys of households					
Bank/GfK NOP[a]	5 years	Feb. 2009	3.1	3.3	0.2
Barclays Basix[b]	5 years	Aug. 2008	3.8	3.0	-1.1
YouGov/Citigroup[c]	5–10 years	Nov. 2005	3.4	3.5	0.4
Surveys of professional forecasters					
Bank	3 years	May 2006	2.0	2.2	0.0
HM Treasury	4 years	Mar. 2006	2.1	2.1	-0.1
Consensus	5–10 years	Oct. 2004	2.2	2.5[d]	0.0
Measures derived from financial instruments[e]					
Swaps	Five-year, five-year forward	Oct. 2004	2.5	2.5	-0.2
Gilts	Five-year, five-year forward	Jan. 1985	3.3	2.7	-0.2
Memo:					
CPI		Jan. 1996	2.0	4.5[d]	0.8

Sources: Bank of England, Barclays Capital, Bloomberg, Citigroup, Consensus Economics, GfK NOP, HM Treasury, ONS, YouGov and Bank calculations.

(a) The Bank/GfK NOP survey asks households how much they expect prices in the shops generally to change, but does not reference a specific index.
(b) The Barclays Basix survey asks households what they expect the rate of inflation to be, but does not reference a specific index.
(c) The YouGov/Citigroup survey asks households how they expect consumer prices of goods and services to develop, but does not reference a specific index.
(d) April 2011 data.
(e) Financial instruments are linked to RPI inflation. The measures shown assume that market participants expect RPI inflation to be 0.8 percentage points higher than CPI inflation in the long term, around the average size of the difference over the period from 1996 to 2011. But there is considerable uncertainty over financial market participants' estimates of that difference, for example due to recent changes in the measurement of clothing and footwear prices in the CPI index. That means that actual CPI expectations may differ slightly from these figures. Change in the past year is calculated as the average in the fifteen working days to 20 May 2011 less the average in the fifteen working days to 20 May 2010.

Chart 2 Changes in five-year, five-year forward inflation derived from gilt yields and news in CPI releases[a][b]
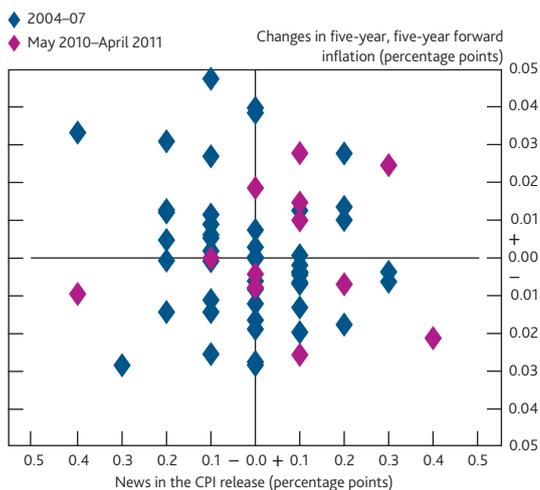
Sources: Bloomberg, ONS and Bank calculations.

(a) Changes are measured as the change in five-year, five-year forward inflation derived from gilt yields over the day on which CPI data were published.
(b) News in the CPI release is measured as the difference between the data outturn and the Bloomberg median forecast.

There is also little evidence that measures of longer-term inflation expectations derived from inflation swaps have tended to rise in response to increases in measures of short-term inflation expectations, either in the period between October 2004 and 2007, or in the past year (**Chart 3**). That

said, the absence of strong correlations cannot provide proof that responsiveness to news is unchanged, since the estimates are based on small sample sizes.

Chart 3 Estimated average changes in forward inflation rates at different horizons in response to a 1 percentage point change in the one year ahead inflation rate[a]
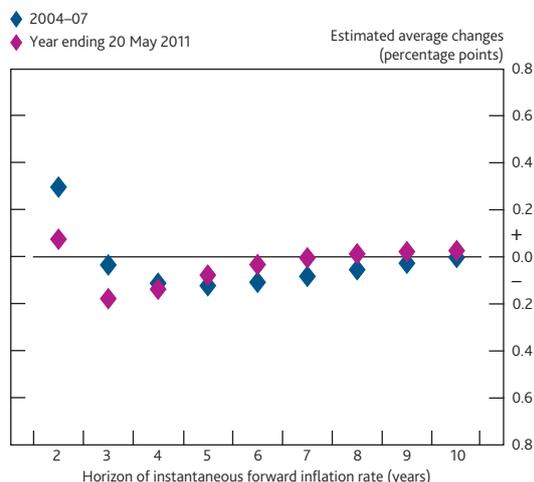
Sources: Bloomberg and Bank calculations.

(a) The average changes are estimated using the slope coefficients from regressions of daily changes in instantaneous inflation forward rates at each horizon on the daily change in the one year ahead instantaneous forward rate. The instantaneous forward rates are derived from inflation swaps.

Some indicators suggest that uncertainty about future inflation has risen, but others signal less change. Measures derived from option prices, for example, suggest that uncertainty among financial market participants has increased since the start of 2010, although it has fallen back somewhat in the past month (**Chart 4**). But the variation in views across households, as measured, for example, by the interquartile range of expectations recorded by the YouGov/Citigroup survey, is at broadly the same level as in 2005. Results from

Chart 4 Uncertainty about longer-term RPI inflation outturns implied by options
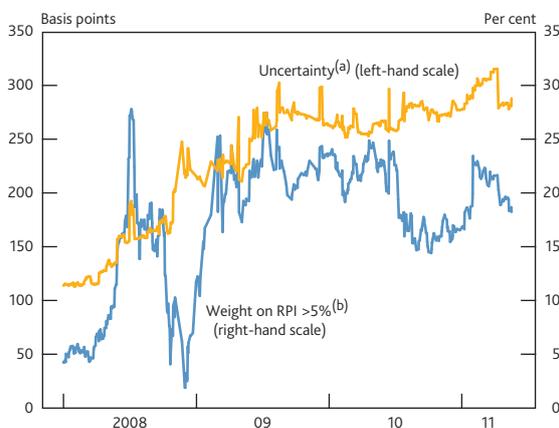
Sources: Bloomberg, Royal Bank of Scotland and Bank calculations.

(a) Standard deviation of the probability distribution of annual RPI outturns for four to five years ahead implied by options.
(b) Probability that RPI inflation will be greater than 5% based on average probability distributions of annual RPI outturns for four to five years ahead implied by options.

the Bank's survey indicate that the average level of uncertainty across individual professional forecasters has increased (**Chart 5**): the probability that respondents on average attach to inflation being more than 1 percentage point away from the 2% target has been at higher levels in the past year than before the onset of the financial crisis in 2007. In addition, during the past year professional forecasters on average reported a somewhat higher probability that inflation would be more than 1 percentage point above the target in the medium term than they had done in the past.

Chart 5 Uncertainty across professional forecasters about inflation in the medium term

■ Average probability that inflation will be more than 1 percentage point above target[a][b]
— Average probability that inflation will be more than 1 percentage point away from target[a][b]
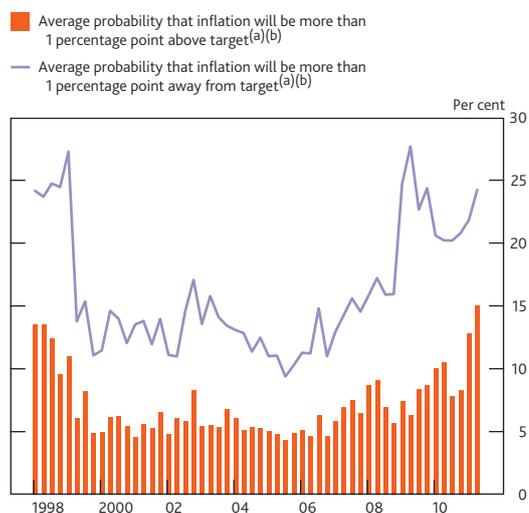
(a) Calculated from the probability distributions for inflation in the medium term reported by forecasters responding to the Bank's survey. Forecasters reported probability distributions for RPIX inflation two years ahead between February 1998 and November 2003; for CPI inflation two years ahead between February 2004 and February 2006; and for CPI inflation three years ahead from May 2006 onwards.
(b) The inflation target was changed on 10 December 2003 to 2% as measured by the annual change in the CPI from 2.5% as measured by the annual change in the RPIX.

Assessing whether shorter-term inflation expectations remain anchored

Even if long-term inflation expectations remain anchored by the monetary policy framework, temporary deviations of inflation from target may be expected to persist for longer than in the past. For example, that might occur if people were to believe that the MPC would return inflation to target more slowly than before, or if they were to expect the shocks hitting the economy to become more persistent.

This section discusses three pieces of evidence that might be symptomatic of shorter-term inflation expectations becoming less well anchored in that sense. First, a decline in the influence of the inflation target on shorter-term inflation expectations. Second, the size of movements in shorter-term inflation expectations. And third, an increase in the responsiveness of shorter-term inflation expectations to news about the economic outlook.

The influence of the inflation target on shorter-term inflation expectations

If shorter-term inflation expectations were to become less well anchored, then individuals might place less weight on the inflation target when forming their expectations. For example, individuals using simple rules of thumb to forecast inflation might switch from a rule based primarily on the inflation target to one that puts more emphasis on past inflation.

Survey data may help to assess how strong an influence the inflation target has on shorter-term inflation expectations formation. For example, the Bank/GfK NOP survey asks households whether a number of factors, including the inflation target, are an important consideration when forming their expectations of inflation in the year ahead.

Movements in shorter-term inflation expectations

The size of movements in shorter-term inflation expectations may, in some instances, provide evidence of de-anchoring. If individuals' inflation expectations were to become less well anchored, such that they expected developments in the economy to have a more persistent effect on inflation than in the past, then their shorter-term inflation expectations might change by more than is consistent with those developments.

One way to gauge whether movements in shorter-term inflation expectations can be explained by recent developments is to compare those changes with the MPC's judgement of how developments in the economy have affected the outlook for inflation in the near term. The latter will be captured by changes in the MPC's projections for CPI inflation, published each quarter in the Bank's *Inflation Report*. But such comparisons may not always be meaningful, for example because estimates of households' inflation expectations do not specifically reference CPI inflation.

An alternative method of assessing whether movements in inflation expectations appear consistent with developments in the economy is to use a statistical technique, such as a structural vector autoregression (SVAR). The SVAR approach involves estimating a set of equations where each variable is regressed on past movements of itself and the other variables in the system. Using these equations, changes in each variable can be decomposed into two sorts: those that are 'explained' by past outturns of the variables in the model; and those that are 'unexplained'.

But an SVAR estimate of the unexplained component of inflation expectations might become larger even if expectations remain anchored. SVAR models typically include only a small number of macroeconomic variables. In reality, however, inflation expectations are likely to be influenced by a much wider range of factors. That means that an SVAR model is unlikely to be able to explain some changes in inflation expectations that are driven by factors omitted from the

model. And so these movements may be captured in the estimated unexplained component.

The responsiveness of shorter-term inflation expectations to news

An increase in the responsiveness of shorter-term inflation expectations to news about the economic outlook might be indicative of expectations becoming less well anchored. If individuals were to expect deviations of inflation from target to be more persistent, then they may revise their expectations of inflation in the years ahead when they receive news about a temporary deviation of inflation from target.

As with longer-term inflation expectations, a simple indicator to monitor is how shorter-term inflation expectations respond to news about contemporaneous CPI inflation. If inflation expectations were to become less well anchored, it is likely that the correlation between changes in shorter-term expectations and CPI news would increase.

Have shorter-term inflation expectations become less well anchored recently?

Households' responses to the Bank/GfK NOP survey suggest that the inflation target remains an important influence on their one year ahead inflation expectations. Although households report that they take a wide range of factors into account when assessing the prospects for future inflation, it is not clear that the relative importance of the inflation target has fallen in the past year (**Table B**).

Table B Factors cited by households as important when forming their one year ahead inflation expectations[a]

Percentage of respondents

	2009	2010	2011
Inflation in the previous one to six months	86	82	88
Inflation in the previous year or before	83	83	88
Current level of interest rates	68	66	66
Current strength of the UK economy	80	77	80
Inflation target	57	57	65
Reports of inflation in the media	61	55	65
Reports of VAT in the media	49	57	69
Other	41	32	36

Source: Bank/GfK NOP.

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

Movements in estimates of households', companies' and professional forecasters' shorter-term inflation expectations provide mixed signals about the extent to which inflation expectations remain anchored. One and two year ahead inflation expectations have increased by less than the revision to the *Inflation Report* central projection (**Chart 6**). But the unexplained component of two year ahead inflation expectations, estimated using an SVAR, has picked up since the start of 2009 (**Chart 7**): that suggests that some of the recent

increase in medium-term inflation expectations cannot be explained by the factors included in the SVAR model. And financial market implied measures of shorter-term inflation expectations appear to have become a little more responsive to news about contemporaneous CPI inflation in the past year (**Chart 8**). But there are large uncertainties around these estimates, as indicated by the bars in the chart.

Chart 6 Changes in shorter-term inflation expectations between 2010 Q2 and 2011 Q2[a]
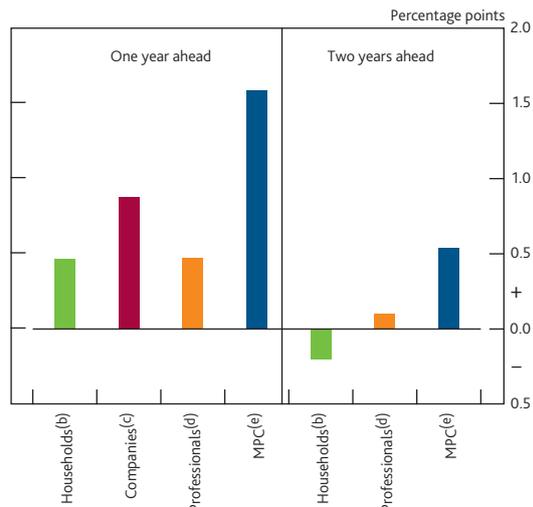
Sources: Bank of England, Bank/GfK NOP, Barclays Capital, CBI (all rights reserved), Citigroup, HM Treasury, YouGov and Bank calculations.

(a) Unless otherwise specified.
(b) Based on an average of expectations for inflation from the Bank/GfK NOP, Barclays Basix, and, for the one year ahead measure, YouGov/Citigroup surveys. These surveys do not reference a specific price index and are based on the median estimated price change.
(c) Based on CBI data for the manufacturing, business/consumer services and distribution sectors, weighted using nominal shares in value added. Companies are asked about the expected percentage price change over the coming twelve months in the markets in which they compete. Change is between 2010 Q2 and 2011 Q1.
(d) Based on an average of expectations of CPI inflation from the HM Treasury and Bank of England surveys.
(e) The MPC measure is based on modal projections under market interest rates in the May 2010 and May 2011 *Inflation Reports*.

Chart 7 SVAR model estimate of the unexplained component of two year ahead inflation expectations[a][b]
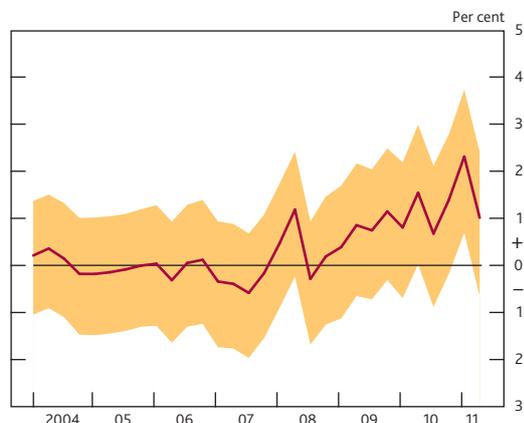
Sources: Barclays Research, Bloomberg, ONS and Bank calculations.

(a) The SVAR model includes: CPI inflation, GDP growth, Bank Rate, wages, real oil prices and two year ahead inflation expectations, measured using the Barclays Basix estimate. The model is estimated using data from 1987 Q3 to 2011 Q2. The swathe is based on estimating the 16th and 84th percentiles of the distribution around the parameters of the model (these percentiles are commonly chosen in econometric analysis).
(b) With thanks to Alina Barnett, who carried out this analysis.

Chart 8 Estimated average changes in instantaneous forward inflation rates derived from swaps in response to CPI news[a][b][c]

◆ 2004–07
◆ May 2010–April 2011
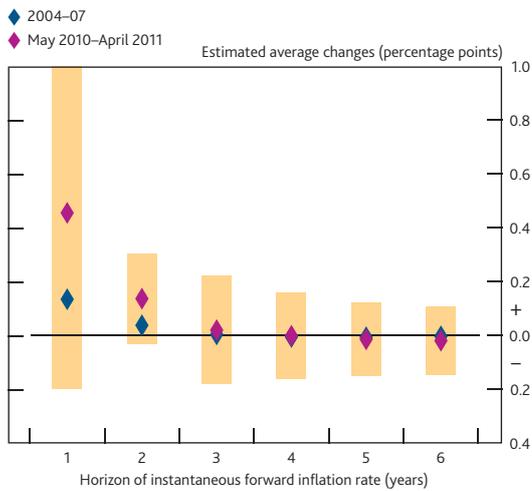
Sources: Bloomberg and Bank calculations.

(a) The average changes are the estimated slope coefficients from regressions of the change in instantaneous forward inflation rates at each horizon on news in the CPI release, on the day on which CPI data were published.
(b) See footnote (b) to **Chart 2** for the definition of CPI news.
(c) The bars cover two standard errors either side of the estimated slope coefficients for the past year.

Assessing changes in price-setting behaviour

If inflation expectations were to become less well anchored, that might lead to changes in price-setting behaviour that cause inflation to be more persistently away from target. For example, if companies were to believe that inflation would remain above target for longer, then they may raise their own prices for the goods and services that they produce by more, or more frequently, than they otherwise would. And, if they were to expect other businesses to raise prices too, their expectations of general price inflation might also rise.

Indicators of companies' general price inflation expectations and their pricing intentions are limited. Surveys of businesses, such as those conducted by the BCC and the CBI, are the main source of evidence. But these provide little information about the extent to which companies' inflation expectations are consistent with inflation being close to target in the longer term, since the survey questions ask how prices are expected to change in the coming quarter or year only.

The rate of inflation among goods and services for which prices typically change infrequently might provide an indirect signal of companies' inflation expectations. Not all companies change their prices at the same frequency. Businesses in sectors that experience frequent changes in input costs and face few costs in changing advertised prices, such as supermarkets, might change their prices regularly. Businesses in sectors that face large costs in changing prices, however, might change their prices only once in a while.[1] If a company can change its price only infrequently, then the best price to set will depend on the range of price and demand conditions

that the company expects to face during the period in which it is unable to change its price. Monetary policy will affect both price and demand conditions. So if people were to doubt the MPC's willingness or ability to return inflation to target, then companies that can change their prices only infrequently may raise their prices by more, or more frequently, than they otherwise would. That means that changes in the prices of these 'sticky price' goods and services might provide some information about companies' expectations of future inflation and their beliefs about monetary policy more generally.[2]

But it is difficult to interpret these pieces of evidence without taking into account other factors that influence prices. Changes in these factors, such as input costs, are likely to cause companies' own price and general price inflation expectations to move in tandem. For example, when imported input costs rose following the depreciation of sterling, companies might have expected to pass on some of the increase in their costs into their own prices; and they might have expected the prices charged by other businesses to rise too, as they did the same. That makes it difficult to assess whether changes in companies' pricing intentions reflect changes in their general price inflation expectations or a separate factor.

Recent developments in price-setting behaviour

Survey estimates of companies' expectations of inflation in the very short term have risen in the past year or so, but that could reflect increases in input costs. The net percentage balance of companies expecting their own prices to go up in the next three months in 2011 Q1 was above its average between 1997 Q2 and 2007 Q4 (**Table C**). But a greater-than-average percentage of businesses also reported that they were facing pressure to raise prices from material prices.

Table C Companies' pricing intentions in the next three months and current pay pressures

	Averages			
	1997 Q2–2007 Q4	2009	2010	2011 Q1
Net percentage balance expecting prices to rise in the next three months	21	7	23	34
Percentage reporting pressure to raise prices from material prices	28	32	39	47
Percentage reporting pressure to raise prices from pay settlements	28	17	20	23

Sources: BCC, ONS and Bank calculations.

(1) For more information about companies' pricing decisions, see Greenslade and Parker (2008) and Bunn and Ellis (2009).
(2) For more information about this method for extracting a signal about companies' inflation expectations, see Bryan and Meyer (2010).

More forward-looking indicators provide few signs that price-setting behaviour has changed in the past year. Companies reported in 2011 Q1 that they were expecting their own prices and the general level of prices to rise only modestly in the next twelve months (**Chart 9**). And, over the past few years, the average rate of inflation among sticky price goods and services has been broadly stable at about 2%, its average level since 1997 (**Chart 10**). That may indicate that companies do not expect inflation to remain above target and that they are setting their prices accordingly.

Chart 9 Companies' expected changes to prices
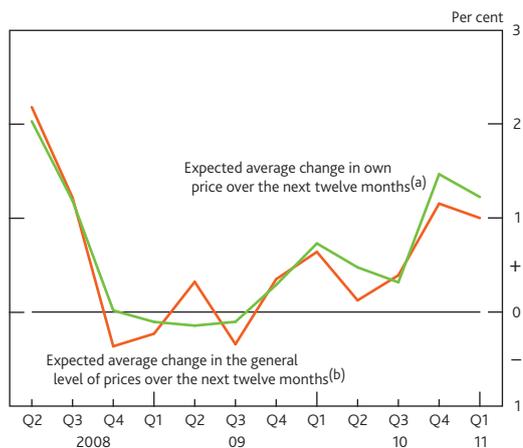
Sources: CBI and ONS.

(a) Companies are asked: 'What percentage change is expected to occur over the next twelve months in your own average output price for goods sold into UK markets?'.
(b) Companies are asked: 'What percentage change is expected to occur over the next twelve months in the general level of prices in the markets that you compete in?'.

Chart 10 Inflation in sticky and flexible price sectors(a)(b)
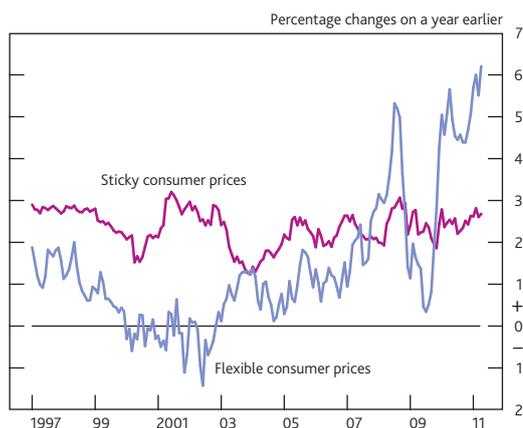
Sources: ONS and Bank calculations.

(a) The CPI basket is divided into twelve subcomponents, based on the classification of individual consumption according to purpose categories. These twelve subcomponents were divided between flexible and sticky price sectors based on the frequency at which the prices of different types of goods and services change. These frequencies were calculated from the price quotes that underpin the monthly CPI, which the ONS makes available to researchers via its secure Virtual Microdata Laboratory (described in Ritchie (2008)). The flexible price sector comprises those components of the basket which change more regularly than the median frequency and the sticky price sector comprises those components of the CPI basket in which prices change less often than the median frequency. The sticky price series excludes utility prices, which are more likely to be changed due to changes in gas and other commodity prices rather than developments in the wider economy.
(b) With thanks to Philip Bunn and Colin Ellis for their help with this analysis.

Assessing changes in wage-setting behaviour

Inflation expectations may affect the persistence of inflation via changes in wages. That might occur directly through wage negotiations. For example, if employees were to expect inflation to remain above target, they may demand higher pay to compensate for the reduced amount of goods and services that they would be able to purchase with their current wages. That would put pressure on companies to raise prices. Alternatively, a rise in wage inflation might be preceded by a change in price-setting behaviour: companies might become more willing to pay higher wages if they were to expect above-target inflation to persist, because they would expect to raise the prices that they charge their customers. Increases in wages would also be likely to put upward pressure on inflation by raising spending.

But other factors are also likely to influence wages. Companies may pay higher wages if their employees become more productive. Or a fall in unemployment might push up wages, because it decreases the pool of individuals whom employers could look to use in place of their current employees. It is not straightforward to judge how large an effect these factors have on wages and so estimate the influence of inflation expectations on wage growth.

Surveys of companies and households may help to isolate the effect of changes in inflation expectations on wages. For example, the BCC surveys ask companies whether they are currently suffering pressure to raise prices from pay settlements. And the February 2011 Bank/GfK NOP survey included an additional question that asked households whether they were looking, or planning to look, to increase pay with their current employer in light of their inflation expectations.[1]

Surveys might also indicate if companies are more likely to increase wages because they expect above-target inflation to persist. Since 2008 Q2, the CBI surveys have asked companies how they expect wage costs per employee to change over the next twelve months, in addition to asking about expected changes in prices. If companies were to become more willing to pay higher wages because they expected to raise the prices they charged customers, then it is likely that they would revise up both their expectation of changes in their own prices and their expectations of changes in wage costs, all other things constant. That would tend to generate a positive correlation between changes in own price inflation expectations and changes in wage cost inflation expectations across companies responding to the CBI surveys.

(1) Respondents were also asked if they were taking, or planning to take other actions, such as looking to increase pay in other ways and shopping around for better value.

Recent developments in wage-setting behaviour

Recent data provide little evidence that inflation expectations are feeding through into wages. Current wage growth remains around 2%, some way below its pre-recession average rate (**Table D**). And growth in unit labour costs, which may be a more relevant measure for companies' pricing decisions, weakened throughout 2010, in part reflecting some recovery in productivity.[1] But it is difficult to judge precisely the extent to which other factors, such as the rise in unemployment during the recession, has pushed down current wage growth and so what offsetting effect inflation expectations may have had.

Table D Alternative estimates of annual pay growth

	Averages[a]		2010				2011
	1997–2007	2009	Q1	Q2	Q3	Q4	Q1
Pay settlements[b]	3.3	2.5	1.6	1.6	1.6	1.6	1.7
AWE regular pay[c]	4.0	1.7	1.8	1.3	2.2	2.3	2.1
Unit labour costs	2.6	5.9	4.5	1.4	1.2	0.9	n.a.

Sources: Bank of England, Incomes Data Services, the Labour Research Department, ONS and XpertHR.

(a) Unless otherwise stated.
(b) Average over the past twelve months, based on monthly data (per cent).
(c) Average weekly earnings. Average since 2001.

There are few signs that households are pushing for higher pay in response to higher inflation expectations. Of those working households that responded to the February 2011 Bank/GfK NOP survey, only a small percentage indicated that they were looking to increase pay with their current employer[2] (**Chart 11**). Consistent with that, the percentage of companies reporting that they were facing significant pressure to raise prices on account of pay in 2011 Q1 was below its average during the period between 1997 Q2 and 2007 (**Table C**).

