## Quarterly Bulletin

### 2010 Q3 | Volume 50 No. 3





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#### Foreword

The UK economy continues to recover from the effects of the financial crisis. But that adjustment process has been slow and painful. It is important to learn from the events of the past three years. Several articles in this *Bulletin* pick up that challenge, exploring: the impact on the price of new household borrowing; the collapse in world trade; the deterioration in businesses' output expectations; and the sharp falls in house prices. Some of the lessons for the way economic models are structured and used were discussed at this year's Chief Economists' Workshop hosted by the Bank's Centre for Central Banking Studies, a write-up of which also appears.

The *Bulletin* begins, as usual, by examining developments in financial markets in the regular *Markets and operations* article. Following heightened concerns earlier in the year, sentiment in financial markets improved in June and July, before deteriorating somewhat in August. In the United Kingdom, the formation of a new government and the subsequent plans for fiscal consolidation removed a key source of uncertainty affecting sterling asset prices. Similarly, publication of the results of stress tests on European banks together with revised proposals for international banking sector regulation helped to ease strains within financial markets. Subsequent to the period reviewed by the article, on 12 September 2010 the governing body of the Basel Committee announced higher global minimum capital standards.

Concerns about sovereign default risk in some European countries persisted. Moreover, doubts remained about the durability and speed of the global economic recovery going forward. Such worries were reflected in further falls in medium-term government bond yields in most of the major economies. Against that background, UK monetary policy remained highly accommodative. And market participants continued to push back the timing of when they expected this accommodation to start to be removed.

One of the defining features of the financial crisis has been the scale and intensity of the challenges faced by the banking sector. In the United Kingdom, Bank Rate was reduced sharply, but the fall in interest rates charged on new lending to households was significantly smaller and indeed some interest rates rose. The article in this edition explores the factors behind the rise in the price of new household borrowing relative to Bank Rate. Higher spreads on long-term wholesale funding costs faced by lenders have been a key contributor, in part as market participants revised up their perceptions of the riskiness of lending to banks. But other factors also appear to have played a role, reflected in a pickup in the residual component of the decomposition. The larger residual needs to be interpreted with caution but, among other things, it is consistent with lenders increasing mark-ups over marginal costs for new lending, which may reflect a need to build higher capital levels within the banking sector.

A second important feature of the recent recession was the collapse in global trade, which fell by more than in any period since the Second World War. That fall was particularly stark relative to the fall in world GDP. A number of explanations have been put forward to explain this collapse and these are explored further in the article in this edition.

Evidence suggests that the fall in world trade primarily reflected a fall in global demand that was concentrated particularly within import-intensive investment spending. In addition, the increasing globalisation of production processes and supply chains over recent decades means that international trade flows are more responsive to shifts in demand anywhere in the world. But other factors, including the tighter availability of specialist trade finance, may also have played a role in the collapse.

The recession was also marked by a collapse in businesses' output expectations, as measured by business surveys. In the past, sharp falls in these surveys have typically provided a relatively good indication of upcoming recessions. But they have also on occasion given false signals. More generally, small moves in survey balances appear to contain relatively little news for aggregate output. The article in this edition explores the factors that influence survey measures of businesses' expectations. Although this aids our understanding of survey measures, the weight that should be placed on surveys when forming a view of the economic outlook is ultimately a matter of judgement.

The financial crisis was, of course, marked also by sharp falls in the prices of a broad range of assets, including housing. Monitoring developments in the housing market can be difficult, particularly during periods of volatility. The article in this edition asks whether auction price data can help to provide a timely read on the housing market. Residential property auction price data have certain advantages and, empirically, they do appear to offer an early insight into developments in the housing market. But, as with any data, they must be interpreted with care.

This edition also contains two reports. The first summarises the key points that emerged from the seventh Chief Economists' Workshop, hosted here at the Bank of England, which took as its theme 'state-of-the-art modelling for central banks'. The second summarises the main points made by participants at the fourth Monetary Policy Roundtable, hosted by the Bank of England and the Centre for Economic Policy Research on 14 July.

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

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The speeches contained in the *Bulletin* can be found at www.bankofengland.co.uk/publications/speeches/index.htm

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

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# Recent economic and financial developments

## Markets and operations

This article reviews developments in sterling financial markets, including the Bank's official operations, since the 2010 Q2 Quarterly Bulletin up to 27 August 2010.<sup>(1)</sup> The article also summarises market intelligence on selected topical issues relating to market functioning.

#### Sterling financial markets

#### Overview

Following heightened concerns earlier in the year about the sustainability of fiscal positions in a number of European countries, sentiment in financial markets improved in June and July, before deteriorating somewhat in August.

In the United Kingdom, contacts noted that the formation of a new government and the announcement of its plans for fiscal consolidation had reduced a key source of uncertainty affecting sterling asset markets. Similarly, publication of the results of stress tests for European banks together with revised proposals for the introduction of new international prudential bank regulations helped to ease strains within financial markets. Subsequent to the review period, the governing body of the Basel Committee announced higher global minimum capital standards for banks.

However, concerns about sovereign default risk in some European countries persisted, with sovereign credit default swap (CDS) premia for these countries remaining elevated. Moreover, despite robust economic growth in the first half of the year, doubts about the durability and speed of the global economic recovery grew, in particular following weaker-than-expected US macroeconomic data. This was reflected in falls in medium-term government bond yields in the major economies, with, for example, US and UK yields approaching historic lows (Chart 1).

Against that background, UK monetary policy remained highly accommodative. And market participants continued to push back the timing of when they expected this accommodation to start to be removed.

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

In each of the monetary policy meetings during the review period, the Bank of England's Monetary Policy Committee (MPC) voted to maintain Bank Rate at 0.5% and the stock of asset purchases financed by central bank reserves at





Source: Global Financial Data.

(a) Ten-year US government bond yields.
(b) Compiled from yields on 2.5% UK Consolidated Stock (Consols) up to 1958 Q1 and yields on ten-year UK government bonds from 1958 Q2 onwards. As Consols are undated stock, the time-series comparison is only approximate

£200 billion. As a result, UK monetary policy remained highly accommodative, echoing the situation in most other industrial economies.

In terms of market interest rates, sterling overnight rates generally traded close to Bank Rate (Chart 2). There was a brief pickup in the secured overnight rate in July, which contacts attributed to a temporary increase in demand for short-dated secured borrowing around the time of the maturity of the ECB's first unlimited twelve-month refinancing operation.

Looking ahead, market participants continued to expect UK monetary policy to remain accommodative for some time. Overnight index swap (OIS) rates fell, as market expectations of Bank Rate at the end of 2011 and 2012 were revised down (Chart 3). In addition, a Reuters survey of economists showed a small increase in the number of respondents expecting the MPC to conduct further asset purchases. These developments in part reflected a reassessment of the global economic

(1) The data cut-off for the previous Bulletin was 21 May 2010.

#### Chart 2 Spread to Bank Rate of sterling overnight interest rates



Sources: BrokerTec, Wholesale Market Brokers' Association and Bank calculations.

<sup>(</sup>a) Spread of weighted average secured overnight rate to Bank Rate.(b) Spread of weighted average unsecured overnight rate to Bank Rate.





Sources: Bloomberg and Bank calculations

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

outlook. Consistent with that, there were similar falls in US dollar OIS rates, though euro OIS rates changed by less.

#### Bank funding markets

In line with OIS rates, short-term interbank borrowing rates fell, having risen slightly in May around the time of heightened concerns over sovereign default risk in some European countries. As a result, sterling Libor-OIS spreads — an indicator of near-term bank funding conditions — remained broadly stable (Chart 4). Similarly, the results from the Bank's new indexed long-term repo (ILTR) operations suggested little material change in banks' demand for sterling liquidity from the Bank. These operations and others within the sterling monetary framework are described in the box on page 160.

However, not all banks can access interbank funding markets on the same terms. In particular, the average deviation of banks' euro funding rates, as indicated by their Libor





Sources: Bloomberg, British Bankers' Association and Bank calculations

 (a) Three-month Libor-OIS spreads derived from Libor fixings.
 (b) Average absolute deviation of individual panel members' three-month Libor submissions from the Libor fixing.

submissions, increased a little. Contacts thought that banks that were perceived to rely more heavily on ECB facilities had to pay higher market interest rates to obtain funding.

Such variations in the cost of interbank borrowing were also evident in cross-currency funding markets. According to contacts, smaller European banks with less direct access than other banks to US dollar funding markets found it more expensive to borrow in sterling and euros and swap the proceeds into US dollars. Reflecting this, the implied cost of US dollar funding via foreign exchange markets increased in July and August, although it ended the review period broadly unchanged (Chart 5).

At longer horizons, five-year UK bank CDS premia — moves in which would typically be associated with changes in bank funding costs — fell during June and July but rose in August, mirroring international moves (**Chart 6**). Overall they were around 20 basis points lower than at the time of the previous *Bulletin*. And in line with US and European banking sectors, major UK banks' equity prices rose on average by around 5%, although there was considerable variation across institutions.

Overall, sentiment towards banks improved somewhat. This appeared largely to reflect three main factors. First, the publication of bank stress-test results by the Committee of European Banking Supervisors reduced uncertainty by providing greater disclosure about European banks' exposures to sovereign debt. Second, banks' earnings results for the

#### Operations within the sterling monetary framework

Over the review period, the level of reserves continued to be determined by two main factors: the stock of reserves injected via asset purchases and the level of reserves supplied by long-term repo open market operations (OMOs). The box on pages 164–65 provides more detail on the Asset Purchase Facility. This box describes the Bank's operations within the sterling monetary framework over the review period.

#### Indexed long-term repo (ILTR) OMOs

The Bank recently reformed the design of its long-term repo (LTR) operations to enable funds to be lent against different types of collateral depending on the degree of stress in the system. The new ILTRs replaced the three-month extended-collateral long-term repos and the three, six, nine and twelve-month long-term repos previously offered by the Bank against standard collateral.<sup>(1)</sup>

The Bank offered £5 billion via three-month ILTRs on both 15 June and 13 July followed by a £2.5 billion six-month operation on 17 August. All three auctions were well covered, suggesting counterparties were comfortable with the new operations. Table 1 shows the results of these operations.

Based on the pattern of bids received, the Bank allotted around 17% of the auction to bids against wider collateral in the three-month ILTR auctions held in June and July, producing a clearing spread on wider collateral of 26 basis points over Bank Rate in both auctions. In each case, the remaining 83% of the auction was allocated to bids against narrow collateral at or very close to Bank Rate, producing a stop-out spread (the difference between clearing spreads) of around 25 basis points.

In contrast, the six-month operation held in August produced clearing spreads of 1 basis point and 50 basis points on narrow and wider collateral respectively, resulting in a stop-out spread of 49 basis points. Consequently, a higher proportion of funds (24%) was allocated against wider collateral.

Reserves provided via ILTRs were more than offset by the maturity of three-month extended-collateral long-term repo operations and six, nine and twelve-month long-term repos. Consequently, the stock of LTRs outstanding declined.

#### **Operational Standing Facilities**

As a result of the suspension of reserves targets and the change to remunerate all reserves at Bank Rate announced on 5 March 2009, the rate paid on the Operational Standing Deposit Facility was reduced to zero. 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 over the period.

#### Table 1 Indexed long-term repo operations

	Total	Collateral set summary	
		Narrow	Wider
15 June 2010 (three-month maturity	y)		
On offer (£ millions)	5,000		
Total bids received (£ millions) <sup>(a)</sup>	7,685	5,300	2,385
Amount allotted (£ millions)	5,000	4,118	882
Cover	1.54	1.06	0.48
Clearing spread above Bank Rate <sup>(b)</sup>		0	26
Stop-out spread <sup>(c)</sup>	26		
13 July 2010 (three-month maturity	<i>י</i> )		
On offer (£ millions)	5,000		
Total bids received (£ millions) <sup>(a)</sup>	6,400	4,850	1,560
Amount allotted (£ millions)	5,000	4,138	862
Cover	1.28	0.97	0.31
Clearing spread above Bank Rate <sup>(b)</sup>		1	26
Stop-out spread <sup>(c)</sup>	25		
17 August 2010 (six-month maturity	()		
On offer (£ millions)	2,500		
Total bids received (£ millions) <sup>(a)</sup>	4,657	3,687	980
Amount allotted (£ millions)	2,500	1,895	605
Cover	1.86	1.47	0.39
Clearing spread above Bank Rate <sup>(b)</sup>		1	50
Stop-out spread <sup>(c)</sup>	49		

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

received.

(b) Amounts shown in basis points.(c) Difference between clearing spreads for wider and narrow collateral in basis points.

#### **Discount Window Facility**

The Discount Window Facility (DWF) is a permanent facility to provide liquidity insurance to the banking system. On 6 July 2010, the Bank announced that the average daily amount outstanding in the DWF with an initial maturity of 30 days or less between 1 January and 31 March 2010 was £0 million. The average daily amount outstanding in the Bank's 364-day DWF between 3 February and 31 March 2009 was £0 million.

#### Other operations Special Liquidity Scheme

At the end of January 2009, £185 billion of UK Treasury bills had been lent under the Special Liquidity Scheme. As noted in the previous Bulletin, as at 28 February 2010, bills with a face value of £165 billion remained outstanding. Since that date, banks have continued to make repayments.

#### US dollar repo operations

In response to renewed strains in the short-term funding market for US dollars, from 11 May 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 27 August 2010, there has been no use of the facility.

<sup>(1)</sup> 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.

Chart 5 Spread of foreign exchange implied cost of three-month US dollar funding over US dollar Libor<sup>(a)</sup>



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

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





Source: Markit Group Limited

(a) Unweighted averages of five-year, senior credit default swaps (CDS) prices.
 (b) Average of Bank of America, Citi, Goldman Sachs, JPMorgan Chase and 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.

second quarter, although generally lower than in the first quarter, were higher than analysts' expectations. Third, revised proposals for the new international prudential bank regulations — the so-called Basel III rules — were perceived as less stringent and, more importantly, according to contacts, potentially allowed for a longer implementation period. Together, these factors arguably removed some of the near-term pressure on banks to raise capital levels significantly, which in the short term at least would be expected to support bank profitability.

As part of the new Basel III rules, banks will need to lengthen the term of their funding should they not wish to hold additional liquid assets on their balance sheets. However, contacts noted that new regulations for money market funds (MMFs) — a key provider of short-term financing for banks may ultimately encourage those institutions to shorten the maturity of their assets.<sup>(1)</sup> Partly in response to these international regulatory initiatives and following changes to bank liquidity rules in the United Kingdom, UK banks used innovative types of short-term funding instruments. Examples of these products are discussed in more detail in the box on pages 168-69.

UK banks also continued to issue longer-term debt in both senior unsecured (Chart 7) and covered bond markets. And there were signs of activity in UK asset-backed securities markets including some public issuance of collateralised loan obligations.<sup>(2)</sup> But the longer-term funding challenge for banks remained — at the end of June, an estimated £750 billion-£800 billion of term funding for major UK banks was due to mature by the end of 2012.<sup>(3)</sup>

Chart 7 UK bank senior debt issuance<sup>(a)</sup>



Source: Dealogic

(a) Issuance with a value greater than or equal to US\$500 million equivalent and original maturity greater than one year.
(b) Senior debt issued under HM Treasury's Credit Guarantee Scheme.

Long-term interest rates

Contacts suggested that investors continued to seek safety in the most liquid government bond markets, away from those where sovereign risks were perceived to be greatest. Reflecting this, some European countries' sovereign CDS premia increased and yields on their government debt rose relative to those on German government bonds (bunds). Greek and Irish government bond yields rose sharply, with the latter affected by the downgrade of Ireland's sovereign credit rating by Standard and Poor's in August.

In contrast, the spread between gilt and bund yields narrowed over the review period (Chart 8). Market participants noted

<sup>(1)</sup> The SEC 2a-7 rule now limits the weighted average maturity of US MMFs to 60 days (from 90 days previously). New guidelines announced by the Committee of European Securities Regulators in May are expected to place similar restrictions on European MMFs

<sup>(2)</sup> An asset-backed security backed by the receivables on loans. Banks package and sell their receivables on loans to investors in tranches of varying currency and risk.

<sup>(3)</sup> See June 2010 Financial Stability Report, pages 50-54.



#### Chart 8 Selected European ten-year government bond spreads<sup>(a)</sup>

Sources: Bloomberg and Bank calculations.

that the new UK Government's fiscal consolidation plans had reduced uncertainty.

Over the review period as a whole, the gilt yield curve shifted lower, mirroring changes in other major government bond markets (Chart 9). Indeed, medium-term yields on US and UK government bonds fell towards historical lows (Chart 1).

CURVES(a) Per cent 6 5 4 5 4 5 4 5 4 2 Dashed lines: 21 May 2010 Solid lines: 27 August 2010 1

Chart 9 International nominal government bond yield

Source: Bank calculations

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

10

Maturity (years)

Part of the fall in yields reflected lower real forward rates as concerns rose about the durability and speed of the global economic recovery. Against that backdrop, the US Federal Reserve announced that it would reinvest the principal payments from its US Agency debt and agency mortgage-backed securities portfolio in long-term

15

0

20

## Changes to the inflation indexation of UK defined benefit pension fund liabilities

On 8 July 2010, the UK Government announced that it would change the price index used to calculate the minimum rate (required by the 1993 Pension Schemes Act) at which private defined benefit pension fund liabilities accrue. Previously, the minimum reference rate had been calculated using the UK retail prices index (RPI). However, for revaluations in 2011 (based on inflation in the year to September 2010), and future years, it will be calculated using the UK consumer prices index (CPI).

Though in principle the change applies to both deferred pensions and pensions in payment, the total amount of liabilities which will be affected remains uncertain. In particular, it will depend on individual scheme rules, the decisions of employers and pension scheme trustees and the extent of any other legislative changes. For example, some pension funds' rules explicitly specify a minimum uplift linked to RPI, rather than referring to the statutory minimum rate. In this case, a pension fund would retain the link to RPI but in order to comply with the statutory minimum it may need to accrue its liabilities at the higher of CPI and RPI each year.

This change in indexation rules may have implications for how pension funds manage their exposure to future inflation when trying to ensure that they have sufficient assets to meet future pension payouts. RPI-linked financial assets, which are currently typically used by pension funds as a hedge against RPI-linked liabilities, may be less suitable as a hedge for CPI-linked liabilities if the two price indices evolve differently.<sup>(1)</sup>

Contacts suggested that funds seeking to hedge their future pension liabilities would ideally like to invest in assets whose pay-offs are closely linked to the relevant price index used for their annual revaluation. At present there is no active market for CPI-linked financial instruments in the United Kingdom and market contacts generally expected that pension funds would continue to hedge their CPI-linked liabilities with RPI-linked instruments. Likewise, contacts noted that there had not been any significant changes in pension fund hedging behaviour in response to the July announcement, although there was some volatility in index-linked gilt yields around that time.

 For more discussion on the differences between CPI and RPI measures see the box 'The wedge between RPI and CPI inflation' on pages 29–30 in the Bank of England Inflation Report, November 2005.

<sup>(</sup>a) Spread over ten-year German government bond yield.

US government bonds with the aim to support the US economic recovery.

In the United Kingdom, real forward interest rates rose in July (Chart 10). This might in part have reflected an initial reaction by investors to the proposed legislative changes to UK pension fund indexation rules (see the box opposite for more details). But contacts thought that the main factor behind this increase in real forward rates was the issuance of the 2040 index-linked gilt, which boosted the available supply of UK index-linked debt. These effects proved temporary and medium-term sterling real interest rates fell in August in line with international markets.

Chart 10 International five-year real interest rates, five years forward  $^{\rm (a)(b)}$ 



Source: Bank calculations.

(a) Sterling and US dollar real interest rates derived from the Bank's government liability curves.

Euro rates derived using the Bank's inflation swap and government liability curves.
(b) Sterling real interest rates are derived from instruments that reference RPI inflation, while US dollar and euro real rates are derived from instruments referencing CPI inflation. This partly explains why the level of medium-term sterling real rates has been consistently below similar-maturity US dollar and euro real rates.

Perhaps consistent with investor perceptions of a protracted period of subdued real and nominal global demand, medium-term forward inflation rates declined somewhat over the review period (Chart 11).

At the same time, information derived from UK inflation options indicated that investors placed less weight on the possibility of high inflation over the medium term, despite recent above-target outturns and the prospective uplift from the VAT changes announced in the June *Budget*, and placed slightly more weight on below-zero outturns (**Chart 12**).

#### Foreign exchange

Developments in relative interest rates might have accounted for some of the 5.6% appreciation of the sterling effective exchange rate index (ERI) over the period (**Chart 13**). In particular, at times during the period, worries about the US economic outlook pushed down on US dollar interest rates relative to sterling interest rates. However, in general, sterling appears to have appreciated by more than would be suggested  $\label{eq:chart11} \begin{array}{l} \mbox{International five-year implied inflation rates,} \\ \mbox{five years forward}^{(a)} \end{array}$ 



Source: Bank calculations

(a) Sterling and US dollar forward inflation rates derived from the Bank's government liability curves. Euro forward inflation rates derived using the Bank's inflation swap curve.

Chart 12 Weight on high and low UK RPI inflation outturns implied by options<sup>(a)</sup>



Sources: Bloomberg, Royal Bank of Scotland and Bank calculations

(a) Probability that RPI inflation will be below zero or greater than 5% based on the average probability distribution of annual RPI outturns for six to seven years ahead implied by options.

#### Chart 13 International exchange rate indices



Sources: Bloomberg and Bank calculations

#### Asset purchases(1)

The Bank did not undertake any gilt purchases under the Asset Purchase Facility (APF) over the review period. As a result, the stock of gilts held by the APF (in terms of the amount paid to sellers) was maintained at £198.3 billion.<sup>(2)</sup> The Bank continued to offer to lend some of its gilt holdings via the Debt Management Office (DMO) in return for other UK government collateral.

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

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

#### Gilt lending facility

In the three months to 30 June 2010, a daily average of £2.12 billion of gilts were lent as part of the gilt lending facility. Use of the facility continued to be concentrated in gilts in which the Bank held a large proportion of the free float (the total amount of a gilt in issue less the amount held by the UK Government).

#### **Corporate bonds**

In order to improve the functioning of the sterling corporate bond market, the Bank continued to offer to purchase and sell

Table 1 APF transactions by type (£ millions)

corporate bonds via the Corporate Bond Secondary Market Scheme.

During the review period, activity in the Bank's auctions continued to reflect broader market conditions. In particular, the Bank received increased offers in its purchase auctions in May and June, with £507 million offered on 8 June, the largest amount of offers in a single auction (Chart A). Despite the deterioration in investor sentiment during this period, the Bank also saw an increase in the number of bids received in some sale auctions.

Activity in the Bank's purchase auctions fell in July and August. Spreads also narrowed and there was continued activity in the Bank's sale auctions.

As of 26 August 2010, the Bank portfolio totalled £1,571 million, compared to £1,419 million at the end of the previous review period.

#### 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.

Spreads on sterling-denominated CP widened marginally in May and June, reflecting broader market conditions. But they stabilised and subsequently narrowed towards the end of the review period. And the majority of spreads on primary

Week ending <sup>(a)</sup>	Commercial paper	Gilts	s Corporate bond		Total <sup>(b)</sup>	
			Purchases	Sales	-	
20 May 2010 <sup>(c)(d)</sup>	251	198,275		1,419	199,945	
Thursday 27 May 2010	200	0	91	1	290	
Thursday 3 June 2010	0	0	25	14	11	
Thursday 10 June 2010	0	0	107	11	96	
Thursday 17 June 2010	50	0	6	3	53	
Thursday 24 June 2010	0	0	4	11	-7	
Thursday 1 July 2010	0	0	4	C	4	
Thursday 8 July 2010	0	0	2	C	2	
Thursday 15 July 2010	0	0	5	2	3	
Thursday 22 July 2010	140	0	9	C	149	
Thursday 29 July 2010	0	0	0	8	-8	
Thursday 5 August 2010	0	0	0	19	-19	
Thursday 12 August 2010	0	0	2	8	-6	
Thursday 19 August 2010	120	0	0	g	111	
Thursday 26 August 2010	0	0	5	4	1	
Total financed by a deposit from the DN	MO <sup>(d)(e)</sup> 120	-		340	460	
Total financed by central bank reserves	(d)(e) 0	198,275		1,231	199,506	
Total asset purchases <sup>(d)(e)</sup>	120	198,275		1,571	199,966	

(a) Week-ended amounts are for purchases in terms of the proceeds paid to counterparties, and for sales in terms of the value at which the Bank initially purchased the securities. All amounts are on a trade-day basis, rounded to the nearest million. Data are aggregated for purchases from the Friday to the following Thursday.

Weekly values may not sum to totals due to rounding. Measured as amount outstanding as at 20 May 2010. 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.





trade-day basi

issuance remained below the levels at which the APF offered to purchase CP. Accordingly, the APF made few purchases during the review period. The stock of APF purchases fell from £251 million on 20 May to close to zero during much of the review period. Following purchases during August, the outstanding stock stood at £120 million as of 26 August 2010. Over the same period, the stock of CP issued by UK corporate and non-bank firms stabilised at around £2.5 billion (Chart B).

Chart B Sterling commercial paper outstanding for UK corporates and non-bank financial firms



Sources: CP Ware and Bank calculations.

#### Secured commercial paper facility

The Bank continued to offer to purchase secured commercial paper (SCP) backed by underlying assets that are short term and provide credit to companies or consumers that support economic activity in the United Kingdom.<sup>(3)</sup> There has been no use of the facility to date.

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

<sup>(</sup>a) Data start on 26 March 2010.
(b) Weekly (Friday-Thursday) amounts in terms of the proceeds paid to counterparties, on a trade-day basis.
(c) Weekly (friday-Thursday) amounts in terms of value at time of initial purchase, on a

**Credit Guarantee Scheme** 

<sup>(1)</sup> The data cut-off for this box is 26 August 2010, unless otherwise stated. (2) Further details of individual operations are available at

www.bankofengland.co.uk/markets/apf/gilts/results.htm

<sup>(3)</sup> The SCP facility is described in more detail in the Market Notice available at www.bankofengland.co.uk/markets/marketnotice090730.pdf.

**Chart 14** Implied contribution of interest rate 'news' to cumulative changes in sterling bilateral exchange rates since the previous *Bulletin*<sup>(a)</sup>



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.

by interest rate differentials (Chart 14). This implies that other factors were also important. For example, contacts suggested that perceptions about the relative risk of investing in sterling-denominated assets improved, perhaps because of reduced uncertainty about the UK fiscal outlook. This could have underpinned the increase in the value of sterling.

Perhaps consistent with a decline in perceived risks, options-based measures of forward-looking uncertainty in sterling exchange rates fell and the implied probability distribution around future values of sterling became less negatively skewed (Chart 15). This might indicate that market participants were less willing to pay to protect themselves from a large future depreciation of sterling. However, similar measures of uncertainty for other currencies also fell, suggesting this development was not unique to sterling.

#### Corporate capital markets

Spreads on investment-grade bonds issued by non-financial companies were little changed for much of the period (Chart 16). Taken together with the fall in government bond yields, the cost of corporate bond financing declined slightly. An indicative measure of the cost of equity finance was broadly unchanged (Chart 17).

Market contacts reported that turnover and liquidity in the sterling corporate bond market had been reduced at times. But they also noted that the corporate bond scheme of the Bank's Asset Purchase Facility (APF) continued to provide a helpful backstop for both purchases and sales of sterling corporate bonds. In particular, the APF received increased offers in its purchase auctions at the beginning of June. The box on pages 164–65 provides more information about the activities of the APF over the review period.

**Chart 15** Three-month option-implied volatility and skewness of simplified sterling ERI returns<sup>(a)(b)(c)</sup>



Sources: ICAP and Bank calculations.

- (a) Returns are defined as the logarithmic difference between the current forward rate and the spot rate at the maturity date of the contract.
- (b) The simplified sterling ERI places 70% weight on the euro-sterling bilateral exchange rate and 30% weight on the US dollar-sterling bilateral exchange rate.
- (c) For more detail on using options prices to derive a probability distribution for the sterling ERI, see the box in the Bank of England Quarterly Bulletin, Summer 2006, pages 130–31.

Chart 16 International investment-grade, non-financial, corporate bond spreads<sup>(a)</sup>



Sources: Bank of America/Merrill Lynch and Bank calculations. (a) Option-adjusted spreads.

Despite the difficult market conditions early in the review period, gross bond issuance by private non-financial corporations (PNFCs) in the calendar year up to July was broadly in line with average issuance over 2005–08. Gross issuance of equity capital picked up towards the end of the review period, although cumulative issuance in the first seven months of 2010 was below the comparable average over 2005–08 (**Table A**).

Overall, while equity issuance net of share buybacks was positive, repayments of maturing debt tended to exceed new bond issuance (Chart 18). Combined with a continued net reduction in loan financing, this indicates that in aggregate UK PNFCs continued to deleverage their balance sheets.

#### Chart 17 Indicative cost of sterling corporate bond and equity finance



Sources: Bank of America/Merrill Lynch, Thomson Reuters Datastream and Bank calculations.

(a) The cost of equity is measured as a risk-free rate plus an equity risk premium. The risk-free The cost of equip is inclusive on the test response of the product of the prediminant in the fact response of the product of t (2010), 'Interpreting equity price movements since the start of the financial crisis', Bank of England Quarterly Bulletin, Vol. 50, No. 1, pages 24–33.
(b) The cost of bond finance is measured as the average yield-to-maturity on the Bank of the financial crisis'.

America/Merrill Lynch Sterling Corporate Industrials and Utilities indices

#### Table A Cumulative bond and equity issuance by UK PNFCs

#### f billions

	Bonds <sup>(a)</sup>		Ed	quity
	Full year	January to July <sup>(b)</sup>	Full year	January to July <sup>(b)</sup>
2005	12.8	4.9	20.2	10.5
2006	24.1	15.1	34.2	19.3
2007	24.2	11.5	27.3	18.1
2008	35.4	21.2	57.4	35.2
2009	44.7	34.2	78.5	55.6
2010		15.0		15.6
2005–08 average	24.1	13.2	34.8	20.8

Sources: Dealogic, London Stock Exchange and Bank calculations

(a) Converted from US dollar to sterling using monthly averages of the US dollar per sterling exchange rate. (b) Cumulative issuance from the beginning of January to the end of July in each calendar year

#### Chart 18 Net capital market issuance by UK PNFCs(a)



(a) Non seasonally adjusted.(b) Includes stand alone and programme bonds

#### Market intelligence on developments in market structure

In discharging its responsibilities to maintain monetary and financial stability, the Bank gathers information from contacts across a wide spectrum of financial markets. This market 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 context for policy formulation, including the design and evaluation of the Bank's own market operations. And the Bank conducts occasional market surveys to gather additional quantitative information on certain markets.

The boxes on pages 168-69 and page 170 summarise recent market intelligence on two selected topics: innovations in money market instruments and ratings-based termination triggers in derivatives contracts.

#### Innovations in money market instruments

Ongoing funding pressures in short-term money markets have led to the use of innovative funding instruments by banks that help them diversify across providers of funds and increase the maturity of their wholesale funding. These instruments include so-called putable certificates of deposit (CDs) and extendible repos.<sup>(1)</sup> Such instruments typically differ in the maturity of the funding they provide, the degree of optionality embedded in them, and methods of pricing. This box describes these instruments in more detail.

#### **Putable CDs**

CDs are unsecured short-term debt issued by banks. As such, they provide banks with unsecured funding, generally for a period of between one month and 18 months. Putable CDs are very similar to ordinary CDs but contain a put option that gives the investor the right (but not the obligation) to sell the CD back to the issuing bank at a pre-defined date prior to its original maturity date. By exercising this option, investors can thus obtain early return of the funds they provided.

A typical structure involves a twelve-month CD with a put option that can be exercised daily but with a 95-day notice (or 'lock-in') period. **Chart A** plots the effective outstanding maturity — the minimum remaining period for which the funds will be available to the bank — of such a putable CD against the elapsed time since issuance. The red area shows how the effective outstanding maturity changes over time for the case when the put option has been exercised after 40 days. In that case, the putable CD matures after a total of 135 days. The blue area shows the effective outstanding maturity for the same CD should the option not be exercised. In that case, the effective outstanding maturity will start to decline after 265 days and the CD will mature after 360 days.

#### Extendible repos

Repo transactions provide funding to banks via a secured investment — the bank sells a security in exchange for cash and agrees to buy it back at a particular date. Extendible repos are similar, except that the date of repayment can be continually extended.

A typical transaction might involve an initial 30-day repo transaction that specifies a pre-defined date (usually fifteen days before maturity) when the transaction can be extended to its original 30-day maturity or, alternatively, be left to run-off. Any extension requires the consent of both parties to the transaction.

**Chart B** shows the maturity profile of such a 30-day extendible repo. The red area shows the effective maturity outstanding in the event that the repo is extended after fifteen





Chart B Maturity profile of a 30-day extendible repo



and 30 days but not after 45 days. At that time, rather than reverting to the original effective outstanding maturity of 30 days, the transaction matures fifteen days later after a total of 60 days. In theory, the repo can be extended indefinitely as illustrated by the blue area.

#### **Market characteristics**

These instruments are an alternative source of term funding for banks to traditional money market instruments. Although UK banks have shown notable interest in these instruments, the value of most transactions appears so far to have been modest relative to banks' overall funding bases.

Some of the attraction of these instruments is likely to reflect recent regulatory developments. In particular, the notice periods have partly been structured to help banks meet new regulatory liquidity requirements that aim to lengthen banks' funding profiles. In the United Kingdom, one part of the Financial Services Authority's liquidity rules is structured around a stress test that makes wholesale funding of less than three months' maturity less attractive to banks. So, for example, putable CDs with a 95-day notice period start off with an effective maturity of more than three months and, hence, do not fall within the regulatory stress test.

From the perspective of investors (ie lenders to banks), these instruments offer higher returns than shorter-maturity instruments while allowing them to redeem their investments early. The short-dated nature of these putable CDs makes them especially attractive to money market funds (MMFs), particularly in the United States, whereas the secured nature of an extendible repo makes it an attractive investment for securities lenders and banks. Table 1 summarises the main market characteristics including the typical investors involved and the geographical coverage.

Large

Global

nders, banks

Table T Market Characteristics			
	Putable CD	Extendible repo	
Currency	Mainly US\$	Mainly US\$	
Investors	MMFs and asset managers	Securities lenders, b and asset managers	

Small but growing

United States and Europe

Table 1 Market characteristics

Size

Region

As with banks, the new instruments may help investors meet new regulatory rules. For example, in the United States, following changes to the Securities and Exchange Commission (SEC) rules, the maximum weighted average maturity of US MMFs' investments was reduced from 90 days to 60 days. Putable CDs with a 95-day notice period potentially offer returns comparable to those from longer-dated ordinary CDs, so they appeal to MMFs regulated by the SEC.

<sup>(1)</sup> Extendible repos were popular among US regional banks before the onset of the financial crisis and have recently been used by UK banks, though backed by more traditional collateral.

#### Additional Termination Event clauses

Additional Termination Event (ATE) clauses are embedded in many derivatives and a wide range of other financial products that include derivatives (eg asset-backed securities). This box focuses in particular on those ATE clauses that apply to derivative transactions between UK pension funds and those banks that are the main derivative dealers.

#### Defined benefit pension funds' use of derivatives

A defined benefit (DB) pension scheme typically guarantees members an income on retirement irrespective of the performance of the fund's assets. This means that a DB scheme bears the risk that the return on the investments may not be sufficient to meet its liabilities.

Given the structure of their liabilities (in particular the requirement to index them to inflation), UK DB pension fund schemes face risks arising from unexpected changes in nominal interest rates, life expectancy, inflation and scheme members' wage growth. To mitigate such risks some DB pension schemes engage in so-called Liability Driven Investment (LDI) strategies. LDI strategies aim to invest in a portfolio that closely matches the risks of the fund's DB liabilities. In particular, pension funds can choose to hedge their exposure to interest rate and inflation risk by entering into derivative transactions such as long-dated interest rate swaps and long-dated inflation-linked swaps.

#### What are ATEs?

Whenever two counterparties enter into a derivative trade (such as a swap) many of the terms and conditions of the trade are pre-defined in a legal agreement: the ISDA master agreement (often called 'the ISDA').<sup>(1)</sup>

Many ISDAs define a standard range of events that trigger an option to allow one counterparty to terminate the trade early. For example, a derivatives trade could be terminated if a counterparty loses regulatory approval or defaults on an obligation. In addition, many ISDAs can include so-called ATE clauses which stipulate additional criteria that may permit early termination of the trade.

ATE clauses that apply to derivative trades between dealers and pension funds typically allow the pension fund to terminate the trade with the original dealer in the event that the dealer is downgraded below a certain credit rating threshold. The most common credit rating threshold is A-.

Such ATE clauses may also allow the pension fund to replace the derivative trade with an alternative dealer and charge the costs of replacing the trade to the original dealer. The details of the replacement costs vary according to the specifics of the ISDA. But if the market in which the derivative trade is being re-established has become more volatile, the costs of replacing the trade will typically be greater than the cost incurred during periods of normal volatility.

#### Why are they important?

Unexpected credit downgrades of financial institutions have in the past been associated with significant volatility in asset prices. Over recent years, the credit ratings of the major dealers have been moved closer to the A- threshold. As a result, the presence of ATE clauses could potentially amplify asset price moves should dealers' ratings be lowered below A-. Contacts indicated that this could be especially disruptive if there were simultaneous downgrades of a number of dealers. This is because the volume of derivatives trades that pension funds might potentially seek to replace would be large relative to the typical daily turnover in those markets.

Moreover, against a backdrop of heightened market volatility, the replacement costs due under an ATE are most likely to rise. The increased replacement costs charged to the original dealers could therefore add to liquidity and capital pressures on those dealers.

In light of this, contacts report that some dealers have sought to renegotiate the credit rating trigger levels to a lower threshold. Alternatively, in some instances, ATE clauses have been modified to allow dealers to place additional collateral with a pension fund instead of paying the replacement cost of the derivative. This reduces the credit exposure of the pension fund to the dealer. However, such collateral triggers may have drawbacks as they require dealers to fund additional collateral at times when their access to funding may be under greater stress.

(1) ISDA stands for International Swaps and Derivatives Association.