Chart 11 Working households' planned actions in light of their short-term inflation expectations[a]
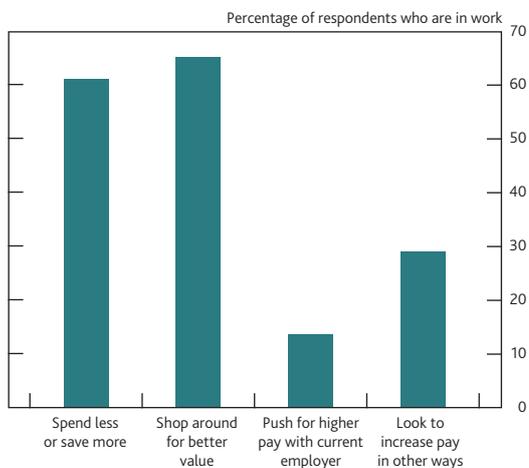
Source: Bank/GfK NOP survey.

(a) Respondents to the February 2011 Bank/GfK NOP survey were asked which, if any, from a list of actions they are taking, or planning to take, in light of their expectations of price changes over the next twelve months. The list included four actions in addition to those shown on the chart: bring forward major purchases; move savings out of banks or building societies into other assets such as shares, bonds, housing or gold; other (unspecified); and take no action. Respondents could select up to three actions.

Companies do not appear to have become more willing to grant higher wages at the same time as raising prices in recent months. Changes in individual companies' wage inflation expectations have tended to be only weakly related to changes in their price inflation expectations in the past couple of years and there are few signs that those correlations have increased in the most recent survey (**Table E**).

Table E Correlations between changes in companies' wage inflation expectations and their price inflation expectations

	2008 Q2–2010 Q4	2011 Q1
Own prices	0.18	0.18
General level of prices	0.20	0.20

Sources: CBI (all rights reserved) and Bank calculations.

Conclusion

A persistent deviation of inflation from target might cause inflation expectations to become less well anchored by the monetary policy framework. For example, individuals might question whether the MPC remained willing or able to return inflation to the target in the medium term. Or, perhaps more likely, individuals might think that the MPC had become more tolerant of deviations of inflation from target and, therefore, would expect inflation to return to target more slowly, even though their long-term expectations remained anchored.

If inflation expectations were to become less well anchored, then deviations of inflation from target might trigger changes in price-setting, wage-setting and spending behaviour that make inflation more persistent. That would, other things being equal, require the MPC to tighten monetary policy by more than it otherwise would in order to return inflation to target.

The indicators discussed above suggest that long-term inflation expectations remain anchored by the monetary policy framework. And, although evidence from shorter-term inflation expectations is more mixed, there is little evidence that they have become significantly de-anchored. Moreover, there are few signs that inflation expectations have affected price or wage-setting behaviour.

But the imperfect nature of data means that there are large uncertainties around all of these indicators, which caution against concluding with confidence that inflation expectations remain anchored to the target. The MPC continues to monitor the indicators set out in this framework closely, and remains alert to other pieces of evidence that might indicate that the risk to inflation from inflation expectations is materialising.

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(1) For more detail on recent developments in pay, see Section 4.3 of the May 2011 *Inflation Report*.
(2) That may underestimate the proportion of employees for whom an increase in inflation expectations is leading to higher pay demands, since some employees are covered by collective bargaining agreements.

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International evidence on inflation expectations during Sustained Off-Target Inflation episodes

By Matthew Corder and Daniel Eckloff of the Bank's Monetary Policy Unit.[1]

The high level of UK inflation in recent years raises the possibility that inflation expectations may drift upwards, making the period of above-target inflation last for longer. This article presents some evidence on inflation expectations during Sustained Off-Target Inflation (SOTI) episodes in other inflation-targeting countries and outlines some of the key trends. The evidence suggests that short and medium-term inflation expectations have tended to drift in the direction of the deviation of inflation from target. But generally the movements in inflation expectations were more gradual than movements in inflation itself and expectations returned to their previous level once inflation returned to target.

Introduction

Inflation in the United Kingdom, measured by the annual change in the consumer prices index (CPI), has exceeded the 2% target set by the Government for much of the past three years. Since the start of 2008, CPI inflation has been above the target in 34 out of 40 months and has averaged 3.2%. This implies that the United Kingdom is now three years into a Sustained Off-Target Inflation (SOTI) episode — as will be defined later in this article. The sustained high level of UK inflation has led to concerns that inflation expectations may rise. As the accompanying article on pages 100–10 in this edition of the *Quarterly Bulletin* explains, higher inflation expectations may make the period of above-target inflation last for longer (Macallan, O'Grady and Taylor (2011)). In that article a framework is presented showing how a range of indicators can be used to assess the risk to inflation from inflation expectations. But given the imperfect nature of the data, the risk can only be assessed imperfectly. Given this uncertainty, it is useful to examine how other countries' inflation expectations have moved during past SOTI episodes.

By examining past SOTI episodes in other inflation-targeting countries, this short article attempts to draw lessons for the United Kingdom. The scope of the analysis is limited. It simply identifies a number of SOTI periods and then discusses the movements in inflation and in survey measures of inflation expectations during and immediately after those periods. It does not consider the effects of the stance of monetary policy, the underlying causes of the deviation in inflation or the cyclical developments in each country. These factors of course

affect the path of inflation and inflation expectations, but the broad trends in past behaviour may nonetheless provide a useful additional piece of evidence for policymakers.

The first two sections describe the selection of the sample of SOTI periods and how inflation evolved over these periods. Subsequent sections consider how inflation expectations at short, medium and long-term horizons appeared to have evolved as inflation deviated from target. The article then analyses how inflation expectations reacted once inflation returned to target, discusses the current UK experience and presents its main conclusions.

International SOTI episodes: sample and data

In December 1989, New Zealand was the first country to adopt a formal inflation target. A host of countries, including Australia, Canada, Chile, Israel and the United Kingdom, subsequently followed suit.[2] Notwithstanding the perceived success of this monetary policy regime, periods of sustained off-target inflation have occurred in a number of these countries.

This article uses each country's inflation targets as a metric for assessing 'normal' levels of inflation. This provides a way to categorise periods of persistently high or low inflation, referred to as SOTI periods. The definition of 'off target' used in this

article depends on the precise nature of the inflation target used by a country. For countries with a target range or a point target with a tolerance band, inflation is 'off target' if it is outside that range or tolerance band with the deviation from 'target' defined as the difference between inflation and the range or band. For those countries with a point target and no tolerance band, such as the United Kingdom, the 'target' is defined as the point target plus or minus 0.5 percentage points. Therefore, inflation is deemed 'off target' if inflation is outside that range. This definition therefore ignores small movements in inflation that are unlikely to have significant effects on inflation expectations.

There are two criteria used to define a SOTI period. First, inflation must have been 'off target' for 75% of any period of 24 months or more. This implies that SOTI episodes must be at least 18 months long. Brief one-off price shocks, which appeared in the annual inflation data for a year before dropping out, are therefore not included in the sample of SOTI episodes. This also allows time for agents to revise their expectations. Second, any identified periods beginning within 18 months of an inflation-targeting adoption announcement are ignored. This is because the introduction of a target may have affected inflation expectations over this period as well as any deviations of inflation from that target. **Table A** lists the periods meeting these criteria.[1][2]

Table A SOTI periods[a]

Country	Date	Above/below 'target'
Australia	1995 Q1–1996 Q2	Above
Australia	1996 Q4–1999 Q4	Below
Australia	2000 Q2–2001 Q4	Above
Chile	2007 Q3–2009 Q1	Above
Colombia	2002 Q4–2004 Q2	Above
Colombia	2007 Q1–2009 Q1	Above
Czech Republic	2002 Q2–2005 Q3	Below
Hungary	2003 Q1–2004 Q4	Above
Hungary	2006 Q4–Now	Above
Iceland	2004 Q2–2010 Q3	Above
Korea	2005 Q3–2007 Q3	Below
Mexico	2002 Q3–2005 Q2	Above
Mexico	2008 Q2–2010 Q4	Above
New Zealand	1994 Q4–1996 Q4	Above
Norway	2003 Q3–2007 Q4	Below
Poland	2001 Q3–2003 Q4	Below
Poland	2007 Q4–2009 Q3	Above
South Africa	2002 Q1–2003 Q3	Above
South Africa	2007 Q2–2009 Q4	Above
Sweden	1996 Q2–2000 Q3	Below
Sweden	2004 Q1–2006 Q1	Below
Sweden	2009 Q1–2010 Q3	Below
United Kingdom	1995 Q3–1997 Q1	Above
United Kingdom	2008 Q2–Now	Above

Sources: National sources, Thomson Reuters Datastream and Bank calculations.

(a) See text for criteria for SOTI periods.

Given the limited number of countries with data on household inflation expectations, this article utilises a mixture of surveys of households and businesses to produce as large a sample as possible.[3] When a country had multiple surveys at a specific time horizon (for example, both household and business surveys at a short-term horizon), the median expectation across all surveys was used. Although household inflation expectations appear to have been more volatile, with larger short-term movements than business expectations, they both moved in a similar direction in SOTI periods. And analysis suggested that excluding business surveys had only a small effect on the median measure of the change in inflation expectations for a country over SOTI episodes and did not offset the gains from having a larger sample.

Inflation in SOTI periods

Chart 1 shows a swathe representing the interquartile range of deviations in inflation from 'target' — as defined earlier — throughout the identified SOTI periods. It also shows the deviation of UK CPI inflation from 'target' during the current UK SOTI period. For each quarter of each SOTI period in the sample, the deviations are calculated and the interquartile range of these deviations measured. Zero on the x-axis is the last point at which inflation was at 'target' as defined earlier. Deviations in 'below-target' SOTI episodes are inverted to make the movement in inflation comparable to 'above-target' SOTI episodes — thus the y-axis represents the standardised movement in inflation from 'target'.[4]

The length of SOTI episodes has varied from just six quarters — the minimum possible given the definition of a SOTI period — to 26 quarters (the median SOTI period length is nine quarters). Individual SOTI periods are dropped from the sample once they end. This has the effect of gradually reducing the sample size shown in the swathe in **Chart 1** from 23 episodes after six quarters to only six episodes after thirteen quarters. **Chart 1** indicates this reduction in sample size by the lighter shades on the right-hand side of the swathe. Changes in the sample size mean that movements in the swathe and in the median deviation may reflect changes in sample as well as movements in inflation itself.

Chart 1 shows that, on average, inflation deviations picked up from the start of the SOTI period, deviating around

(1) The table excludes episodes where surveys of inflation expectations for households or firms are not available.
(2) Deviations from 'target' are measured at the same frequency as the inflation data are themselves published (ie generally monthly). As many inflation expectations surveys are conducted quarterly, the analysis in this article uses quarterly data. A quarter is included at the start of a SOTI period if inflation is 'off target' in the first or second month of that quarter. A quarter is included at the end of a SOTI period if inflation is 'off target' in the second or third month of that quarter.
(3) The analysis is focused on the inflation expectations of those directly involved in the wage and price-setting processes. So surveys of professional forecasters and financial market participants are excluded.
(4) Analysis suggests that inflation expectations move by a similar magnitude when inflation rises above or falls below its 'target'. So analysing standardised moves in inflation expectations should not bias the results.

Chart 1 Inflation throughout SOTI periods[a]

- Interquartile range
- Median
- Current UK[b]

Standardised change relative to 'target' (percentage points)[c]

Quarters into SOTI period
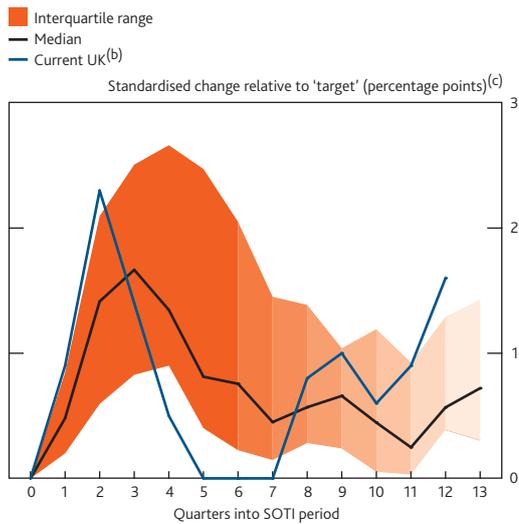
Sources: National sources, Thomson Reuters Datastream and Bank calculations.

(a) The chart shows deviations from 'target' as defined in the article. Thus for countries with a target range or a point target with a tolerance band, inflation is 'off target' if inflation is outside that range or band. For countries with a point target and no tolerance band, such as the United Kingdom, inflation is 'off target' if the deviation from the point target exceeds 0.5 percentage points. Thus in the case of the United Kingdom, CPI inflation must either exceed 2.5% or fall below 1.5% to be deemed 'off target'.
(b) The current UK SOTI period began in 2008 Q2. At the time of going to print, the UK CPI inflation data were not available for the thirteenth quarter.
(c) Deviations in 'below-target' SOTI periods are inverted to make the deviations in inflation from 'target' comparable to 'above-target' SOTI periods.

Chart 2 One year ahead inflation expectations

- Interquartile range
- Median
- Median for countries in **Chart 3**[a]
- Current UK[b]

Standardised change relative to pre-SOTI four-quarter average (percentage points)[c]

Quarters into SOTI period

Sources: Bank of England, Barclays Capital, Citigroup, GfK NOP, national central banks, Thomson Reuters Datastream, YouGov and Bank calculations.

(a) **Chart 3** uses a smaller sample as fewer countries publish medium-term expectations.
(b) The median of the Bank/NOP, Barclays Basix and YouGov/Citigroup surveys at the one-year horizon.
(c) Deviations in 'below-target' SOTI periods are inverted to make the deviations in inflation from 'target' comparable to 'above-target' SOTI periods. A negative value therefore implies that expectations are either below their pre-SOTI average in 'above-target' SOTI periods or above their pre-SOTI average in 'below-target' SOTI periods.

1.7 percentage points from 'target' after three quarters. Inflation deviations then gradually fell back. The median deviation of inflation from 'target' remains above zero throughout **Chart 1** as countries that have returned to 'target' are dropped from the sample. The current UK experience looks atypical, with a sharp fall in inflation in the middle of the SOTI period, in part reflecting the cut in VAT and the fall in energy prices following the global recession. The current UK SOTI episode is also longer than the median SOTI period length. On the basis of the MPC's latest *Inflation Report* forecast, 2011 Q2 is likely to be the thirteenth quarter of the current UK SOTI period. Only six of the 23 other periods have lasted longer than three years.

How did inflation expectations react?

As might be expected, one year ahead inflation expectations tended to move in line with inflation developments. **Chart 2** shows a swathe constructed in a similar manner to **Chart 1**, but now evaluates the deviation in one year ahead inflation expectations from their four-quarter average prior to the SOTI period. To compare movements in inflation expectations across both 'above-target' and 'below-target' SOTI episodes, the sign of the movement in inflation expectations is standardised so movements in inflation expectations in the same direction as the movement in inflation are treated as positive values. Thus a positive value either means that inflation expectations rose during an 'above-target' SOTI episode or fell when inflation fell persistently below 'target'. The chart also shows the movements in one year ahead inflation expectations in the current UK SOTI episode, where

negative values indicate that inflation expectations fell even though inflation deviated above 'target' for most of the period.

Chart 2 shows that, over the first six quarters of the SOTI periods, one year ahead inflation expectations on average moved around 0.8 percentage points from their pre-SOTI average in the direction of the deviation from 'target'. This is significantly less than the peak movement in inflation, but the drift in inflation expectations beyond six quarters is more persistent than the move in inflation. The chart shows that UK inflation expectations picked up more sharply early in the current SOTI episode, but fell sharply as inflation also fell. Expectations have since risen again to be more in line with other countries' experience. The latest data, however, have highlighted the volatility in the survey measures of one year ahead inflation expectations. **Chart 2** also shows the median change in one year ahead inflation expectations for those countries that also have medium-term inflation expectations data (dashed line). This 'matched' sample is for comparison with **Chart 3** and will be discussed later.

Chart 3 evaluates movements in medium-term expectations — typically at a two or three-year horizon — compared to their pre-SOTI four-quarter average and presents them in a similar manner to **Chart 2**. The median standardised change in medium-term expectations two years into a SOTI episode was similar to that shown in **Chart 2**. But not all countries have medium-term inflation expectations data. This means the median (solid) lines in **Charts 2** and **3** are not strictly comparable. The median change in medium-term inflation expectations was a little smaller than that for short-term

Chart 3 Two/three year ahead inflation expectations
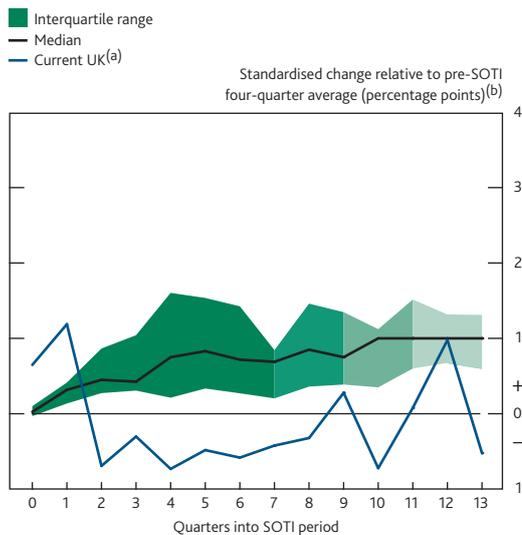
■ Interquartile range
— Median
— Current UK[a]

Standardised change relative to pre-SOTI
four-quarter average (percentage points)[b]

Quarters into SOTI period

Sources: Barclays Capital, national central banks, Thomson Reuters Datastream and
Bank calculations.

(a) Barclays Basix survey at the two-year horizon. The Bank/NOP survey at the same horizon
    could not be used as it began part way through the current SOTI episode.
(b) Deviations in 'below-target' SOTI periods are inverted to make the deviations in inflation
    from 'target' comparable to 'above-target' SOTI periods. A negative value therefore implies
    that expectations are either below their pre-SOTI average in 'above-target' SOTI periods or
    above their pre-SOTI average in 'below-target' SOTI periods.

Chart 4 Two/three year ahead inflation expectations
after SOTI periods

■ Interquartile range
— Median

Standardised change relative to pre-SOTI
four-quarter average (percentage points)[a]

Quarters since SOTI period concluded

Sources: Barclays Capital, national central banks, Thomson Reuters Datastream and
Bank calculations.

(a) Deviations in 'below-target' SOTI periods are inverted to make the deviations in inflation
    from 'target' comparable to 'above-target' SOTI periods. A negative value therefore implies
    that expectations are either below their pre-SOTI average in 'above-target' SOTI periods or
    above their pre-SOTI average in 'below-target' SOTI periods.

expectations in a matched sample (the dashed line in **Chart 2**), in almost all periods. Medium-term expectations also appear to have picked up more slowly than short-term expectations. And there is little evidence of a sharp movement in inflation expectations — changes tended to accumulate gradually over time. Again the current UK experience is atypical: inflation expectations fell sharply two quarters into the current SOTI episode as inflation also fell. There is some evidence that expectations drifted up again as inflation picked up part way through the SOTI period, although the data are again volatile.

Few countries have assembled surveys that measure inflation expectations at the five-year horizon; Norway and Sweden are the only countries to have collected these data during previous SOTI periods.[1] Drawing robust conclusions from the four available episodes from these two countries is obviously fraught with difficulty. But the median deviation in long-term inflation expectations in this small sample is less than that for short and medium-term expectations. UK long-term inflation expectations (as measured by the YouGov/Citigroup survey of expectations 5–10 years out) are similarly little changed (see the accompanying article on pages 100–10).[2]

How did inflation expectations react after the SOTI period ended?

An important question for policymakers is how quickly inflation expectations return to their pre-SOTI average. **Chart 4** shows how medium-term inflation expectations moved at the end of a SOTI period. Zero on the x-axis is the final quarter of the SOTI period.[3] Some countries' SOTI

episodes ended within the past two years so data is not available for the full eight quarters after the SOTI ended. As in earlier charts, when a country falls out of the sample due to a lack of data, the shading of the interquartile range changes to reflect this.

Inflation expectations did return to their pre-SOTI average, but only after inflation itself returned to 'target'. **Chart 4** suggests that medium-term expectations reached their pre-SOTI average after around six quarters.

Current UK experience

Since the start of 2008, UK inflation has exceeded the 2% target set by the Government in 34 of the past 40 months and averaged 3.2%. That means that the United Kingdom is now three years into a SOTI episode, as defined above. This is longer than the majority of the other SOTI episodes considered. But a small number of countries have experienced similarly long SOTI episodes and can provide some insight for the current situation in the United Kingdom.

Charts 2 and **3** both show that survey-based measures of inflation expectations can be volatile, clouding comparisons

(1) Market measures of inflation expectations are available for some countries, but as
    explained in Macallan *et al* (2011), not all the movement in these measures can be
    attributed to movements in inflation expectations. This article does not consider
    these measures of inflation expectations.
(2) The Bank/NOP and Barclays Basix surveys at the five-year horizon could not be used
    as they began part way through the current SOTI episode.
(3) As in earlier charts, inflation is defined as back at 'target' if it is within the central
    bank's target range or tolerance level limit (or within 0.5 percentage points of the
    target for those central banks with a point target and no tolerance range).

with past SOTI episodes. As noted earlier, for much of the current UK SOTI episode, UK inflation expectations were lower than their pre-SOTI four-quarter average. This may reflect the volatility of inflation in the earlier part of the current UK SOTI period. More recently, UK inflation expectations have drifted up and were comparable to past episodes twelve quarters into the SOTI. But the latest available data for 2011 Q2 suggests that inflation expectations have fallen back somewhat.

The volatility of survey-based measures of inflation expectations highlights the importance of considering a range of indicators of inflation expectations. The accompanying article on pages 100–10 discusses how a range of indicators might be used to monitor the risk to inflation from inflation expectations. That article suggests that there is little evidence of longer-term inflation expectations becoming less well anchored to the target. The signals regarding shorter-term inflation expectations are more mixed but there are few signs that they have become significantly de-anchored.

Conclusion

This article suggests that across a sample of inflation-targeting countries, when inflation has deviated from 'target' for a sustained period, short and medium-term inflation expectations have tended to drift in the same direction as the deviation of inflation from 'target'. Initial movements were smaller than inflation itself. However they were more persistent than the rise in inflation and on average medium-term inflation expectations returned to their pre-SOTI average around six quarters after inflation itself returned to 'target'. Evidence at longer horizons is sketchier, but seems to suggest that movements in long-term inflation expectations in other countries were smaller.

The UK experience is atypical, with inflation expectations moving both up and down during the current SOTI episode, probably reflecting the temporary fall back in inflation part way through the current UK SOTI episode. But there are only a small number of countries that have experienced SOTI episodes of a similar length to the current UK experience, so it is difficult to make firm comparisons.

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Public attitudes to monetary policy and satisfaction with the Bank

By Sally Hills and Clare Macallan of the Bank's Monetary Assessment and Strategy Division.[1]

The Bank of England's success in achieving its monetary policy objectives will depend, in part, on the public's awareness and understanding of monetary policy. Results from the Bank/GfK NOP survey suggest that public awareness of the policy framework remains high and has changed little over the past year. A greater proportion of respondents to the Bank/GfK NOP survey were satisfied than dissatisfied with the way in which the Bank has set interest rates to meet the inflation target. But the extent of satisfaction has fallen since mid-2010.

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 consumer prices index. 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 often referred to as quantitative easing.[2]

The MPC's success in achieving its objective of price stability will depend, in part, on the public's understanding of, and support for, the monetary policy framework. If people understand that the MPC's objective is for inflation to be at target in the medium term, then they may behave in such a way that deviations of inflation from target are more short-lived: households, for example, may moderate their wage demands and companies may be less likely to raise prices in response to higher costs.[3]

In recognition of the importance of public understanding in determining the effectiveness of the monetary policy framework, the Bank uses a variety of methods to explain the MPC's role of setting interest rates to meet the inflation target to the public. For example, it publishes the minutes of the MPC's monthly meetings and a quarterly *Inflation Report*. MPC members give speeches and interviews, and make regional visits across the United Kingdom. The Bank also has an education programme that covers school children of all ages.

The Bank has also sought to quantify the impact of its efforts to build general public support for price stability. Since 1999, the Bank has commissioned GfK NOP to conduct a survey of

households' attitudes to monetary policy on its behalf. This article draws on results from the survey to assess the public's awareness of monetary policy and their satisfaction with the way in which the Bank has set monetary policy to control inflation.

Public awareness of monetary policy

Public awareness of the institutional arrangements 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 monetary policy[4] is set by either the Bank or the MPC has remained at about 40% since the survey began (**Chart 1**). And, when options are offered, around 70% of respondents tend to identify the Bank of England as the group responsible for setting interest rates, rather than government ministers, civil servants, high street banks or the European Central Bank.

The level of understanding among households of the way in which monetary policy affects inflation — the transmission mechanism of monetary policy — appears to have been broadly constant over time. According to the standard view in economics, a rise in Bank Rate would be unlikely to affect inflation immediately, because many wage and price decisions would already have been made. But a higher level of Bank Rate would tend to push down inflation one or two years ahead, for example by reducing demand and weakening

Chart 1 Indicator of public awareness of the monetary policy framework[a]
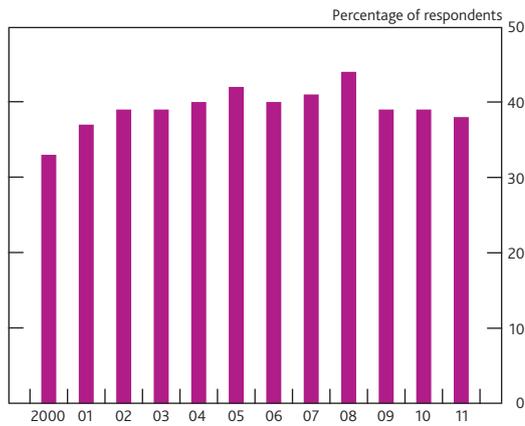
Source: Bank/GfK NOP survey.

(a) Percentage of respondents answering that either the Bank or the MPC set Britain's basic interest rate level.

Chart 2 Interest rate perceptions and effective household interest rates

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

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

Chart 3 Interest rate expectations over the next twelve months

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.

companies' ability to charge higher prices. That view is shared by some respondents to the Bank/GfK NOP survey. Around 40% of households surveyed in February 2011 either agreed or strongly agreed with the statement that 'a rise in interest rates would make prices in the high street rise more slowly in the medium term — say a year or two'. That is a similar proportion to previous years. Around 35% of households either agreed or strongly agreed with the statement that changes in interest rates would affect prices in the short term, of a month or two ahead.

The Bank/GfK NOP survey also monitors public awareness of the policy decisions that the MPC has taken in recent years. In 2009 and early 2010, a greater proportion of households perceived that interest rates on deposits, mortgages and loans had fallen in the previous twelve months than had risen. The net balance of respondents who perceived that interest rates fell over that period was similar to the period when rates fell in 2001 and 2002, despite the much larger falls in measured interest rates in the more recent episode (**Chart 2**). That may be because qualitative measures, such as net percentage balances, are unlikely to capture the size of movements in interest rates precisely. Since May 2010, households, on balance, perceived that interest rates had risen over the previous twelve months. That might, in part, have reflected a small rise in effective deposit rates during that period.

On balance, the proportion of households expecting interest rates to rise over the next twelve months has risen since the end of 2008 (**Chart 3**). But the pickup in the net balance of interest rate expectations has not been smooth: there were declines in the balance of households expecting rates to rise in May and August 2010 and again in May 2011. That might indicate that households revised their expectations in the light of information that the recovery of the UK economy from recession might be slower than previously expected.

Satisfaction with the Bank

More respondents to the Bank/GfK NOP survey have been satisfied with the way in which the Bank has set interest rates to control inflation than have been dissatisfied in all surveys since the question was first asked in 1999 (**Chart 4**). But the net balance of households satisfied with the Bank has been lower since the onset of the financial crisis in 2007. And the extent of satisfaction has fallen since mid-2010, in part reversing an increase during 2009.

Chart 4 Satisfaction with the Bank and inflation perceptions
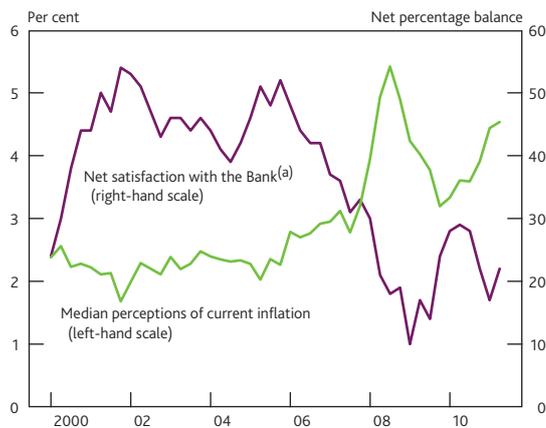
Source: Bank/GfK NOP survey.

(a) The percentage of respondents who were fairly or very satisfied with the way in which the Bank of England is doing its job to set interest rates in order to control inflation less the percentage who were fairly or very dissatisfied.

Households' satisfaction with the way in which the Bank has set interest rates to control inflation has tended to be lower when their perceptions of the current rate of inflation have been higher. Across time, changes in net satisfaction have broadly mirrored changes in household perceptions of changes in prices over the past twelve months, as reported in the same survey (**Chart 4**). And, across individuals, households with higher inflation perceptions tend to be more likely to report that they are dissatisfied with the Bank.

But other factors may also have affected satisfaction. For example, households may have become less satisfied with the Bank following the financial crisis and the associated falls in aggregate demand (**Chart 5**).

Chart 5 Satisfaction with the Bank and real GDP
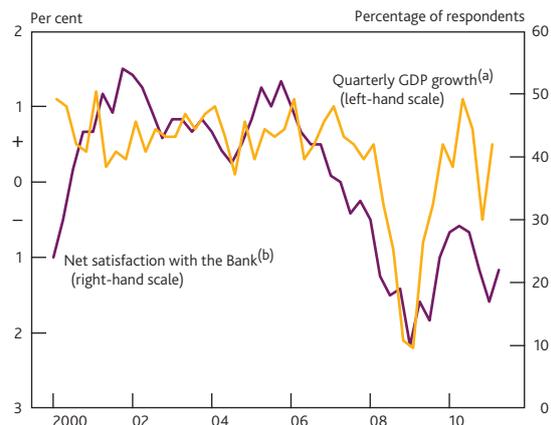
Sources: Bank/GfK NOP survey and ONS.

(a) Chained-volume measure at market prices.
(b) See footnote (a) to **Chart 4**.

Conclusion

The level of public awareness of the monetary policy framework remains high and appears to have been little affected by recent economic events. And households' perceptions of changes in interest rates reflect movements in deposit and loan rates fairly well.

Despite a modest improvement in the May 2011 survey, the extent of public satisfaction with the way in which the Bank has set interest rates to control inflation has declined since the middle of 2010, perhaps in part reflecting a rise in households' perceptions of inflation over that period.

The use of foreign exchange markets by non-banks

By James O'Connor and James Wackett of the Bank's Foreign Exchange Division and Robert Zammit of the Bank's Sterling Markets Division.[1]

As part of its Market Intelligence programme, the Bank of England monitors developments in a range of financial markets, feeding information gathered from contacts into its monetary and financial stability policy processes. This intelligence provides the Bank with insights into a variety of rapidly evolving markets, including the foreign exchange market, where turnover has more than trebled over the past decade. This article draws on this intelligence, economic theory and market data to shed light on the role that non-bank participants — both financial and non-financial — play in the foreign exchange market.

Introduction

The Bank of England's Market Intelligence programme, which involves frequent meetings and conversations between Bank staff and a wide range of market participants, allows it to better understand developments in a range of financial markets. This programme, which has been expanded significantly during recent years, gathers information that informs policies aimed at ensuring both financial and monetary stability — the Bank's two core purposes. This article draws on information gathered from contacts, as well as economic theory and market data, to examine one of the financial markets that the Bank regularly monitors — the foreign exchange market. In particular, it focuses on two of the market's 'end-users' — the non-bank financial sector and the non-financial corporate sector.

Understanding developments in foreign exchange markets is important for both financial and monetary stability. For example, the use of foreign exchange markets by non-bank participants, and their motivation for doing so, influences the liquidity of the market, particularly during times of heightened volatility in financial markets. And the degree to which companies use financial instruments to protect themselves against changes in exchange rates can influence the speed with which they adjust dividends, wages or prices in response to unexpected changes in exchange rates.

The article is structured as follows. The first section provides a brief overview of the size and composition of the market, focusing on the non-bank sector. The following section discusses the conceptual reasons why participants might use the foreign exchange market, before the rest of the article explores the use of foreign exchange markets by two particular

groups — the non-bank financial sector and the non-financial corporate sector — drawing heavily on market intelligence. In doing so, it explores not only how these groups use the 'spot' exchange rate market, but also their growing use of the foreign exchange derivatives market. The box on page 122 describes the different instruments used in the foreign exchange market.

Size and composition of the foreign exchange market

Average daily turnover in global foreign exchange markets has more than trebled over the past decade, reaching around $4 trillion in 2010, according to the 2010 BIS *Triennial Central Bank Survey* (**Chart 1**). Within this, London remained the most prominent financial centre for foreign exchange trading, accounting for more than one third of all turnover. Sterling is the fourth most traded currency — behind the US dollar, the euro and the Japanese yen — and is used in around 6% of all transactions.[2]

There are a wide variety of participants in the foreign exchange market, which fall broadly into three categories: banks, other financial institutions and non-financial companies.

The banking sector accounted for around 40% of all turnover in foreign exchange markets in 2010 (**Chart 1**). Banks are central to the functioning of the foreign exchange market, including by quoting prices at which they are willing to buy and sell currency with non-bank participants. In this 'market-making' role, banks act as intermediaries, using their

Chart 1 Global foreign exchange turnover in notional amounts
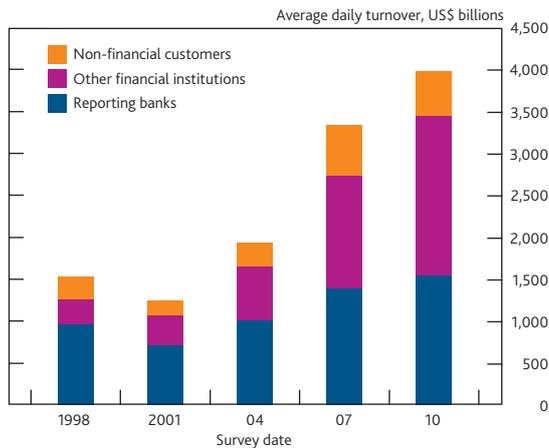
Source: Bank for International Settlements.

balance sheets to facilitate the interaction between different non-bank participants. But banks also trade currencies among themselves in the interbank market as part of their everyday business, and to clear positions created by making markets for their customers.

The focus of this article, however, is on the remaining two groups. Of these, the largest is the non-bank financial sector (captured within data on 'other financial institutions'), which accounted for nearly half of overall turnover in 2010.[1] This group consists of a variety of institutions. On the one hand, there are investors such as pension funds and insurance companies — so-called 'real money' investors. But the sector also includes leveraged investors, such as hedge funds, who operate using a combination of money injected directly by investors and debt.

The final group is non-financial customers, which largely refers to the non-financial corporate sector. It includes both industrial and service sector companies that use the foreign exchange market as part of their everyday business. In 2010, this group accounted for around 13% of global turnover in the foreign exchange market: this had fallen back from 18% in 2007, reflecting in part the negative impact of the global financial crisis on international trade.[2]

The role of the foreign exchange market

The size of the foreign exchange market means a vast number of transactions take place on a daily basis. Broadly speaking, these transactions fall under three categories.

First, the foreign exchange market allows companies to exchange currencies to pay for, and receive income from selling goods, services and assets overseas. This article will only briefly discuss this role, however, focusing instead on the two other roles, set out below.

Second, the foreign exchange market allows companies to protect themselves against unexpected changes in the exchange rate that affect the returns they make from their underlying business. This process is known as 'hedging'.

Third, market participants may use the foreign exchange market to seek to earn additional profits. This 'profit-seeking' behaviour may derive from a view that the market is mispriced and hence there are gains to be made by trading.

The manner in which market participants hedge or profit-seek will depend on their specific businesses. The next two sections explore, in turn, the use of the market by non-bank financial institutions and by the non-financial corporate sector.

The use of foreign exchange markets by non-bank financial institutions

Non-bank financial institutions use foreign exchange markets for both hedging and profit generation. There are sparse data on their actions however, meaning that market intelligence plays a prominent role in forming conclusions about non-bank financial institutions' use of foreign exchange markets. Of the two motivations, market contacts attribute the majority of turnover to hedging behaviour, but there is also a significant amount of profit-seeking. This section discusses each of these motives in turn.

Hedging behaviour by non-bank financial institutions

Non-bank financial institutions hedge to avoid unexpected changes in exchange rates leading to variations in the returns derived from investing in overseas assets. For example, the returns to a UK investor from a bond issued by the US government, which promises to pay $100 in one year's time, are determined not only by US interest rates, but also by the rate at which US dollars can be exchanged back into sterling. If sterling appreciates against the dollar in the period between buying and selling the bond then the total sterling return from the investment will be less than if the exchange rate had not changed.

An investor can protect themselves against — or 'hedge' — this currency risk by simultaneously investing in an instrument for which the pay-off is inversely related to the impact that changes in exchange rates have on the returns from investing in an overseas asset. In this example, the investor could simultaneously enter into a forward foreign exchange contract, guaranteeing that $100 will be exchanged for a pre-agreed amount of sterling at the end of the year (see the box on

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(1) Under the BIS definitions, 'other financial institutions' also includes banks that do not respond to the survey, which are believed to account for a small proportion of the sector. It also includes companies that trade on behalf of retail investors. The data and market intelligence suggest activity by retail investors is limited in the United Kingdom, but much more prominent in other areas of the world.
(2) For further discussion of the collapse in world trade during the financial crisis, see Domit and Shakir (2010).

page 122 for a more detailed description of a forward contract, and other instruments used in the foreign exchange market). Consequently, any change in the exchange rate over the intervening period will have a negligible effect on the overall portfolio, meaning that the investment's currency risk is hedged.

Over the past decade, UK investment in overseas financial assets has increased (**Chart 2**), which has brought about a concomitant increase in the amount of hedging of foreign exchange exposure. This investment expansion has been motivated mainly by a desire across a range of investors to improve the trade-off between risk and return that arises by investing in a broad range of assets, including in overseas assets (so-called 'portfolio diversification').

Chart 2 Domestic and overseas long-term investments by UK insurance companies and pension funds
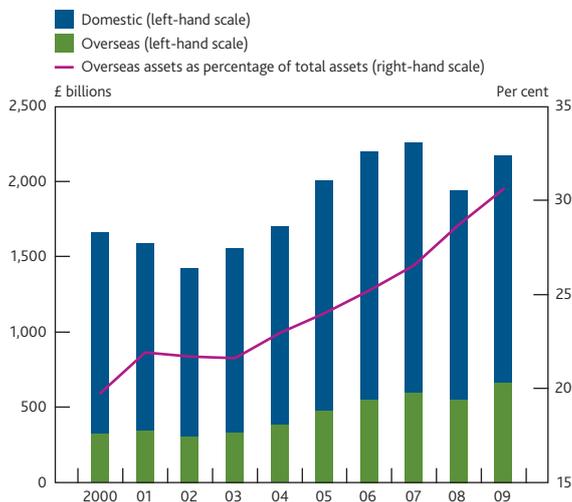
In practice, however, contacts reported that investors do not always perfectly hedge the currency risk inherent in their holdings of overseas assets, partly as a result of uncertainty over how long they will invest in overseas assets. Instead they tend to use short-maturity instruments, typically swaps and forward contracts of maturity less than three months, and enter into new short-maturity instruments when the initial contracts mature. The amount of new investment required to continue the hedge will vary depending on the changes that have occurred to the total value of the overseas assets during the period between entering into foreign exchange derivative contracts (the 'roll' period). Contacts reported little use of options, or more complicated foreign exchange derivatives, for hedging purposes by non-bank financial institutions.

The degree to which non-bank financial institutions hedge currency risk depends on the composition of their portfolio. For example, contacts suggest that non-bank financial institutions that invest in a portfolio of debt instruments — such as government or corporate bonds — are more likely to hedge currency exposures than those that manage a portfolio

of equity instruments. This was reportedly because the proportion of volatility in an international bond portfolio as a result of exchange rate changes tends to be larger than would be the case for an international equity portfolio of similar size, and hence hedging was more likely to be necessary in order to protect overall returns. Moreover, contacts suggest some equity investors view currency risk as a source of diversification.

Investing in foreign currencies as a means of generating profits

In addition to hedging the currency risk from investing in overseas assets, some non-bank financial institutions also try to earn additional profits from changes in exchange rates. This may result from investors deliberately not reducing the currency risk from overseas investments, thereby meaning that movements in exchange rates affect their returns. Or investors may invest in foreign exchange instruments even when they have no underlying holdings of overseas assets. Indeed, some investors invest a proportion of their assets solely in currencies and related foreign exchange derivatives for this purpose.

In a perfectly efficient market, investors should not consistently be able to generate positive risk-adjusted returns by investing in financial assets.[1] While investors may expect to earn positive returns from certain investments in exchange rates, this should merely compensate them for the risks they are taking that pay-offs will be lower in 'bad' states of the world, such as recessions. Some argue, however, that inefficiencies in the foreign exchange market — such as informational asymmetries — mean that positive risk-adjusted returns can be made on a consistent basis, justifying the existence of profit-seeking investors in foreign exchange markets.

There are broadly two types of investors looking to generate positive risk-adjusted returns from perceived inefficiencies in the foreign exchange market: 'fundamental' and 'technical' investors. On the one hand, fundamental investors use economic or financial theory to form an opinion about a 'fair value' for an exchange rate. They then either buy or sell a currency in order to profit from their expectation that current exchange rates will converge towards this fair value. On the other hand, technical investors base investment decisions on patterns observed in past values of the exchange rate and place less value on economic data or theory in forming their investment decisions.

According to contacts, investors looking to profit from changes in exchange rates tend to use foreign exchange

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(1) Investors will be willing to pay a higher price, and hence demand lower expected returns, for assets that provide high pay-offs during 'bad' states of the world, such as recessions. And *vice versa* for assets that provide low pay-offs during bad states of the world.

Instruments used in foreign exchange markets

There are a number of financial instruments that participants in foreign exchange markets can use. A large proportion of turnover is in simple transactions in the spot market (**Chart A**). But there is also significant turnover in the derivatives market, which allows market participants to purchase and sell currency at pre-arranged prices at a future date, and gives them greater flexibility in managing currency exposures via instruments such as options. This box briefly outlines the most common instruments used.

Chart A Average daily turnover in UK foreign exchange markets by instrument type

Source: London Foreign Exchange Joint Standing Committee.

A *spot* foreign exchange transaction captures the immediate purchase or sale of one currency in return for another. The rate at which this transaction takes place is what is commonly referred to as the exchange rate.

A *forward* contract is an agreement to buy or sell a certain amount of currency at a pre-determined date in the future at the forward rate of exchange. In a perfectly efficient market, the forward exchange rate is calculated by adjusting the current exchange rate to account for differences in interest rates between two currencies. *Non-deliverable forwards* are similar to outright forwards, but are not physically settled at maturity. Instead, a cash payment will be made by one party to the other, usually in dollars, if the spot rate differs to the agreed forward rate on maturity.

Foreign exchange swaps involve a counterparty agreeing to buy an amount of currency at an agreed spot exchange rate while simultaneously entering into a forward contract that locks it into selling the same amount of currency at a later date at a pre-agreed forward rate.

A *currency swap* is a contract in which two market participants agree to exchange regular (typically quarterly, semi-annual, or annual) floating payments in different currencies. In essence a currency swap equates to a series of forward contracts.

Currency options give the buyer the right, but not the obligation, to exchange one currency for another at a pre-determined exchange rate on, or before, a pre-specified maturity date. Typically, 'European' options are used within foreign exchange markets, meaning that an option holder can only choose to exercise their option on the maturity date, and not before. 'American' options also permit the holder to exercise the option prior to the maturity date. There are also a number of more complicated ('exotic') options used within foreign exchange markets, including Asian options, Bermudan options, forward starting options, compound options and barrier options.

instruments that are similar to those used by investors looking to hedge. Real money investors tend to use simple foreign exchange derivatives such as forwards and swaps, typically with maturities of less than three months. Usage is more varied across hedge funds, however; some will use relatively simple instruments and operate in a similar manner to real money investors, while others use options and other derivatives to a much greater extent and degree of complexity.

In recent years, profit-seeking investors known as 'high-frequency traders' have formed an increasingly significant part of the foreign exchange market, facilitated by improvements in technology. There are many different types of participants that trade very frequently in foreign exchange markets, including banks. But high-frequency trading

companies can broadly be defined as investors that purchase and sell currencies — predominantly in the most liquid spot markets — with a shorter holding period than other market participants in order to generate profits. The investment decisions of high-frequency traders are determined and executed by pre-defined mathematical models (algorithms), requiring sophisticated information technology systems to analyse large amounts of data. Reflecting this, investments by high-frequency traders typically last for less than five seconds on average, and regularly last for less than one second. Although measuring the foreign exchange turnover accounted for by high-frequency trading companies is difficult, market contacts suggest that they have contributed significantly to the growth in turnover by 'other financial institutions' (**Chart 1**), and are estimated to account for approximately 20%–25% of turnover in London.

High-frequency trading companies typically rely on their relationships with banks — so-called 'prime broking' relationships — to access the infrastructure needed to sustain trading activities. A high-frequency trader's prime broker will lend them funds in return for a fee (or interest rate), but will impose certain constraints on the company, including on the amount of leverage that can be used. According to contacts, much of the growth in the value of transactions financed by prime brokerage in the London Foreign Exchange Joint Standing Committee survey (Bank of England (2011)) can be accounted for by high-frequency traders.[1]

Historically, high-frequency trading companies attempted to generate profits primarily by exploiting price discrepancies between different foreign exchange trading venues; known as 'latency arbitrage'.[2] But, as the efficiency of the foreign exchange market has improved over recent years, high-frequency traders' strategies have evolved. For example, high-frequency traders may engage in activities similar to market-making, profiting from the difference between the prices at which they are willing to buy and sell currencies (the 'bid-offer spread'). Or they may employ strategies based on their analysis of market flow and positioning, observed correlations between currencies and other asset prices, or in response to data releases.

There are mixed views about the impact of high-frequency traders on the foreign exchange market. On the one hand, increased competition has contributed to the reduction in the spread between the prices at which market participants can buy or sell currency, lowering the costs to the ultimate end-users of foreign exchange markets. In particular, contacts note that bid-offer spreads have fallen, particularly for smaller-sized transactions, lowering the cost of transacting in the foreign exchange market for non-bank participants in normal market conditions. And, since high-frequency traders observe prices across different trading venues, they might increase the efficiency by which liquidity is transferred around the foreign exchange system.

On the other hand, there are concerns about whether high-frequency traders could amplify market volatility during periods of heightened stress within financial markets. Since some high-frequency traders behave like market makers, the perceived liquidity benefits from their presence may be illusionary. In particular, given their short holding period, contacts suggest there may be a risk that high-frequency traders withdraw from the market during periods of volatility, potentially aggravating any deterioration in liquidity conditions. There is, however, some evidence to suggest that high-frequency traders might actually stabilise conditions to some extent (Chaboud *et al* (2009)), perhaps because their behaviour has tended to normalise more quickly than other participants after periods of heightened volatility.

How non-bank financial institutions trade in foreign exchange markets

There are a number of different ways that non-bank financial institutions can execute trades in the foreign exchange market. In recent years, they have increasingly been executed electronically as advances in technology have increased the speed and ease by which trades can be conducted. The latest published survey by the London Foreign Exchange Joint Standing Committee (conducted in October 2010) suggested that over half of turnover by non-bank financial institutions was conducted via electronic trading or broking systems (Bank of England (2011)). The growth in electronic execution methods partly reflects the growth in algorithmic trading — which makes use of computer programs to automate trading based on pre-defined rules. An example of an algorithmic trade is one in which a large trade is split into a series of smaller segments, and executed at the most liquid periods, in order to minimise its impact on exchange rates. Banks will often do this on behalf of their customers in return for a fee.

Discussions with market participants suggest that non-bank financial institutions tend to conduct foreign exchange transactions with the market maker that offers the best price. But non-price factors are also important. For example, contacts noted that the ease with which a market maker could execute large transactions efficiently was also an important consideration; as was their ability to offer trade ideas and provide intelligence on foreign exchange markets.

The use of foreign exchange markets by private non-financial companies

In contrast to financial institutions, which use foreign exchange markets for both hedging and profit-seeking purposes, UK non-financial companies use foreign exchange markets predominantly to reduce the currency exposure arising from their underlying business. The degree to which companies have used foreign exchange markets has increased over time, mirroring the rise in global trade activity. As discussed previously, the foreign exchange turnover of non-financial companies in the London market fell back during the recent global crisis as trade flows collapsed, but rose again in October 2010 (**Chart 3**).

This section outlines why companies might choose to hedge currency exposures, the constraints on them and the ways in which they tend to do so in the United Kingdom.

Motives for hedging

In perfect financial markets, in which there are no informational asymmetries, no taxes and no transaction costs,

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(1) See also Broderick and Cox (2010).
(2) Latency is the time it takes to deliver an executable price to a client plus the time it takes for the trade record to return to the price maker.

Chart 3 Average daily turnover of non-financial companies in UK foreign exchange markets
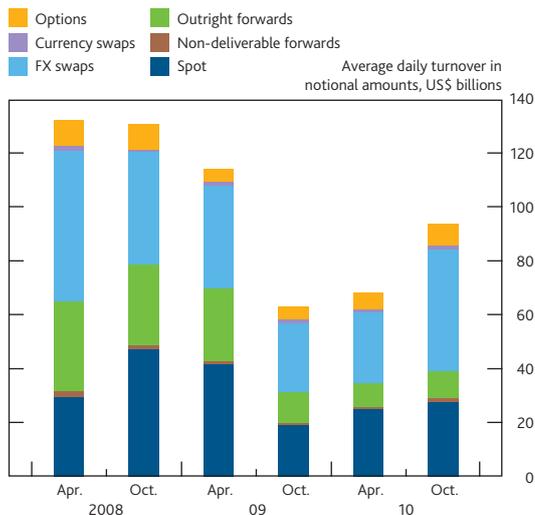
Source: London Foreign Exchange Joint Standing Committee.

hedging foreign exchange exposures should not affect the value of a company (Modigliani and Miller (1958)). If investors can hedge unwanted currency exposures themselves at identical costs to the company, they will not reward companies that hedge by demanding lower returns to hold a stake in that company. Consequently, companies' use of foreign exchange markets need not extend beyond using the spot foreign exchange market.

But if the assumptions about perfect markets are relaxed, there are various reasons why hedging currency risk might increase a company's value; either by increasing expected dividends or reducing the additional compensation required by investors to hold an asset with uncertain pay-offs.

Contacts suggest a number of motives for hedging by non-financial companies, the most important of which is the desire to minimise losses triggered by unexpected exchange rate movements. Broadly speaking, there are three channels through which companies perceive changes in exchange rates to influence their profitability. First, the domestic value of international trade may be made less profitable by changes in the exchange rate; so-called 'transactional' risk. Second, companies face a 'translational' risk from movements in exchange rates affecting the domestic value of overseas assets and liabilities. For example, the reported value of an overseas factory owned by a company will change as a result of movements in the exchange rate. And third, companies are exposed to the 'event' risk that returns from potential mergers, acquisitions and overseas investments are determined, in part, by changes in exchange rates.

Companies may also hedge currency risk to help smooth income over time. For example, in countries with progressive corporate tax regimes such as the United Kingdom, reducing the variability of pre-tax income can increase expected

post-tax income.[1] And contacts also reported that investors tend to demand additional returns to compensate them for investing in a company with greater variation in its reported earnings. Companies may therefore use foreign exchange markets to smooth currency exposures and reduce reported earnings volatility.

Hedging currency risk may also provide companies with more time to respond to unexpected exchange rate movements. For example, if companies perceive the change to be persistent, they may respond by adjusting their business model, either to secure alternative funding sources, to change production and supply methods, and/or to find new sources of customer revenues. But these changes take time and hedging can provide companies with an interim period during which they can respond.

Contacts suggest that while the motives for hedging vary across firms and industries, hedging activity tends to be greater for companies that face a higher probability of financial distress. Companies in highly competitive industries — where products are sold at prices only slightly above the production cost — reportedly tend to hedge a higher proportion of currency exposures than those in less competitive industries. Those companies in less competitive industries are more likely to be able to absorb losses from an adverse change in exchange rates with little impact on the probability of bankruptcy, whereas companies in more competitive industries are more likely to hedge to mitigate the higher bankruptcy risk that they face.

Constraints to hedging

The potential benefits of hedging must be balanced against the costs of doing so. For small companies in particular, the additional costs associated with hedging currency exposures may exceed the additional benefits from doing so, particularly since there are fixed costs to establishing a hedging programme. Consistent with this, the *April 2011 Business Risk Report* (conducted by Lloyds Banking Group) showed that a substantial majority of small and medium-sized companies in the United Kingdom do not hedge currency risk using financial market instruments (**Chart 4**). This contrasts with large companies, where 88% of respondents to the *2010 Risk Management Survey* of large global multinational companies (conducted by Bank of America Merrill Lynch) reportedly hedged at least some of their currency exposure using financial instruments. As well as reflecting the lower hedging costs for large firms, this finding might also reflect large companies being more likely to earn a higher proportion of revenues as a result of international trade than smaller companies, and thus have greater exposures to changes in exchange rates.

(1) For further information on the tax incentives to hedge, see Graham and Smith (1999).

Chart 4 Small and medium-sized companies with a hedging strategy in place

- ■ Yes
- ■ No

Percentages of respondents

Annual turnover
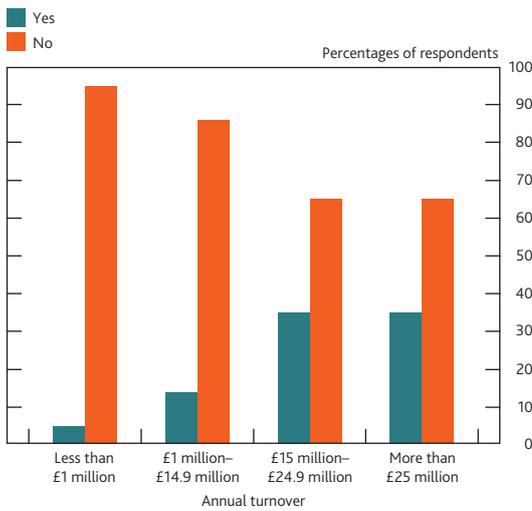
Source: Lloyds Banking Group.