# Research and analysis

PROMISE

## Understanding the price of new lending to households

By Richard Button of the Bank's Financial Institutions Division and Silvia Pezzini and Neil Rossiter of the Bank's Monetary Assessment and Strategy Division.<sup>(1)</sup>

During the recent financial crisis Bank Rate was reduced sharply, but in general the interest rates charged on new lending to households did not fall by as much and indeed some interest rates rose. This article assesses the factors that have influenced new lending rates using a simple decomposition of new lending rates into lenders' funding costs, credit risk charges and a residual (which includes both operating costs and the mark-up). Applying the decomposition to two indicative lending products suggests that funding costs have been an important driver of new lending rates and the residual has also risen. The residual needs to be interpreted with caution — by definition it reflects all the remaining unmodelled factors. But among other things, a larger residual is consistent with lenders increasing mark-ups over marginal costs for new lending, which may reflect a need to build higher capital levels within the banking sector.

#### Introduction

Banks and building societies provide important services to households and businesses, intermediating saving and borrowing, providing payment services and distributing risk. The interest rates at which lenders extend credit are important for both monetary policy and financial stability. They will affect spending and investment decisions and so influence nominal demand in the economy. And they will affect the profitability of lenders and so — if profits are retained influence the flow of new capital available to the banking sector.

In the United Kingdom, the Monetary Policy Committee (MPC) is able to influence new lending rates through changes to Bank Rate.<sup>(2)</sup> But while Bank Rate was reduced significantly during the recent financial crisis, new lending rates to households fell by a much smaller amount — and in some cases rose (Chart 1).

This article explores the factors that may have influenced the path of new lending rates to households. The analysis in this article cannot be repeated for lending to businesses as a similar set of new lending rates is not available.

A simple framework is adopted to decompose new lending rates into lenders' funding costs, credit risk charges and a residual, which includes both operating costs and the mark-up. This analytical framework is consistent with the pricing approach taken by the major UK lenders.<sup>(3)</sup> In practice,



(a) Sterling-only end-month average quoted rates. The Bank's quoted interest rate series comprise data from up to 24 UK monetary financial institutions.

(b) £10,000 personal loan average quoted rate.
 (c) 75% loan to value (LTV) tracker mortgage average quoted rate

however, there will be some variation between pricing models, reflecting lenders' distinct strategies and balance sheets. So this article can only provide an indication of the factors that may have influenced the price of new lending.<sup>(4)</sup>

- (3) See, for example, British Bankers' Association (2010), which outlines the broad principles of the pricing approach for lending to small businesses.
- (4) This article has been partly informed by discussions with the major UK lenders about their approach to setting the price of new lending to households.

<sup>(1)</sup> The authors would like to thank James Benford, Claire Halsall and Jens Søndergaard for their earlier work on this topic and Jonathan Bridges, Rob Edwards and Özlem Oomen for their help in producing this article.

<sup>(2)</sup> Changes in new lending rates will influence inflation principally through domestic demand. But changes in Bank Rate also influence inflation via movements in asset prices, the exchange rate and expectations/confidence affecting domestic demand, external demand and import prices.

The article is structured in five sections. The first section introduces the framework that is used to decompose the price of new lending. The second section applies this framework to the average price of new lending charged by the banking sector for both new secured and unsecured lending to households. The third section then examines how the results differ using individual lenders' new lending rates. The fourth section considers the relationship between the residual item from the decomposition of average new lending rates and lenders' net interest margins. The final section sets out the implications from the results for both monetary policy and financial stability.

#### Framework

A simple framework can be used to decompose new lending rates offered by the major UK lenders<sup>(1)</sup> into three underlying factors. First, there is the funding cost faced by lenders. Second, there are credit risk charges, for both the cost associated with the expected loss on the loan and the capital charge (to account for the cost of holding capital against unexpected losses). Third, there is a residual item which captures a variety of other factors, principally the operating cost and mark-up. The remainder of this section reviews each of these components in turn.

#### Funding cost

Lenders need to raise funds to extend loans to households. These funds can come from a variety of sources and at a range of interest rates. The sources can be categorised broadly into customer deposits (from households and businesses) and wholesale funding (from other lenders and institutional investors).<sup>(2)</sup>

In setting the price for new lending, lenders must factor in the cost of raising an additional unit of funding — the marginal funding cost. Lenders report that the marginal funding source is typically long-term wholesale debt since this is the market in which it is possible to raise a large amount of funding over a short period.<sup>(3)</sup> Lenders would be less able to raise a specified amount of retail deposits over a short period as households do not typically respond quickly to changes in interest rates. Furthermore, long-term wholesale funding will more closely match the expected number of years that a loan will be extended, which is typically around five years on average (although this will differ by product).<sup>(4)</sup> Going forward, new liquidity regulation for the banking sector will place importance on long-term funding for all forms of lending.<sup>(5)</sup>

In this article the marginal funding cost — the cost of long-term variable-rate wholesale funding — is estimated as the sum of three-month Libor plus the average of the five-year credit default swap (CDS) premia of the major UK lenders weighted by their shares in new lending. The marginal funding cost is explored in more detail in the box on pages 174–75. Before the financial crisis, lenders were able to raise new long-term wholesale funding at rates quite close to Bank Rate (**Chart 2**). Risk premia were small. Implicitly, market participants considered there to be a relatively low risk that lenders might fail.





Sources: Bank of England, Bloomberg, British Bankers' Association, Markit Group Limited and Bank calculations.

(a) This is the estimated marginal funding cost for extending variable-rate sterling-denominated loans. It is the sum of three-month Libor plus an average of the five-year CDS premia of the major UK lenders (Banco Santander, Barclays, HSBC, Lloyds Banking Group, Nationwide, Northern Rock and Royal Bank of Scotland). For further information on the marginal funding cost, see the box on pages 174–75.

From the autumn of 2007 onwards, market participants became increasingly concerned about the robustness of the banking sector and demanded higher compensation for the risk that lenders might fail, so credit risk premia increased. Consequently, the cost of issuing new long-term debt rose both in absolute terms (in the early stages of the financial crisis) and relative to Bank Rate.

More recently, despite improvements in the capital and liquidity positions of lenders, the cost of issuing new long-term debt has remained high relative to Bank Rate. Market participants appear to continue to demand significantly greater compensation than previously for the credit risk associated with long-term exposures to lenders.<sup>(6)</sup>

#### **Credit risk**

Lenders' decisions about whether to extend credit to households and at what price will also depend on their

- (3) Lenders with a greater proportion of retail deposits may consider the cost of wholesale and retail funding when setting the marginal funding cost.
- (4) For example, while mortgages often have a final maturity of around 25 years, in practice borrowers typically repay the loan early. This may be to achieve a lower borrowing rate, to increase the size of the loan or because the borrower is moving home.
- (5) For example, see Basel Committee on Banking Supervision (2009).
- (6) For a detailed discussion of recent developments in UK banks' funding costs, see the June 2010 Financial Stability Report, pages 46–53 (Bank of England (2010a)).

<sup>(1)</sup> For the purposes of this article, the major UK lenders comprise Banco Santander (including Abbey prior to acquisition), Barclays, HSBC, Lloyds Banking Group (including Lloyds TSB and HBOS prior to the merger), Nationwide, Northern Rock and Royal Bank of Scotland.

<sup>(2)</sup> Short-term wholesale funding comprises interbank deposits, certificates of deposit and commercial paper. Long-term wholesale funding comprises senior unsecured bonds and senior secured bonds, such as residential mortgage-backed securities and covered bonds.

#### The marginal funding cost: transfer pricing

The decision by lenders to extend loans or raise deposits is made by their individual business units, such as the retail business unit that is responsible for extending credit to and raising deposits from households. In principle, business units could use the deposits that they raise to fund the loans they extend, but the amount of loans typically exceeds the amount of deposits leaving a funding requirement (a customer funding gap) that must be filled with wholesale funding. In practice, each lender's treasury will raise and determine the cost of marginal funding, intermediating both the cost and the demand and supply of funding across business units. The 'transfer price' is set by each lender's treasury. It typically represents both the rate at which funds are provided to business units to make loans and the rate at which the deposits raised by business units are remunerated. This box explores transfer pricing in greater depth.<sup>(1)</sup>

Taking the transfer price as a starting point, a business unit will then decide the rate at which to extend loans or raise deposits (Figure A). Typically, new lending rates are priced at a spread above the transfer price, while new deposit rates are priced at a spread below the transfer price. Consequently, the transfer price does not affect the average profitability of the business unit, ie the interest received on loans minus the interest paid on deposits (X minus Y in Figure A). When expressed as a proportion of loans outstanding, this is the net interest margin of a business unit. While the transfer price does not affect the average profitability of the business unit it will affect both new lending and deposit rates.

Each lender's treasury typically sets the transfer price based on long-term wholesale funding costs. This is the market in which a lender can be most confident that it can raise a significant amount of funding at short notice. In contrast, a lender may not be able to raise a large amount of retail deposits at short

notice. For example, a large group of individuals may be slower to decide to increase their deposits than a small group of institutional investors may be to provide a large amount of wholesale funding. It is possible that a lender with a greater proportion of funding from retail deposits may choose to consider the costs of both wholesale and retail funding when setting the transfer price. It is also possible that not all lenders may have explicitly set the marginal cost of funding as the cost of long-term wholesale debt prior to the financial crisis; instead the customer funding gap may have been filled using short-term wholesale funding (eg interbank loans). But this is unlikely to affect the pricing framework as there was little difference between long-term and short-term wholesale funding costs prior to the financial crisis (the cost of both types of funding was close to three-month Libor).

The funding cost typically used by each lender's treasury to set the transfer price is the cost of raising variable-rate long-term wholesale debt. This is the cost of raising fixed-rate senior unsecured bonds and entering into an interest rate swap where the lender receives a series of fixed-rate cash flows and pays a series of floating-rate cash flows. The transfer price has two components. First, there is the stream of variable-rate cash flows paid in the interest rate swap (three-month Libor). And second, there is the spread of the fixed-rate bond yield over the swap rate — this is the asset swap spread (Figure B).

Lenders do not issue new long-term debt on a regular basis, so the spread is set by each lender's treasury using a variety of reference points, including the prevailing asset swap spread of lenders' debt trading in secondary markets or lenders' CDS premia. This article uses lenders' five-year CDS premia which provide transparent daily data at constant maturity (ie the maturity of the CDS is always five years). It would be possible to use the prevailing asset swap spread of lenders' debt trading in secondary markets, but this is not available on a consistent basis at a constant maturity (the maturity of bonds falls each



Figure A Transfer pricing within a typical lender<sup>(a)</sup>

(a) A blue arrow indicates the rate at which the business unit is remunerated for lending funds to the treasury and to borrowers A red arrow indicates the rate at which the business unit pays to borrow funds from the treasury or savers

day). Even if it were possible to compare five-year CDS premia and five-year asset swap spreads, their levels may still differ due to the liquidity of secondary bond markets, an issue at times during the financial crisis.

**Figure B** sets out the cost of variable-rate funding for variable rate loans. But business units may extend credit on a fixed-rate basis. In addition to centrally managing the funding flows and setting the transfer price, the treasury also centrally manages interest rate risk. This ensures the loans extended by the business unit are all priced on a floating-rate basis. In

practice, the treasury will swap the fixed-rate cash flows received from the borrower into floating-rate cash flows (analogous to the swap used to transform fixed-rate debt into floating-rate debt). The cost of this swap is reflected in the transfer price for fixed-rate lending — so the marginal funding cost for new fixed-rate lending is typically higher than the marginal cost for new floating-rate lending.

(1) For information on transfer pricing in a pan-European context, see Section 6 and Annexes 2 and 3 of European Central Bank (2009).





assessment of the risk that the borrower may not repay the loan in full.

This credit risk comprises two components. First, lenders must account for the cost of the expected loss associated with the loan. Second, lenders must account for the cost of holding capital to meet the possibility that losses might exceed this central estimate — this is the unexpected loss associated with the loan. This capital charge can be calculated on both a regulatory capital basis (as set out by the Financial Services Authority (FSA) in line with Basel guidelines) or on an economic capital basis (as set by the lenders themselves).

The two components of credit risk are calculated by each lender using proprietary data. These data are confidential so this article constructs estimates based on the method set out in the box on pages 176–77 and on the assumption that lenders price new loans on the basis of the regulatory capital charge.

Loans will attract different credit risk charges depending on the perceived risk. For secured lending the loan is backed by collateral, for example mortgages are secured on residential property: the value of this collateral reduces the loss faced by the lender if the borrower defaults. In contrast, for unsecured lending (for example personal loans) the loan is not backed by collateral and so the lender expects to suffer a more significant loss if the borrower defaults. It follows that the expected loss and capital charge for secured lending are both lower than those for unsecured lending.

The expected loss component is estimated to have increased over the past two years (**Chart 3**). This reflects an increase in the number of borrowers missing interest payments for more



(a) For detail on the methodology used to estimate the expected loss see the box on

pages 176–77. (b) Expected loss for personal loans (all products).

(c) Expected loss for 75% LTV mortgages (all products)

#### Credit risk

Lenders must account for the most likely loss associated with the loan — this is the expected loss. And lenders must account for the cost of the capital they hold to meet the possibility that losses might exceed this central estimate — this is the capital charge. Lenders do not release data on the two components of credit risk. For the purposes of this article estimates for these components are constructed based on the method set out in this box.

#### **Expected loss**

The expected loss can be thought of as the combination of the likelihood that a borrower will default, the loss rate suffered by the lender if default occurs and the balance of the loan at the time of default. As a result it varies over time. Formally, the expected loss (*EL*) is the product of the probability of default (*PD*), the loss given default (*LGD*) and the exposure at default (*EAD*) expressed as a percentage of the full loan amount:

$$EL_t = PD_t \times LGD_t \times EAD_t \tag{1}$$

Lenders generate both the probability of default and the loss given default for secured and unsecured lending to households using internal models conditioned on proprietary historical data of default experience. However, it is possible to estimate both the probability of default and the loss given default using a combination of publicly available data and assumptions. The exposure at default is assumed to be the full loan amount as borrowers may default at any point from the start of the loan. For the purpose of this article it is set to 100%.

#### Estimating the probability of default

The probability of default measures how likely it is that borrowers will default. A leading indicator of default is borrowers falling behind on interest payments on the loan (known as arrears), particularly for those who miss more than six consecutive interest payments. Data on arrears rates (arrears as a proportion of loans) are published for both secured and unsecured lending to households.

For secured lending to households, the Council of Mortgage Lenders publishes arrears rates, including the greater than six months' arrears rate. This can be used to estimate the probability of default on, for example, a 75% loan to value (LTV) mortgage. Historical data on defaults show that the probability of default will vary with the degree of collateralisation of the loan. For example, mortgages with a lower LTV ratio (ie higher collateralisation) generally enter default less frequently and so have a lower probability of default.<sup>(1)</sup> Data from the Financial Services Authority (FSA) on default rates suggest the probability of default for 75% LTV mortgages can be calibrated as 0.7 multiplied by the aggregate mortgage six-month arrears rate (M-ARREARS<sub>>6m</sub>). So the probability of default for secured lending is given by:

$$PD_{secured,t} = 0.7 \times M-ARREARS_{>6m,t}$$
 (2a)

For unsecured lending to households, there is no published arrears rate for personal loans. However, the UK Cards Association publishes arrears rates for credit cards, including the greater than six months arrears rate (*CC-ARREARS*<sub>>6m</sub>). Personal loan arrears rates can be estimated from credit card arrears rates using a simple calibration parameter ( $\varepsilon$ ):  $\varepsilon$  reflects the relationship between the probability of default for credit cards and the probability of default for personal loans. This can be calibrated using a measure of the realised probability of default — the write-off rate (the level of write-offs as a proportion of the stock of lending).  $\varepsilon$  is the ratio of the personal loan write-off rate to the credit card write-off rate. So the probability of default for unsecured lending is given by:

$$PD_{unsecured,t} = \varepsilon_t \times CC - ARREARS_{>6m,t}$$
 (2b)

#### Estimating the loss given default

For secured lending, lenders will only realise a loss if the collateral backing the loan is lower than the value of the loan at the time of default. The major UK lenders' Basel II Pillar 3 disclosures on loss given default suggest that realised recovery rates (across all mortgage types and all LTVs) are around 85% (based mainly on UK exposures, but including some non-UK exposures). This article adopts a conservative assumption of a 65% recovery rate for 75% LTV mortgages. This lower recovery rate enables the pricing model to allow for possible falls in house prices in the order of 20% by the time of the default. Recognising that for 75% LTV mortgages the value of the collateral is greater than the loan, the loss given default for mortgages can be calculated using the assumed recovery rate:

$$LGD_{secured,t} = \max\{0; 1 - (1/LTV_t) \times 0.65\}$$
 (3)

For unsecured lending, similar Basel II Pillar 3 disclosures on the loss given default for personal loans (part of 'other retail exposures') suggest that realised recovery rates are around 30%–40% (again including some non-UK exposures). To be conservative, this article assumes the recovery rate on personal loans is just 10%.

#### Comparing expected losses to realised losses

Over time, lenders experience defaults on their existing loans and write off these bad debts. The write-off rate — the amount of write-offs expressed as a percentage of the loan portfolio — is a measure of realised losses on existing lending. Comparing the estimates of expected losses on new lending used in this article to the realised losses on existing lending provides a test of whether the expected losses were (with hindsight) large enough. Generally, the estimates used in this article for expected losses for both secured and unsecured lending are larger than the realised losses (write-off rates) experienced by lenders on their secured and unsecured (excluding credit card) loan portfolios (Charts A and B).

Chart A Secured lending to households: expected loss on new 75% LTV mortgages and realised loss on existing mortgages



(a) Expected loss for 75% LTV mortgages (all products). (b) UK-resident lenders' write-off rate on all sterling secured lending to households (across all LTVs).

Chart B Unsecured lending to households: expected loss on new personal loans and realised loss on existing unsecured lending(a)



(a) Excluding existing credit card loans

Expected loss for personal loans (all products). UK-resident lenders' write-off rate on all sterling non credit card unsecured lending to households.

It is possible for the expected loss at a certain point in time to be lower than the realised loss on existing lending if, for example, the outlook for the creditworthiness of borrowers is expected to improve relative to the recent period. This is most likely the case in the most recent data for unsecured lending where the realised loss on existing lending is high (in part due to the effects on households of the recent recession), but the

expected loss on new lending is slightly lower as the outlook for households' financial condition is improving steadily in line with the gradual recovery in the macroeconomy currently under way.

#### Capital charge

The capital charge can be thought of as the cost of accounting for the unexpected loss associated with extending a new loan. This article assumes the capital charge is set on a regulatory capital (rather than economic capital) basis. This can be calculated using the Basel I/II formula where the capital charge is the product of the 8% minimum capital requirement (MCR), the risk weight (*RW*) and the cost of capital ( $R_{C}$ , assumed to be 10% for all lenders):<sup>(2)</sup>

$$CC = MCR \times RW \times R_C \tag{4}$$

The standardised approach in Basel II sets the risk weights for lending at 35% for mortgages with LTV lower than 80% (otherwise 50% for higher LTVs) and at 100% for all types of unsecured loan.<sup>(3)</sup> Lenders with advanced credit risk modelling techniques may be authorised by the FSA to set risk weights based on their default experience (the internal ratings-based approach). Without these risk weights, this article assumes that lenders use the risk weights set out under the standardised approach (in the case of 75% LTV mortgages, 50% until the end of 2006 and 35% from 2007 onwards) to estimate the capital charge that covers for unexpected losses.<sup>(4)</sup>

As a result, the estimated capital charges for 75% LTV mortgages are 40 basis points until the end of 2006 and 28 basis points from 2007 onward, and 80 basis points for personal loans. From 2007, lenders using the internal ratings-based approach under Basel II have some flexibility in setting lower risk weights depending on their experience, so these are conservative estimates.