Companies' desire to manage currency risk through the use of derivatives may also depend on the accounting treatment of foreign exchange instruments. According to contacts, publicly listed companies' decisions appear to depend, at least in part, on their ability to obtain so-called 'hedge accounting'. Derivatives are normally subject to 'fair value' accounting, which means that mark-to-market gains or losses are recognised in the profit and loss statements of companies. Hedge accounting allows companies to delay recognising these gains or losses until the associated transaction is realised, lowering volatility in reported earnings. These findings are consistent with the April 2010 *Risk Management Survey* of large companies. When asked about the significance of accounting considerations for hedging purposes, 33% of respondents stated accounting considerations were 'critical', 56% noted they were 'important' and only 10% said they were 'unimportant'.

Companies' ability to reduce currency risks may also be impinged by their ability to forecast cash flows. Non-financial companies tend to be more confident about forecasting cash flows, and hence currency exposures, in the short term, and will often hedge a higher proportion of this currency exposure. In contrast, it is harder for them to forecast longer-maturity cash flows, meaning they usually hedge less at this maturity. According to the *2010 CitiFX Corporate Risk Management Study* of large multinational companies, most respondents suggested that they tend to reduce the maturity of foreign exchange transactions as uncertainty about future earnings increases.

Corporate hedging methods

Before turning to financial instruments, some companies will use so-called 'natural' hedges to offset some of their currency risk. Natural hedging refers to methods such as companies moving production facilities to the overseas country in which they have the foreign exchange exposure, or borrowing in the

overseas currency. Reports from the Bank's Agency network, which gathers information from businesses around the country, suggest that there has been an increasing trend towards companies using these natural hedging methods.

For those companies that use financial instruments to hedge currency risk, contacts report that they mainly use short-maturity foreign exchange forwards and swaps. They typically rely on instruments with a maturity of less than twelve months (**Chart 5**).

Chart 5 Maturity of foreign exchange derivative contracts used by non-financial participants

- ■ Forwards and swaps(a)
- ■ Options bought and sold(b)

Per cent
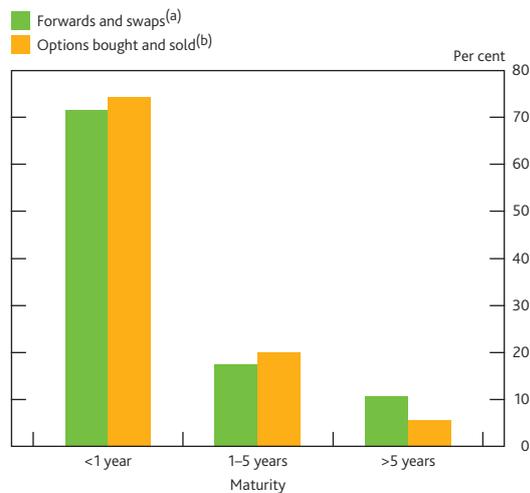
Maturity

Source: Bank for International Settlements.

(a) Proportion of turnover for specific maturities of forwards and swaps relative to the total turnover of those instruments.
(b) Proportion of turnover for specific maturities of options bought and sold relative to the total turnover of those instruments.

Contacts reported that the average maturity of foreign exchange instruments used by non-financial companies shortened slightly following the financial crisis. As well as reflecting greater uncertainty about the global trade outlook, and hence future cash flows, this may also have reflected an increase in the cost of long-maturity derivatives relative to short-maturity derivatives. Banks have increasingly incorporated a charge to compensate them for the risk that a company might default on long-term derivative trades, potentially increasing the cost of hedging for companies.

The use of options and more complicated structured products by non-financial companies is less widespread than forwards and swaps. According to the *2011 Foreign Exchange Services Study* by Greenwich Associates, only 16% of large companies in the United Kingdom use currency options to manage currency exposures. According to contacts, companies that use options tend to have a 'target' exchange rate, and will use options to ensure that this minimum target is met.

Contacts reported two main reasons for the lower reliance on the options market. First, companies were particularly averse to the upfront cost associated with purchasing simple

('vanilla') options. For example, the *2010 CitiFX Corporate Risk Management Study* conducted by Citigroup found that 64% of respondents did not use options because of considerations about cost. And, for those companies that do use options, many will reduce the upfront cost by using a combination of purchases and sales of options, or purchasing more exotic options, albeit in return for limits on the potential benefits of these hedges. And second, the accounting treatment of options reportedly made them a less favourable hedging instrument relative to forwards and swaps.

According to market contacts, the majority of foreign exchange turnover by non-financial companies reflected companies trying to reduce transactional currency risk. There was also some reported hedging of translational risk using longer-maturity instruments. Managing the currency risks associated with events such as mergers and acquisitions, or large overseas investments, was typically constrained to the largest companies, with more complicated derivatives sometimes used in these transactions. For example, contacts reported the use of 'contingent options', which give the company the option to exchange a certain amount of currency at a pre-specified exchange rate subject to the 'event' taking place.

The manner in which non-financial companies liaise with banks to manage currency exposures does not appear to have changed markedly since the financial crisis. Companies typically conduct foreign exchange transactions with a relatively small set of banks, often those with which they have a pre-existing lending relationship. And, although contacts suggested that many larger companies have re-evaluated their hedging programmes in light of the financial crisis, there appear to have been few changes in the way that companies protect themselves against the risk that a bank will renege on its foreign exchange derivative obligations. For example, few companies have adopted agreements that ensure that collateral is provided if there is a change in the value of

existing foreign exchange derivatives. The *2009 Foreign Exchange Services Study* of large corporates by Greenwich Associates suggested that only 15% of respondents had established credit support annexes (CSAs) — a legal document outlining the rules governing the mutual posting of collateral — and 10% had collateral agreements in place.

Summary

The foreign exchange market plays an integral role in the economy. This article has described the use of the market by non-bank participants, drawing on market intelligence gleaned from discussions with financial market participants, survey data and economic theory.

In the non-bank financial sector, the majority of foreign exchange turnover is reported to reflect investors hedging currency risk associated with overseas investments. But there remains a significant amount of profit-seeking within foreign exchange markets, both by leveraged and non-leveraged investors. An increasingly important profit-seeking group of participants in recent years has been high-frequency traders, which have changed the dynamic of foreign exchange markets, with smaller trade sizes at a much more regular frequency.

In contrast, non-financial companies almost entirely use foreign exchange markets to reduce the currency risk associated with their everyday business activities. The means by which they do so are varied and are, in part, related to accounting treatments. They typically use relatively simple, short-maturity foreign exchange instruments, although there is also some activity in options markets.

The Bank will continue to monitor developments in foreign exchange markets, in part through its role as chair of the London Foreign Exchange Joint Standing Committee, to help to contribute to both monetary and financial stability.

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Housing equity withdrawal since the financial crisis

By Kate Reinold of the Bank's Structural Economic Analysis Division.[1]

The amount of housing equity withdrawal (HEW) has swung from being significantly positive before the financial crisis and recession, to negative over the past few years. The net effect of a chain of housing transactions is typically a large equity withdrawal. The fall in the number of housing transactions is therefore likely to have been a key driver of the fall in equity withdrawal since the financial crisis. There is little sign that, at the aggregate level, households are making an active effort to pay down debt more quickly than in the past.

To explain what is meant by housing equity withdrawal (HEW), it is useful to first define housing equity itself. The stock of housing equity is the portion of housing wealth which does not have lending secured on it:

$$\begin{array}{ll} \text{Stock of housing} \ = & \text{stock of housing} \ - \ \text{stock of lending} \\ \text{equity} & \text{wealth} \qquad\qquad \text{secured on housing} \end{array}$$

The stock of housing equity can change in three main ways: through changes in the stock of secured lending when households take out or repay debt; through changes in the stock of housing wealth when new properties are built or improvements are made to existing properties;[2] and from revaluations of the stock of housing wealth due to changes in house prices. The balance of the first two ways of changing equity (ie excluding revaluations) in each period is classed as HEW, which is calculated by the Bank of England.[3][4]

In 2008, HEW turned negative for the first time since the 1990s. That signified that the household sector as a whole was injecting equity into housing after a long period of withdrawals. While it might be tempting to interpret this as an active effort by households to pay down debt more rapidly than in the past, it is not clear that this is the case.

In practice, HEW summarises the net effect of many different ways in which individual households might inject or withdraw housing equity. For example, a homeowner might take out a further advance on their mortgage and so withdraw housing equity. Another homeowner might make improvements to their home and so inject housing equity. And HEW can also be affected by housing market transactions. When households, in aggregate, are withdrawing more equity than they are injecting, HEW is positive, and when they are injecting more than they are withdrawing, HEW is negative. As will be set out in this article, the weakness in housing market transactions has been an important driver of the fall in equity withdrawal.

Past *Bulletin* articles by Davey (2001), Benito and Power (2004) and Benito *et al* (2006) have considered the uses of withdrawn equity, for example for consumption or dwellings investment. That is beyond the scope of this article which focuses solely on what has driven the move to equity injections since 2008.

The first section of this article explains the many different injections and withdrawals which underlie the HEW figures. The second section looks at the HEW figures since the financial crisis started. It presents illustrative Bank estimates of the different gross flows making up HEW, and considers how their recent movements should be interpreted. The calculations behind the estimates of the gross flows are explained in the box on pages 130–31.

Understanding HEW

HEW occurs when withdrawals of housing equity by the household sector are larger than injections of equity. The Bank measures HEW by taking the difference between net lending secured on dwellings and households' gross investment in housing. But while this is the simplest way to estimate net withdrawals of housing equity, it does not offer insights into why HEW has changed.

Although more difficult to measure, the different underlying gross injections and withdrawals that make up the HEW statistic can shed light on movements in HEW. These flows are set out in **Figure 1** and **Table A** and are drawn from Davey (2001). Some of these flows are closely related to housing market turnover, while others are carried out by homeowners but are unrelated to housing market transactions. These are considered in turn.

Gross flows related to housing market transactions

Some injections and withdrawals of housing equity are closely related to turnover in the housing market. Housing market transactions typically occur in chains — when buying a property most people first have to sell their own property. In order for a chain to start there usually needs to be a buyer who does not sell another property (typically a first-time buyer or buy-to-let investor). And for it to end, a seller who does not

buy another property (for instance a house builder selling a new-build property or a 'last-time seller', for example when a property is sold after inheritance or emigration) is needed. In between, there are homemovers who sell one property and buy another.

Different buyers and sellers at different stages of the chain of housing market transactions may make equity withdrawals or equity injections (**Figure 1**). The buyer at the start of the chain injects equity, either to the value of their deposit or to the value of the property if they buy outright. Homemovers within the chain may make no change to their equity, choose to inject it through undermortgaging, or withdraw it through overmortgaging or trading down (see **Table A** for definitions). And the seller at the end of the chain withdraws equity, to the value of their equity share in the property, ie the house price less their outstanding mortgage (if they have one).

Figure 1 Housing chains and housing equity withdrawal
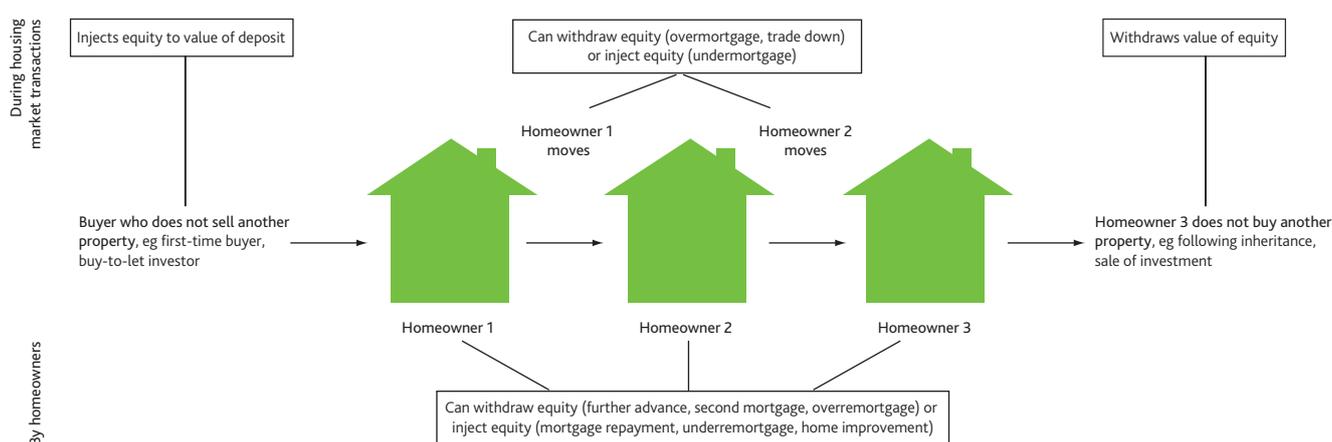
Table A Methods of withdrawing and injecting equity

Withdrawals		Injections	
During housing market transactions			
Last-time sales	A seller does not buy a new property, so the proceeds of the sale are released from the housing market.	Buyers who do not sell another property, eg first-time, buy-to-let purchases	The deposits paid by first-time buyers and buy-to-let investors.
Overmortgaging	A moving owner-occupier increases their mortgage by more than the difference between the old and new house prices.	Undermortgaging	A mover changes their mortgage by less than the difference between the old and new house prices.
Trading down	A seller moves to a cheaper property but reduces the mortgage by less than the difference between the old and new property prices, so leaving a cash sum.		
By homeowners			
Further advances and second mortgages	A borrower raises a further advance on an existing mortgage or takes a second mortgage without improving the property to the same extent.	Repayments of mortgage debt	Regular and lump-sum repayments of principal and the redemption of mortgages, except on sale or remortgaging.
Overremortgaging	A borrower taking a new mortgage increases their debt without improving the property to the same extent.	Underremortgaging	A borrower takes a new mortgage and reduces their debt without moving properties.
		Home improvements	Home improvements paid for with non-secured funds.

The net effect of a housing chain is typically a large equity withdrawal. This is because between buying for the first time and selling for the last, homeowners make mortgage repayments which increase their equity share. While the buyer at the start of the chain usually injects some equity, and homemovers may, on balance, inject equity (although they could also withdraw), these are typically dwarfed by the larger withdrawal by a last-time seller (Holmans (2001)).

So movements in HEW will be closely related to turnover in the housing market. And indeed, **Chart 1** shows that there is a close comovement between HEW and housing market transactions.

Chart 1 Housing market transactions and housing equity withdrawal
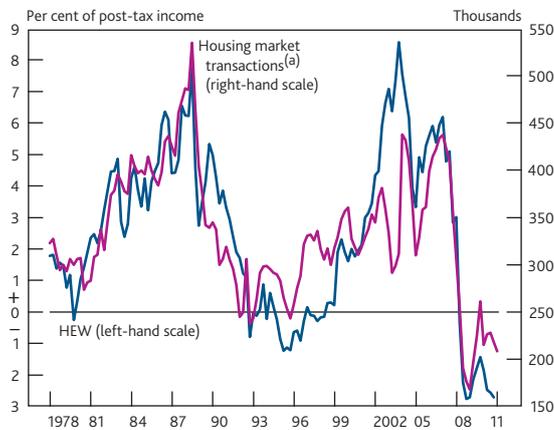
Sources: Bank of England, HM Revenue and Customs (HMRC) and Bank calculations.

(a) Number of residential property transactions in the United Kingdom with a value of £40,000 or above per quarter from 2005 Q2. Prior to that date, the series has been assumed to grow in line with quarterly HMRC data on particulars delivered in England and Wales.

HEW related to housing market transactions will also be influenced by house prices. House price rises increase the size of a homeowner's equity and so with the same number of housing chains, the size of total withdrawals by last-time sellers will be larger.

Gross flows by homeowners

Not all gross flows within HEW are related to housing market transactions; many withdrawals and injections are carried out by homeowners with no sale of property (**Figure 1**). Homeowners can renegotiate the size of their mortgage without moving — either by over or undermortgaging when moving to a new mortgage deal or by taking out a further advance. And regular repayments of mortgage principal, lump-sum mortgage repayments or improvements to a property, all constitute equity injections.[1]

Changes in HEW since the financial crisis

The different flows mentioned above are likely to have different motivations and therefore provide different signals about household behaviour. For example, further advances

taken on a mortgage might be taken to finance a consumer purchase or a home improvement, while equity withdrawn following a last-time sale after inheritance may not have such a specific purpose. And regular mortgage repayments are often a condition of a mortgage, while lump-sum mortgage repayments might be an active effort to pay down debt. So understanding how the gross flows have changed is important for interpreting changes in the HEW figures.

This section first sets out some of the developments since the crisis that will have influenced HEW. It then goes on to present estimates of the different gross flows underlying HEW and explain how they have changed.

Factors that are likely to have affected HEW

The financial crisis was associated with a sharp tightening in credit availability, a fall in house prices and a fall in housing market transactions to around half of their pre-crisis levels. These developments (which are themselves interlinked) are all likely to have had implications for HEW.

First, the fall in housing market turnover will have reduced equity withdrawals related to transactions. Tighter credit conditions have led to a large reduction in the number of first-time buyers as the typical size of deposit needed has risen substantially. First-time buyers start housing chains and so the fall in their number will have reduced the number of chains. As explained above, housing chains typically lead to large equity withdrawals, so the lower number of housing market transactions, all else equal, will have led to lower equity withdrawals.

Second, equity withdrawals related to housing market transactions that have still taken place will be smaller. This is because house prices currently lie around 13% below their 2007 level and so the value of homeowners' housing equity is lower than it would otherwise have been.

And finally, withdrawals and injections by homeowners (unrelated to housing market transactions) will also have been affected. Tighter credit conditions may mean some homeowners have become less able to draw down on their housing equity than in the past. In addition, the crisis may have affected households' desire to either draw on or inject housing equity. Some homeowners may view their equity as a buffer against which they can withdraw when they experience falls in their income. During the financial crisis and subsequent recovery many households' real incomes have been squeezed, so it is possible that some homeowners will have chosen to draw on their equity as a result. But other homeowners may

(1) New house building increases the value of the housing stock but is not a separate gross injection. If a mortgage is used when purchasing the property, then the size of the stock of secured lending will also increase. Any net increase in the value of equity is captured by the equity injection of the first-time buyer or buy-to-let investor at the start of that housing chain.

Estimating the gross flows and considering their robustness

This box explains how each of the gross flows making up HEW (shown in **Chart 2** and outlined in **Table A**) are estimated and checks their robustness.

Table 1 sets out which flows are measured and which need to be estimated, and the method and sources used. Data are available on regular and lump-sum repayments of mortgage principal, improvements to the housing stock and further advances. But estimates are needed for injections by first-time buyers and buy-to-let investors; withdrawals by last-time sellers and households trading down; and the change in equity through over and undermortgaging and remortgaging.

Deposits of first-time buyers can be estimated using data on the number of first-time buyers, their average house price and the median deposit as a share of their house price. For buy-to-let investors' deposits, there are data available on the number of investors, but not their average house price nor their average loan to value ratio. These are therefore assumed to be the average house price in each period, and 75% respectively.

It is more difficult to estimate withdrawals by last-time sellers and homeowners trading down.[1] But data from the British Household Panel Survey (BHPS) can be used to give an estimate. These data provide the distribution of each age group's house prices relative to the average house price for each year of the sample considered (1993 to 2010, **Chart A**). This distribution is hump-shaped, reflecting homeowners moving to relatively more expensive properties as they move up the housing ladder and then down to relatively cheaper properties in later life. Using each year's ratio, and multiplying by the average house price (as measured by the average of the Halifax and Nationwide indices) creates an estimate of the house price of different groups of homeowners over time.[2]

Using the BHPS it is also possible to estimate homeowners' loan to value ratios for each age group. Alongside the house price ratios, this allows the average size of each equity withdrawal through last-time sale and trading down over time to be estimated.

The method used to estimate the number of last-time sellers is based on the assumption that the number of buyers starting housing chains equals the number of sellers ending them. Housing chains can be started by first-time buyers and buy-to-let investors, and end with a last-time seller or a

Table 1 Estimating gross flows

Flow	Measured or estimated?	Method and sources
Injections		
Mortgage repayments	Measured	Bank of England data on regular and lump-sum repayments of mortgage principal[a]
Improvements	Measured	ONS data on dwellings investment spent on improvements[b]
Deposits from first-time buyers	Estimated	Product of: • average house price (Halifax and Nationwide standard price of first-time buyer) • number of first-time buyers (Council of Mortgage Lenders (CML) data on mortgages advanced) • average advance as a per cent of house price (CML)
Deposits from buy-to-let investors[c]	Estimated	Product of: • average house price (Halifax and Nationwide all houses) • number of buy-to-let investors (CML data on mortgages advanced for buy-to-let) • average advance as a per cent of house price (assumed 75%)
Withdrawals		
Withdrawals by last-time sellers	Estimated	Product of: • estimate of equity of last-time seller (estimated using BHPS data) • an estimate of the number of last-time sellers
Withdrawals by traders down	Estimated	Product of: • difference between estimate of equity in old house and estimate of equity in new house (estimated using BHPS data) • an estimate of number of down traders
Further advances[d]	Measured	Bank of England data on 'other secured lending'
Net effect of over and undermortgaging and remortgaging	Estimated as a residual	Estimated as a residual. Takes the difference between the Bank's HEW statistic and the other flows.

(a) Before 1999, total repayments data are not available. Before this date, data on repayments to building societies are scaled by building societies' share of outstanding secured lending in the period.
(b) Improvements are taken from disaggregated ONS dwellings investment data which are not published. They have therefore not been subject to the same level of scrutiny as published National Accounts variables.
(c) Buy-to-let data are only available from 1999. Before this, any injections of equity by buy-to-let investors will be captured in 'other'.
(d) Further advances data are only available from 1998. Before this, any withdrawals of equity through further advances will be captured in 'other'.

Chart A House prices and loan to value ratios by age group[a]

Sources: BHPS surveys 1993 to 2008 and Bank calculations.

(a) Swathes show the range of the profiles for each year of the survey and the lines are the averages across these surveys.

new-build property. Last-time sellers can therefore be estimated as the number of first-time buyers and buy-to-let purchases less sales of new-build property. Multiplying this by the average equity withdrawal of a last-time sale gives an estimate of how much equity is withdrawn annually through last-time sales.

BHPS data suggest that households typically move into relatively cheaper properties between the ages of 50 and 70 (**Chart A**). In order to get an estimate of the number of households trading down it is assumed that every homeowner is equally likely to move home. Under that assumption, the number of transactions can be multiplied by the proportion of homeowners who are aged between 50 and 70 to get an estimate of the number of homeowners down trading each period. This is clearly stylised as different age groups probably have very different likelihoods of moving. Again, multiplying this number by the estimate of the average amount of equity withdrawn through trading down gives an estimate of the size of withdrawals through trading down each year.

Finally, it is not possible to estimate the balance of over and undermortgaging and remortgaging without detailed survey data. In theory, the net of the gross flows should be the same as the Bank's HEW statistic and so these flows are estimated by taking the difference between the aggregate HEW figures and the sum of the estimated and measured gross flows. This residual bar will also capture any error in the other estimates.

Robustness
The assumptions underlying some of the calculations are extremely stylised so it is important to test their robustness. It is reassuring that, where the samples overlap, these estimates of gross withdrawals from last-time sellers and households trading down are similar to those of Holmans (2001) and Benito and Power (2004) (**Chart B**). The estimates of injections by first-time buyers and buy-to-let investors presented in this article are smaller than Holmans'. If indeed these injections are underestimated, the 'other' bars, which are positive on average, might also be too small (**Chart 2**).

Chart B Comparing estimates of gross flows
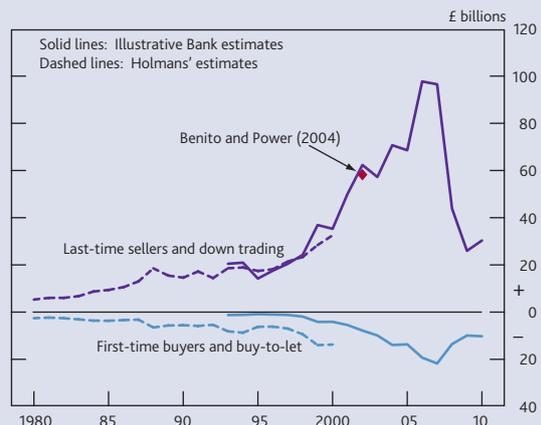
Sources: Benito and Power (2004), Holmans (2001) and Bank calculations.

(1) A last-time seller is any homeowner who sells a property and does not buy another in the same transaction, eg after inheritance, emigration, divorce or sale of investment property. For simplification, the equity of a last-time seller is estimated as that of an elderly household (so focusing on last-time sales following inheritance). But the estimate of the number of last-time sales will capture last-time sales with any motivation.

(2) The BHPS is not available after 2008. For 2009 and 2010, the 2008 profiles are used.

have chosen to deleverage due to an increase in their uncertainty about the future.

Estimates of the gross flows
Holmans (2001) estimated the size of all the different gross injections and withdrawals for the years 1980 to 2000. This was a comprehensive summary of the different ways in which equity could be injected or withdrawn, drawing on detailed survey data, measured statistics and various assumptions.[1]

The method in this article follows on from Holmans, but in a simplified way. By making various assumptions the main gross

flows can be estimated for recent years. And the analysis yields similar results to Holmans'. The box explains how the calculations are put together and their robustness.

Chart 2 shows estimates of the different gross flows making up HEW between the years 1994 and 2010. The line is the Bank's aggregate HEW statistic and the bars refer to the different gross flows. A positive number means that equity is being withdrawn, in aggregate; a negative number reflects an

(1) Benito and Power (2004) also used survey responses to identify the relative size of the different gross flows, but concentrated on withdrawals.

injection, in aggregate. Most of the different flows correspond closely to those set out in **Table A**. The 'other' bars are a residual category including the balance of four of the different flows (over and undermortgaging and remortgaging) for which there are no data, as well as any measurement error.[1] As mentioned above, these estimates are illustrative, and their robustness is discussed in the box on pages 130–31.

Chart 2 Gross flows of housing equity withdrawals and injections[a]
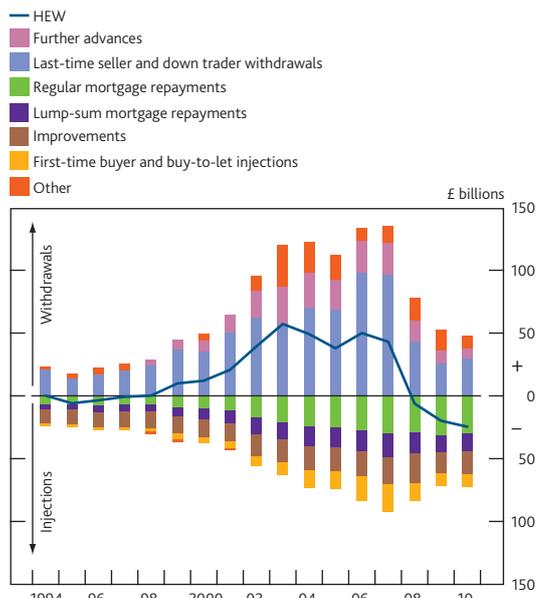
Sources: Bank of England, CML, Halifax, HMRC, Nationwide, ONS and Bank calculations.