(3) See Basel Committee on Banking Supervision (2006). Prior to 2007, under Basel I, risk weights were 50% for all mortgages, 100% for unsecured. Not all major UK lenders may have transitioned to Basel II capital requirements from January 2007.

<sup>(1)</sup> While LTV is not a measure of affordability, a lower LTV at origination means a larger deposit was used upon purchase, alongside the mortgage. This should increase the willingness of a borrower to continue to meet interest payments to avoid losing the deposit and may indicate increased ability of a borrower to meet interest payments (higher deposit may be a sign of higher income). See Table 4.5 on page 40 of Financial Services Authority (2009).

<sup>(2)</sup> Academic studies place the cost of capital for banks at slightly below 10%. See page 60 of the June 2010 Financial Stability Report. Assuming a higher cost of capital would not have a material impact on the residual, for example 15% would only increase the capital charge for 75% LTV mortgages to 60 basis points until the end of 2006 and 42 basis points from 2007 onward. The charge for personal loans would increase to 120 basis points.

<sup>(4)</sup> The experience of the financial crisis may suggest that some Basel II risk weights were not appropriate for the level of risk borne by the lender. This and other issues are currently under debate between central banks and regulators, and the lenders themselves.

than six months, which has been in part influenced by the recession and associated rise in unemployment.

While the expected loss changes over time, the regulatory capital charge is assumed to have been unchanged in recent years, following the introduction of Basel II. For secured loans (75% LTV mortgages) the capital charge is 28 basis points, while for higher risk unsecured lending (personal loans) the capital charge is 80 basis points. Further detail on the calculation of the regulatory capital charge component can be found in the box on pages 176–77.

#### Other factors

In addition to funding costs and credit risk charges, a variety of other factors will also influence lenders' pricing models. These are captured in the residual in this decomposition.

Two principal factors that will be captured within the residual are the operating costs incurred by a lender through the life of a loan and the mark-up. Taking them in turn, lenders incur operating costs on all the activities that support the origination and servicing of a loan, such as maintaining a branch network and paying staff wages.<sup>(1)</sup> It is likely that operating costs have been little changed recently, though lenders may have actively sought to reduce operating costs in order to restore profitability following the financial crisis. The other main factor included in the residual is the mark-up that lenders charge over their marginal costs, which ensures that each loan extended generates an expected rate of return.

In addition, new lending rates may also be affected by other factors. For example, fees attached to products (such as application fees) and revenue streams from activities related to lending (such as insurance premiums) would increase the overall return on new lending. This may decrease the price of new lending. A fall in competition within the banking sector would tend to increase the price of new lending, holding other factors constant. Prospective tightening of capital and liquidity regulation may raise expectations of future costs associated with loans currently being extended and so increase the price of new lending.<sup>(2)</sup>

#### Decomposing the price of new lending

Having set out the analytical framework, this section outlines the quantitative decomposition of new lending rates for both secured and unsecured lending to households. As discussed earlier, given the variation in pricing models between lenders, there is, inevitably, considerable uncertainty attached to the size of each component. The relative sizes of the components and their trends over time are more informative than the absolute size of any component at any point in time. By construction, the magnitude of the residual is highly sensitive to the assumptions on the costs associated with funding and credit risk and so should be considered an indicative estimate. The analysis of new lending rates is based on the average quoted new lending rates.<sup>(3)</sup> In practice, lenders offer a menu of new rates for secured and unsecured lending. The Bank collates these quoted new lending rates by product and publishes average quoted rates.<sup>(4)</sup> The next subsections will decompose the price of two common loan products.

#### Secured lending

Lenders offer a range of secured lending products. They include variable-rate mortgages (for example tracker and discounted variable-rate mortgages) and fixed-rate mortgages (products with initial fix periods, for example two-year and five-year, which later revert to the standard variable rate, the SVR). These are offered across a range of LTV ratios.

Decomposing a typical rate for secured lending — such as a 75% LTV tracker mortgage<sup>(5)</sup> — shows that the two main factors associated with changes in pricing are the funding cost and the residual. The expected loss and capital charge are relatively small in absolute terms, though the proportionate increase in the expected loss component since the financial crisis has been large (**Chart 4**).



(a) 75% LTV tracker mortgage average quoted rate. See Chart 1, footnote (a) for information on average quoted rates.

The evolution of new secured lending rates can be divided into three broad periods. Before the onset of the financial crisis, new mortgages were priced broadly in line with estimated

- (3) In practice, households may borrow at rates higher or lower than quoted rates, which are only a guide to pricing.
- (4) For more information, see 'Explanatory notes quoted household interest rates' (Bank of England (2010b)).
- (5) The rate on a Bank Rate tracker mortgage is set at a fixed spread to Bank Rate for the life of the mortgage (typically 25 years). The rate on the mortgage changes only if Bank Rate is changed by the MPC.

These costs will vary with lenders' business models. For example, processing loan applications through a branch network is typically more costly than through a call centre or over the internet.

<sup>(2)</sup> On 12 September 2010, the governing body of the Basel Committee announced higher global minimum capital standards. See Basel Committee on Banking Supervision (2010).

marginal funding costs and the residual was very small. During the financial crisis, funding costs rose sharply and the residual became negative. It is possible lenders were surprised by the persistence of higher funding costs and so may have been slow to update the pricing of new mortgages. Since early 2009 the residual has increased markedly.

The rise in the residual may have reflected an increase in the mark-up charged on new lending. Operating costs are unlikely to have changed significantly during the financial crisis. And the product fees associated with mortgages are unlikely to have changed materially.

Another potential explanation for the rise in the residual could be that lenders incorporated higher credit risk charges into the price of new secured lending than the already conservative estimates included in this article. For the expected loss, lenders may expect a greater deterioration in households' creditworthiness to increase the probability of default. For the most recent period, trebling the expected loss (for example by using an arrears rate at a level similar to the peak observed in the early 1990s recession) would explain a quarter of the current residual. For the capital charge, lenders may have expected a greater cost of capital over the life of the loan following the financial crisis. For the most recent period doubling the capital charge would explain a third of the current residual.

Alternatively, the lenders may update the price of new lending more slowly than the pace at which lenders' funding costs change (for example because of 'menu costs' in updating quoted new lending rates too frequently). If this were true, the price of new lending could be expected to fall significantly in the near term. The implications of the recent increase in the residual will be considered in the final section of this article.

#### Unsecured lending

Lenders offer a range of unsecured lending products, including personal loans (typically  $\pm$ 5,000 or  $\pm$ 10,000, available over a range of maturities), credit cards and overdrafts.

Decomposing a typical rate for unsecured lending — such as a £10,000 fixed-rate personal loan — shows that, as with secured lending, changes in both the funding cost and the residual item are important determinants of pricing (Chart 5). But, unlike secured lending, the expected loss is large given the lack of collateral. The capital charge is again relatively small, though larger than for secured lending.

The evolution of unsecured lending rates can also be divided into a number of distinct periods. Between 2004 and 2006, unsecured loan rates were on average somewhat below marginal costs. But the sale of single premium payment protection insurance (PPI) alongside personal loans ensured that the overall mark-up on the loan was likely to have been

#### Chart 5 Decomposition of new unsecured lending rate<sup>(a)</sup>



Sources: Bank of England, Bloomberg, British Bankers' Association, Markit Group Limited, UK Cards Association and Bank calculations.

(a) £10,000 personal loan average quoted rate. See Chart 1, footnote (a) for information on average quoted rates.
(b) The loan is fixed rate, so the funding cost incorporates the cost of entering into an interest

 The loan is tixed rate, so the funding cost incorporates the cost of entering into an interes rate swap. For further information on the marginal funding cost, see the box on pages 174–75.

positive at the time.<sup>(1)</sup> From 2006, the level of personal insolvencies increased, but lenders tightened criteria for new unsecured lending to reduce likely losses on new lending rather than raise the price. From 2008 investigations by the FSA into the pricing and cross-selling of PPI, started in 2005, gathered pace, and lenders were formally prevented from cross-selling PPI with personal loans in early 2009. In light of the loss of income from PPI, lenders started to rebuild the mark-up on unsecured lending.

The funding cost used in the decomposition follows the same pattern as that for secured lending. It currently accounts for a smaller proportion of the overall cost of new unsecured lending than it did before the crisis.

The expected loss component is higher than that for secured lending, principally reflecting the potential for greater losses should the borrower default. This article assumes that the recovery rate on this type of lending is small at 10% of the loan amount.

As with secured lending, it is possible that the residual reflects an increase in the mark-up on new lending (partly in response to the loss of PPI-related income) or could again reflect higher credit risk charges, over and above the conservative estimates included in this article.

<sup>(1)</sup> PPI is an insurance product offered to households by lenders and other intermediaries. The policy typically aims to meet monthly loan repayments for up to twelve months if the borrower is out of work. Households can choose to pay regular monthly premiums (regular payment PPI) or pay a one-off premium (single payment PPI), which is often added to the balance of the personal loan (and so accrues interest at the same rate as the loan). A report on PPI by the Office of Fair Trading found that the premium for single payment PPI was equivalent to doubling the interest rate on the personal loan and that around half of the premium was retained by lenders (Office of Fair Trading (2006)). This substantially offset the low margins on personal loans.

#### Differences in lenders' rates and costs

The results have so far been couched in terms of aggregate data. While this article assumes that the major UK lenders face the same marginal costs for expected loss and the capital charge, lenders offer distinct new lending rates and face different costs when extending loans, leading to a range of decompositions and associated residuals across the banking sector. Individual institution data are confidential and cannot be published. But this section aims to give a feel for the range of pricing decompositions across the major UK lenders using the price of new secured lending as an example. The distributions discussed in this section do not account for the uncertainty over the absolute size of any component.

The range of lenders' new secured lending rates has widened somewhat following the reduction in Bank Rate (Chart 6). This may reflect differences in funding costs faced by lenders. But it may also reflect differences in lenders' pricing models. The median new lending rate in Chart 6 is not the same as the average new lending rate in Chart 4 (which is a weighted average of the individual lenders' rates based on the market share of new lending).

Chart 6 Distribution of new secured lending rates<sup>(a)(b)</sup>



Sources: Bank of England and Bank calculations

(a) 75% LTV tracker mortgage average quoted rate. See Chart 1, footnote (a) for information on average quoted rates. (b) Not all the major UK lenders quote rates in all periods, so the sample varies over time.

The differences in the long-term wholesale funding cost between lenders became particularly marked during the financial crisis (Chart 7). Funding costs were broadly similar across lenders up to mid-2007. During the second half of 2007, funding costs began to diverge sharply as market participants reappraised the credit risk faced by each lender. And the distribution across the banking sector remains wider than before the financial crisis.

Having been negative during the early stages of the financial crisis, the residual component of new lending rates rose in

#### Chart 7 Distribution of marginal funding costs<sup>(a)(b)</sup>



Sources: Bloomberg, British Bankers' Association, Markit Group Limited and Bank calculations

(a) Long-term variable-rate wholesale funding cost proxied by three-month Libor plus five-year CDS premia (for each individual lender). See Chart 2, footnote (a) for informa marginal funding cost.

(b) The sample is aligned with Chart 6.

2009, as in the analysis using average new lending rates (Chart 8). A reasonably wide dispersion remains, reflecting differences in pricing models between lenders and continued differentiation between borrowers in funding markets. This dispersion will also reflect other factors such as the use of product fees and cross-selling by different lenders, the competitive environment and the operational capacity of lenders' back offices to process loan applications. The relative importance of these factors is likely to have varied across institutions and over time.





Bank of England, Bloomberg, British Bankers' Association, Council of Mortgage Lenders, Markit Group Limited and Bank calculations

(a) 75% LTV tracker mortgage average quoted rate. See Chart 1, footnote (a) for information on

average quoted rates. (b) The sample is aligned with Chart 6.

(c) For details on the decomposition of the average new lending rate see Chart 4.

#### The residual and net interest margin

The residual item appears to have been an important part of the price at which lenders extended some types of credit to households and is substantially higher now than before the financial crisis. The increase in the residual may reflect a rise in the mark-up over marginal costs as operating costs are expected to have been little changed and may even have fallen recently. This section explores the possible reasons for that increase.

The rise in the residual — to the extent it reflects an increase in the mark-up over marginal costs — is consistent with a desire by lenders to improve the net interest margin on the existing loan portfolio. The net interest margin is the difference between the interest that a lender receives on all loans and the interest it pays on all funding instruments as a proportion of loans outstanding. Since the start of the financial crisis, lenders' net interest margins have come under pressure and their response may have been to raise the mark-up on new lending.

One source of pressure on net interest margins has been the rise in the cost of funding the existing loan portfolio, both from customer deposits and wholesale funds. The cost of different funding instruments has risen relative to Bank Rate following the onset of the financial crisis (Chart 9). While variations in the cost of customer deposits do not affect the price of new lending (as the marginal cost is set as the price of long-term wholesale funding), they will affect the net interest margin on lending. For a discussion on the interaction between the price of new lending and the net interest margin, see the box on pages 174-75.



Chart 9 Cost of different funding instruments

(a) The long-term wholesale funding cost is proxied by the sum of three-month Libor plus an average of the five-year CDS premia for the major lenders.
(b) The sight deposit and one-year retail bond rates are weighted averages of rates from banks

and building societies.

(c) The one-year retail bond rate is the cost of a floating-rate one-year retail deposit, ie the cost of a one-year fixed-rate bond net of a one-year interest rate swap

Before the financial crisis lenders typically offered rates on new household deposits below Bank Rate. As Bank Rate was reduced sharply during the financial crisis, lenders commensurately reduced deposit rates. But as deposit rates cannot fall below zero, the spread between the deposit rates and Bank Rate also fell sharply. This is known as the 'endowment effect' and has been one source of pressure on lenders' net interest margins. In addition, as lenders seek to reduce their reliance on wholesale funding, competition for long-term retail deposits has increased, putting upward pressure on absolute rates and spreads to Bank Rate.

Net interest margins have also been squeezed by contractual obligations that lenders face on their existing stock of loans. For example, lenders may be obliged to pass on changes in Bank Rate to some variable-rate mortgage products (such as trackers and those linked to lenders' standard variable rate, the SVR). Before the financial crisis, the rate on new lending was lower than the rate on existing loans, reflecting competitive pressures in the market which reduced new lending rates. But during the financial crisis that situation has reversed as the 'back-book effect' has led to a sharp fall in the average interest rate charged on existing secured loans, such that the rate is now lower than that on new lending (Chart 10).





(b) The actual (effective not quoted) rate on variable-rate secured lending prevailing on all loans on lenders' balance sheets.

(c) The actual (effective not quoted) rate on variable-rate secured lending prevailing on new

lending each month

The combination of the endowment effect (raising the cost of deposits) and the back-book effect (lowering the return on existing assets) has contributed to a sharp fall in net interest margins on the overall stock of loans to households since the onset of the financial crisis. Lenders are seeking to rebuild net interest margins — some have stated long-term targets — in part through a higher mark-up on new lending. This is consistent with lenders rebuilding capital through retained earnings, an important part of the ongoing adjustment process for the UK banking sector and a factor that should ultimately lead to lower funding costs.

Sources: Bank of England, Bloomberg, British Bankers' Association, Markit Group Limited and Bank calculations.

## Implications for monetary policy and financial stability

The decoupling of new lending rates from Bank Rate since the onset of the financial crisis appears to have been predominantly driven by two factors. First, long-term wholesale funding costs (relative to Bank Rate) increased sharply. And, second, the residual component also picked up.

Higher long-term wholesale funding costs reflect a reappraisal among market participants about the perceived riskiness of lenders. Prior to the financial crisis, risk premia on all types of assets were low — including on lenders' long-term debt. But the events of the financial crisis led investors to require greater compensation for exposure to the credit risk of lenders, and funding costs in wholesale markets increased sharply. That contributed to a rise in new lending rates relative to Bank Rate.

The increase in the residual is likely to reflect a number of factors, including the mark-up on new lending. An increase in the mark-up is consistent with a desire by lenders to improve the net interest margin given the low return on the stock of existing loans (the back-book effect) and the higher cost of

retail deposits (the endowment effect). It may also have been influenced by a reduction in the degree of competition within the banking sector following consolidation.

Movements in the residual can have different implications for monetary policy and financial stability. Holding other factors constant, an increase in the residual would push up on the cost to households of new borrowing, acting to dampen demand. But if an increase in the residual reflected higher mark-ups on new lending, it could increase lenders' profitability and — if those profits were retained — enable lenders to increase capital.

Higher levels of capital in the banking sector are desirable to enhance financial stability, so long as the process of building capital levels does not unduly constrain the supply of credit to households and businesses. Building up higher levels of capital in the banking sector reduces the likelihood that lenders will default and reduces the losses to creditors if lenders do default. This should lower market participants' perceived riskiness of the lenders and correspondingly lenders' marginal funding costs, thus enabling them to reduce the price of new lending to households while preserving mark-ups.

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## Interpreting the world trade collapse

By Silvia Domit and Tamarah Shakir of the Bank's International Economic Analysis Division.<sup>(1)</sup>

World trade's dramatic collapse from the end of 2008 was emblematic of a globally synchronised recession that threatened to become a depression and of a financial crisis painfully transmitted to the real economy. The extent of the fall in world trade relative to that in world GDP and the subsequent strength of the trade recovery so far suggests particular factors have been affecting global trade flows. This article considers the possible reasons for the pronounced fall and recovery in world trade relative to world GDP, focusing on UK export demand. At its core, the extraordinary decline in trade stemmed from the combination of a shock to global demand skewed towards highly tradable sectors and the ever-more globalised production process for these goods. The encouraging improvement in world trade from the second half of 2009 can also be attributed to some of these factors, as well as suggesting that permanent damage to the global marketplace may be less extensive than first feared.

#### Introduction

World trade<sup>(2)</sup> fell three times between World War II and 2008 (1958, 1975 and 1982), but the speed and severity of 2009's collapse was much more dramatic (Chart 1).<sup>(3)</sup> World trade started to fall at the end of 2008 and by the first quarter of 2009 the pace of decline was fast enough to allow worrying comparisons with the collapse in trade during the Great Depression.<sup>(4)</sup> Fortunately, the second half of 2009 saw enough of a recovery in world trade to allay the worst fears. But even by April 2010 trade remained 5% below its April 2008 peak and 17% below what it would have been had it continued to grow at its pre-crisis average rate.<sup>(5)</sup>

The trade collapse is more remarkable when compared with the, nonetheless, significant declines seen in both world GDP and world industrial production. By the second quarter of 2009, world GDP had fallen by around 3% on a year earlier and world industrial production had fallen by around 10%, while world trade had fallen by over 18% (Chart 2). Although world trade has tended to be more cyclical than world output in the past, the past relationship would suggest a fall in trade of around two times more than GDP rather than the six times larger fall seen in 2009. And it is this extent of the trade decline that has been the focus of debate.

Of the causes used to explain the trade collapse, most fall into one of two broad groups. First are those explanations focusing on how global trade patterns and global production processes have changed over time, arguably making world trade today

Chart 1 World trade volumes(a)(b)



Sources: Eichengreen and O'Rourke (2009) for 1930–38, World Trade Organisation for 1951–79, IMF for 1980–2009 and Bank calculations.

(a) Market exchange rate weighted export volumes. IMF series covers goods and services, other

(b) Hance collarge intervenging opport outputs in a cline college output of the cline output

inherently more volatile than world GDP, relative to the past. Second are the arguments focusing on how the specific nature of the global recession, following the financial crisis of 2008, may have had an especially large impact on world trade.