(a) Data on further advances and buy-to-let injections are only available after 1998 and 1999 respectively. Before these dates, these flows will be captured in 'other'.

Chart 2 shows that between 1997 and 2007 withdrawals of equity were increasing at a faster pace than injections. This meant that withdrawals began to exceed injections and so HEW was positive. But since the financial crisis, there has been a large fall in withdrawals. With broadly unchanged injections, withdrawals have been smaller and so HEW turned negative.

There are two factors which have driven the fall in withdrawals: the fall in withdrawals by last-time sellers and down traders (lilac bars), and the fall in further advances (pink bars). Indeed, the fall in the lilac bars is large enough to account for the entire move to net equity injections. That is, the move to aggregate injections can be accounted for by a fall in the number of people withdrawing large amounts of equity through last-time sales and trading down. And that is likely to reflect the large fall in housing transactions (and to a lesser extent the relatively smaller fall in house prices).

Further advances on mortgages also fell by around two thirds between 2007 and 2010. This could indicate that households are *unable* or *unwilling* to withdraw equity as they have done in the past. It is impossible to judge from the data which of these factors are at play but survey responses suggest that

both are contributing. In the 2010 NMG household survey, 22% of all households reported that they were credit constrained suggesting that some households were unable to acquire more debt (Nielsen *et al* (2010)). And a third of all households were avoiding taking on more debt, suggesting that some were also unwilling, perhaps due to heightened uncertainty.

While withdrawals have fallen sharply since the crisis, injections have been little changed. The green bars and purple bars in **Chart 2** show that injections of equity from regular and lump-sum repayments of mortgage principal have been relatively stable since the start of the crisis. This suggests that, as a whole, the household sector has not been actively paying down debt more quickly than in the past (although some individuals may have been). This is consistent with intelligence from the major UK lenders that there had not been widespread overpayments of mortgages in 2010.

The total injections of equity by first-time buyers and buy-to-let investors are also little changed. Since the crisis, the deposit required for each house purchase has risen. But there has also been a sharp fall in the number of first-time buyers and buy-to-let investors. So while each buyer may be making a larger injection of equity, the yellow bars in **Chart 2** show that the gross flow of injections from first-time buyers and buy-to-let investors has actually fallen.

Conclusion

The calculations of the gross flows underlying HEW presented in this article suggest that the weakness in housing market transactions is likely to have been the key driver of the move from equity withdrawals to equity injections. Fewer homeowners trading down and selling a property without buying another mean that a large source of equity withdrawal has disappeared. Flows of injections have changed little over the period. So the move to injections does not by itself suggest that the household sector as a whole is paying down debt more rapidly than in the past.

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(1) It is not straightforward to compare the gross flows presented here with the series used by the Bank to estimate the HEW statistic. Most of the flows (further advances, last-time seller and down trader withdrawals, first-time buyer and buy-to-let injections, and mortgage repayments) will be captured in net secured lending. Improvements to the housing stock are one part of the investment series used in the Bank's calculations. But investment also includes other series such as new build which, as is discussed above, is not an individual gross flow.

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Using internet search data as economic indicators

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Data on the volume of online searches can be used as indicators of economic activity. This article examines the use of these data for labour and housing markets in the United Kingdom. These data provide some additional information relative to existing surveys. And with further development, internet search data could become an important tool for economic analysis.

The increasingly widespread use of the internet by both businesses and consumers has led to the creation of a potentially useful data source: information on internet search behaviour. Search engine providers keep a record of the searches entered on their website. Some of this information has been made publicly available, enabling users to track the popularity of an extensive range of search terms. This vast database could be used to analyse various issues. For example data on searches for 'flatscreen televisions' and 'fridges' could help to analyse how demand for durable goods has changed over time.

Internet search data have the potential to be useful for economic policy making. Monitoring current economic activity closely is an important aspect of policymaking, but official economic statistics are generally published with a lag. Consumer and business surveys, which are published more quickly than official counterparts, have typically been used to monitor current activity. This type of analysis is often called 'nowcasting', since it tries to explain current, rather than forecast future, activity.

Numerous articles have already been published exploring the use of internet search data as economic indicators. This was initiated by Choi and Varian (2009a) who illustrated its use for predicting US retail sales, automotive sales, home sales and trends in travel destinations. In a preliminary study for the United Kingdom, Chamberlain (2010) finds that search terms are well correlated with disaggregated retail sales data. While the literature suggests that internet search data may be useful for nowcasting, comparisons against traditional survey indicators have yet to be made.

This article explores how internet search data can be used, now and in the future, to enhance understanding of the economy. It builds on the previous literature by evaluating the features of the data and by considering whether internet search data contain information over and above existing

survey indicators for the UK housing and labour markets. The first section outlines the potential benefits, and some of the problems, of internet search data. The second section briefly describes the available internet search data. The third section applies the search data to analysis of the labour and housing markets, comparing their performance to existing survey indicators. The final section considers the potential of these data.

The potential benefits and problems of internet search data

Internet search data have a number of appealing properties as economic indicators. They are extremely timely and cover a potentially vast sample of respondents (approximately 60% of the adult population in the United Kingdom now use the internet every day).[2] In contrast to most traditional survey methods, they are collected as a by-product of normal activity, rather than requiring individuals or firms to respond to survey questions after the event. This can avoid problems associated with non-response or inaccurate responses. And it also means that information is continually collected on a wider range of issues, rather than just on a few pre-determined questions. As a result, search data can help analyse issues that arise unexpectedly.

In spite of these benefits, there remain difficulties with using these data. Widespread internet use is a relatively new phenomenon, so the data have a short backrun compared to other economic indicators. Internet use remains highly correlated with factors such as age and income, so the sample may not be representative. There are also issues surrounding the way search engines are used. Different users interested in the same topic could enter entirely different search queries.

Using the Google Insights for Search data set

Google data on search volumes are freely available from www.google.com/insights/search. This application allows the user to compare the popularity of search terms of their choice. The ability to track the popularity of such a wide range of search terms makes this the most suitable data source for this type of study. The comparison can be narrowed according to the country or region from which the internet search was made, and to a specific period in time. The data are extremely timely. Search data are available back to 2004.

The popularity of each search is reported as a weekly index.[1] This index is calculated by dividing the number of searches that include the query term by the total number of online search queries submitted during the week (since search volumes have risen over time, this controls for the upward trend). This fraction is then normalised so that its maximum value over the period is set to equal 100, and the rest of the series is scaled appropriately. There is no information on the actual number of searches, so there is a limit to how these data can be used.

The reported weekly index is based on a random sample of all searches conducted on Google. A new sample is drawn when the user enters a query. The query is stored for a day, so repeated queries for the same term on the same day will return the same results. But data for the same search term conducted on different days could differ. Since this introduces volatility, this article uses a more stable data set by taking the average of the data generated on seven consecutive days.

As the economic variables of interest are reported at a monthly frequency, the weekly index obtained from the database is not directly comparable. Comparison is complicated because some weeks overlap two months. To overcome this, the data used in this article are first transformed into an implied daily series by assigning each day of the week the same value, and then these daily values are aggregated into a monthly average. For certain search terms there are clear seasonal patterns. So the calculated monthly indices are seasonally adjusted using a standard census X-12 procedure.

(1) The data include searches for a particular term even if it is searched for as part of a longer string of words; for example, data for the term 'dishwasher' would include searches for 'energy efficient dishwasher'.

Equally, users with entirely different intentions could enter very similar search queries. For example, a lot of searches will be purely out of curiosity. So there is often significant noise in the search data. There are also many economic activities that still involve little use of the internet — for example, firms' investment in new production facilities — and so are unlikely to be related to internet search activity. Finally, there are also some limitations to the data as they are available now, which are related to how they are extracted from the search engine. This will be discussed further below.

The available internet search data

In line with previous studies on internet searches, this article uses data from the Google Insights for Search application: for more information on the data set and how the data are used in this article, see the box above. Although many search engines publish lists of the most popular search terms, the Insights application is currently the only one with a flexible interface that reports the popularity of a search term specified by the user. As Google currently has such a large proportion of the search engine market,[1] it is likely that its data cover the largest possible sample of internet users. Of course, these techniques could equally well be applied to data from other search engines if they were to make similar statistics available.

In their current form, there are some limitations to the available data. The popularity of each search is reported as an index rather than a volume of searches. So the data are not

informative of the actual level of interest in the search term. Furthermore, because the reported index is based on a random sample of total searches, the backrun of data can change. This appears to be a particular issue for less popular search terms. Therefore users of these data must be careful that the results of their analysis are not specific to the index reported on any given day. To overcome this issue, this article averages the index reported on seven consecutive days, and uses more popular search terms which tend to be more stable.

Deciding which search queries to consider is a crucial element of using internet search data. To keep the analysis simple and transparent, only individual search terms are considered in this article. As discussed below, preferred queries are selected based on economic intuition. But further work into the selection of search terms could be helpful in fully exploiting the information in the search data.[2]

Analysing the labour and housing markets

This article evaluates the usefulness of the data for two specific markets: the labour and housing markets. These are two areas where the internet has become an increasingly important tool for companies and the public alike.

(1) Google's share of the UK internet search market, by search volume, was 85% for the four weeks ending 21 May 2011 (Experian Hitwise).
(2) A variety of approaches have been used in the literature. Perhaps most notably, in their study of influenza trends, Ginsberg et al (2009) select their preferred search terms using a purely statistical procedure involving running 450 million different models to choose between candidate queries. This exhaustive process is beyond the scope of this analysis.

For example, it is now likely that people who are unemployed, or fear they may soon lose their job, will search on the internet to find out about the benefits system and to search for new jobs. So internet search terms may be useful for monitoring the labour market. Labour market studies using internet search data have been carried out in a wide range of countries. For the United States, Choi and Varian (2009b) find that unemployment and welfare-related searches can improve predictions of initial jobless benefit claims. Askitas and Zimmerman (2009), D'Amuri (2009) and Suhoy (2009) find similar results for Germany, Italy and Israel respectively.

In the housing market, people interested in both buying and selling properties make use of the internet to monitor market conditions and advertise their properties. Therefore internet searches may also be related to conditions in the housing market. Most previous studies for the housing market focus on the United States. Choi and Varian (2009a) find that real estate related searches can improve on standard nowcasts for house sales. A similar study by Wu and Brynjolfsson (2009) finds that this applies at a state, as well as national level. They also find evidence that search data can be informative for future housing transactions and prices. Webb (2009) finds evidence that searches for 'foreclosure' are highly correlated with actual US home foreclosures, and so suggests search trends could be used as an early warning system of troubles in the US housing market.

Both the survey data and the internet search data are timelier than official statistics, and consequently can help to 'nowcast', or enhance understanding of the current state of the economy. To assess the value of search data in the United Kingdom, this article compares simple regression models for unemployment and house prices, to those augmented with internet search variables. Existing indicators are also considered to see if internet search data can better explain the official data. The performance of each model in nowcasting the official data is then compared. The simple models used are a benchmark against which to compare our results, and are not intended to illustrate the Bank's approach to modelling these markets.

Labour market

A range of labour market related searches which could be used to nowcast unemployment (such as 'jobs', 'Jobseeker's Allowance', 'JSA', 'unemployment benefit', 'unemployed', 'unemployment') were considered. **Chart 1** illustrates that, over the available sample, some of these have behaved similarly to actual unemployment as measured by the Labour Force Survey (LFS) published by the ONS.

It is notable that 'jobs', which is likely to have been searched for by both those in and out of employment, did not increase much during the recession. Searches for 'unemployed' rose markedly during the recession. The term 'JSA' (acronym for

Chart 1 LFS unemployment and unemployment-related searches
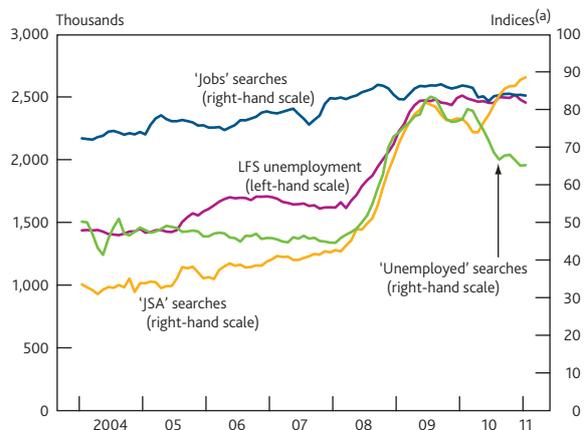
Sources: Google, ONS and Bank calculations.

(a) The weekly search data are calculated as an index, where the highest point in the series is rescaled to 100. The index here is a monthly average of that weekly data.

Jobseeker's Allowance) was chosen because its movements best correlated with those in the official data. It is also a term likely to be used by those who think they may soon become unemployed and so search for more information on unemployment benefit.

When trying to investigate the econometric relationship between the official unemployment data and the search term data, it is important to note that both have trended upwards over this period. Therefore, to avoid the results being dominated by the correlation between the trends, the change in unemployment on the previous three months (ΔU) is modelled. The baseline model is a simple autoregressive model. This includes only changes in unemployment in previous months as explanatory variables. Different unemployment indicators (X) are then added, and compared to the baseline model. The unemployment equation takes the form:

$$\Delta U_t = \alpha + \beta_1 \Delta U_{t-1} + \beta_2 \Delta U_{t-2} + \phi \Delta X_t$$

First, internet search data are included and its performance compared with the baseline. These data are available from 2004 so the estimation is from June 2004 to January 2011. Second, the performance of a model with internet search data is compared to models that use alternative indicators of unemployment, such as the claimant count, and the GfK consumer confidence question on changes in expected unemployment for the next year.[1] Since some indicators are timelier than LFS unemployment, indicators for the current period are used to 'nowcast' current unemployment.

(1) The GfK survey question asks respondents: 'How do you expect the number of people unemployed in this country will change over the next twelve months?'. The GfK data lagged by four months are used, since these best correlate with the dependent variable.

Results

The baseline model can account for a large proportion of the variation in unemployment. The second column in **Table A** shows that when the 'JSA' internet search term is added to the model, it has the expected positive coefficient, and is significant at the 1% level. The last two rows of **Table A** show that the 'JSA' model also improves the fit according to in-sample goodness of fit measures: it has a higher adjusted R-squared and a lower Akaike information criterion than the baseline.[1] This provides clear evidence that search terms do contain relevant information for explaining changes in unemployment. The 'JSA' model is outperformed by the claimant count model, which (as shown in the third column of the table) has the lowest Akaike information criterion. But both the search data and the claimant count are significant at the 5% level when all indicators are simultaneously included in the equation. So the results suggest that search data contain useful information in addition to existing surveys.

Table A Unemployment regression results

Independent variables	Baseline	'JSA'	Claimant count	GfK	All
	(1)	(2)	(3)	(4)	(5)
α	5.36 (0.16)	1.25 (0.73)	11.16 (0.01)	8.35 (0.04)	9.02 (0.03)
ΔU_{t-1}	1.08 (0.00)	0.85 (0.00)	0.76 (0.00)	0.91 (0.00)	0.69 (0.00)
ΔU_{t-2}	-0.20 (0.03)	-0.13 (0.17)	-0.28 (0.00)	-0.15 (0.08)	-0.21 (0.02)
$\Delta 'JSA'_t$	–	5.02 (0.00)	–	–	2.37 (0.04)
ΔCC_t	–	–	0.44 (0.00)	–	0.32 (0.00)
ΔGfK_{t-4}	–	–	–	2.22 (0.00)	0.57 (0.38)
Adjusted R-squared	0.81	0.85	0.86	0.83	**0.87**
Akaike information criterion	9.85	9.65	**9.52**	9.75	**9.52**

Dependent variable: Change in LFS unemployment, latest three months on previous three months. Delta denotes change on previous period.
Sample: 2004 M6 to 2011 M1.
P-values for heteroskedasticity robust standard errors are shown in parentheses.

An out-of-sample test is also conducted. This is used to compare how well each model nowcasts current unemployment data. For the test, the model is first estimated up to June 2008, and a nowcast produced for July 2008. The difference between the nowcast and the unemployment data for that particular month is then recorded — this is referred to as the one month ahead nowcast error. The exercise is then repeated, with the model estimated up until July 2008, and with a nowcast for August 2008 being compared with the data. This is continued up to the end of the sample. The one month ahead nowcast errors are then compared across models. **Table B** shows that the claimant count model produces the smallest errors. In line with the in-sample results above, the out-of-sample test suggests that the 'JSA' is outperformed by the claimant count model but improves upon the GfK model.

Table B Unemployment equations out-of-sample forecast test

	Baseline	'JSA'	Claimant count	GfK	All
	(1)	(2)	(3)	(4)	(5)
RMSE	40.4	35.3	**33.8**	37.1	37.1

Each model is first estimated for the period up to 2008 M6. The square root of the mean-squared forecast error (RMSE) for one month ahead forecasts is then compared. These results are robust to different starting periods for the out-of-sample testing.

Housing market

For the housing market a similar approach is followed to that taken above for the labour market. A significant proportion of housing-related searches are for specific companies' websites. However, these searches vary over time depending on the popularity of each website. So a wide range of more generic search terms are considered (including 'house prices', 'buy house', 'sell house', 'mortgage' and 'estate agents'). The search terms 'buy house' and 'sell house' were initially considered, since they would capture the demand for and supply of houses. But the data for these search terms vary significantly when downloaded on different days, perhaps because of low search volumes. This volatility affected the robustness of the results. Instead, the search term 'estate agents' was chosen as it is much more stable when downloaded on different days. The term is correlated with both house prices and housing transactions, but appears to move more closely with house prices over our sample period. As a result, this article considers a model of house prices.

The term 'estate agents' may capture both demand and supply-related searches. But it appears that demand searches dominate so that there is a positive relationship between prices and searches (**Chart 2**).

Chart 2 House price inflation and 'estate agents' searches
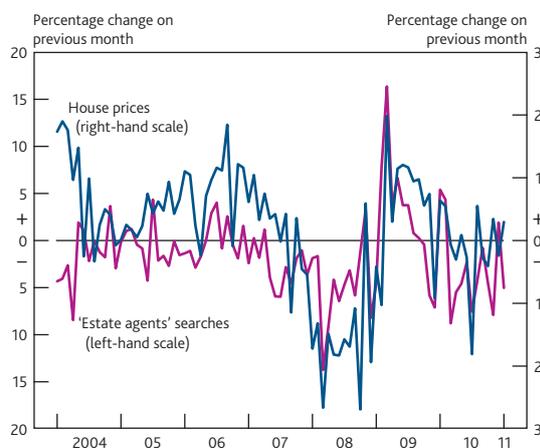
Sources: Google, Halifax, Nationwide and Bank calculations.

(1) Both are measures of the goodness of fit of a model. The higher the R-squared, the greater the variation in the data that can be explained by the regression model. The Akaike information criterion measures the goodness of fit that can be achieved using the smallest number of explanatory variables: the lower the number, the better the fit.

The dependent variable in the model is monthly house price growth ($H\dot{P}$). In the previous section, contemporaneous searches and indicators were used to nowcast current unemployment. But since the house price data are timelier than the equivalent labour market data, the previous month's searches and indicators must be used to produce nowcasts. So these terms enter the equation with a lag. The models suggest that lagged variables tend to correlate more strongly in any case. This may be because there is more of a lag in the housing market between internet search activity and actual market activity, due to the time taken for negotiation, and administrative and legal processes. There are several alternative indicators of house prices. The house price growth balances from the Home Builders Federation (HBF) and the Royal Institution of Chartered Surveyors (RICS) are both used here (X). The house price growth equation takes the form:

$$HP\dot{}_t = \alpha + \beta_1 HP\dot{}_{t-1} + \beta_2 HP\dot{}_{t-2} + \phi X_{t-1}$$

Results

The results for the house price equation seem to be even more encouraging than the unemployment equation. Column 1 in **Table C** shows that, as with the unemployment equation, the baseline model is able to explain a significant proportion of the growth in house prices and each of the variables have the appropriate sign. Column 2 shows that when the search variable is included, it enters with a positive coefficient and is significant at the 1% level. Both of the alternative surveys are significant when they are included individually at the 10% level. But the search term model performs better according to in-sample criteria such as the adjusted R-squared and the Akaike information criterion. And when all the indicators are included simultaneously, the search variable remains

significant at the 1% level, while the other surveys are insignificant.

These results are supported by the out-of-sample test, conducted in the same manner as for unemployment (**Table D**). When added individually, the model with the internet search term variable has a lower root mean square error for one month ahead nowcasts compared to models with other survey indicators. So there is evidence that the search data can improve understanding of the current state of the housing market.

Table D House price equations out-of-sample forecast test

	Baseline	'Estate agents'	RICS	HBF	All
	(1)	(2)	(3)	(4)	(5)
RMSE	0.87	0.69	0.87	0.87	**0.67**

The potential of the data

This analysis suggests that internet search data contain valuable information for analysis of unemployment and house prices. These applications treated the search data in a similar manner to existing surveys in conducting standard regression analysis. But internet search data also have the potential to answer different sorts of questions to existing indicators. They have the particular advantage that they can help analyse issues that arise unexpectedly. Whereas survey data must be consciously collected based on pre-determined questions, internet data are collected based on behaviour at the time, and a backrun will be available provided the term was searched widely on the internet.

An example of this type of issue is analysis of the public reaction to the recent changes in the rate of VAT. Data on internet searches including 'VAT' can provide an insight into the way consumer confidence survey balances moved in the months surrounding the VAT changes.

The orange line in **Chart 3** shows the GfK consumer confidence question asking about whether now is a good time to make a major purchase, with the timing of VAT changes shown by the vertical lines. As expected, there is a clear relationship between changes in VAT and the major purchases survey balance. However, the survey balance fell much more following the January 2011 increase to 20%, than following the increase to 17.5% in January 2010. This difference could be due to a more muted consumer response to the 2010 VAT increase. Or it might reflect other changes on the month offsetting the negative VAT impact.

The consumer confidence survey does not ask specifically about the VAT impact, so it is difficult to distinguish between these two explanations. However, data on internet searches

Table C House price regression results

Independent variables	Baseline	'Estate agents'	RICS	HBF	All
	(1)	(2)	(3)	(4)	(5)
α	0.00	0.00	0.00	0.00	0.00
	(0.97)	(0.04)	(0.10)	(0.25)	(0.00)
$H\dot{P}_{t-1}$	0.20	0.12	0.05	0.05	-0.02
	(0.06)	(0.13)	(0.68)	(0.73)	(0.86)
$H\dot{P}_{t-2}$	0.58	0.58	0.41	0.44	0.41
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
'Estate agents'$_{t-1}$	–	0.09	–	–	0.09
		(0.00)			(0.00)
RICS$_{t-1}$	–	–	0.00	–	0.00
			(0.01)		(0.09)
HBF$_{t-1}$	–	–	–	0.00	0.00
				(0.07)	(0.84)
Adjusted R-squared	0.53	0.68	0.56	0.55	**0.70**
Akaike information criterion	-7.05	-7.42	-7.09	-7.07	**-7.47**

Dependent variable: Change in house prices on previous month.
Sample: 2004 M5 to 2011 M3.
P-values for heteroskedasticity robust standard errors are shown in parentheses.
The dot above the variables denotes growth rate.

Chart 3 Internet search responses to VAT changes[a]
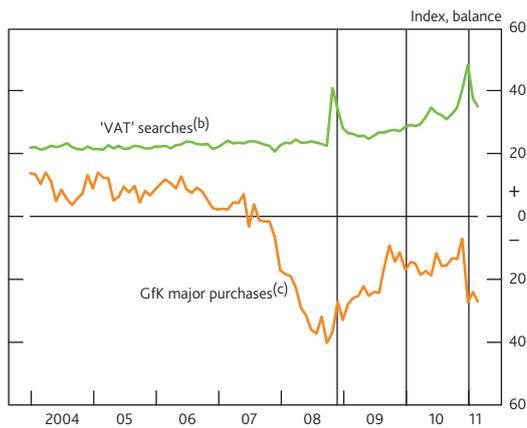
Sources: GfK/EC Consumer Confidence Barometer, Google Insights for Search and Bank calculations.

(a) Vertical lines indicate changes in standard rate of VAT.
(b) The weekly search data are calculated as an index, where the highest point in the series is rescaled to 100. The index here is a monthly average of that weekly data (see the box on page 135).
(c) The GfK survey question asks respondents: 'In view of the general economic situation, do you think now is the right time for people to make major purchases such as furniture or electrical goods?'.

including 'VAT' collected over this period can help provide some insight into the consumer reaction. The green line in **Chart 3** shows that searches including 'VAT' increased in the period surrounding VAT changes. And consistent with the consumer confidence balance, there was only a small increase in searches following the 2010 VAT increase. This appears to provide evidence that the impact on consumers of the VAT increase in 2010 was not as significant as the other two changes in VAT.

The internet data are helpful for determining how consumers responded. But in this case neither the consumer confidence survey nor the internet data are able to explain the observed differences in consumer behaviour. Given the similarities between the two VAT increases, the difference in responses for both data sources may be surprising. In both cases the changes had been pre-announced, and in both cases the changes were permanent. One possible explanation may be related to the previous movements in the rate of VAT. The increase to 17.5% was the reversal of a temporary reduction in the VAT rate. By contrast, the increase to 20% was a permanent increase to a higher rate of taxation.

This simple example illustrates the potential value internet search data have for providing added detail on the way

consumers are behaving. The internet data are particularly useful in this type of situation because traditional survey indicators would not necessarily have been adapted to ask specifically about VAT changes.

This is just one area where internet search data have the potential to shape the information we have about economic behaviour. As the backrun of the data increases, and more activities become internet orientated, it is likely that the importance of this data source will increase further. Already the data can be informative if the appropriate search terms are used. And this could be the key to future development of this data source. As consumer search queries become more complex, it will be important to develop better ways to extract the economic content contained in these data. Determining which search terms to use, and how to distinguish noise from signal will be important future developments in this area. It is likely that these data can help answer important economic questions; it is a case of making sure the right questions are asked of the data.

Conclusion

This article has considered the potential usefulness of internet search data as economic indicators. There remain some limitations of these data: there is only a short backrun, there is no information on the actual volume of searches, and as the index is based on a subsample the backrun of data can change. However, even in their current form, initial results suggest these data can be useful. In line with studies for other countries, internet search data can help predict changes in unemployment in the United Kingdom. These appear to be as useful as existing indicators. For house prices, the results are somewhat stronger: search term variables can outperform some existing indicators over the period since 2004. There is also evidence that these data may be used to provide additional insight on a wider range of issues which traditional business surveys might not cover.

The Bank will continue to monitor these data as part of the range of different indicators it considers in forming its view about the outlook for the economy of the United Kingdom. As further developments are made in this area, and the backrun of the data increases, these data are likely to become an increasingly useful source of information about economic behaviour.

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The gains from delegation revisited: price-level targeting, speed-limit and interest rate smoothing policies

Summary of Working Paper no. 415   Andy Blake, Tatiana Kirsanova and Tony Yates

In the standard monetary policy model, the monetary authorities face a commitment problem that has been termed the 'stabilisation bias'. When a shock hits that threatens to push up inflation, the policymaker would like to generate the expectation that inflation will be low in the future, because this will help anchor inflation today, and in so doing allow it to tighten policy by less, which itself is beneficial. To generate this expectation of a muted rise in inflation, the policymaker promises that tight policy will be tight not only today, but also tomorrow. However, when the threat to inflation has waned, tight policy is costly to sustain, and it is better to renege at that point. Anticipating this, observers do not believe the promise of tight policy at the outset, inflation expectations rise, and the authority is forced to tighten policy by more today than would have been necessary if its promise had been believed. Such a policymaker is said to operate under discretion. A policymaker that can commit (that is, is forced by some means not to reconsider its plans when the threat to inflation abates), can achieve inflation control at the expense of much less variability in the real economy. This is because it does not have to tighten policy so much today, and can instead rely on policy being a little tighter today and tomorrow.

It has been claimed that the benefits of this policy can be obtained even in the absence of a commitment if the monetary authority is handed an objective to follow that is modified with respect to the one that society ultimately prefers. A few schemes have been proposed that do this, but the one that has received most attention and is easiest to explain is the price-level target. This target involves replacing the term in inflation that would normally appear in the policymaker's objective function with deviations of the price level from some target path. This scheme does its job by

making the objective that the discretionary policymaker faces tomorrow depend in part on what happened today. If the inflation rate turns out high today, then, in order to meet the price-level target, inflation needs to be correspondingly lower tomorrow. The expectation that this will happen leads people to forecast that inflation will be low, and this mimics the outcome obtained under commitment.

Our paper shows that the benefits from schemes like price-level targeting obtain with much less generality than previously thought. The analysis sketched above was carried out in the simplest possible monetary policy models that abstract from dynamics caused by features like capital accumulation. In such models, it was correctly assumed that there was only one possible equilibrium when policymakers were assumed to be operating under discretion. However, in the more realistic model that we deploy which features capital accumulation, we invariably find that there is more than one equilibrium. We show that when we introduce the delegation schemes — such as price-level targeting, but including others too — this feature of having more than one equilibrium survives. The significance of this finding is that in our model it is not possible to say whether using a price-level target (or one of the other schemes) would make a discretionary policymaker better off or not. In some cases, the worst equilibria under the delegation schemes are inferior to the best equilibria when the policymaker tries to maximise the original, unmodified objective function. These results hold for all the delegation schemes we study (price-level targeting, hybrid price-level and inflation targeting, interest rate smoothing, and the speed-limit policy, one which ensures policy pays attention to the change, rather than the level in the gap between actual output and potential). The results also hold for two different variants on our model of capital accumulation.

An efficient method of computing higher-order bond price perturbation approximations

Summary of Working Paper no. 416   Martin M Andreasen and Pawel Zabczyk

Economists have a keen interest in understanding what determines changes in attitudes to risk and how they work through the economy. This in part explains why policymakers analyse the behaviour of bond and equity prices, as these reflect people's preferences for risk-taking. Such analyses are often conducted using dynamic stochastic general equilibrium (DSGE) models. These models use theory to describe how all the actors in the economy behave. The word 'stochastic' indicates that there is a fundamental uncertainty pervading the economy, with different types of random disturbances affecting the dynamics of prices and quantities.

The economic relationships underlying the model uniquely determine the evolution of the interconnected system, and finding a rule which pins down that evolution is called solving the model. Unfortunately, in most cases exact solutions are unknown and therefore economists need to approximate them. This is typically done using linearisation, which often delivers very good approximations. However, this method ignores the impact of uncertainty on the transmission mechanism of shocks, and so is inadequate in an asset pricing context.

There exist many alternatives to linearisation, with 'higher-order perturbation' methods being one of them. In practice, however, there is a trade-off between accuracy and speed. In the past, this trade-off has meant that researchers studying prices of long-maturity bonds needed to rely on at most second-order perturbation approximations. This occurred because it was computationally very demanding to allow for higher-order effects, which are present in the true — though unknown — solution to any DSGE model.

The simple aim of this paper is to propose a method which speeds up the process of approximating bond prices by exploiting the relationships which they satisfy. Our method comprises two steps. In the first step, standard solution packages can be used to approximate all the variables other than bond prices. In the second step, we use the fundamental pricing equation to solve for bond prices recursively, ie using approximations to shorter-term bonds to find those for longer-term bond prices.

We show that our two-step method can reduce the time it takes to solve models by more than 100 times. This is achieved with the same level of accuracy as using standard perturbation methods. The paper also compares the accuracy of bond price approximations obtained using perturbation methods to that of computationally feasible alternatives. It shows that for the models analysed third-order perturbations generate the most accurate approximations to bond yields.

How non-Gaussian shocks affect risk premia in non-linear DSGE models

Summary of Working Paper no. 417   Martin M Andreasen

The current financial crisis and the recession that followed have highlighted the close link between the macroeconomy and asset prices. Unfortunately, standard economic tools are not well suited to examine this relationship. Economists often use dynamic stochastic general equilibrium (DSGE) models when studying the economy. These models use economic theory to describe how all agents in the economy interact through time. The term 'stochastic' refers to the crucial feature that there is uncertainty in the economy (ie the economy is constantly being hit by 'shocks', also known as innovations), and this affects agents' behaviour.

The relationships implied by DSGE models determine all quantities and prices in the economy, and finding a set of rules which ensure that all markets clear is called solving the model. The exact solutions to most DSGE models are unfortunately unknown and economists therefore have to resort to approximations. This is normally done using linearisation, assuming that relationships are close to linearity near the equilibrium. This often delivers a fairly accurate approximation. But this method does not capture effects of uncertainty in the model; ie agents are effectively assumed to behave as if there were no uncertainty. This is an unfortunate assumption to impose, in particular in an asset pricing context, because it constrains all risk premia to be zero.

Luckily, there are many alternative solution methods to linearisation. The one considered in this paper is to approximate the solution by second and third-order expansions around the model's deterministic steady state (ie the point at which the economy would arrive in the long run if there were no uncertainty). These expansions introduce the curvature that is needed to capture the consequences of risk. We then analyse how three types of 'non-Gaussian' shocks affect risk premia in a wide class of DSGE models. Gaussian shocks are well behaved; ie they follow a normal distribution which is unchanged over time. In practice, this assumption frequently does not hold. The first type of shock we consider captures rare disasters, which refer to the possibility that the economy may be hit by a very large negative shock on rare occasions, for instance four times during a century (roughly the frequency of major recessions). We then show that rare disasters do not affect risk premia in a second-order

approximation but do affect the level of risk premia at third order. The variability of risk premia is however not affected at either second or third order by the presence of rare disasters in the model. The second type of shock we analyse are stochastic volatility shocks which refer to the possibility that the variability of the fundamental innovations may change at random time points. One can think of stochastic volatility shocks as disturbances to the confidence level of the economic agents. We show that stochastic volatility may affect the mean level but not the variability of risk premia at second order. For a third-order approximation, stochastic volatility may affect the mean level and the variability of risk premia. The final non-Gaussian shock distribution we analyse is structural disturbances with a type of time variation known as generalised autoregressive conditional heteroscedasticity (GARCH). We find that GARCH may affect the mean level but not the variability of risk premia at second order, whereas GARCH may affect both the level and the variability of risk premia in a third-order approximation.

To explore the quantitative effects of these non-Gaussian shocks, we then examine how rare disasters, stochastic volatility, and GARCH in productivity shocks affect the ten-year nominal term premium in an otherwise standard New Keynesian DSGE model solved to third order. We find that the chosen specification of rare disasters can have substantial effects on the level of the term premium and values of skewness and kurtosis (which measure aspects of asymmetry and the probability of extreme events occurring) for several macro variables. However, rare disasters hardly affect the standard deviation of most macro variables. We also find that stochastic volatility can generate sizable variation in the term premium without distorting the model's ability to match characteristics of a number of key macroeconomic series. The effects of GARCH are slightly different from those generated by stochastic volatility. In particular, GARCH increases both the mean level and the variability of the term premium.

This analysis is unavoidably technical but it is not arcane. It is essential if we wish to understand the consequences of extreme shocks to the economy in an uncertain world. Never has this been more important than in the past few years.

Cyclical risk aversion, precautionary saving and monetary policy

Summary of Working Paper no. 418   Bianca De Paoli and Pawel Zabczyk

Monetary policy making in central banks calls for an understanding of how the economy responds to shocks. Economists work with models to achieve this. One type of model that has become increasingly used is the dynamic stochastic general equilibrium framework. Theory is used to describe how all the actors in the economy behave, and to spell out the dynamic evolution of the interconnected economy. The 'stochastic' part indicates that there is a fundamental uncertainty pervading the economy.

Most such policy analyses are conducted using linear models. That is, the underlying decision rules, which will often be non-linear, are approximated by 'first-order' linear relationships. These can be very good approximations, but while they may be able to replicate salient features of macroeconomic dynamics, there are important areas where their ability to 'match data' is less satisfactory. In particular, all such models ignore the impact of uncertainty on the transmission mechanism of shocks.

Specifically, there are two important aspects of household behaviour that cannot be captured in linear models. First, there is no reason for households to require compensation for holding risky assets, in contrast to reality. Second, there is no 'precautionary' motive for saving — meaning that the models ignore households' desire to build up reserves of wealth to buffer them against the possibility of episodes of bad luck. So to the extent that precautionary savings are a clear feature of macroeconomic data and that risk premia are significant determinants of asset price data, using models so badly misspecified along these dimensions could result in systematically biased policy recommendations. This paper investigates the issue in more depth.

To address these points, our framework allows uncertainty to affect saving. This channel is ruled out by assumption in (first-order) linear models but is incorporated in our solution method which accounts for (higher-order) uncertainty effects. We assume that the utility households get from consumption is driven by 'external habits'. That is, they value consumption according to the difference between it and a slow-moving reference value. This introduces some cyclical variation into attitudes to risk. The critical thing for the policymaker is that these cyclical swings in risk attitudes affect the cyclical behaviour of the 'natural' rate of interest.

We find that properly accounting for swings in risk appetite and the desire to save in this way reduces the optimal size of monetary policy responses to productivity shocks. Following a positive productivity shock central bankers striving to maintain price stability cut rates to boost demand and prevent falls in the price level. However, since a persistent positive productivity shock also reduces households' desire to save, the cut in rates required to boost demand is smaller — ie the desire to save to smooth consumption is partially offset by the desire to save for precautionary reasons. Conversely, given that a positive demand shock merits interest rate hikes to prevent inflation rising — and since associated falls in precautionary motives exacerbate the increases in demand — policy needs to respond more strongly once changes in precautionary savings are accounted for. Overall, the precautionary channel introduces a 'contractionary bias' during booms and an accommodative slant during downturns. The model is highly stylised and illustrates rather than estimates the size of these effects, but helps to clarify the mechanism.

A global model of international yield curves: no-arbitrage term structure approach

Summary of Working Paper no. 419   Iryna Kaminska, Andrew Meldrum and James Smith

Monetary policy makers routinely analyse financial market variables to extract information for policy. Of particular interest are the yields associated with government bonds of different maturities (the 'term structure of interest rates') and the exchange rates between different currencies. The term structure contains information about expectations of future short-term risk-free rates, such as Bank Rate. Longer-maturity bond yields will also reflect a 'risk premium' — a component that compensates investors for the additional risk associated with those bonds. Most previous work that estimates these risk premia has assumed that each country is a closed economy. There is, however, strong evidence that bond yields are affected by some factors that are common across countries, as well as by local factors such as domestic monetary policy. This paper presents estimates of bond risk premia that allows for a mix of common and local factors across the United Kingdom and its largest trading partners — the United States and the euro area — in the same consistent framework.

Movements in exchange rates should partly reflect differences in short-term interest rates across countries. For example, when interest rates in a 'home' country are relatively high, in the absence of any exchange rate movements investors could obtain unlimited risk-free arbitrage profits by borrowing overseas and buying home bonds. Uncovered interest parity (UIP) states that if interest rates at home are high (low) relative to overseas, investors must expect the home currency to depreciate (appreciate) in order to equalise the overall return on home and foreign bonds. But it is well documented that currencies in high interest rate countries have tended to appreciate on average. One possible explanation for this is a

'foreign exchange risk premium' that compensates investors in high interest rate currencies for some additional risk. The model estimated in this paper also provides estimates of foreign exchange risk premia for sterling, the US dollar and the euro.

The approach taken is to model bond yields and exchange rates as functions of unobserved risk factors, assuming that there are no arbitrage opportunities available from investing in foreign or domestic bonds or bonds of different maturity. The resulting model is fitted to bond and exchange rate data for the three currency areas mentioned above for the period October 1992–June 2008.

In the preferred model, bond yields in each country are driven by two 'global' factors that are common across countries and one factor that is specific to the local economy. It turns out that there is a high correlation between the two global factors and measures of global output and inflation, while the local factor is highly correlated with the local short-term interest rate (ie the instrument of monetary policy). This is consistent with previous findings in the literature that consider only two countries.

The model estimates of expected changes in exchange rates suggest that the broad trends were expected by investors. This is consistent with foreign exchange risk being an important factor explaining deviations from UIP. The model does not fit the volatility in exchange rates observed on a month-by-month basis, but this is not surprising given the well-documented difficulty in modelling exchange rates.

Tailwinds and headwinds: how does growth in the BRICs affect inflation in the G7?

Summary of Working Paper no. 420   Anna Lipińska and Stephen Millard

Much has been written about the impact of globalisation on the economy. It is fairly clear that its pace increased after the early 1990s and an important part of this was the emergence of the so-called 'BRIC' economies — Brazil, Russia, India and, perhaps most importantly, China — which experienced rapid rises in productivity and GDP over this period. Many authors argued that increased trade with the BRIC economies helped keep inflation low in the developed world — so-called 'tailwinds' — by depressing import prices and increasing the share of imports in demand in the developed world. Furthermore, more intense global competition is likely to have reduced mark-ups and put downward pressure on wages in developed countries, as well as raising productivity growth, as firms were put under increasing pressure to innovate. Production costs also fell as firms increasingly found it easier to off-shore activities to low-cost countries and source low-cost labour from abroad. All these factors have been used to help explain why inflation was so low in the developed world over the past decade. But, there may have been an inflationary 'headwind' acting to counteract the tailwind. Rapid growth in emerging economies pushed up the global price of commodities such as oil and steel. Given such a rise in commodity prices, all countries importing these commodities suffered an increase in their production costs putting upwards pressure on their aggregate inflation rates. Although recent events following the world financial crisis have overlaid this picture, the underlying factors remain relevant in the longer term. But, in order properly to understand the processes at work, we need an organising framework for thinking about this problem.

Consequently, in this paper, we develop a stylised calibrated structural model within which we can begin to assess the quantitative impacts of the continuing rise of the BRIC economies on inflation in the developed world. Our aim is primarily to understand the mechanisms at work, so although we try to make broad features realistic it is a highly simplified and abstract model, which does not use actual data. Thus, for example, we consider only one commodity, 'oil'.

We build a three-country model in which there are two oil-importing countries — home and foreign, which can be thought of as the G7 and the BRIC economies, respectively — and one oil-exporting country, which sells its endowment of oil and spends the associated revenues on consumption of goods from both the developing and developed world. Oil is used to produce intermediate tradable goods and is also consumed directly. Final goods in each country are produced using intermediate goods from both countries. International financial markets allow some borrowing and lending between countries, but are not complete (which means that it is impossible to buy insurance to completely remove international risks). In each country, a monetary authority sets interest rates in order to keep inflation close to target.

We use this model to examine the effects of a productivity shock in the foreign economy, such as was seen in the BRIC economies in recent years. In our baseline calibration, it turns out that the tailwinds outweigh the headwinds and home inflation is reduced as a result of the shock, suggesting that the rise of the BRIC economies acted to help keep inflation low in the developed world. This is, of course, not to say that at the time of writing the recent rises in non-agricultural commodity prices are unconnected with the resumption of growth in emerging economies.

We then perform several experiments where we try to disentangle the importance of different factors that can shape inflation dynamics in the home country when the foreign country is hit by a persistent productivity shock. These factors are wage stickiness, the role of the oil sector and its share in both consumption and production, foreign monetary policy and the degree of completeness of financial markets. We find that the tailwinds effect, lowering inflation in the home economy, dominates the headwinds effect only as long as there is scope for borrowing and lending across countries and the foreign country's production is not too oil intensive. This suggests that we need to examine the extent to which the BRIC economies use oil if we are to obtain a final answer to our question. Indeed, an exact quantification of the effects of the rise of the BRIC economies would require a more careful calibration of the model, in particular, proper estimation of asymmetries between the developed and developing economies.

Global rebalancing: the macroeconomic impact on the United Kingdom

Summary of Working Paper no. 421   Alex Haberis, Bojan Markovic, Karen Mayhew and Pawel Zabczyk

Global current account imbalances widened sharply in the years preceding the financial crisis of 2007–08. And, although since the onset of the crisis global imbalances have narrowed somewhat, they remain substantial. The implications of an unwinding in global imbalances are of great interest to policymakers and academics and further global rebalancing is widely thought to be desirable for the world economy.

This paper considers the implications for the United States, the United Kingdom and the rest of the world (ROW) of shocks that may contribute to a further reduction in global current account imbalances using a dynamic stochastic general equilibrium model. These models are a standard tool for analysing macroeconomic relationships. The phrase 'dynamic general equilibrium' indicates that they allow for interrelationships between the different parts of the economy (and, in this case, between countries) that take time to unfold; the word 'stochastic' that random shocks arrive to disturb the equilibrium.

We consider a positive demand shock in the ROW, which is interpreted as representing countries with current account surpluses. This is calibrated to be consistent with features of past surplus reversals as studied by the IMF. A similarly sized negative demand shock in the United States (and the United Kingdom) is also considered. Finally, we consider the effects of a supply shock that raises US productivity growth relative to other countries, which is calibrated to match the United States' productivity advantage over its trade rivals in the recent past. We consider the effects of these shocks under the assumptions that nominal exchange rates are flexible and also when the ROW pegs to the dollar.

We find that the demand shocks, calibrated as above, in either the ROW or the United States would lead the US current account position to close from its end-2009 level. The supply shock we consider would not be sufficient to close the deficit. The quantitative differences to the simulation results under the different assumptions about the ROW's exchange rate regime are small. This is because, in our model, inflation in the ROW and the United States adjusts to deliver the real exchange rate movements, and associated expenditure switching. This may, of course, not accurately reflect what happens in practice.

The implications for UK output and inflation and the sterling real effective exchange rate depend on the nature of the shock that drives global rebalancing. A rebalancing of surplus countries' demand towards consumption would boost UK demand, pushing up on firms' real marginal costs, thereby raising inflationary pressures in the United Kingdom. This shock would be associated with a depreciation of the sterling real effective exchange rate. Further weakness in domestic demand in the United States would contribute to weaker output and inflation in the United Kingdom, and a real appreciation of sterling. Productivity gains in the United States would lead the United Kingdom to import more US goods, weighing down on UK output. Inflationary pressures would also be reduced in this scenario, and there would be a real depreciation.

Understanding the macroeconomic effects of working capital in the United Kingdom

Summary of Working Paper no. 422 Emilio Fernandez-Corugedo, Michael McMahon, Stephen Millard and Lukasz Rachel

Working capital is defined as the difference between a firm's current assets and its current liabilities. However it is the economic concept, rather than the accounting definition, that matters; firms have a financing gap between payment for their inputs to production (such as labour) and receipt of the revenue from sales of output, which typically comes much later. Having the right amount of working capital at the right time is crucial for the efficient operation of businesses. As a result, firms spend much time managing their working capital, especially in recessions, and perhaps even more so in banking crises when the availability of credit is affected more than usual. However, most macroeconomic models do not consider an explicit role for either working capital or a banking sector. While there are a few existing papers that incorporate working capital considerations, and there is a growing literature that models a banking sector, there is little evidence on the important interactions of the two. This paper attempts to address this gap.

Decisions about working capital are driven mainly by liquidity considerations and, unlike capital investment decisions, tend to be reversible and short term. The financial crisis affecting the world economy that started during the summer of 2007 put a premium on liquidity not only on the financial sector but also on the corporate sector. In particular, the 'credit crunch' put pressure on firms' working capital positions, causing them to cut back on investment. In addition to the demand side of the economy, working capital problems may also affect the supply side of the economy. For example, problems in the financial sector may increase the cost of raising liquidity for firms, leading to an increase in their overall costs. Uncertainty about receiving payments for goods and services, together with difficulties obtaining trade credit insurance, may lead some firms to delay production (possibly affecting employment) until the uncertainty dissipates. Moreover, working capital difficulties may result in firm insolvencies and, thus, capital scrapping and higher unemployment. According to these supply-side arguments, weak working capital positions may result in lower employment and output and higher inflation.

The purpose of this paper is to understand how the responses of key macroeconomic variables such as investment,

inventories, employment, output and inflation to economic shocks are affected by the need for firms to raise working capital. To this end, we first document the behaviour of working capital over UK business cycles, as well as over the recent financial crisis.

We then develop a model that introduces an explicit role for its components. This model differs from others in the literature in that we consider inventory behaviour, a key element of the story and a major input to the production process, as well as trade credit, albeit in a simple way. Our model also incorporates a stylised banking sector that generates spreads between borrowing and lending rates of interest, which allows us to use our model to examine how a financial crisis affects the economy. It is the combination of these shocks from the banking sector with working capital considerations that is important for the results in this paper.

We first use the model to examine the response of macroeconomic variables to movements in productivity and monetary policy. We find that the responses of variables to shifts in productivity are almost identical to a standard model, though working capital considerations tend to dampen the responses of hours, stocks, investment and output to the shock, and there is a greater price response. But, this otherwise standard flexible price model allows monetary policy to have real effects, since it can directly affect firms' costs by affecting the price of their borrowing to finance working capital.

We then use the model to investigate the effect on the macroeconomy of a financial crisis similar to that recently experienced in the United Kingdom. We find that disruptions to the supply of credit would have had large and persistent effects on the real economy through the working capital channel. This finding may help to explain the large and persistent effects of financial crises that have been found in numerous empirical studies and also suggests that this channel was important in explaining the dynamics of the recent downturn in the United Kingdom. We also find that monetary policy, by offsetting widening spreads faced by borrowers in the economy, worked to offset this shock.

Shifts in portfolio preferences of international investors: an application to sovereign wealth funds

Summary of **Working Paper no. 423**   Filipa Sá and Francesca Viani

This paper develops a framework for understanding the implications for the dollar, interest rates, asset markets and global imbalances of a shift in the portfolio preferences of foreign investors. It develops a dynamic general equilibrium model with two regions (the United States and the rest of the world (ROW)) and two goods (US and ROW-produced goods). A distinctive feature of the model is the presence of two asset classes: equities and government bonds. This allows us to study the implications of two types of changes in the portfolio preferences of foreign investors: a reduction in their preference for US assets and a diversification away from US debt and into US equity assets.

To illustrate how the model works, this paper uses it to analyse the implications of an expansion in sovereign wealth funds (SWFs). SWFs are expected to manage an increasing share of foreign exchange reserves. Compared to central banks, SWFs have higher risk tolerance and invest less in US assets. Their growth may have implications for real activity and external balance.

The information available on the investment strategies of SWFs suggests that their portfolios are typically more diversified than traditional reserves held by central banks, with a larger share invested in equities and a wider geographical dispersion. Given these differences in investment strategies, the shift of reserve assets from central banks to SWFs could have implications for asset prices, the flow of funds between countries, exchange rates and the evolution of global imbalances. In particular, SWFs may increasingly diversify away from dollar assets. This might lead to a reduction in capital inflows into the United States, a depreciation of the dollar and an increase in returns on dollar assets. SWFs may also diversify their portfolios away from low-risk, short-term debt instruments, and into longer-term equity assets, which might lead to changes in asset prices and rates of return. The changes in asset returns generated by the growth in SWFs might induce a reduction in the so-called 'exorbitant privilege', ie the difference between the return the United States receives

on its foreign assets relative to the return it pays on its foreign liabilities.

We simulate a scenario where all 'excess reserves' currently held by central banks in emerging market economies are transferred to SWFs, where 'excess reserves' are defined as being above the level that would be required for liquidity purposes. Two diversification paths are considered: one in which SWFs keep the same asset allocation as central banks, ie the same investment shares in equities and bonds, but diversify away from dollar assets (path 1); and another in which they keep the same currency composition, but shift towards a riskier portfolio in the US market, with a larger share invested in US equities and a smaller share invested in US bonds (path 2).

The simulation results show that, in path 1, the dollar depreciates in the period immediately after the shock, leading to a reduction in the US trade deficit and net debt. In subsequent periods, the return on US assets must increase to clear asset markets. This generates a rebalancing of the portfolios of foreign investors towards holding more dollar assets, which leads to an appreciation of the dollar. The 'exorbitant privilege' in the United States decreases and US net debt increases over time. In path 2, the dollar depreciates and the US trade deficit decreases. However, US net debt increases over time due to a reduction in the 'exorbitant privilege'.

The model is general enough to be usable for a variety of experiments. It could be calibrated to countries outside the United States. For example, it could be used to study the implications of the sudden reversals in capital flows that occurred in Iceland, Greece and Ireland during the global financial crisis and to analyse the consequences for other countries with high debt levels if foreign investors were to withdraw their investment. The model could also be used to understand the implications of the 'flight to safety' observed during the crisis, with foreign investors moving away from US equities and corporate debt into US government debt.

How did the crisis in international funding markets affect bank lending? Balance sheet evidence from the United Kingdom

Summary of Working Paper no. 424   Shekhar Aiyar

How did problems originating in one asset class in one country propagate internationally, sparking the Great Recession? A standard stylised explanation relies on the globalisation of the banking system, and has two parts. First, stress in the US banking system (and others directly exposed to US mortgages/structured products) spread internationally through international funding markets. Second, this shock to the foreign funding of various countries' banking systems was transmitted domestically through a reduction in credit supply. While there is a substantial empirical literature documenting the first step above, evidence on the second step is rather slim. This paper tests the transmission to domestic lending of the shock to UK-resident banks' external funding during the crisis.

As a global financial centre, the United Kingdom hosts a large and heterogeneous set of banks, some of which are UK-owned, but many of which are branches or subsidiaries of banks headquartered in other countries. During the financial crisis, these UK-resident banks were subject to an unprecedented shock to foreign funding, with an aggregate fall in external liabilities of about 24% (by way of comparison, the previous largest fall was 9%, during the Exchange Rate Mechanism crisis). This study examines the transmission of this shock to domestic lending. It uses a novel data set, created from detailed and confidential balance sheet data — reported quarterly to the Bank of England — on about 140 UK-resident banks.

The study aims to estimate the impact of the change in a bank's external liabilities on its domestic lending during the crisis. But in principle, of course, causation between these variables can run in both directions, and moreover, domestic lending can be affected by a host of factors that are omitted from the study. To ensure accurate identification of the causation from the change in external liabilities to the change in domestic lending, an econometric technique called instrumental variables is used. Provided that certain statistical conditions — which are mostly verifiable in the data — are satisfied, this technique circumvents the problems of reverse causality and omitted variables.

The main finding is that each 1% reduction in banks' external funding caused a 0.5% to 0.6% contraction in domestic lending, a substantial impact. Given the large shock to banks' external funding that actually occurred, it is likely that this was a crucial channel for transmitting the financial shock to the real economy. The estimated relationship is robust to a wide range of specifications and sensitivity tests. Foreign subsidiaries and branches on average reduced lending by a larger amount than domestically owned banks, while the latter calibrated the reduction in domestic lending more closely to the size of the funding shock. There is little evidence that foreign assets buffered domestic lending against shocks to foreign liabilities.