(2) Defined in this article as world imports, unless stated otherwise.

(4) Eichengreen and O'Rourke (2009).

<sup>(1)</sup> The authors would like to thank Marco Stringa and Merxe Tudela for their help in producing this article.

A rare few studies, such as Benassy-Quere et al (2009), have argued that estimated real trade declines may be overstated because of the use of inappropriate price deflators. But others, such as Francois and Woerz (2009), show that even with detailed analysis of real and nominal numbers, real trade falls were very large.

<sup>(5)</sup> Based on monthly world goods imports data produced by CPB Netherlands August 2010 vintage. Pre-crisis period defined as the ten years before April 2008.

#### Chart 2 World economic activity<sup>(a)</sup>



Sources: CPB Netherlands, IMF, Thomson Reuters Datastream and Bank calculations.

(a) The world industrial production and goods trade series are constructed by the CPB Netherlands, aggregating national data using world production shares and market exchange rates respectively. The world GDP series was constructed by the authors, aggregating national-level data using IMF-calculated purchasing power parity (PPP) shares, based in 2006, and covers at least 70% of world activity.

This article discusses the possible explanations for the severity of the fall in world trade put forward by the recent literature and Bank staff analysis. It then uses a quantitative approach to assess the importance of some of those explanations in understanding the pattern of world trade recently, concentrating on demand in the United Kingdom's major export markets.

## What might be possible explanations for the large fall in world trade relative to GDP?

#### (i) The changing structure of world trade

World trade has grown faster than world GDP in both real and nominal terms, at least since the end of the Second World War and even more rapidly since the 1980s (**Chart 3**). A basic





Source: IMF (April 2010 World Economic Outlook).

(a) Trade series are aggregated by the IMF using market exchange rates at constant and current prices. GDP series is aggregated by the IMF using PPP shares. measure of the elasticity of trade relative to GDP, following from the work of Irwin (2002),<sup>(1)</sup> shows that since the late 1980s changes in OECD GDP have been associated with larger changes in OECD trade, than in earlier decades (**Table A**).

#### Table A Elasticity of OECD trade with respect to OECD GDP(a)

Period	Estimated elasticity	
1961–2008	1.83	
1989–2008	2.50	

Sources: OECD and Bank calculations

(a) Based on an OLS regression of OECD imports relative to OECD GDP.

A previous *Bulletin* article<sup>(2)</sup> identified two main reasons behind the faster growth in world trade relative to GDP between 1980 and 2000. First, prices of tradable goods had tended to fall by more than the prices of non-tradable goods, primarily as a result of faster productivity growth in the tradable goods sector. And second, declining trade tariff rates reduced the cost of international trade and increased the returns to production specialisation. Together, these factors were thought to account for over 60% of the secular increase in world trade relative to world GDP between 1980 and 2000.

Part of the faster productivity growth in the tradable goods sector could itself be a result of increased production specialisation. And of particular importance for trade flows may have been not only specialisation by sector or product type in the old-fashioned sense, but also through specialisation in stages of production or 'vertical specialisation'. For example, businesses in country A specialise in producing parts of cars and businesses in country B specialise in assembling those parts. Cross-country differences in resources, wages and productivity mean that businesses can benefit from sourcing inputs from abroad and from fragmenting their production process.

A lack of definitive data on vertical specialisation does limit comprehensive study of this topic. There are though a number of partial empirical studies that do suggest increasing vertical specialisation in recent decades. A study by Brooks and Hua (2008) finds that the share of components in world machinery and transport imports rose by 3 percentage points (to 44%) between 1990 and 2006. In South Asia, the increase was much more pronounced, from 47% to 63%. Amador and Cabral (2009) construct an index of world vertical supply integration for 79 countries. This measure identifies vertical trade for each country by examining exports and related intermediate imports for individual goods categories, relative

Irwin (2002) examined the long-run relationship between world trade and world income since the 19th century and found that since the mid-1980s trade has become more responsive to income than in previous periods.

<sup>(2)</sup> Dean and Sebastia-Barriel (2004).

to thresholds based upon world averages. This metric shows an even faster increase in vertical specialisation: from less than 20% in 1995 to over 30% in 2005.

The proliferation of global supply chains, created by vertical specialisation, leads to more trade flows for a given increase in final demand for goods and services, in absolute terms. For example, once, a product in its lifetime might have begun as raw materials from one or two countries, exported to another for manufacture, and then exported once more for sale. Now, as global supply chains have grown, a final product might start as raw materials exported to various countries for manufacture into component parts, before being exported again for assembly elsewhere, and then finally being shipped to the purchaser — requiring more trade transactions for the same final purchase. And so, as final demand for goods has grown, as measured by GDP, the gross trade flows associated with that final demand have risen by more in absolute terms. In turn, when demand falls the accompanying fall in trade flows is larger too.

Having a larger number of intermediate trade flows for every unit of final demand explains why the absolute fall in trade flows is larger than that in demand, but it does not explain why the fall is *proportionately* larger (such that the percentage declines in trade would be larger than the percentage declines in GDP). World trade did not just fall more than GDP in absolute terms; it fell more in proportionate terms too.

To explain proportionately larger falls in trade, there would need to be some aspect of the concentration of global supply chains that makes these trade flows especially sensitive to the fall in demand. O'Rourke (2009)<sup>(1)</sup> used a stylised example to reveal that trade flows can fall proportionately more than GDP if some sectors have seen more growth in supply chains than others, and if the shock to demand is skewed towards those longer supply chains.

Another related argument for the role of vertical specialisation in intensifying the trade collapse is that vertical supply chains may have been important in transmitting the fall in demand between countries (Yi (2009)). All 104 nations for which the WTO reports data experienced a drop in trade during the second half of 2008 and the first half of 2009.<sup>(2)</sup>

This synchronised trade collapse also raised concerns about a permanent reduction in global trade integration. For example, Yi (2009) suggested that the transmission of production and demand shocks between countries might be more sensitive to downturns because of factors such as home bias in production, which could take a long time to reverse. Indeed, as trade collapsed, concerns mounted over a permanent reduction in global trade integration. However, the quick rebound in world trade (**Chart 2**) suggests that those links

have not been broken to the extent that was feared. Studies of supply chains in France, Germany and Italy also indicate that these chains may have been more resilient than anticipated. Bricongne *et al* (2009) observe that large French firms absorbed the demand shock mostly by reducing the volume of their exports rather than ceasing trade relationships. Altomonte and Ottaviano (2009) find similar results in their study of supply chains between Germany, Italy and Eastern Europe.

There is some evidence that the growth in vertical specialisation did play at least some role in the collapse and subsequent recovery in world trade. Intermediate components, which had been increasing as a share of imports in Japan and Europe in recent decades, saw their share fall substantially in 2009 (Chart 4). Cheung and Guichard (2009) find that vertical specialisation and supply chains, among other factors, can help explain the trade collapse by incorporating indices of vertical supply chain growth in a world trade equation.





Sources: Eurostat and Japan's Ministry of Finance.

(a) Intermediate components are industrial supplies for Japan and intermediate goods for EU27. Imports for EU27 exclude trade among the EU27 members. Data as at 14 August 2010.

It is not clear though that the development of vertical specialisation alone is enough to explain all of the unusually large fall in world trade. The development of vertical specialisation has been ongoing for a number of decades, and so should arguably be partly captured in pre-2009 trade models. And little analysis has been put forward to suggest that vertical specialisation spread even more rapidly in very recent years. But, as discussed in section (iii), when considered alongside other features of the trade collapse, such as the concentration of falls in manufactured goods, the extent of

O'Rourke uses a stylised example involving Barbie dolls produced via supply chains and Ken dolls produced in one step. With a demand shock skewed towards Barbie dolls rather than Ken dolls, then not only does trade fall more in absolute terms, it also falls more proportionately.
 Baldwin (2009).

business (values)

global supply chains may have been a force exacerbating the world trade collapse.

#### (ii) A collapse in trade credit supply

As world trade collapsed, the availability of the specialist trade finance that accompanied it also received a lot of attention. Much international trade requires some form of specific financing given the nature of cross-border exchange and the varying time delays between payment and receipt of goods and services. It is an idiosyncratic type of credit, where the financing can take alternative forms, from letters of guarantee provided by banks, to intra or inter-business financing, to loans from public sector export-import banks.

If international trade relies more on credit compared with domestic transactions, then trade may have been more vulnerable to the dislocation in financial markets during the crisis at the end of 2008. There were a number of pressures that may have caused both a fall in trade finance supply and an increase in demand for it given trade flows. In some cases, increased risk aversion reportedly led to a rise in demand for trade finance instruments intermediated by financial institutions in place of open account-based operations, where credit is extended by the seller to the buyer. At the same time, financial institutions tightened lending conditions, including for trade finance, as a consequence of the crisis.

Whereas there is some consensus that tight credit conditions played some role in the collapse of world trade (see section (iii)), there is less of a consensus that trade finance itself was a primary factor globally, even if anecdotal evidence suggests that it did play a relatively larger role in some regions. This lack of consensus is partly a result of limited data availability.

Some information has been provided by the trade finance survey developed by the IMF and the Bankers' Association for Finance and Trade (BAFT), which was first released in early 2009. It asked banks in various countries questions about the demand for and supply of trade finance instruments. The results suggested that the primary reason for the decline in trade credit was reduced demand for trade activities and not the supply of credit. And although reduced credit availability was cited by a majority of respondents in the first survey, this percentage fell in the subsequent release, which covered the period where trade fell the most (Chart 5). In line with the IMF-BAFT findings, a World Bank survey in developing countries<sup>(1)</sup> concluded that although constrained trade finance played a substantial role for small and medium-sized enterprises, weak demand was the major reason behind the decline in exports during the bulk of the world trade collapse, between September 2008 and March 2009. One caveat to these conclusions is that these surveys have only partial coverage, which could possibly introduce biases to the results.<sup>(2)</sup> But they are scarce sources of timely information about trade finance on a global level.



Chart 5 Key reasons behind the decline in trade finance

Source: IMF-BAFT Trade Finance surveys.

(a) For the period between October 2008 and January 2009. Not seasonally adjusted.
 (b) For the period between 2008 Q4 and 2009 Q2. Not seasonally adjusted.

It is possible that these surveys do not suggest that trade credit conditions had a large impact on world trade, in part, because of successful public policy intervention. At their London meeting in April 2009, the G20 agreed on a \$250 billion support framework to expand trade finance supply via export credit agencies and multilateral development banks. The average utilisation rate for this support facility was initially high, at around 70% and it fell to 40% in the second half of 2009, as supply of trade credit from private sources increased.<sup>(3)</sup>

#### (iii) A fall in demand skewed towards tradable goods

Another explanation for the collapse in world trade is that the restriction in credit availability and loss of economic confidence by households and businesses, triggered by the financial crisis, may have led to a fall in global demand that was unusually skewed towards tradable goods. Cheung and Guichard (2009) show that the tightening in overall credit conditions can, in part, help explain the collapse in trade because of a relatively larger impact on trade-intensive sectors.

One starting point for considering whether the fall in demand was skewed towards tradables is to consider how trade relates to different types of expenditure. Estimates of the correlation between imports and different expenditure components of final domestic demand using OECD data since 1961 suggest that investment (or gross fixed capital formation) moves most closely with imports (**Table B**).

<sup>(1)</sup> Malouche (2009)

<sup>(2)</sup> These surveys are partial in their coverage of world regions and relevant banks. Also, to the extent that the respondent banks only observe actual demand given the price being charged (rather than potential demand), it could be that the reported contribution of weak demand is overstated if part of this weakness is actually because of tighter credit conditions.

<sup>(3)</sup> For further details see www.g20.org/exp\_03.aspx
#### Table B Correlation between imports and final domestic demand expenditure components in the OECD<sup>(a)</sup>

Final domestic demand component	1961–2008	
Private consumption expenditure	0.49	
Government consumption expenditure	-0.04	
Gross fixed capital formation	0.71	

Sources: OECD and Bank calculations

(a) Correlation coefficient on the growth rate of imports with the growth rate of domestic demand components.

In 2009, world investment fell as a share of world GDP by over 2 percentage points, from 24% of GDP in 2008 to 21% of GDP, compared to a long-run average of 23% of world GDP (**Chart 6**). That represented a fall of 9% in investment compared with a fall in world GDP of 2% in 2009. And this fall in investment can be linked to the fall in the demand for, and trade of, manufactured goods and machinery, which form a large share of investment expenditure,<sup>(1)</sup> and contributed to over half of the fall in imports in the OECD (**Chart 7**). That pattern is also consistent with the large falls in industrial production, also dominated by manufactured goods, relative to GDP seen during the downturn (**Chart 2**).





In addition to the large decline in investment, a second characteristic of the downturn in world activity was the presence of widespread de-stocking by businesses. De-stocking is a normal feature of business cycles but it is possible that the globally synchronised nature of the downturn, and factors such as a desire by businesses to raise cash holdings in the face of disrupted credit markets, may have led to a particularly intense global inventory correction. And stocks tend to have a high import content.<sup>(2)</sup>

Falling demand for manufactured goods might have extra potency for trade flows because of the relatively high prevalence of cross-border supply chains in manufactured goods as opposed to services or commodities. Every unit fall in

#### Chart 7 OECD import values by goods type<sup>(a)</sup>



(a) This OECD aggregate does not include data for Canada, Chile, Greece, Mexico and Slovenia.
 (b) Commodities refers to 'mineral fuels, lubricants and related materials' and 'commodities and

transactions'. (c) Manufactures includes 'manufactured goods', 'machinery and transport equipment' and 'miscellaneous manufactured articles'.

final demand for manufactures leads to a greater decline in trade on two counts: (i) because manufactures form a high share of tradables and (ii) because of the gross flows associated with vertical specialisation in some manufacturing production.

The importance of the nature of the shock to global demand in explaining the collapse and subsequent rebound in world trade can be demonstrated with a simple quantitative exercise. There are a number of ways in which to consider world trade. For this exercise, we focus directly on imports in the United Kingdom's main trade partners, to account for the share of the world that is relevant for the United Kingdom.<sup>(3)</sup> We do that by constructing a measure for world imports which weights individual country imports by their importance in UK exports.

In this exercise, the explanatory factors considered to explain the path of world trade (weighted by UK export demand) were:

- World GDP, weighted by the share of each country in UK export markets.
- Investment in the United Kingdom's major trading partners, the United States, euro area and Japan (which account for 70% of UK export markets) to proxy for the composition of demand effect.

<sup>(1)</sup> For example, spending on business equipment formed over 50% of US private fixed investment and UK capital expenditure in 2008.

<sup>(2)</sup> Taking the United Kingdom as an example, stockbuilding is one of the most trade-intensive expenditure components of GDP.

<sup>(3)</sup> We do not, however, examine the subsequent implications for UK exports or net trade.

• Aggregate of the change in stocks (private inventories) in the United States and Germany.<sup>(1)</sup> This was also included to proxy for the composition of demand effect.

As a starting point, we construct a simple mapping equation from UK export demand to world GDP growth alone. This mapping captures the average relationship between trade and GDP from the start of 1980 to the third quarter of 2008. But this mapping can only explain half of the fall in trade seen between 2008 Q4 and 2009 Q2 (**Chart 8**).<sup>(2)</sup>

#### Chart 8 Explaining UK export demand<sup>(a)</sup>



(a) UK export demand is calculated by aggregating the volume of national imports weighted by country share in UK exports (based in 2006), and covers at least 80% of UK export markets.

Two combined changes improve the results substantially. First, the addition of investment and stocks measures to capture the composition of global demand. Second, shortening the sample period, to cover 1995 Q1 to 2008 Q3, to reflect the growth in vertical specialisation in recent years. From this enhanced mapping (Chart 8), the positive coefficients found on the stocks and investment terms suggest that the composition of demand can help to explain the fall in world trade and its subsequent rapid recovery.<sup>(3)</sup>

### Conclusion

The fall in world trade from the end of 2008 into 2009 was abnormally large even compared with the substantial fall in world activity over the same period. And those declines were reflected directly in UK export demand. This article has explored the possible explanations for this collapse, considering the interaction between the nature of the demand shock following the financial crisis and the underlying change in global trade patterns stemming from increasingly globalised production processes.

Our analysis suggests that the collapse of export demand from UK trade partners was driven largely by the effect of a fall in demand that was particularly acute for investment expenditure and inventories. That investment expenditure included considerable volumes of highly tradable capital and durable goods; goods that are also increasingly produced in international supply chains. The existence and proliferation of these supply chains has increased trade in intermediate goods for each unit of final demand. This means that when there was a fall in final demand for capital and durable goods, trade fell by more than GDP, both because those goods form a greater share of value added in trade than they do in GDP, and because the intermediate components used in their production are captured in trade flows but not in GDP. Trade finance conditions deteriorated sharply during the crisis, but survey evidence suggests they played a less important role when compared with the impact of the overall fall in demand.

The recovery in global trade from the second half of 2009 has been encouraging, and so far stronger than that in GDP. This signals that even though the trade flows within global supply chains may have fallen off rapidly during the crisis, the chains themselves were not permanently broken. That indicates that world trade integration may not have been severely damaged in the recent recession.

(1) Aggregated in US dollars at constant (2005) prices.

(2) Based on an out-of-sample forecast. Simple equation (t-statistics): D(Log(UK export demand)) = -0.01+2.0\*D(Log(World GDP))

(-0.1) (10.4). (3) Long-run equation (*t-statistics*):

Short-run equation (t-statistics):

D(LOG(UK export demand)) =

0.94\*D(LOG(World GDP))+0.21\*D(LOG(G3INVESTMENT)) -0.40\*(Long-run residual) (-1)+0.40\*D(LOG(World GDP(-1)))+0.11\*(World stocks) (2.9), (1.5), (-3.7), (1.5), (3.1).

LOG(UK export demand) = -5.0+1.6\*LOG(World GDP)+0.5\*LOG(G3 investment) (-81) (25) (7)

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# What can we learn from surveys of business expectations?

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The recent financial crisis was accompanied by an unprecedented deterioration in businesses' expectations for future economic activity. This article examines the strength of the signal that measures of these expectations have provided for output growth in the past. Recessions have typically been preceded by large declines in surveys of business expectations. But these measures have, on occasions, given false signals of recessions, falling sharply with little discernable response in economic activity. And small movements in these survey measures tend to contain little information. The article considers techniques that may help to distinguish whether large declines in measured expectations are meaningful or not. But it concludes that this must ultimately be left to judgement. Consequently, while measures of business expectations are useful economic indicators, they must be interpreted with care.

## Introduction

Businesses' expectations about the economy can play an important role in driving movements in economic output, especially during recessions. While these expectations cannot be measured or observed directly, qualitative surveys can provide a guide. These survey measures deteriorated markedly following the onset of the financial crisis in mid-2007. This article examines the strength of the signal that these survey measures of business expectations have typically provided for future output growth.

The article is structured as follows. It begins by explaining why these measures might provide useful information to economic policymakers. It then examines the quality of the signal provided by these measures before considering whether they can be used to forecast economic activity.

## Why do we look at measures of business expectations?

Measures of business expectations provide timely indicators of future economic activity that can inform monetary policy decisions. If, for example, businesses revise down their expectations for future activity, then they are also likely to revise down their production plans. And they may also scale back investment plans or hire less labour. This would lead to a fall in output growth unless there was an offsetting policy response or a subsequent change in the economic environment. Changes in monetary policy typically take time to feed through to the wider economy. So monetary policy makers set policy with a view to how changes in economic conditions are likely to affect future output and therefore inflation, and timely indicators of future economic activity can be very valuable.