The transmission of the external shock to different subcomponents of domestic lending is also explored. Evidence is found that the shock caused a significant cutback in lending to businesses, to other banks, and to other financial institutions, with the caveat that these subsamples of the data are smaller and noisier. But no evidence is found for an impact on household lending. This could be because the financial crisis led to the unravelling of the securitisation model of household mortgage lending and caused banks to take mortgage securities back onto their balance sheets, a development which would tend to increase reported bank lending to households.

International transmission of shocks: a time-varying factor-augmented VAR approach to the open economy

Summary of Working Paper no. 425   Philip Liu, Haroon Mumtaz and Angeliki Theophilopoulou

Understanding and quantifying the international transmission mechanism whereby economic shocks are propagated around economies is important for formulating possible policy responses to developments in the world economy. This is one of the reasons why a substantial empirical literature has focused on this issue. But the existing work on this issue shares two shortcomings. First, analyses do not allow for the possibility of time variation in the parameters of the model. This feature is surprising as changing dynamics of variables such as inflation and output have been highlighted by many studies of macroeconomies. Second, most empirical studies on the international transmission of shocks are based on small-scale vector autoregressions (VARs) (models that relate each variable in the system to past values of all included variables). Arguably, central banks across the world monitor (and possibly respond to) a far wider information set than is typically assumed in these small VARs, leaving them open to the possibility of misspecification. Moreover, from a practical perspective small VARs are unable to provide inference on a large number of variables that may be of interest to policymakers.

The aim of this paper is to fill these gaps in the empirical literature on international transmission. We attempt to do this by devising an empirical model that: allows for time variation in the international transmission mechanism; and allows the simultaneous estimation of the response of a large set of UK variables to foreign monetary policy, demand and supply shocks. In particular, this paper proposes an open economy factor-augmented VAR (FAVAR) which incorporates time-varying coefficients. This captures the widely accepted idea that most macroeconomic variables can be thought of as being largely driven by a small number of common factors. Those included in our proposed FAVAR can be thought of as weighted averages of a large panel of international and UK data. Consequently the proposed model contains significantly more information than the small-scale VARs used in the existing literature.

The empirical results, using quarterly data from 1974 to 2005, indicate that there have been important changes across time in the response of UK variables to international shocks. For example, while real activity responded strongly to foreign money expansion during the 1970s, this response was muted during the period 1992–2005. These results are consistent with a fall in the degree of exchange rate pass-through to import prices. Foreign aggregate demand shocks had a large positive impact on UK GDP during the years 1980–90. However, the impact over the subsequent period was substantially smaller. Foreign supply shocks had a persistent impact on UK inflation and wages during the mid-1970s, but with a smaller impact estimated during the period 1990–2005.

Labour supply as a buffer: evidence from UK households

Summary of Working Paper no. 426   Andrew Benito and Jumana Saleheen

How households adjust their behaviour in response to macroeconomic shocks, such as unexpected changes to their income, has a key bearing on how the economy responds to those shocks — and what the appropriate policy response should be.

Discussions of households' responses to shocks often emphasise households' spending response. But another key decision made by households is their labour supply. That decision has a key bearing on the overall supply side of the economy. The two sets of decisions on spending and labour supply are also likely to be connected to one another. So understanding households' labour supply behaviour may also help us understand the demand-side consequences of various shocks for the economy. Put simply, if households respond to shocks by altering their labour supply this places less onus on any spending response. It will also have important consequences for wages and prices.

This paper explores empirically the use of labour supply as a 'buffer', in the sense that it helps a household absorb some shock. That response has been highlighted in recent models of household behaviour. These relax an assumption present in earlier models that focused exclusively on households' spending and saving behaviour, and took their labour supply as fixed. Flexible labour supply in response to uncertainty may also help account for some 'puzzles' in household behaviour. That includes understanding why households work relatively long hours while young — when wages are relatively low, but future incomes are highly uncertain — and work shorter hours while old, when wages are typically much higher. It could also help rationalise why estimated spending responses to changing asset prices have often seemed 'small' relative to the predictions of a standard life-cycle model. An ability to respond through labour supply means less emphasis need be placed on spending to achieve some adjustment.

There is, however, little empirical evidence on the use of labour supply as a response to shocks, although there is a long tradition of estimating elasticities of labour supply to income and wages. This paper focuses on labour supply as a response to financial shocks — whatever their source — using individual-level data on around 80,000 person-year observations in Britain, available from the British Household Panel Survey. The indicator for a 'financial shock' is based on whether an individual is surprised by how their financial situation changed over the past year, compared to how they had expected it would change one year earlier.

An important constraint on the use of hours of work as a response to a financial shock is the incidence of hours constraints. Many jobs offer limited scope to adjust paid hours by working paid overtime, and there are significant costs incurred in trying to find an alternative or second job. Our analysis begins by documenting the scope for hours adjustment through working paid overtime and second jobs. While that flexibility is greater in manual than

non-manual occupations, many individuals do have significant scope to adjust their remunerated hours without changing job. Around one half (one fifth) of manual (non-manual) male employees work paid overtime. A somewhat lower proportion of women employees work paid overtime, with a much higher proportion of women working in non-manual occupations. Around 8%–10% of employees have a second job. Among those that do work 'extra' hours, the hours worked average around one quarter of their regular contracted hours. Simple stylised facts like this suggest many individuals have scope to adjust to any financial shocks by changing their desired hours.

Our results for hours adjustment suggest employees' hours of work respond positively to an adverse financial shock. Moreover, this effect is largely restricted to those who change job during the year in question. That suggests that hours constraints within jobs are important and labour mobility between jobs is key for facilitating individuals' labour supply response to a financial shock.

The presence of hours constraints within jobs may determine whether participation responds in addition to hours worked. For instance, in response to a financial shock, individuals may delay retirement rather than increase their current hours of work. So we look at the participation decision and how this varies with the experience of a financial shock, while controlling for other factors that are related to individuals' propensity to participate. Our analysis finds that this margin of labour supply adjustment does respond to a financial shock. We find this applies to both men and women. Perhaps surprisingly, we find no evidence that the effect is larger among the old, for whom the decision of delaying retirement is more pertinent.

Some recent theoretical models suggest labour supply responses may interact with credit constraints faced by some households, particularly those with high levels of debt. More indebted households may have less of an available borrowing capacity to respond to any adverse shock and may face a stronger motive to respond to the shock by raising their labour supply. Our analysis addresses this possibility.

At the time that some shock affects the economy, reflected in a fall in financial wealth or other factors that have a bearing on households' financial situation, labour demand may also weaken. The financial turmoil and recession of 2007–09 would appear to be a prime example of that. As labour demand weakens, this may make it difficult for households to realise an increase in labour supplied. That does not mean that labour supply issues can be ignored — only that one has to look at both labour supply and labour demand together. That is likely to be important to understand the cyclical properties of labour quantities and real wages.

System-wide liquidity risk in the United Kingdom's large-value payment system: an empirical analysis

Summary of **Working Paper no. 427**   Marcelo Perlin and Jochen Schanz

Intraday liquidity requirements in large-value real-time gross payment systems can substantially exceed the liquidity that its direct members hold overnight on their accounts with the central bank. As an illustration, UK banks' aggregate holdings of reserves balances with the Bank of England fluctuated around £30 billion in 2008, while the daily amount of liquidity that banks pass through the United Kingdom's large-value payment system, CHAPS, was in the order of £250 billion. To be able to process these payments, banks borrow additional liquidity intraday from the central bank, and recycle liquidity during the day: that is, they partly rely on incoming funds to settle their outgoing payments.

Banks contribute liquidity to the system by sending more payments than they received. We empirically investigate the effects that a hypothetical change in a single bank's payments behaviour has on the liquidity position of its counterparties. Our objective is to highlight the consequences for system-wide risk if these counterparties do not adapt their normal-time behaviour to the changed behaviour of this bank. To this effect, we first estimate banks' payments behaviour: that is, we attempt to find in the data a 'payments rule' that relates a bank's outgoing payments to its available liquidity and incoming payments. We then combine these rules to simulate payments behaviour in the system. In particular, we are interested in the effects that a change in a single bank's payments rule would have on the liquidity position of its counterparties.

We investigate two such hypothetical changes. First, a bank simply stops sending payments — perhaps because of an operational problem. If its counterparties continue to send payments to that bank, they transfer liquidity without receiving any in return from the bank that stops sending payments. Their liquidity buffer may shrink in response.

Following our estimated payment rules, the counterparties reduce the value of payments they make, in turn causing the liquidity buffer of their counterparties to fall. We incorporate these spillovers in our simulation and compute, for each counterparty, the time and probability with which it is likely to run out of funds. Assuming that its counterparties do not deviate from their estimated rule, we find that the probability of at least one counterparty becoming liquidity constrained within the first hour is substantial. (In practice, the probability might be smaller, as banks' liquidity management is more sophisticated than we can capture with our model.)

The second change assumes that a bank stops providing additional liquidity to the system — perhaps because it finds itself short of liquidity, or because it becomes concerned about the other banks' ability or willingness to add liquidity to the system. Instead, it only sends out exactly what it has received. We show that such a tit-for-tat strategy would also reduce its counterparties' available liquidity. Again, we compute the time and probability with which the counterparties are likely to run out of funds, assuming that they continue to follow our estimated payment rules. We find that the probability of at least one counterparty becoming liquidity-constrained within the first hour is still substantial, although lower than in the previous case.

Finally, we attempt to identify factors that explain why changing some banks' payments behaviour has a greater effect on their counterparties than changing the behaviour of other banks. A possible reason is that some banks are larger than others, or that they occupy more important positions in the interbank network. In our case, size appears to explain most of the variability of the average effect on the counterparties. More detailed information about the network helps to identify which counterparties are most at risk.

Intraday two-part tariff in payment systems

Summary of Working Paper no. 428   Tomohiro Ota

Timely and liquidity-efficient settlement of payments is an important policy objective for central banks. Settlement delay is, however, recognised as a potential problem in major payment systems. This paper studies two possible solutions to the problem of settlement delay, throughput guidelines and a time-varying tariff, compares their performances, and discusses the design of a time-varying tariff.

The economics of payment literature generally assumes that early payments are always good. Banks have an incentive to delay their payments to minimise the cost of liquidity. By delaying payments until other banks make payments to them, they can free-ride the cash inflow to make their own payments. Since every bank delays aiming at the free-riding, no bank can successfully recycle payment inflow from others. The 'competition of delay' is socially inefficient. This paper also confirms the inefficiency of the 'competition of delay', but finds that delaying payments is not always inefficient. It is socially optimal for a bank with a higher cost of liquidity to delay its payments and for a bank with a lower cost to make early payments. By doing so, the payment system can establish an efficient role-sharing to minimise the aggregate cost of intraday liquidity. That is, the low-cost bank prepares more intraday liquidity than a high-cost bank, and the high-cost bank can recycle the payment inflows (cash) from the low-cost bank for its payments for free. The delay need not be long — just until the bank with the higher cost of liquidity has received funds in.

The typical solution to the delay, the throughput guidelines adopted by the United Kingdom and others, is to penalise a

bank if it fails to make a certain fraction of payments by predetermined deadlines. The model in this paper shows that these guidelines have potential drawbacks. First, they do not penalise payment delay until the deadline. As a result, they may create a bunching of payments just before the deadline, as the guidelines provide greater incentives for banks to make last-minute payments. Second, they impose the same deadline on all banks in the payment system even if they have different liquidity costs. This inhibits heterogeneous banks from the efficient role-sharing.

The second solution, the time-varying tariff adopted by Switzerland and others, penalises late payments in a different way. A payment system with such a tariff charges member banks a fee (tariff), which is increasing over time, on each payment. This paper shows that a linear time-varying tariff can overcome the potential drawbacks of throughput guidelines. The tariff allows each member bank to determine its optimal payment schedule, according to its cost of liquidity. The efficient delays are retained, while the inefficient 'competition of delay' is eliminated. The tariff itself is independent of the cost — ie a system operator does not need to monitor each bank's cost of liquidity, which would be costly or infeasible, to design the optimal tariff.

We also show that the tariff fails to encourage early payments in the specific situation where banks simultaneously experience a large rise in liquidity cost, as in a liquidity crisis. Otherwise, the tariff improves the efficiencies of the payment system by minimising the aggregate cost of liquidity and discouraging inefficient settlement delay, compared with the throughput guidelines.

Domestic financial regulation and external borrowing

Summary of Working Paper no. 429   Sergi Lanau

The financial crisis of 2007–08 has prompted an intense debate on the role of financial regulation. An extended global credit boom has been one of the defining features of the 2000s and is possibly one of the major causes of the crisis. In many major economies banks' balance sheets expanded rapidly and lending to the private sector skyrocketed. One of the alternatives policymakers have to control these credit booms is an improvement in bank regulation. This paper focuses on the international dimension of such a policy option. If the goal is to reduce the leverage of non-banks, is unilateral domestic regulation enough? Perhaps regulation will decrease lending by domestic banks but will non-banks borrow more from banks abroad and remain excessively leveraged?

This paper uses cross-border banking data for the period 1978–2005 to shed some light on these questions. More precisely, the paper tests whether there is a link between domestic financial regulation and non-banks' borrowing from foreign banks. A positive and robust relationship between tighter domestic regulation and borrowing from foreign banks would suggest that financial regulation needs an international angle to be completely effective.

The concept of 'foreign bank' used in this paper includes all non-resident banks regardless of their nationality of ownership. For instance, the UK-based branches of a bank headquartered in Switzerland are not considered 'foreign banks' and their loans to UK residents are not international lending. In contrast, any loans from the Swiss headquarters to UK residents match our definition of international lending.

Financial regulation is measured by an index of financial deregulation which aggregates six dimensions of regulation: credit controls, interest rate controls, banking sector entry barriers, banking supervision, public ownership and the development of securities markets. The effects of capital account restrictions are also taken into account but are not aggregated into the index. It is worth stressing that we identify the effects of unilateral changes in financial regulation. An analysis of global regulatory trends is beyond the scope of this paper.

The data set contains annual cross-border flows from banks to non-banks for 1,390 country pairs. Obviously, financial regulation is not the only determinant of borrowing that evolves over the period 1978–2005. This paper uses econometric techniques that ensure that the effects of other relevant economic factors are not erroneously attributed to financial regulation. The role of important static factors such as distance between countries and cultural links is also taken into account.

Using a generic index of financial deregulation, it is found, all else equal, non-banks borrow more from foreign banks under tighter domestic financial regulation. More specifically, a country on the upper quartile of the deregulation index distribution borrows 20% more than a country with the lightest regulation.

The paper also establishes which components of the generic deregulation index are driving our results. The imposition of interest rate controls and entry barriers to the banking sector have a positive and significant effect on foreign borrowing. For example, the adoption of branching restrictions increases foreign borrowing by 15%. Bank privatisation also has a positive impact on foreign borrowing by non-banks. In contrast, credit controls, the adoption of Basel standards and the development of bank supervisory agencies do not have a significant effect on foreign borrowing. Importantly, the results also hold for the subsample of advanced economies.

The findings in this paper suggest that an international perspective is essential to design effective financial stability tools. In response to increased domestic regulation, non-banks might compensate to some extent for the reduction in domestic credit by borrowing more abroad. It is worth emphasising that this paper does not claim that domestic regulation is ineffective at reducing leverage: leverage would fall if the reduction in domestic credit is larger than the increase in foreign borrowing we document in this paper.

Consistency in international policy, as could be supported by fora such as the European Systemic Risk Board and the Financial Stability Board, could limit the scope of the effects highlighted in this paper.

Report

A review of the work of the London Foreign Exchange Joint Standing Committee in 2010

This article reviews the work undertaken by the London Foreign Exchange Joint Standing Committee during 2010.

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 (FX) market in London, representatives from brokers, trade associations including the Wholesale Markets Brokers' Association, the Association of Corporate Treasurers — representing corporate users of the FX market, the British Bankers' Association and the Financial Services Authority (FSA). A list of the members of the Committee as at end-2010, and a high-level organogram, can be found at the end of this article. The Committee held six meetings during 2010.

A key feature at the FXJSC meetings during 2010 was the ongoing discussion on regulatory developments, both in Europe and the United States, and their possible impact on FX markets. Changes in the FX market infrastructure and the evolution of relatively new types of market participants were also areas of interest. Presentations by UBS and Citi on FX prime brokerage, and by Forex Capital Markets on retail trading, provided the Committee with an overview of two growing segments of the FX market. Furthermore, the Chicago Mercantile Exchange Group, IntercontinentalExchange, ICAP's EBS and CLS Bank (CLS) gave presentations on their services and outlook for the FX market.

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 FX market as well as representatives from service providers and trade associations.

In 2010, the 'option confirmations automation' working group of the operations subgroup concluded its work on establishing best-practice standards for 'exotic' FX options such as

single barrier and double barrier options. Two new working groups were established to formulate best-practice standards for standard settlement instructions and FX novations respectively. The existing CLS working group expanded its scope to consider ways of increasing CLS usage and system capacity.

During the second part of the year, the operations subgroup invited a number of major FX vendors to present on their products and the challenges facing the FX market. These presentations are expected to continue in 2011.

The operations 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, as well as a joint meeting in May, 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 FX 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 for the relevant sections. The current version of the Code was published in April 2009.[1] The FXJSC and its subgroups are working towards publishing an updated version in 2011.

Work of the FXJSC legal subgroup

The legal subgroup was established in 2004 with some 18 professional members providing in-house legal counsel

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(1) The NIPs Code can be accessed at:
     www.bankofengland.co.uk/markets/forex/fxjsc/nipscode.pdf.

for many of the major institutions involved in the wholesale FX market in London. The group met three times in 2010. 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. During 2010, the legal subgroup welcomed guest speakers on topical issues from Shearman & Sterling, Simmons & Simmons, the FSA, the Bank of England as well as member firms, and kept updated on developments in the global FX market.

The group continued to liaise with a range of other domestic and foreign legal committees to keep abreast of developments in FX markets.

Work of the FXJSC chief dealers' subgroup

The chief dealers' subgroup was established in July 2005. Its membership in 2010 comprised twelve chief dealers active in the London FX market.

The subgroup met four times during 2010 to discuss conjunctural and structural developments in the FX market. There was considerable focus on potential developments in financial market regulation and how the industry was engaging with the relevant authorities to discuss specific foreign FX issues. The group also discussed developments in FX market infrastructure, including system capacity and resilience, as well as e-trading.

Work of the FXJSC investor subgroup

The FX investor subgroup was established in its current form in 2010 and comprises 16 members representing asset managers, hedge funds and a subset of members from the main Committee. The key focus of the subgroup in 2010 was regulatory developments in the United States and Europe and their possible impact on the investment management industry.

International co-operation

Liaison between the eight FX committees based in different international financial centres (London and Frankfurt for the euro area; Hong Kong; New York; Singapore; Sydney; Tokyo; and Toronto) continued during the year.

In May, the FXJSC operations subgroup, together with the New York operations managers working group and the European Central Bank operations managers group, held a joint meeting to discuss topical issues and current workstreams. The members of the three subgroups agreed to work together as far as possible to improve efficiency further and introduce additional best-practice standards in the FX market.

International survey results overview

Twenty nine banks representing the most active participants in the London FX market, including members of the FXJSC, contributed to the twelfth and thirteenth semi-annual surveys of FX turnover in London in April and October 2010, conducted by the FXJSC. Both surveys showed marked increases in London FX turnover.[1] Average daily turnover rose 15% in April 2010 and 8% in October 2010 from six months earlier (**Chart 1**). Average daily turnover recorded in the October 2010 survey was $1,821 billion, 24% higher than a year earlier. This was the highest level of turnover recorded since the survey began,[2] surpassing the high previously recorded in April 2008. These developments were broadly in line with FX activity in other global centres, with most committees reporting record highs for turnover in October 2010. The New York Foreign Exchange Committee reported an increase of 14% in the year to October 2010, while activity in the Singapore and Australia FX markets rose by 23% and 39% respectively. Canadian turnover rose by 13% on the year. Japan does not conduct a survey in October,[3] but data for April 2010 showed turnover increased by 16% from the April 2009 survey.

Chart 1 Global FX[a] daily average turnover
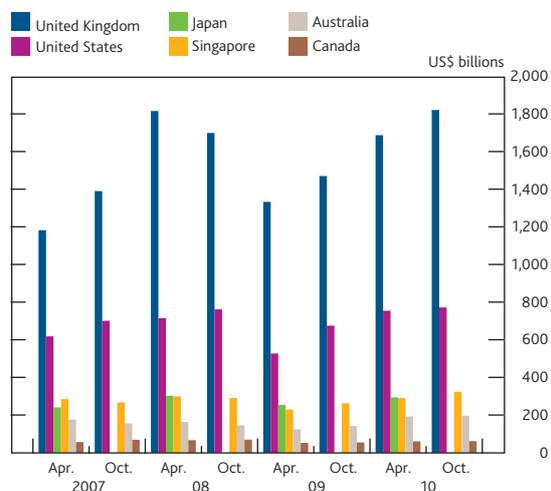
Sources: Australian Foreign Exchange Committee, Canadian Foreign Exchange Committee, London Foreign Exchange Joint Standing Committee, New York Foreign Exchange Committee, Singapore Foreign Exchange Committee and Tokyo Foreign Exchange Market Committee.

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

Increases in turnover in the London FX market continue to be driven by rises in spot FX trading. In October 2010, spot turnover rose by 11% from the previous survey in April 2010, and by 38% from a year earlier (**Chart 2**). FX swap turnover also rose markedly, up 19% on the year, although turnover remains below the April 2008 highs. Most other products posted similar turnover increases over the two surveys, with

(1) Based on spot, outright forwards, non-deliverable forwards, FX swaps, FX options and currency swaps.
(2) The first published FXJSC survey results were in October 2010.
(3) The Tokyo Foreign Exchange Market Committee publishes annual turnover results.

outright forwards the outlier, falling by 8% in October 2010 from a year earlier.

Chart 2 UK daily average turnover by product
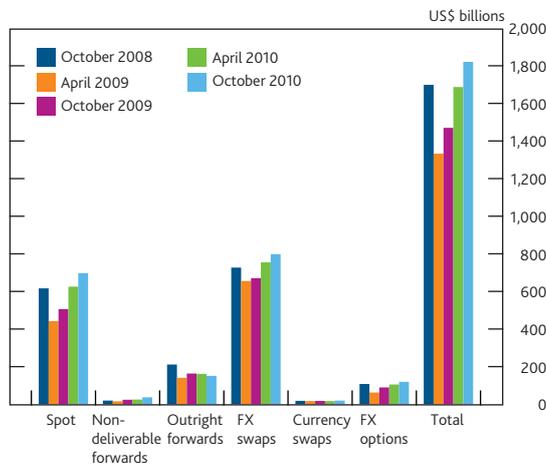
Source: London Foreign Exchange Joint Standing Committee.

The 2010 *Quarterly Bulletin* article on the BIS triennial survey results for the United Kingdom in April 2010[1] noted marked growth in FX transactions financed by prime brokerage. The October 2010 FXJSC survey suggests this growth has continued; total prime brokerage turnover increased by 45% in October 2010, from a year earlier, and accounted for 14% of total turnover, compared to 11% in October 2009 (**Chart 3**). Prime brokered spot transactions continue to lead this trend, and in October 2010 a quarter of all spot turnover was transacted via a prime brokerage service.

Chart 3 UK prime brokerage turnover as a proportion of total turnover
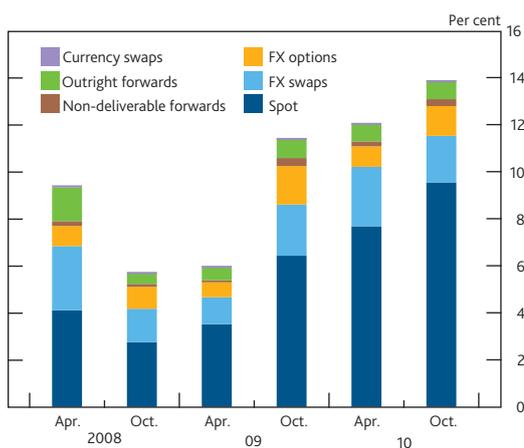
Source: London Foreign Exchange Joint Standing Committee.

Turnover in all major currencies increased since October 2009, although there was little change in the market share of each currency (**Chart 4**). Turnover in sterling pairs rose by 16% in October 2010 from a year before, while turnover in US dollars and euros rose by 25% and 26% respectively. Turnover in the Australian dollar continued to increase markedly over the year (+53%), and became the fifth largest currency recorded in the

survey. Emerging market currencies also showed relatively strong turnover growth, led by increased turnover in Chinese yuan, Turkish lira, Korean won and Singapore dollar. Turnover concentration for the survey was broadly similar to that seen in October 2009; the top five banks participating in the survey accounted for 52% of overall turnover.

Chart 4 UK daily average turnover by currency
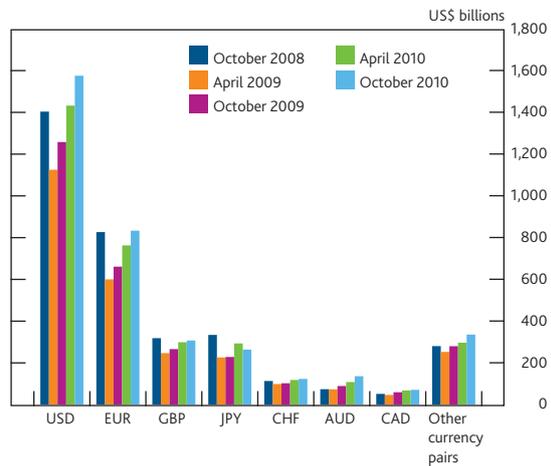
Source: London Foreign Exchange Joint Standing Committee.

The forthcoming FXJSC survey results for April 2011 will be published in Summer 2011.

Figure 1 Foreign Exchange Joint Standing Committee: structure
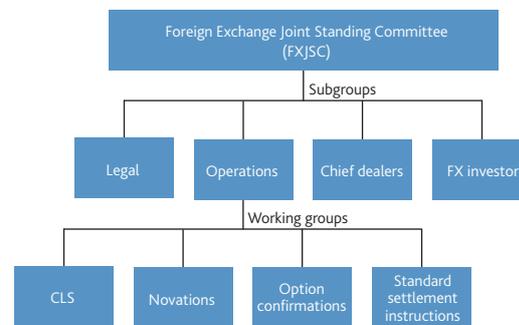
(1) Broderick, T and Cox, C (2010), 'The foreign exchange and over-the-counter interest rate derivatives markets in the United Kingdom', *Bank of England Quarterly Bulletin*, Vol. 50, No. 4, pages 354–65, available at www.bankofengland.co.uk/publications/quarterlybulletin/qb100410.pdf.