Companies' expectations of future output are distinct from their degree of uncertainty about economic prospects. For example, following a change in economic conditions, businesses may revise up their expectations for future economic activity. But if they are sufficiently uncertain about prospects, then they may wait before changing production plans so as to avoid being left with unsold inventory. Hence, changes in the degree of uncertainty could affect the economic impact that results from changes in expectations. Survey measures of expectations are unlikely to reflect businesses' uncertainty about future activity.<sup>(2)</sup> So this article uses the term expectations to represent businesses' main beliefs about future activity and does not consider the impact of uncertainty, or distinguish between optimism and expectations.

## Measuring business expectations

Businesses' expectations cannot be measured or observed directly, so qualitative survey-based indicators must be used instead. In the United Kingdom, three large business survey providers all ask a question that captures businesses'

<sup>(1)</sup> The author would like to thank Geoff Coppins and Rob Elder for their help in producing this article.

<sup>(2)</sup> An exception to this may be the CBI surveys, which ask businesses about their optimism rather than their expectations for future output.

expectations. The British Chambers of Commerce (BCC) and The Chartered Institute of Purchasing and Supply (CIPS) surveys ask businesses whether their activity or turnover will be higher in twelve months' time.<sup>(1)</sup> And the Confederation of British Industry (CBI) surveys ask them how optimistic they are about the business situation. These surveys are discussed further in the box on page 192.

## What can we learn from surveys of business expectations?

This section explores whether survey measures of business expectations can provide a guide to future growth in market sector output. It also investigates whether understanding the factors that have driven movements in expectations can help to extract a better signal from the surveys.

#### Are surveys of business expectations a good indicator for output growth?

Before assessing whether the surveys are a good indicator of output growth, it is worth considering the horizon over which they might be informative. In principle, surveys might be expected to provide a guide over the next year, which is the time period identified in most of the questions (at least in the BCC and CIPS surveys). But businesses may be more uncertain about the economic situation further ahead and so place more weight on near-term expectations when answering the survey. Or they may answer the survey based on medium-term expectations only to find subsequently that those expectations are derailed. So the horizon over which the surveys provide information may be shorter than that implied by the questions.

Empirically, the surveys do indeed appear to be more closely related to official data over a shorter horizon. Chart 1 shows the different 'composite' measures of business expectations (as described in the box on page 192) against four-quarter growth in market sector output. Rather than the four-quarter lead that might be expected on the basis of the questions, expectations appear to lead output growth by a much shorter horizon. That finding is supported by correlation analysis, which shows that surveys have a stronger relationship with the change in market sector output over the next quarter, than over the next two to four quarters (Table A). The remainder of this article focuses therefore on the relationship between surveys of business expectations and output growth over the subsequent quarter.

Despite the relatively close relationship implied by the correlation analysis, the strength of the relationship between surveys of business expectations and one quarter ahead growth in market sector output appears to have fluctuated over time (Chart 2). Broadly speaking, expectations were a good indicator for both the recent recession and that in the early 1990s. But, by and large, they have been less useful for tracking small changes in output; the correlations in Table A

#### Chart 1 Surveys of business expectations and four-quarter growth in market sector output



Sources: BCC, CBI, CIPS/Markit, ONS and Bank calculations

(a) Business expectations surveys are shown as composites as described in the box on page 192. Each composite is rescaled to have the same mean and variance as market sector output, but is not seasonally adjusted. All series are plotted contemporaneously.

#### Table A Correlation between surveys of business expectations and growth in market sector output(a)(b)

Quarters	BCC	CBI	CIPS
1	0.68	0.72	0.79
2	0.66	0.70	0.76
3	0.59	0.65	0.68
4	0.51	0.58	0.60
Start date	1989 Q1	1998 Q4	1997 Q2

Sources: BCC, CBI, CIPS/Markit, ONS and Bank calculations

(a) The top row shows the correlation coefficient between the composite survey measure of expectations in period 0 and the growth in quarterly market sector output between period 0 and 1. The second row shows the correlation coefficient between expectations in period 0 and growth in quarterly market sector output between period 0 and 2 etc. (b) The sample ends in 2010 Q2 for all series

#### Chart 2 Surveys of business expectations and one-quarter growth in market sector output



Sources: BCC, CBI, CIPS/Markit, ONS and Bank calculations

(a) Business expectations surveys are shown as composites as described in the box on page 192. Each composite is rescaled to have the same me an and variance as market sector output, but is not seasonally adjusted. All series are plotted contemporaneously.

<sup>(1)</sup> The CIPS manufacturing survey does not include a question on expectations but the question about new orders can be used as a proxy. As manufacturing has a fairly low weight in output this should not affect markedly the interpretation of the economy-wide composite balance.

### Survey measures of business expectations

Three of the large UK business surveys ask a question that should capture businesses' expectations. The surveys have different advantages in terms of the wording of the question, coverage and history. This box examines these differences, which are summarised in **Table 1**.

There are two key differences between the questions asked in the CBI surveys and those asked in the BCC and CIPS surveys. First, the CBI surveys ask businesses about their change in optimism rather than their expectations for growth in activity or turnover. Second, the questions in the CBI surveys ask about conditions in the sector more broadly, rather than for the specific company.<sup>(1)</sup>

There are, however, reasons to believe that the surveys are still comparable despite these differences. According to the CBI Answering Practices Survey for the services sector, many respondents answered the question on the basis of their level of optimism rather than the change. And most based their response on the experience of their own business rather than the sector as a whole.<sup>(2)</sup>

The surveys also differ in their sectoral coverage. Each institution carries out multiple surveys, each aimed at a different sector of the economy. These individual surveys can

then be aggregated together to form a composite measure of expectations for the whole economy. But the coverage of each institution's surveys differs. For example, the CBI survey does not cover the construction sector, and the CIPS survey does not cover the distribution sector. The BCC survey covers both these sectors. But none of the surveys cover government sector output, so they should be used as an indicator for market sector output.<sup>(3)</sup>

The surveys, and the different components of individual surveys, have been running for different periods of time. This article considers all three composite measures of business expectations where possible. But it focuses mainly on the BCC composite as this is available back to 1989. It also draws on the CBI manufacturing balance as this has a longer history.

Despite differences in both the nature of the questions and the coverage of the surveys, it is however notable that the composite measures of expectations from the three surveys move broadly in line with each other (Charts 1 and 2).

(1) An exception is the CBI survey for the distribution sector. This asks businesses whether they expect the overall business situation to improve over the next three months, and does not specify whether businesses should consider their sector or their company.

(2) See Simpson (2007).

(3) For a further discussion of market sector output, see Churm et al (2006).

Table 1 Survey measures of business expectations					
Survey	Frequency	Year began	Coverage	Weight of covered sectors in GDP (2006)	Survey questions
CIPS					
Services	Monthly	1996	Private non-distribution services	0.41	In twelve months' time, do you expect the overall level of activity at your business unit to be higher, the same or lower than now?
Manufacturing	Monthly	1992	Manufacturing	0.13	Please compare the level of new orders received (UK and export) this month with the situation one month ago.
Construction	Monthly	1997	Construction	0.06	As for the CIPS services survey.
BCC					
Services	Quarterly	1989	Private services	0.52	Do you believe that over the next twelve months turnover will: improve/remain the same/worsen?
Manufacturing	Quarterly	1989	Production and construction	0.23	As above.
CBI					
Services	Quarterly	1998	Private non-financial non-distribution services	0.33	Are you more, or less, optimistic than you were three months ago about the general business situation in your sector?
Financial services	Quarterly	1989	Financial services	0.08	Are you more or less optimistic about the overall business situation in your sector?
Distribution	Quarterly	1983	Distribution	0.11	Do you expect the overall business situation over the next three months to: improve/ remain stable/deteriorate?
Industrial Trends	Quarterly	1972 <sup>(a)</sup>	Manufacturing	0.13	As for the CBI services survey.

Sources: BCC, CBI, CIPS/Markit and ONS.

(a) This balance is available back to 1972 on a quarterly basis, but back to 1958 on a four-monthly basis.

are much lower if the sample excludes recessions. And the surveys have sometimes given a false signal of a recession, most notably in 1998 and 2001.<sup>(1)</sup> Extending the sample period — by drawing on the longer-running CBI manufacturing survey — provides support for the idea that expectations balances are good indicators of large swings in output, but less successful at picking up smaller changes (**Chart 3**).

## Chart 3 CBI manufacturing business expectations and one-quarter growth in manufacturing output



Sources: CBI, ONS and Bank calculations

(a) The business expectations survey is rescaled to have the same mean and variance as the ONS manufacturing output data, but is not seasonally adjusted. Both series are plotted contemporaneously.

The fluctuating relationship between surveys of business expectations and market sector output is apparent in rolling correlations (**Chart 4**). During the period of relative macroeconomic stability between 1997 and 2007, composite measures of business expectations appeared to contain little information about future output growth. The relationship is somewhat stronger for the CBI manufacturing survey over that period, perhaps reflecting the relatively greater volatility of the manufacturing sector. More recently, the correlations have all picked up sharply during the financial crisis, as did the correlation for the CBI manufacturing survey during the early 1990s recession. This supports the idea that the signal from surveys of business expectations is stronger during periods of sharp movements in output growth.

There are a number of reasons why surveys of business expectations may have given false signals in the past, such as in 1998, or to a lesser extent 1992 and 2001. In 2001, businesses may have overestimated the economic impact of the terrorist attacks in the United States. Similarly, the false signals in 1992 and 1998 may have reflected businesses overestimating the potential economic impact of sterling's exit from the exchange rate mechanism and the LTCM crisis respectively. Businesses may have also underestimated the size of the policy response: Bank Rate was cut on each occasion, which, along with monetary policy loosening overseas, would have helped to support economic activity. But, given the lags in the monetary policy transmission Chart 4 Rolling five-year correlations of business expectations surveys and one quarter ahead growth in market sector output



Sources: BCC, CBI, CIPS/Markit, ONS and Bank calculations.

mechanism, that policy response is unlikely to explain fully why near-term output appears to have been affected less than the surveys implied by these events.

In summary, large swings in surveys of business expectations appear to contain useful information for policymakers. That is consistent with the work of Santero and Westerlund (1996), who conducted similar analysis across a sample of eleven OECD countries. In the United Kingdom, however, large swings in expectations have, on occasion, given a false signal. So a forecaster needs to take care whether to interpret a large fall in expectations as a signal for a recession, or simply as noise in the data.

## Explaining movements in surveys of business expectations

This section considers the factors that might influence movements in businesses' expectations. Identifying these factors can provide a closer understanding of what influences company behaviour. Furthermore, in a study of *consumer* confidence, Berry and Davey (2004) found that movements in confidence that could be explained by other factors contained more information for consumer spending than unexplained movements.

Businesses' expectations about future activity are likely to be affected by a number of factors. They may respond to changes in macroeconomic conditions, such as tighter monetary policy, or business-specific conditions, such as weaker orders. They may also be driven by businesses' response to non-economic factors, such as wars or terrorist attacks. It is impossible to identify precisely what a survey will be capturing. But the remainder of this section draws on statistical analysis to explore the degree to which expectations are responding to other 'economic' factors.

<sup>(1)</sup> The exception here is the BCC survey, which did not give a false signal in 2001.

Table B shows the correlations between the BCC measure of business expectations and a range of economic and financial variables. The BCC measure of business expectations is used as its composite is available back to 1989. The table shows the highest correlation with each variable, whether that is with the level or the change. It also reports both the contemporaneous and one quarter lagged relationships. A contemporaneous relationship may be more likely if the variable is relevant to a businesses' production process (such as input price inflation), or if it summarises high-frequency data that the business can observe (such as the sterling exchange rate). A lag may be more appropriate if the variable reflects something to which the business might respond once it has seen the data release (such as public sector net lending).

Many of the variables have a strong correlation with BCC business expectations. For example, the survey measures of both orders (domestic and overseas) and cash flow have a very strong relationship with expectations, as do the various estimates of GDP growth. For some variables, however — such as changes in both Bank Rate and input price inflation — the nature of the relationship is in the opposite direction to that which economic intuition might suggest. That may reflect a third, common, factor — perhaps demand growth — that is driving both expectations and these variables in the same direction. For example, stronger-than-expected demand is likely to cause companies to revise up their expectations but it may also drive up input price inflation and trigger a tightening in monetary policy.

These simple bivariate correlations do not show how these variables might combine to explain movements in business expectations. Instead, a simple regression model can be constructed to separate movements in business expectations into those that are explained by a combination of other variables, and those that are 'unexplained'. This model is set out in the annex to this article.

The regression model is able to explain the vast majority of the variation in expectations (Chart 5). Of the explanatory variables, the BCC survey measure of businesses' orders is the most important and can explain much of the variation. That could reflect, in part, the influence of a common factor - such as business sentiment - on both the orders and expectations survey balances. In addition, Consensus forecasts for GDP also play an important role. These forecasts may act as a summary indicator for much of the information contained in other macroeconomic and financial variables but not picked up in orders. The level of oil prices and businesses' reported cash-flow positions also help to explain movements in the BCC business expectations measure. The residual component — the unexplained part of business expectations — is small, suggesting that surveys of business expectations are driven predominantly by these other observable economic factors.

Table B Correlations between BCC business expectations and other variables(a)

	Unit	Lag (quarters)	
		0	1
Asset prices			
Bank Rate	Level	0.01	-0.09
	1Q change	0.60	0.35
Oil price	Level	-0.33	-0.43
	1Q percentage change	0.17	0.09
Sterling ERI	4Q percentage change	0.51	0.43
UK equity prices	1Q percentage change	0.33	0.40
UK house prices	1Q percentage change	0.52	0.56
Macroeconomic			
GDP forecast <sup>(b)</sup>	Percentage change over next 4Q	0.79	0.75
GDP (real-time estimate)(c)	1Q percentage change	n.a.	0.69
GDP (latest estimate) <sup>(d)</sup>	1Q percentage change	0.79	0.76
Insolvencies	1Q change	-0.46	-0.46
M4 lending to PNFCs	1Q percentage change (annualised	d) 0.29	0.17
UK-weighted world trade <sup>(e)</sup>	1Q percentage change	0.71	0.58
Unemployment rate	1Q change	-0.73	-0.56
Inflation			
Producer input prices	Annual inflation rate	-0.08	-0.26
	Change in annual inflation	0.31	0.18
Producer output prices	Annual inflation rate	-0.30	-0.45
	Change in annual inflation	0.32	0.11
RPIX	Annual inflation rate	-0.31	-0.40
	Change in annual inflation	0.25	-0.03
Unit labour costs	1Q percentage change	-0.30	-0.28
Fiscal			
Public sector net lending	Level	0.38	0.24
as a share of GDP	1Q change	0.52	0.41
Survey variables <sup>(f)</sup>			
Capacity utilisation	Net balance	0.38	0.22
Cash flow	Net balance	0.91	0.76
Employment	Net balance	0.71	0.50
Orders	Net balance	0.90	0.73

Sources: Bank of England, BCC, Bloomberg, Consensus Economics, IMF, ONS and Thomson Reuters Datastream.

(a) The BCC business expectations survey is the composite measure described in the box on page 192. It is not

(b) Forecasts for GDP growth over the next four quarters from Consensus Economics.

(c) The real-time estimate is the GDP growth rate published by the ONS just prior to when businesses would have completed the survey. As the GDP data are published with a lag, the contemporaneous estimate would have completed the survey. bluo not have been available.

(d) The latest estimate uses the most recently published vintage of data. It will differ from the real-time estimate because the ONS revises data as it receives new information and adopts new methodologies (see

estimate because the UNS revises data as it receives new information and adopts new methodologies (se Cunningham and Jeffery (2007)). (e) As described on page 187 of Domit and Shakir (2010). (f) Survey variables from the *BCC Quarterly Economic Survey*. The questions asked are: are you currently operating at full capacity?; during the past three months how has your cash flow changed?; over the past three months has your workforce increased?; excluding seasonal variation, have your domestic (and export) orders increased over the past three months? The first three balances are not seasonally adjusted.

These results are consistent with those of a study of business expectations in New Zealand (Silverstone and Mitchell (2005)). The authors looked at the determinants of movements in a survey of expectations about the 'general business situation' using a panel data set. They found businesses' expected output to be the most influential survey balance and future GDP outturns to be one of the most important macro indicators.<sup>(1)</sup> However, they found that the

## Chart 5 Contributions to movements in BCC business expectations $^{(a)}$



Sources: BCC, Bloomberg, Consensus Economics and Bank calculations. (a) For definitions of the variables see the footnotes to **Table B**.

determinants of business expectations vary over time and between companies.

The model for the United Kingdom suggests that two fifths of the sharp fall in expectations during 2008 can be explained by declining orders (**Chart 6**). The deterioration in companies' cash-flow positions can account for about a quarter, and the fall in GDP forecasts and lagged impact of rises in oil prices also played a role. But the full extent of the fall in business expectations cannot be explained. That is, expectations fell by even more than those factors would have suggested, according to this model.





Sources: BCC, Bloomberg, Consensus Economics and Bank calculation

(a) For definitions of the variables see the footnotes to Table B

The unexplained weakness in expectations became larger around the time of the failure of Lehman Brothers, an episode that created conditions of near panic in some financial markets. It seems likely that these extreme events caused businesses' expectations to worsen over and above what could be explained by observable economic developments. That is consistent with certain previous financial events — such as sterling's exit from the exchange rate mechanism and the LTCM crisis — and also the build-up to the Iraq war of 2003, during which the BCC measure of business expectations fell further than could be explained by economic factors alone. But for other events, such as the terrorist attacks in September 2001, the fall in business expectations was less than suggested by the economic factors in the model (Chart 7).<sup>(1)</sup>

## Chart 7 The unexplained component of BCC business expectations



Sources: BCC, Bloomberg, Consensus Economics and Bank calculations

The unexplained weakness in expectations that emerged at the time of the Lehman Brothers crisis dissipated shortly afterwards, as the financial situation stabilised, in part due to policy actions around the world. Following previous crises the fall in the residual component also dissipated quickly, either due to a rapid monetary policy response, or as businesses realised the impact of the crisis was likely to be less than originally feared.

More recently, measures of business expectations fell back in 2010 Q2 (**Chart 1**).<sup>(2)</sup> The model for BCC expectations suggests that it cannot be explained by identified economic factors. That fall may have reflected concerns about sovereign debt following recent developments in the euro-area periphery.

## Can meaningful declines in surveys of business expectations be distinguished from false signals?

As has been discussed, measures of business expectations have given false signals on several occasions. This subsection examines whether the model of business expectations or other indicators — such as consumer confidence — can help identify when a sharp decline in measures of business expectations might be giving a false signal.

The terrorist attacks in September 2001 did however have a larger impact on both the CBI and CIPS measures of business expectations, which fell more sharply than their BCC counterpart.

<sup>(2)</sup> The CBI and CIPS measures of business expectations fell back more sharply than the BCC measure, but from a higher level.

Movements in expectations that can be explained by other economic factors might be expected to provide a better indication of future activity. Indeed, as discussed earlier, Berry and Davey (2004) found that movements in *consumer* confidence that could be explained by other economic factors contained more information for consumer spending than the unexplained component.

However, a similar approach for business expectations is unable to distinguish between false signals and meaningful changes. Chart 8 compares the BCC expectations balance with the fitted values from the estimated equation. Since the equation can explain many of the fluctuations in expectations, the fitted values move very closely to the surveys themselves. This is the case even when BCC business expectations gave false signals in 1998 and 1992, reflecting the simultaneous fall in several of the explanatory factors. Indeed, survey output balances also gave a false signal for market sector output during these periods. So distinguishing whether a sharp fall can be explained or not does not help identify false signals. It is worth noting however that in the recent recession the raw business expectations balance gave a better signal, so the 'unexplained' component may have held some marginal information.

## Chart 8 BCC business expectations, explained BCC business expectations and one-quarter growth in market sector output



Sources: BCC, Bloomberg, Consensus Economics and Bank calculations

(a) The BCC business expectations survey is the composite measure described in the box on page 192. It is rescaled to have the same mean and variance as market sector output, but is not seasonally adjusted.

A change in business expectations may provide a better guide to future output if it is accompanied by corroborative evidence, such as a similar movement in consumer confidence. Certainly, consumer confidence also fell sharply during the recent recession when business expectations surveys gave a meaningful signal (**Chart 9**). And consumer confidence remained fairly robust when business expectations gave a false signal in 1998 and 2001. But the evidence is inconclusive. For example, consumer confidence fell alongside business expectations in 1992 but that proved to be a false signal. A further consideration might be whether the fall in business expectations followed a financial crisis. For example, the false signals in 1992, 1998 and 2001 all followed financial crises. But the timing of the 2001 fall suggests that the terrorist attacks may have had a more significant impact than the bursting of the dotcom bubble. And the fall in business expectations following the recent crisis provided a reasonable guide to future activity.





Sources: BCC, CBI, CIPS/Markit, research carried out by GfK NOP on behalf of the European Commission, ONS and Bank calculations.

(a) Business expectations surveys are shown as composites as described in the box on page 192. Business expectations and consumer confidence are rescaled to have the same mean and variance as market sector output. The business expectations surveys are not seasonally adjusted.

These findings suggest that while measures of business expectations can give a useful leading indicator of sharp movements in output, there is no clear systematic method for identifying meaningful signals from false signals. An element of judgement is still required.

## Conclusion

Surveys of business expectations contain useful information for policymakers, but they must be interpreted with care. Past recessions in the United Kingdom have been preceded by a sharp fall in expectations, so the surveys can be a useful leading indicator of a sharp fall in output. But the surveys have given false signals in the past, and small movements in the surveys tend to contain little useful information.

There does not appear to be a systematic method for identifying whether a sharp fall in expectations is giving a false signal. Distinguishing between falls that have or have not followed a financial crisis has not helped in the past. Neither has decomposing movements in business expectations into those driven by economic factors, and those that are unexplained. So a forecaster should monitor surveys of business expectations, but needs to use judgement when deciding how to interpret an abrupt deterioration.

### Annex Model to explain BCC business expectations

 $BE_t = 0.44*Orders_t + 0.31*Cash flow_t + (4.4)$ (3.5)

 $\begin{array}{l} 0.20^*GDPFC_t & - \ 0.14^*POil_{t-1} \\ (3.6) & (-3.5) \end{array}$ 

 $R^2 = 0.93$ Sample period: 1992 Q1–2010 Q2. Brackets show t-statistics. Series are normalised over the sample period.

Where:

BE is the BCC business expectations balance;

*Orders* is a weighted average of the BCC survey questions on domestic and export orders: excluding seasonal variation, domestic/export orders are up/same/down;

*Cash flow* is the BCC survey question on cash flow: during the last three months how has your cash flow changed: improved/same/worsened?;

*GDPFC* is the forecast for GDP growth over the next four quarters from Consensus Economics; and

*POil* is the quarterly average of the Brent oil price in sterling terms.

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## Residential property auction prices

By Matthew Corder of the Bank's Monetary Policy Unit and Kate Reinold of the Bank's Structural Economic Analysis Division.<sup>(1)</sup>

Large movements in house prices over the past three years have re-emphasised the challenge of analysing their movements. This article presents data on properties sold at auction that may offer insights into short-term dynamics in the housing market.

The housing market plays an important role in the macroeconomy. Movements in house prices influence the amount of equity that people can withdraw from their homes to finance spending (Benito *et al* (2006)). And changes in house prices and housing market turnover influence both investment in the housing stock (Corder and Roberts (2008)) and durables spending (Benito and Wood (2005)). Developments in the housing market also have important implications for financial stability through the financial sector's exposures (Bank of England (2010)).

This article draws on property auction market data to look at short-term movements in the housing market.<sup>(2)</sup> The first section examines the speed with which house prices and transactions might respond to changes in the housing market. The second section then outlines the possible advantages to using property auction market data, before the third section considers how the data have evolved.

## The response of house prices to changes in the housing market

Movements in house prices and transactions reflect changes in housing demand and supply. For example, a rise in transactions may be seen as reflecting an increase in demand thereby encouraging sellers to revise up prices. But the correlation between house prices and transactions is not straightforward. It depends on the speed with which both react to underlying changes in housing market demand and supply, and on the interactions between prices and transactions themselves. For example, changes in credit availability and house prices can lead to changes in the number of housing market transactions (Benito (2006)).

In practice, house prices and activity seem to respond to shocks in a similar manner — resulting in a close correlation (Chart 1). House prices do, however, appear to lag transactions slightly, which some studies have attributed to a delay before sellers amend the minimum price they are willing to accept for their house — their 'reserve price'. For example, Merlo and Ortalo-Magné (2004) found that, on average, those sellers that changed their asking prices waited eleven weeks before doing so.





Sources: Bank of England, Halifax and Nationwide

(a) The average of the Halifax and Nationwide house price indices. The published Halifax index has been adjusted in 2002 by the Bank of England to account for a change in the method of calculation.

(b) House prices are recorded at the loan approval stage.

Why might sellers be slow to adjust their reserve prices? Sellers may 'anchor' their reserve prices around some reference point, for example prices observed for recent transactions in an area (Kahneman and Tversky (1979)). This could make sellers slow to adjust to changes in housing market conditions. Sellers may also be loss averse: they are more reluctant to revise down their reserve price when house prices are falling (Genesove and Mayer (2001)).

<sup>(1)</sup> The authors would like to thank Jake Horwood for his help in producing this article. The authors would also like to thank Essential Information Group for their data and analysis, which are a valuable input to the Bank's work.

<sup>(2)</sup> The use of property auction market data to assess developments in the housing market is not new (see, for example, Fathom (2010)). But the data used in this article cover a greater share of the property auction market than has typically been used previously.

The remainder of this article examines whether the use of property auction market data may allow a more timely read on developments in the housing market.

### The auction market

Residential property auction data can provide an alternative insight into developments in the housing market. These data have two main advantages. First, they measure prices at an earlier stage in the house purchase process than some other indices, such as the Land Registry house price index (see Thwaites and Wood (2003)). Hence, they are likely to provide a more timely indication of current conditions in the housing market.

More importantly, given the type of sellers operating in the auction market, auction prices may adjust more quickly to sharp changes in housing market conditions than prices in the wider housing market. The 'true' market price for a property is always uncertain so buyers and sellers draw their estimate from a distribution of possibilities (Figure 1). Contacts report that reserve prices are typically lower in the auction market than in the broader housing market, thereby giving a higher probability of a quick sale.

#### Figure 1 Market clearing in the housing market



There are a number of reasons why reserve prices might be lower in the auction market. When setting a reserve price for a property, sellers face a trade-off between speed of sale and price: a low price may lead to a quick sale, while a higher price is likely to lead to a longer marketing period. Sellers at auctions are typically lenders with repossessed stock, local authorities, property companies, executors and trusts, all of whom are likely to want to sell quickly. They also have not lived in the property and so have not developed the attachments to the property of an owner-occupier that can lead to a reserve value above the market value.<sup>(1)</sup> Further, if a seller's reserve price is too high and out of line with market demand, auction market contacts suggest that auctioneers are quick to insist that it is revised. This lower reserve price may be particularly important in an environment of falling prices. If sellers are slow to revise down asking prices when prices are falling, then buyers may be less likely to offer a price higher than the reserve price. This helps explain the sharp fall in overall housing market transactions in 2008. Lower reserve prices in the auction market mean there is a greater probability of successful matches and so there should be a smaller fall in transactions. The auction market may therefore give an earlier indication of changes in house prices than the wider property market in a falling market.

There may, therefore, be reason to believe that auction prices might lead other house price measures. But whether this happens in practice is an empirical question, which will be considered further in the next section.

### Property auction market data

Property auction data are available since 1991 from Essential Information Group (EIG). From around 2000 these data cover all property sold in auction rooms — on average 1,300 house sales per month, equivalent to 1.3% of all housing market transactions (**Chart 2**).<sup>(2)</sup> This section examines first how the number of auction sales has evolved. It then constructs an aggregate price index for housing auction data before comparing this measure to other house price indices.





Sources: EIG, HM Revenue and Customs and Bank calculations.

- (a) Data for UK total market transactions prior to 2005 are an estimate based on data for
- England and Wales. (b) During the 1990s, EIG were increasing their coverage of the auction market, so some of the increase over this period reflects a larger sample. This was completed in around 2000.

<sup>(1)</sup> Evans (1983) describes a similar situation for land prices

<sup>(2)</sup> The EIG data exclude internet property auctions. The EIG data include properties that are unsold at auction but on which offers are made and accepted up to 30 days after the auction. These accounted for an average of 7% of the sample between 2001 and 2010 Q2.

Auction market activity was relatively resilient during the period of falling house prices in 2008, compared with sharp falls in transactions in the wider housing market. That resilience in part reflected an increase in the number of repossessions sold at auction (Chart 2). But sales of other lots still fell by considerably less than transactions in the wider housing market. This is consistent with the theory that lower reserve prices in the auction market allow more of the adjustment to come through prices, thereby supporting the number of sales.

The rise in the number of repossessed properties sold at auction may reflect a higher number of repossessions or weaker demand in the broader housing market. Contacts at EIG suggest lenders first try to sell properties through estate agents. If this option fails, they take the property to auction (typically after around eight weeks). A rise in the number of repossessed properties sold at auction may therefore indicate that lenders have struggled to sell them on the normal market, consistent with there being excess supply of properties. More recently, the number of repossessed properties sold at auction has returned to more normal levels, perhaps reflecting both fewer overall repossessions and more balanced demand and supply conditions in the housing market.

Turning to auction prices, care must be taken when combining the prices of individual lots into an aggregate index. Prior to 2001 it is only possible to calculate a simple average price. But this can be distorted by changes in the mix of properties sold over time. For example, in 2008, (lower-priced) flats formed a larger proportion of lots sold at auction. This contributed to the sharp fall in the simple average price of properties sold at auction (Chart 3).

Chart 3 Auction price data and the average of lenders' house price indices

- Simple average of auction prices
- Average of lenders' house price indices<sup>(a)</sup>





Sources: EIG, Halifax, Nationwide, Survey of English Housing and Bank calculations

(a) See Chart 1. footnote (a)

Since 2001, however, it is possible to construct an auction house price index that adjusts for the composition of the properties sold. Detailed data on average prices are available, broken down by region, property type and number of bedrooms, allowing the construction of a mix-adjusted series. The average prices of different types of property (for example, two-bedroom flats in London) are weighted together.<sup>(1)</sup> The weight of each property type is based on the 2001 Survey of English Housing (SEH) estimates of the prevalence of different property types in the private housing stock. The resulting index is smoother than the simple average, and matches more closely the average of the indices produced by Halifax and Nationwide (Chart 3).

Over the past ten years, quarterly house price inflation on the mix-adjusted auction price index has followed a similar path to that of other house price indices (Chart 4). House price inflation was high in the early 2000s, before falling back around 2004–05. It then picked up again, before turning negative during the recent recession. More recently, house price inflation has recovered and house prices have been broadly stable in 2010. Other measures of house prices are discussed in the box on page 202.





Sources: EIG, Halifax, Nationwide, SEH and Bank calculations (a) See Chart 1, footnote (a)

Empirically, auction price data appear to lead the average of the lenders' indices. Correlation analysis shows a slightly stronger relationship between the two indices when the auction index leads by one quarter than when they are contemporaneous (Table A). While the difference is small, it is statistically significant. Other statistical tests also support this finding.(2)

<sup>(1)</sup> The average price for a particular type of property is calculated using a simple

arithmetic average while the overall index is based on a geometric average.

<sup>(2)</sup> Granger causality tests suggest auction price inflation leads house price inflation (as measured by the average of the lenders' indices) when one or two leads are included, but the reverse is not true

## Measuring house prices

There are several UK house price indices. Each varies by data source, sample, standardisation methodology and the definition of an 'average' house (**Table 1**). This means that each has a different interpretation and the 'right' index to look at depends largely on the question asked. This box provides a brief overview of the five main differences between the measures — a broader discussion is available in Thwaites and Wood (2003).<sup>(1)</sup>

First, different indices use different samples of data. The most comprehensive data set is produced by the Land Registry which reports the prices of all registered transactions. But there is a delay with which these data are available. Other series are based on subsets of the market. For example, the mortgage lenders, Halifax and Nationwide, only include houses on which they have extended mortgages.

Second, throughout the process between listing a property and transacting, the reported price can change. For example the asking price may be different from the agreed price on which the mortgage is lent, which may again differ from the final price registered with the Land Registry.

Third, the type of properties bought and sold varies over time. If a higher proportion of (lower-priced) flats is sold in a quarter a simple average measure of prices would fall. Standardisation, for example by mix adjustment or hedonic

regression, addresses this by creating a price index of some 'average' house over time. The fourth issue is that different indices have different definitions of the 'average' house. Some indices are based on the features of a fixed 'average' house and compare the price of that property over time; others are based on the average features of recently transacted houses. Finally,

Table 1 House price indices

when weighting together properties to create an average, some indices use the share of that property type in the overall value of transactions (putting more weight on higher-value properties); others use the share in the volume of transactions.

Given the many ways in which house price indices can differ, it is reassuring that the main indices move fairly closely together once timing effects are accounted for (**Chart A**). Short-term divergences occur, but the broad movement of house price inflation is common to all the indices.

#### Chart A House price indices

- Mix-adjusted auction data (advanced one quarter)
- Nationwide
   CLG
- Halifax
- Land Registry (lagged one quarter)
- LSL Acadametrics (lagged one quarter)



Sources: Department of Communities and Local Government, EIG, Halifax, Land Registry, LSL Property Services/Acadametrics, Nationwide, SEH and Bank calculations.

 This box does not consider surveys which only report the balance of respondents reporting rising or falling prices, eg the Home Builders Federation or Royal Institution of Chartered Surveyors.

Index	Sample	Time	Standardisation method	Definition of 'average' property	Weighting method	Seasonally adjusted?
Auction series	Property sold at UK auctions	Exchange	Mix adjustment	2001 housing stock (from SEH)	Volume	Yes
Home.co.uk	Properties for sale through home.co.uk	Asking prices	Mix adjustment	2003–04 housing stock (from SEH)	Value	No
Rightmove	Sellers' asking prices posted on website	Asking prices	Mix adjustment	England and Wales housing stock	Value	No
Department of Communities and Local Government	Currently about half of all UK mortgages	Approval	Hedonic regression	Rolling average of UK transactions	Value	Yes
Halifax	Halifax loans for house purchase	Approval	Hedonic regression	1983 Halifax loan approvals	Volume	Yes
Hometrack	Survey of estate agents' estimated local average prices	Approval	Mix adjustment	England and Wales housing stock	Value	No
Nationwide	Nationwide loans for house purchase	Approval	Hedonic regression	Rolling average of UK transactions	Volume	Yes
Land Registry	All sales registered in England and Wales	Completion	Repeat sale regression	None (calculated from growth rates)	Volume	Yes
LSL Property Services/ Acadametrics	All sales registered in England and Wales	Completion	Mix adjustment	Rolling average of UK transactions	Value	Yes

## Table A Correlation between quarterly house price inflation on the mix-adjusted auction index and the average of lenders' indices

	Contemporaneous	One-quarter lead	Two-quarter lead
Correlation coefficient	0.82	0.89	0.81

Sources: EIG, Halifax, Nationwide, SEH and Bank calculations.

As with all data sources, there are other factors to consider when using auction price data. The small number of properties sold at auction means that the data can be volatile. And even though reserve prices are lower in the auction market, there is still a price below which sellers are not willing to go. In addition, anecdotal evidence from EIG suggests properties sold at auction may be of a lower quality, which is not accounted for in the mix adjustment. Comparing the level against other indices may therefore give a misleading impression, hence the focus of this article on changes in house prices. Further, the mix-adjustment methodology is cruder than the hedonic regressions used by the lenders. As such it does not get as close to measuring a constant-quality house as, for example, the Halifax and Nationwide indices. Hence, there may be times at which the auction price data deviate from other measures: see, for example, the volatility in the auction price data in recent quarters (**Chart 4**). Auction price data must therefore be viewed in conjunction with a variety of other housing market indicators.

### Conclusion

Residential property auction data provide an alternative perspective on developments in the housing market. Auction prices may be recorded at a stage that gives greater insight into current market conditions than some other indices. And lower reserve prices in the auction market mean that auction prices may react more quickly.

In practice, the benefits of using the data become an empirical question. Evidence suggests that these data may lead other indices by around one quarter. But care must be taken when analysing the data, particularly given the relatively small number of properties sold at auction. Nevertheless, the results suggest that the auction data are a useful addition to a toolbox for analysing trends in the housing market.

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## The financial market impact of quantitative easing

**Summary of Working Paper no. 393** Michael Joyce, Ana Lasaosa, Ibrahim Stevens and Matthew Tong

In response to the intensification of the global financial crisis towards the end of 2008, and a sharp downturn in domestic economic prospects, the Bank of England's Monetary Policy Committee (MPC) loosened monetary policy using both conventional and non-conventional means.

The MPC cut Bank Rate, the United Kingdom's policy rate, from 5% at the start of October 2008 to 0.5% in March 2009. But given the likelihood of undershooting the 2% CPI inflation target in the medium term, the Committee also decided it needed to ease monetary conditions further through a programme of asset purchases financed by the issuance of central bank reserves. This programme of large-scale asset purchases — commonly referred to as quantitative easing or QE — had resulted in the MPC making £200 billion of purchases, overwhelmingly of UK government securities (gilts), by February 2010; an amount equivalent to 14% of nominal GDP.

There are a number of ways through which injections of money into the economy via asset purchases funded by reserves might be expected to affect nominal spending growth. But one important route is through higher asset prices, which should reduce the cost of obtaining funding and increase the wealth of asset holders, thus boosting spending and increasing nominal demand. This paper assesses the impact of the Bank's QE policy on financial markets — the first leg in this transmission mechanism. We attempt to quantify how QE has affected gilt markets and how it has also fed through more widely into other financial asset prices.

There are three main channels through which QE might affect asset prices. First, the announcement of QE purchases may itself provide information to economic agents about the state of the economy and about how the MPC might be likely to react to future developments. This is a macro/policy news channel. Second, in general, provided different financial assets are not viewed as perfect substitutes by investors, QE will also have an effect through a portfolio rebalancing channel. The increase in demand for gilts resulting from the Bank's purchases will raise their prices and lower their yields. And the impact of the purchases should be felt across a range of assets, as sellers of gilts to the Bank use their new money balances to bid up the prices of other assets. Finally, the presence of a central bank in the market may improve market functioning and reduce the extra compensation ('liquidity premium') that investors demand for buying assets that risk being more difficult to sell in the future.