Tables of membership at end-2010

Members of the London Foreign Exchange Joint Standing Committee as at December 2010

Name	Firm/organisation
Brian Welch	Association of Corporate Treasurers
Christopher Bae	Bank of America Merrill Lynch
Rob Loewy	Bank of China
Richard Gill	Bank of New York Mellon
Mike Bagguley	Barclays
Eric Auld	BNP Paribas
Andrew Rogan	British Bankers' Association
Vincent Leclercq	Calyon
James Bindler	Citi
Alan Bozian	CLS Bank
Martin Wiedmann	Credit Suisse
Zar Amrolia	Deutsche Bank
Heather Pilley	Financial Services Authority
Phil Weisberg	FXAll
Nick Burgin	Goldman Sachs
Frederic Boillereau	HSBC
John Nixon	ICAP
Troy Rohrbaugh	JPMorgan Chase
Richard Gladwin	Nomura
Roger Hawes	Royal Bank of Scotland
James Potter	Tullett Prebon
Alex McDonald	Wholesale Markets Brokers' Association
Susan Revell	Morgan Stanley, Chair, legal subgroup
Graeme Munro	JPMorgan Chase, Chair, operations subgroup
Nick Cox	BlackRock, Chair, outreach subgroup
Michael Cross (Chair)	Bank of England
Grigoria Christodoulou and Sumita Ghosh (Secretariat)	Bank of England

Members of the London Foreign Exchange Joint Standing Committee operations subgroup as at December 2010

Name	Firm/organisation
Dennis Sweeney	Association of Foreign Banks
Simon Bruce	Bank of America
Richard Gray	Bank of England
Pamela Bald	Bank of New York Mellon
Duncan Lord	Barclays
Andrew Rogan	British Bankers' Association
Leigh Meyer	Citi
Phil Kenworthy	CLS Services
Andreas Gaus	Credit Suisse
Tony Beels	Deutsche Bank
Graham Warby	Goldman Sachs
Mike Neale	HSBC
Anna Box	ISDA
Andrew Harvey	Morgan Stanley
Matthew Norris	Nomura
Jane Collins	Reuters
Jeremy Hill	Royal Bank of Scotland
Ian Cowell	State Street
Joe Halberstadt	SWIFT
Daniel Haid	UBS
Graeme Munro (Chair)	JPMorgan Chase
Grigoria Christodoulou and Sumita Ghosh (Secretariat)	Bank of England

Members of the London Foreign Exchange Joint Standing Committee chief dealers' subgroup as at December 2010

Name	Firm/organisation
Ichei Kuki	Bank of Tokyo-Mitsubishi UFJ
Danny Wise	Barclays Capital
Bob de Groot	BNP Paribas
Bernie Kipping	Commonwealth Bank of America
Angus Greig	Deutsche Bank
Jon Pierce	Goldman Sachs
Chris Nicoll	Morgan Stanley
Ed Monaghan	Royal Bank of Canada
Roger Hawes	Royal Bank of Scotland
Chris Freeman	State Street
Niall O'Riordan	UBS AG
Martin Mallett (Chair)	Bank of England
James O'Connor	Bank of England

Members of the London Foreign Exchange Joint Standing Committee FX investor subgroup as at December 2010

Name	Firm/organisation
Michael Cross	Bank of England
Girome Bono	BlueCrest Capital
Sam Finkelstein	Goldman Sachs Asset Management
Troy Rohrbaugh	JPMorgan Chase
Murray Steel	Man Investments
Lisa Scott-Smith	Millennium Global
Eric Dannheim	Moore Capital
Sarah Edgington	Morgan Stanley
Richard Gladwin	Nomura
Paul Lambert	Polar Capital
Neil Record	Record Currency Management
Collin Crownover	State Street Global Advisors
Andy Bound	Tudor
David Buckle	UBS Asset Management
Nick Cox (Co-Chair)	BlackRock
James Bindler (Co-Chair)	Citi
Grigoria Christodoulou and Sumita Ghosh (Secretariat)	Bank of England

Members of the London Foreign Exchange Joint Standing Committee legal subgroup as at December 2010

Name	Firm/organisation
Gaynor Wood	Bank of America
Chris Allen	Barclays Capital
Richard Haynes	Citi
Sharon Blackman	Citi
Carl Husselman	Deutsche Bank
Anne Moore-Williams	FSA
Dan Parker	Goldman Sachs
Mehboob Lakhany	HSBC
Patrick Palmer	JPMorgan Chase
Stephen Potts	Lloyds TSB
Alex Bouchier	Royal Bank of Scotland
Alistair Clevely	Standard Chartered
Kate Binions	Standard Chartered
Simone Paul	State Street
Martin Oakley	Thomson Reuters
Clara Pastor	UBS
Susan Revell (Chair)	Morgan Stanley
Jacqueline Joyston-Bechal (Secretary)	Bank of England

Speeches

Bank of England speeches

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

The challenges of the 'New global economy'
Andrew Sentance, Monetary Policy Committee member, May 2011.

www.bankofengland.co.uk/publications/speeches/2011/
speech500.pdf

In a speech to the Jersey Chamber of Commerce, Dr Andrew Sentance described the way in which the global economy has become more integrated and the challenges that poses. Four main forces have come together — new technologies, trade liberalisation, political change and market deregulation. This has presented three challenges for policymakers: first, an ongoing process of structural change created by the shift in global economic gravity towards Asia; second, a prolonged period of upward pressure on energy and commodity prices; and third, increased potential for global economic volatility. In the face of these challenges, he argued that monetary policy should continue to be guided by price stability and seek to counteract global inflationary pressures through influencing the exchange rate, the demand climate and price expectations. Continuing to accommodate inflation without adjusting monetary policy poses a threat to the credibility of the monetary policy framework and may damage longer-term economic growth.

The economic outlook: some remarks on monetary policy
Paul Fisher, Executive Director for Markets, May 2011.

www.bankofengland.co.uk/publications/speeches/2011/
speech499.pdf

In this speech, Paul Fisher set out his personal views on monetary policy. Over the past couple of years, inflation has been driven higher by changes in VAT, energy and import prices. Given the lags involved in the transmission mechanism and the need for rebalancing, Paul thought that there was little monetary policy should have done to offset these various price-level shocks, although the combination of high inflation and slow growth does pose a significant challenge for policymakers.

Paul then discussed his views on consumer spending, spare capacity and inflation expectations, concluding that the risks to medium-term inflation are broadly balanced around the 2% target. But given his immediate concerns about consumption, he believed that raising Bank Rate could be exactly the wrong thing to do at this precise moment, and that there remains

time to allow the economy to recover before the eventual policy normalisation begins.

Building resilient financial systems: macroprudential regimes and securities market regulation
Paul Tucker, Deputy Governor, May 2011.

www.bankofengland.co.uk/publications/speeches/2011/
speech498.pdf

In a speech at the International Council of Securities Associations Annual General Meeting, Paul Tucker discussed how the regulation of securities markets fits into the development of macroprudential regimes. He explained how banking and securities markets have become less distinct over recent decades, with implications for both in banking supervision and securities regulation. He discussed whether, from a financial stability perspective, a distinction between 'intra-financial firm markets' and 'end-user markets' might be more useful than the more familiar distinction made by securities regulators between 'public markets' and 'private markets'. He went on to describe various ways in which listing authorities and securities regulators could do more to detect and contain risks to stability.

The economic outlook
Charles Bean, Deputy Governor, May 2011.

www.bankofengland.co.uk/publications/speeches/2011/
speech497.pdf

In a speech to the Northern Ireland Chamber of Commerce, Deputy Governor Charles Bean described the economic outlook and changes in the UK economy. He asked whether the recent slowing of growth represented a temporary 'soft patch' or indicated a prolonged period of slower growth. He said that consumer and public spending were likely to remain subdued but that the MPC expected both business investment and net trade to contribute positively to growth over the next few years. He went on to describe the puzzling weakness in productivity growth and the temporary factors which were contributing to the currently elevated level of inflation. Charles Bean concluded by noting that there would likely be a difficult period ahead as living standards adjusted to the impact of substantial shocks to the economy, but that monetary policy, which sought to smooth the adjustment path, would be consistent with the MPC's remit.

The supervisory approach of the Prudential Regulation Authority
Andrew Bailey, Executive Director, Prudential Regulation Authority — Deputy CEO designate, May 2011.

www.bankofengland.co.uk/publications/speeches/2011/speech496.pdf

In this speech, Andrew Bailey set out how the PRA intends to approach supervision of banks and investment firms. He emphasised the PRA's proposed new single statutory objective of promoting financial stability in the United Kingdom and importantly that the PRA will not seek to avoid failure of regulated firms 'at all costs'. He highlighted that the PRA will want to ensure firms carry out their business in a way that minimises any adverse effects on the financial system, including by seeking to ensure that those firms that do fail can be closed in an orderly manner.

Andrew set out some of the PRA's key features, including forward-looking judgement-based supervision, a focus on firm resolvability, a new risk framework assessing risks to financial stability, regular contact with PRA senior management for systemically important firms, high-quality data, purposive rules and a proactive approach to influencing the international debate.

The short long
Andrew Haldane, Executive Director for Financial Stability, May 2011.

www.bankofengland.co.uk/publications/speeches/2011/speech495.pdf

At the 29th SUERF (Société Universitaire Européene de Recherches Financières) Colloquium in Brussels, Andrew Haldane discussed a paper written with Richard Davies on the effects of short-termism in investment decision-making. Mr Haldane began by outlining the existing empirical and quantitative evidence for short-termism, which is broadly consistent with the theory that capital myopia may be rising. He went on to construct a set of quantitative tests to assess the significance and scale of short-termism in equity markets, by examining whether expected future cash flows are discounted excessively in the determination of equity prices today. The empirical tests suggested that there is significant evidence of short-termism over the past few decades across all industrial sectors. Finally, Mr Haldane outlined the implications of this for the real economy, namely that some projects may be rejected because future cash flows are discounted too heavily, reducing investment and growth. Public policy responses to this market failure include greater transparency about long-term performance, improved governance, better contract design and tax or subsidy measures.

Keynote speech to the Building Societies Association Annual Conference
Andrew Bailey, Executive Director, Prudential Regulation Authority — Deputy CEO designate, May 2011.

www.bankofengland.co.uk/publications/speeches/2011/speech494.pdf

In this speech, Andrew Bailey discussed the impact of the crisis on building societies and retail banking more generally and what that means for the future. Andrew began by addressing the issue of promoting diversity in the banking industry and specifically mutuals, saying he is in favour of promoting competition in the banking industry. But he explained that we need to be very careful what we mean by promoting competition and diversity because both need to be sustainable. Andrew went on to discuss competition saying that competition in banking needs careful assessment to understand the nuances. Andrew ended his speech by noting the importance of good risk management systems that help management to understand the risks inherent in their businesses and the need to attract and retain senior management and board members of the right calibre.

Key issues for UK monetary policy
Andrew Sentance, Monetary Policy Committee member, April 2011.

www.bankofengland.co.uk/publications/speeches/2011/speech493.pdf

In a speech in Manchester, Dr Andrew Sentance discussed four key issues that contributed to his difference of view from the majority on the MPC over the past year. First, was the powerful influence of global inflationary pressures, which he expected to be more persistent than the current *Inflation Report* forecast assumed. Second, was the role of sterling in UK monetary policy, which he argued was an important channel through which monetary stimulus transmitted inflationary impetus to the economy. Third, he argued that the relationship between the 'output gap' and inflation was uncertain, and a wide range of evidence suggested little dampening impact on inflation from spare capacity. Fourth, he pointed to the key roles of credibility and inflation expectations in keeping inflation on target over the medium term, highlighting the risk that persistent inflation over-runs without policy reactions could lead to upward drifts in expectations and a loss of credibility.

Macroprudential policy: building financial stability institutions
Paul Tucker, Deputy Governor, April 2011.

www.bankofengland.co.uk/publications/speeches/2011/speech492.pdf

In a speech at the 20th Annual Hyman P Minsky Conference, Paul Tucker discussed the interaction of the United Kingdom's new macroprudential regime with domestic arrangements for microprudential supervision, with monetary policy, and with new international arrangements. He explained that the creation of the Financial Policy Committee (FPC) plugged a gap between microprudential regulation and macroeconomic policy, placing greater emphasis on the resilience of the financial system as a whole. Faultlines would need to be identified across firms, markets and infrastructure. He said it was important that authorities set standards of resilience suited to tail events without impairing the longer-term performance of the economy, and emphasised that policymakers should be able to vary the required level of resilience in light of changing circumstances through the use of cyclical instruments. He also discussed the arrangements for the interim FPC, its objectives, role and scope. He described how its work would fit with that of the Monetary Policy Committee.

Central bank policy on collateral
Paul Fisher, Executive Director for Markets, April 2011.

www.bankofengland.co.uk/publications/speeches/2011/speech491.pdf

During the financial crisis, the Bank massively expanded the scale of its operations to provide liquidity to the banking system. That expansion prompted new and difficult questions about the range of securities the Bank would accept as eligible collateral. In his speech Paul Fisher set out some of the Bank's thinking on its collateral policy, including a number of high-level principles and a set of associated questions relating to eligibility, valuation, haircuts and limits. Paul also explained how the Bank's operations vary in their policy objectives and so have different eligible collateral pools that are tailored to match the policy goals of the different operations. He then moved on to explain recently announced changes to the eligibility of a number of sovereign and supranational issuers whose debt has moved from the narrow to the wider collateral set.

Japan can — and will — be a normal economy again
Adam Posen, Monetary Policy Committee member, April 2011.

www.bankofengland.co.uk/publications/speeches/2011/speech490.pdf

In the speech at the 12th Annual Mitsui Symposium at Columbia University, Dr Posen argued that the view of the Japanese economy as atypical and not subject to standard economic analysis is unfounded. He argued that in the absence of macroeconomic policy mistakes, and following a temporary growth surge driven by the rebuilding from the earthquake and tsunami, the Japanese economy should grow over time at approximately the rate of productivity growth — around 2% annually — adjusted for changes in prices and population size. He noted that despite the high level of outstanding public debt, net debt is actually much lower than gross debt and public indebtedness to foreigners remains insignificant. This suggests that fiscal policy need not be a significant constraint on the short-term rebuilding nor long-term growth. And he argued that the current recovery and the inevitable depreciation of the yen should help counter deflation. Finally, Japan stands to benefit from its role as a managerial, financial and technological hub of the world's fastest-growing region.

The big fish small pond problem
Andrew Haldane, Executive Director for Financial Stability, April 2011.

www.bankofengland.co.uk/publications/speeches/2011/speech489.pdf

Speaking at the Institute for New Economic Thinking annual conference in New Hampshire, Andrew Haldane discussed the public policy questions which arise as a result of observed and potential future international capital flows. Mr Haldane referred to the tension between the speed with which emerging market economies' capital markets were widening and the extent to which international investors were seeking to diversify portfolios to spread risk and boost returns, as the 'big fish small pond' (BFSP) problem. Whether this BFSP problem will continue depended on two factors: the degree of 'home bias' among advanced-economy investors; and the change in relative size of emerging market economies' capital markets relative to advanced economies. Mr Haldane's projections suggested that the problem was likely to intensify in the future. In response, he considered the possible public policy responses to the BFSP problem, including the role that capital controls, financial deepening and macroprudential measures might play, in developing new rules of the financial road for global finance.

Mortgages and housing in the near and long term
David Miles, Monetary Policy Committee member,
March 2011.

www.bankofengland.co.uk/publications/speeches/2011/
speech488.pdf

In this speech, Professor David Miles argued that the
UK housing market would not remain depressed beyond a
period of a few years. Before the crisis, mortgage lending
standards had been too weak. A sudden tightening of
loan to value ratios, similar to that experienced since the start
of the financial crisis, could be expected to cause a temporary
reduction in the demand for housing from first-time buyers.
And the smaller the demand from first-time buyers, the
fewer subsequent transactions would be triggered between
homemovers. But activity would only remain weak while
first-time buyers accumulated sufficiently large deposits.
Professor Miles concluded that the drop in housing market
activity represented a necessary transition towards a more
sustainable equilibrium.

Recent developments in the sterling monetary framework
Paul Fisher, Executive Director for Markets, March 2011.

www.bankofengland.co.uk/publications/speeches/2011/
speech487.pdf

In this paper, Paul Fisher discussed two key issues for central
bankers. First, Paul reviewed the pros and cons of a number of
systems for the implementation of monetary policy decisions
on Bank Rate, including the pre-crisis system of reserves
averaging, and the current 'floor' system for implementing
monetary policy. He concluded that the Bank intends to revert
to reserves averaging in due course.

In the second part of the paper, Paul discussed some of the
operational policy questions raised by the extended-collateral
long-term repos, implemented during the crisis to provide
market-wide liquidity insurance to the banking system. To
resolve these issues the Bank, with the help of Paul Klemperer
from Nuffield College, Oxford, an expert in auction theory,
redesigned its long-term operations, launching its new
permanent indexed long-term repo (ILTR) operations in
June 2010. The remainder of the paper discussed the ILTRs in
more detail.

Uncertain uncertainty
Martin Weale, Monetary Policy Committee member,
March 2011.

www.bankofengland.co.uk/publications/speeches/2011/
speech486.pdf

In a speech to the Institute and Faculty of Actuaries,
Dr Martin Weale discussed the nature of the uncertainty

surrounding macroeconomic forecasts. Dr Weale noted that
as interest rate changes take some time to have an effect it
makes sense to set monetary policy with reference to where
inflation is expected to be in the future. He argued that
economic forecasts were therefore a necessary part of the
policy process and those forecasts should be in the public
domain. But, it was therefore important that producers of
forecasts should help outside users of them to understand
their limitations.

Dr Weale went on to discuss how the uncertainty surrounding
forecasts might best be described. The MPC's *Inflation Report*
forecasts are presented as fan charts, rather than point
estimates, summarising the assumed probabilities of various
outcomes occurring. But even those probability estimates are
themselves uncertain. As a contribution to the debate,
Dr Weale provided a range of possible alternative depictions of
the MPC's forecasts that might help users understand more
about the nature of the uncertainty faced by the MPC about
the economic outlook.

MPC in the dock
Spencer Dale, Executive Director and Chief Economist,
March 2011.

www.bankofengland.co.uk/publications/speeches/2011/
speech485.pdf

In this speech, Spencer Dale made the case for the defence of
the MPC on four counts: Why is inflation so high? Why has
inflation been so much higher than we expected? Could
inflation stay high? And how is the current stance of policy
consistent with the inflation outlook? On the second count,
the explanation for why inflation had been so much higher
than expected came in two halves. In 2009, the surprise
largely stemmed from the extent of pass-through from higher
import prices to consumer prices following the deprecation of
sterling. More recently, the surprise largely stemmed from the
surge in commodity prices. Finally, he explained his vote at
the previous MPC meeting to raise Bank Rate to 0.75%. It was
not driven by 'nice' reasons, but instead by a concern that —
despite a relatively weak outlook for growth — the risks to the
inflation target in the medium term were to the upside.

Capital discipline
Andrew Haldane, Executive Director for Financial Stability,
March 2011.

www.bankofengland.co.uk/publications/speeches/2011/
speech484.pdf

At the annual meetings of the American Economics
Association, Andrew Haldane discussed the success of
international capital standards in forestalling banking distress
and set out one possible framework that might address some

of the observed shortcomings. Mr Haldane defined three principles required for regulatory capital standards to best insure the financial system against crisis: simplicity; robustness; and timeliness. Taking each one in turn, Mr Haldane argued that current regulatory capital ratios might have become too complex and error-prone to meet such criteria. That led him to consider how market-based metrics of bank solvency might offer an alternative to reliance on banks' own risk models. Such metrics are transparent, largely model-free and offer timelier signals of impending stress. Mr Haldane suggested that building into the regulatory capital structure of banks contingent convertible instruments ('Cocos') with triggers based on market-based measures of solvency might reintroduce market discipline by altering incentives of investors, management and regulators. In turn, this would ensure that regulation offered a timely and robust framework for risk management.

Let it grow: how monetary policy can support sustainable economic growth
Andrew Sentance, Monetary Policy Committee member, March 2011.

www.bankofengland.co.uk/publications/speeches/2011/speech483.pdf

In a speech to the East of England CBI, Dr Andrew Sentance discussed the prospects for the economic recovery and how monetary policy can best support it. He noted that prior to the snow-affected 2010 Q4, the recovery was healthy relative to the early 1980s' and 1990s' experiences. In particular, strong global growth supported a strong rebound in manufacturing output. Though weak consumption was likely to hold back growth in early 2011, this reflected short-term factors including higher VAT. As private sector wage settlements increased, consumption growth could rebound and the current episode of high inflation could prove more persistent than the *Inflation Report* outlook suggested. Monetary policy could best support economic growth by fostering a climate of price stability and avoiding destabilising lurches in policy. Failure to take timely action now risked more abrupt rises in interest rates in the future, which could pose a threat to the recovery.

Challenges in note circulation — availability and quality of low-denomination notes
Victoria Cleland, Head of Notes Division, March 2011.

www.bankofengland.co.uk/publications/speeches/2011/speech482.pdf

In a speech at the Currency Cycle Conference in Barcelona, Victoria Cleland, Head of Notes Division, outlined how the Bank is working with the UK cash industry to meet public demand for improved availability and quality of £5 notes. Following a pilot of £5 ATM dispense in 2009, the largest ATM

operators agreed to ensure that by 2012 at least 1.2% of their total dispense value was in £5s. This meant that, typically, around 10%–15% of such operators' ATMs were to be reconfigured to dispense £5s. Victoria noted that progress was on track; in 2012 nearly twice as many £5s should enter circulation than in 2010. She explained that a 'virtuous circle' should develop: as more £5s are acquired by the public, and retailers are more able to bank the poorer quality ones, 'the fiver should start to look as familiar — and as smart — as our other denominations'.

Financial stability — objective and resolution
Andrew Bailey, Executive Director for Banking Services and Chief Cashier, March 2011.

www.bankofengland.co.uk/publications/speeches/2011/speech481.pdf

In this speech, Andrew Bailey spoke about the causes of financial crises and the inherent risks that exist through the activities that banks undertake. He emphasised the importance of financial stability being seen as a public policy objective and for the public having to have a greater understanding of what it involves.

Andrew discussed the Government's consultation paper which aimed to define the financial stability objective that the Financial Policy Committee would be given. He highlighted three important areas for the Government to include in legislation, namely transparency, accountability and the importance of a purposive approach to interpreting legislation.

Andrew finished by discussing the problem of too big/too important to fail institutions, and the work under way to create a resolution tool which would remove the unacceptable dependence of banks on public money.

Do we need an international monetary system?
Mervyn King, Governor, March 2011.

www.bankofengland.co.uk/publications/speeches/2011/speech480.pdf

In this speech, the Governor began by noting that the emergence of the imbalances in current accounts over the past 20 years had had huge effects on the global pattern of spending, creating unsustainable paths for domestic demand, net debt and long-term real interest rates. The main lesson from the experience was that national policy frameworks alone were unable to prevent components of demand from growing at unsustainable rates while maintaining satisfactory growth in the economy as a whole.

Fixed, or managed, exchange rate regimes may help to limit the real economic costs of 'excessive' volatility that reflected

short-lived shifts in market sentiment, but if they impeded desirable adjustments of real exchange rates, they could contribute to unsustainable patterns of spending. Given imperfections in financial markets in both borrowing and lending countries, such capital flows could lead to a degree of fragility, such that, when adjustment came, there was a high probability that it would be abrupt.

The immediate issue of how to move to a more sustainable position required a resolution of different countries' economic strategies for rebalancing — there could be only one path. So

there must be scope, in the short term, for a 'grand bargain' to adopt a set of policies that would support an agreed path of rebalancing and avert a move towards protectionism. This should be the central objective of the G20's Framework for Strong, Sustainable and Balanced Growth.

The Governor concluded by saying that he felt the most obvious problem at the global level was that current account imbalances were growing again. Recognising the common interest in moving to a more sustainable pattern of world demand was in everyone's self-interest.

Appendices

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)

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. 415 The gains from delegation revisited: price-level targeting, speed-limit and interest rate smoothing policies (March 2011)
Andy Blake, Tatiana Kirsanova and Tony Yates

No. 416 An efficient method of computing higher-order bond price perturbation approximations (March 2011)
Martin M Andreasen and Pawel Zabczyk

No. 417 How non-Gaussian shocks affect risk premia in non-linear DSGE models (March 2011)
Martin M Andreasen

No. 418 Cyclical risk aversion, precautionary saving and monetary policy (April 2011)
Bianca De Paoli and Pawel Zabczyk

No. 419 A global model of international yield curves: no-arbitrage term structure approach (April 2011)
Iryna Kaminska, Andrew Meldrum and James Smith

No. 420 Tailwinds and headwinds: how does growth in the BRICs affect inflation in the G7? (April 2011)
Anna Lipińska and Stephen Millard

No. 421 Global rebalancing: the macroeconomic impact on the United Kingdom (April 2011)
Alex Haberis, Bojan Markovic, Karen Mayhew and Pawel Zabczyk

No. 422 Understanding the macroeconomic effects of working capital in the United Kingdom (April 2011)
Emilio Fernandez-Corugedo, Michael McMahon, Stephen Millard and Lukasz Rachel

No. 423 Shifts in portfolio preferences of international investors: an application to sovereign wealth funds (April 2011)
Filipa Sá and Francesca Viani

No. 424 How did the crisis in international funding markets affect bank lending? Balance sheet evidence from the United Kingdom (April 2011)
Shekhar Aiyar

No. 425 International transmission of shocks: a time-varying factor-augmented VAR approach to the open economy (May 2011)
Philip Liu, Haroon Mumtaz and Angeliki Theophilopoulou

No. 426 Labour supply as a buffer: evidence from UK households (May 2011)
Andrew Benito and Jumana Saleheen

No. 427 System-wide liquidity risk in the United Kingdom's large-value payment system: an empirical analysis (May 2011)
Marcelo Perlin and Jochen Schanz

No. 428 Intraday two-part tariff in payment systems (May 2011)
Tomohiro Ota

No. 429 Domestic financial regulation and external borrowing (May 2011)
Sergi Lanau

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 paper has been published recently:

No. 32 Financial protectionism: the first tests (May 2011)
Andrew K Rose and Tomasz Wieladek

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/bankstats/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:

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

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/redbookdec10.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.

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

Copies are available on the Bank's website at:

www.bankofengland.co.uk/publications/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 2011 are as follows:

Quarterly Bulletin		*Inflation Report*	
Q1	21 March	February	16 February
Q2	13 June	May	11 May
Q3	19 September	August	10 August
Q4	12 December	November	16 November

Financial Stability Report
June
December

Quarterly Bulletin, Inflation Report and Financial Stability Report subscription details

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

Destination	2011					
	QB, IR and *FSR* package	*QB* and *IR* package	*IR* and *FSR* package	*QB* only	*IR* only	*FSR* only
United Kingdom						
First class/collection(1)	£31.50	£27.00	£13.50	£21.00	£10.50	£5.25
Students/schools (concessionary rate UK only)	*£10.50*	*£9.00*	*£4.50*	*£7.00*	*£3.50*	*£1.75*
Academics (concessionary rate UK only)	*£21.00*	*£18.00*	*£9.00*	*£14.00*	*£7.00*	*£3.50*
Rest of Europe						
Letter service	£38.50	£33.00	£17.00	£25.00	£13.00	£6.50
Outside Europe						
Surface mail	£38.50	£33.00	£17.00	£25.00	£13.00	£6.50
Air mail	£50.00	£43.00	£21.50	£34.00	£17.00	£8.50

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

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

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

These publications are available from Publications Group, Bank of England, Threadneedle Street, London, EC2R 8AH; telephone +44 (0)20 7601 4030; fax +44 (0)20 7601 3298; email mapublications@bankofengland.co.uk or fsr_enquiries@bankofengland.co.uk.

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