Asset prices in the United Kingdom recovered substantially during 2009, but not all of the improvement can be attributed to QE. A range of policies at home and abroad and other influences will have also affected asset prices. In order to isolate the impact that is directly attributable to QE, we use several approaches. We first examine the reaction of market prices over a relatively short interval around each QE announcement. To the extent that financial markets incorporate information efficiently, we would expect market prices to react to new information about the impact of QE within a short period. This method suggests that gilt yields are about 100 basis points lower than they would otherwise have been without QE, with the majority of the effect coming through the portfolio rebalancing channel.

Looking at immediate announcement reactions is less suited to examining the impact on other assets, since it may take time for investors to change the composition of their portfolios and for the effects of portfolio rebalancing to be fully incorporated into asset prices. Corporate bond yields, probably the closest sterling-denominated substitute for gilts, fell significantly following QE announcements. But further falls in corporate yields also occurred in subsequent months. Equity prices fell immediately after the initial QE announcements but strengthened significantly thereafter, and the balance of risks perceived by market participants around equity prices implied by option prices became less negative. We also find there were improvements in liquidity in corporate bond markets, and substantial increases in net equity and corporate bond issuance during 2009, which may be at least partly related to QE.

As an alternative approach, we try to infer what historical experience would imply about the effects of a QE-like policy. We do this by simulating its impact using two econometric models based on a portfolio balance framework. This exercise suggests an impact through the portfolio balance channel on gilts and corporate bonds that is broadly similar to that observed using our analysis of announcement reactions. The impact on equity prices, however, is subject to more uncertainty, though potentially large.

The effectiveness of the MPC's asset purchases will ultimately be judged by their impact on the wider macroeconomy. Our analysis suggests that the purchases have had a significant impact on financial markets and particularly gilt yields, but there is clearly more to learn about the transmission of those effects to the wider economy.

## How do individual UK producer prices behave?

## Summary of Working Paper no. 394 Philip Bunn and Colin Ellis

UK monetary policy is concerned with keeping inflation on target at 2% a year. So it is important for policymakers to consider how prices behave. In particular, the degree of nominal rigidity in the economy will influence the short-term impact of monetary policy on real activity and hence inflation. This paper uses a large database of individual producer price quotes for the United Kingdom to examine the behaviour of prices. The aim of this work is to improve our understanding about how prices are set. The results may help to shed light on which pricing theories most closely reflect how prices are determined in the real world.

There have been recent euro-area and US studies that use very large databases of individual price quotes underlying published aggregate inflation series to examine pricing behaviour. Using data that has been made available by the Office for National Statistics, this paper examines the behaviour of individual UK manufacturing output prices between 2003 and 2007 using the price quotes underlying the published Producer Price Index.

This paper uncovers a number of stylised facts about pricing behaviour. First, on average 26% of producer prices change each month. The total number of price changes is concentrated among a relatively small number of items that change price very frequently. Because a small number of items account for many price changes this means that price changes occur less frequently when measured by the average for individual products than the simple average would suggest.

UK producer prices appear slightly more flexible than in the euro area and they display a similar degree of flexibility to producer prices in the United States. There is substantial variation in the frequency of UK producer price changes between different sectors and product groups. The prices of energy products change the most often, with an average of 87% of prices changing in any given month. In general, prices appear to change more often in industries where a relatively high proportion of manufacturers' costs are accounted for by basic commodities. The prices of textile and clothing products change the least often.

The probability of price changes is not constant over time. The average frequency of UK producer prices changing increased every year between 2003 and 2007, but there is also some evidence of a correlation between the share of prices changing each month and the aggregate inflation rate. January is the most popular month for prices to change, followed by April. December is the month in which the lowest proportion of prices change. Producer prices are most likely to change one, four and twelve months after they were previously set.

There is little evidence to suggest that downward nominal rigidities are important in UK product markets since 40% of all price changes are decreases and a large proportion of those price cuts are small changes. The distribution of price changes is wide, although a significant number of changes are relatively small and close to zero. Just under 30% of all price changes are between -1% and 1%, and around 45% are between -2% and 2%. The distribution of producer price changes in the United Kingdom appears to be a little wider than in the euro area. There is substantial variation in the distribution of price changes between different industries. For periods of up to one year, the average size of price changes tends to be smaller for items that change price very frequently, although beyond one year there is little relationship between the frequency and magnitude of price changes.

UK producer price changes are less persistent at the disaggregated level than aggregate inflation data imply. Aggregate monthly inflation rates in UK producer prices are persistent, ie the change in prices in the current month is related to the change in the previous month. But we find no evidence of persistence in monthly inflation rates at the individual item level. Our results suggest that this persistence in aggregate producer price inflation rates may be a result of aggregation across heterogeneous products rather than that persistence in inflation rates at the individual item level is reflected in the aggregate data.

The notion of nominal rigidities is a feature of many economic models. A variety of mechanisms have been put forward to explain this assumption, which can have differing policy implications. The empirical evidence presented in this paper on UK producer prices is not consistent with any one pricing theory. There are pieces of evidence that can be used to both support and detract from different theories. Variation in the share of prices changing in different years and months, and differing probabilities of prices changing depending on the time since the previous price change, are not consistent with models that assume the probability of prices changing is constant over time. But the large number of small price changes that we see in the data are not consistent with models in which firms face small fixed costs to adjust their prices. Also, the significant number of large price changes we observe are not consistent with firms receiving disutility from making large price changes. The heterogeneity across industries and product groups implies that there may not be one theory that can explain pricing behaviour at the economy-wide level. Different models may better explain pricing behaviour in different sectors. The clear heterogeneity in the data would argue against the use of 'representative agent' models.

## New insights into price-setting behaviour in the United Kingdom

## Summary of Working Paper no. 395 Jennifer Greenslade and Miles Parker

It is important to understand how companies set prices, since price-setting behaviour plays a key role in the monetary transmission mechanism. Part of the reason why monetary policy may affect the real economy, at least in the short run, is that some prices adjust sluggishly. Many of the economic models that are frequently used for monetary policy analysis assume that there are constraints on price adjustment, often called 'nominal rigidities'. Many surveys have taken place to try to improve our understanding of the extent of price rigidity, and the reasons underlying it, by asking firms directly. Examples include surveys for the United States, Canada, the euro area, as well as an earlier survey for the United Kingdom in 1995. The advantage of surveys over econometric techniques is that by asking firms directly we can obtain qualitative information, such as the factors taken into consideration by firms when reviewing the prices charged for their products.

This paper analyses the results of a new survey of the price-setting behaviour of nearly 700 UK firms. It was carried out between December 2007 and February 2008, before the onset of the recent recession. Consequently, the results need to be interpreted as applying to a period of relative macroeconomic stability, although there had been a background of volatile commodity prices and a very recent tightening in credit conditions. Our survey suggested that in the United Kingdom, many firms reviewed their prices at regular intervals, but it was also common for firms to review prices in response to specific events. This was similar to the findings of a recent euro-area survey. Overall, the median UK firm reviewed its price twice a year, although there were notable differences between sectors.

When determining the optimal price, around a fifth of firms used a rule of thumb. Around one third of firms set their prices based on their expectations of the near future. In terms of how companies set prices, survey evidence supported the use of the mark-up over costs form of pricing. Firms reviewed prices more frequently than actually changing them, with the median firm changing price only once per year. But there were marked differences between sectors — for example, UK construction and retail companies changed their prices more often than companies in the manufacturing and other services sectors. And large firms often changed prices on a more frequent basis. So, there were important heterogeneities at work.

Different factors influenced price rises and price falls. Higher costs — in particular, labour costs and raw materials were the most important driver behind price rises, whereas lower demand and competitors' prices were the main factors resulting in price falls. The survey also considered the speed of response to changes in cost and demand conditions. Nearly half of companies changed their prices within a quarter following an increase in costs or a fall in demand.

When asked which factors were most important in causing price stickiness, the existence of implicit and explicit contracts between firms and customers and 'co-ordination failure' (where firms felt constrained because they were acting individually) were viewed as the most important. Pure menu costs (time, effort, reprinting etc) were not widely cited, in keeping with previous survey results.

Looking at how price-setting had changed over time, a substantial number of firms increased the frequency of price resets over the decade preceding the survey. Firms mainly attributed that to an increase in competition over the period, which increased the cost to the firm from deviating from the optimal price, and higher variability of input prices. Yet the more stable macroeconomic environment then in place also resulted in some firms decreasing the frequency of price changes.

## Using estimated models to assess nominal and real rigidities in the United Kingdom

### Summary of Working Paper no. 396 Gunes Kamber and Stephen Millard

Most monetary policy makers focus on achieving price stability: typically defined as low and stable inflation. But in order to achieve price stability, it is important to understand what drives prices and inflation and how monetary policy fits in, ie how the monetary transmission mechanism works. The standard framework for understanding inflation is the 'New Keynesian' Phillips Curve that relates inflation this period to expected inflation in the next period, and to the deviation of real marginal cost from trend. This framework has proved to be useful for thinking about the monetary transmission mechanism and inflation. But, in order to use it to provide quantitative predictions, it is necessary to embed it within a quantitative general equilibrium framework, which takes account of the dynamic relationships in the economy and the constant arrival of shocks to the system. Estimating the key parameters of such a model, allows us to assess the uncertainty around the parameters themselves and, hence, predictions made using the framework.

In this paper, we estimate two such models using UK data. In both cases, we use a 'minimum distance' technique which estimates the parameter values as those that make the theoretical responses of variables to particular shocks as close as possible to those same responses in the data. In our case, motivated by our particular interest in understanding inflation dynamics within the United Kingdom and how monetary policy makers can use interest rates and other means so as to achieve their inflation target, we set the parameters so as to match the responses of variables to movements in interest rates, the tool used by the Monetary Policy Committee over our sample period.

The first model we consider is the model of Smets and Wouters, which has become a 'workhorse' model. However, in this model, there is no distinction made between employment and hours: firms hire 'total hours' in a spot labour market. But a long tradition in monetary economics has assigned labour market frictions and, in particular wage-setting frictions, a central role in explaining inflation dynamics. So we also estimate the model of Gertler, Sala and Trigari, in which the labour market is modelled more explicitly within the New Keynesian framework. More specifically, it assumes that it takes time for unemployed workers to find jobs and for vacant jobs to find workers, and that both activities are costly.

We first use a structural vector autoregression approach to obtain estimates of the effects of interest rate changes on some important macroeconomic variables in the United Kingdom. This approach, based on a set of equations explaining each variable in terms of the same set of lagged variables, allows us to identify the effect of interest rates with only minimal restrictions on the theory. We find that output, consumption, investment and capacity utilisation all fall in response to rises in interest rates and that the responses of all these variables are 'hump shaped' with the peak response of output occurring five quarters after the initial rise in rates. Inflation rises on impact before falling to a trough two years after the initial rise in rates. The effect on inflation dies out after three years. Changes in interest rates have little effect on the relative price of capital and real wages. Productivity responds quickly, suggesting that movements in employment occur with a lag relative to movements in output.

In terms of the models, we find that both are able to explain these responses reasonably well. In addition, they are able to do this without relying on too much price or wage stickiness. In particular, our estimates imply that wages are reset about once every three quarters, and prices every year and a half. Having said that, the results also imply a large degree of indexation in price and wage-setting. It is not clear that this result is in line with our intuition for what actually happens in the United Kingdom. Neither model is able satisfactorily to explain the response of productivity to interest rate movements. An implication of this is that they are unable to explain the response of employment, given that they can explain the response of output. This suggests that it may be worth thinking more about the costs of adjusting labour input if we are to explain movements in employment as well as we can explain movements in output. We leave this for future research.

## Evolving macroeconomic dynamics in a small open economy: an estimated Markov-switching DSGE model for the United Kingdom

## Summary of Working Paper no. 397 Philip Liu and Haroon Mumtaz

The United Kingdom has experienced major structural and economic changes over the past three decades. In a large empirical literature, researchers have argued that these changes have manifested themselves as shifts in the dynamics of macroeconomic variables, with a number of papers focusing on documenting these changes. An understanding of what lies behind and the consequences of these changes is obviously important for the conduct of monetary policy.

However, much of the work on the UK economy is subject to a number of criticisms. Among these, first, studies are typically formulated in a closed economy setting. This is surprising given the fact that the United Kingdom is a small open economy and international developments have become increasingly important. Second, they typically employ vector autoregressions (VARs), systems of regression equations which simply specify each variable of interest as a function of past values of all variables included in the model. Although VARs have the distinct advantage of simplicity and flexibility, they do not always deliver a clear economic interpretation of shocks hitting the economy.

The aim of this paper is to investigate structural changes in the United Kingdom using a model where these criticisms are mitigated. We examine the evolving structure using an estimated open economy dynamic stochastic general equilibrium model (DSGE) where the parameters of key structural equations are allowed to change periodically over time. DSGEs are models where all the dynamic linkages between variables are transparently explained in terms of the behaviour of firms, households or the policymaker. The 'stochastic' part means that unexpected shocks continually hit the economy. So unlike VARs, the DSGE model explicitly incorporates expectations of agents (for example, the public and the central bank) into the modelling process and provides a clear interpretation of shocks that are assumed to hit the economy at any given time. We estimate several different versions of this model - ie versions that allow parameters of different structural equations to change over time. We then use statistical criteria to test how well each version of the model fits UK data. The changing dynamics of the UK economy are examined using the best-fitting model.

This turns out to be a very plausible one. One feature is that periods of turbulence come and go, but were infrequent between 1992 and the recent past, although the results towards the end of our sample in 2007/08 and early 2009 are characterised by high volatility. Moreover, these estimates from the chosen model suggest that the mid-1970s were characterised by small reactions by the monetary authorities to inflation. As a consequence, output, inflation and the real exchange rate were more volatile then than the recent past.

## The sterling unsecured loan market during 2006–08: insights from network theory

### Summary of Working Paper no. 398 Anne Wetherilt, Peter Zimmerman and Kimmo Soramäki

Financial markets in general can be viewed as networks, where buyers and sellers engage in repeated interactions. In particular, this analogy can be applied to money markets, as borrowers and lenders rely on each other for their daily funding needs. This paper examines the unsecured sterling overnight money market during a period which covers the crisis of 2007–08. A unique data set of individual trades in the UK CHAPS interbank payment system is used to construct a network of lending relationships between banks in the overnight market.

Network analysis of the overnight money market indicates that the structure of relationships between banks changed as the crisis unfolded. First, the data show that there is a core of a small number of banks which account for a large portion of overnight relationships. But, when concerns about counterparty risk increased, banks in the network diversified their relationships, reducing their dependence on the core. A possible explanation is that banks attempted to reduce funding liquidity risk by establishing more funding relationships.

Second, the analysis indicates that some of the observed changes in the network are asymmetric, in that they affected borrowers more than lenders. The paper argues that this asymmetry may be unique to the overnight market where increased counterparty risk is a concern for borrowers, but perhaps less so for lenders. This may be because many borrowers hope to roll overnight loans for an extended period. Thus borrowers may be keen to establish a relationship with one or more core counterparties, who are more likely to be able to provide this funding on a daily basis.

Third, the paper also suggests that changes to the reserve regime in September 2007 made liquidity management more straightforward, because banks had less strict end-of-day targets to meet. Banks therefore had much more discretion about whether to participate in the overnight market, and who to trade with. The network data show a drop in the probability of forming a relationship at this time.

The paper does not attempt to measure whether the impact of market events was greater or less than the impact of policy events. This question could be important when attempting to gauge the effect of central bank actions.

The analysis is confined to the overnight unsecured market, reflecting data availability. It does not examine to what extent this market was affected by changes in the term markets and in the secured markets. Hence, this research does not permit conclusions about the resilience of liquidity in the money markets in general, or the case for any changes in the underlying infrastructure. These issues are left for future research.

## Liquidity costs and tiering in large-value payment systems

### Summary of Working Paper no. 399 Mark Adams, Marco Galbiati and Simone Giansante

Interbank payment networks (ie the channels through which banks execute payments), differ widely across countries. In some countries, these networks have a 'star' shape: all (or most) banks are directly connected to a central node, a piece of infrastructure where all payments are executed. In other countries one instead observes 'tiered' structures: a few banks (*first-tier banks*) are directly connected to the central processor, while all other banks are connected to first-tier banks and channel payments through them. This paper studies the forces behind the formation of 'stars' versus 'trees' in payment networks; what it does *not* consider instead is the question of *which structure* is more desirable. This work has therefore a purely explanatory aim, rather than a normative one.

These forces stem from the nature of modern *large-value* payment systems (LVPSs). Most LVPSs today work in real-time gross settlement (RTGS) mode, whereby each payment must be settled individually by transferring the corresponding value from payer to payee. The main advantage of RTGS is that it eliminates credit risk. However, as payments must be settled in *gross* amounts, the RTGS mode requires large amounts of liquidity — a shortcoming which can however be reduced by co-ordinating payments, so liquidity is 'recycled' between banks.

Another reason why central banks pushed for the adoption of RTGS is that in practice, although not by necessity, RTGS systems use central bank money as medium of settlement. That is, the funds used to settle payments are held in accounts at the central bank. This brings about two benefits: first, the safekeeper of these funds cannot default; second, the central bank is able to monitor and possibly regulate the payment activity.

However, in some countries (including the United Kingdom), many banks are *not* direct members of the national RTGS system, and their payments are *not* settled on the RTGS system. These are the 'tiered' systems mentioned above, where second-tier banks execute payments via *correspondents* in the first tier. Payments between correspondents (due to the correspondents' proprietary and/or client operations) settle on the official RTGS system. But payments between banks with a common correspondent are made on the books of the correspondent itself. *Internalised* by the correspondent banks, these payments thus do not transit across the RTGS system. As a consequence, they are neither subject to the RTGS rules, nor can they be easily monitored by the authorities.

Surveys of UK correspondent banks indicate that internalised payments are a significant fraction — around one third by value — of all interbank payments. The value of payments which correspondents make through the RTGS system on behalf of clients is also large. These latter payments may also create risks, as they are often not pre-funded. That is, correspondents often agree to make them by extending credit to the client. So, when present, tiering is an important feature of a payment system which may have an important bearing on the system's functioning, and on the risks therein. As mentioned above, one shortcoming of RTGS systems is their potentially high liquidity need. Tiering can be seen as a spontaneous response to this, because a major effect of tiering is to reduce liquidity costs. This is for two reasons. First, internalised payments can be made without liquidity (the *internalisation effect*). Second, by pooling own and client payment flows, the correspondents may face smoother, better manageable and therefore less costly liquidity needs (the *pooling effect*).

We build a model of tiering choices, with two 'inputs': the cost of liquidity, and an exogenous pattern of payment flows. Starting from these, we formally model the internalisation and liquidity pooling effects. We then show that even such a parsimonious model, when calibrated on real data, generates realistic payment networks. This ability to reproduce some stylised facts suggests that the cost of liquidity *is* an important driver of tiering. This is ultimately controlled by the central bank, so we conclude that a central bank has powerful policy levers to influence tiering patterns. However again: this paper sheds light on how these policy levers can affect tiering, but is silent on *how they should* be used to this aim. Such a judgement cannot be expressed here, because several consequences of tiering are not considered in this work. Above all, we disregard any 'risk' to individual institutions and to the system as a whole.

More precisely, our model features a fixed number of banks sending payments to each other. During a day, each bank receives a random stream of payment instructions at a constant rate. Each instruction requires payment of a single unit of currency to another bank. Intraday banks act mechanically: payments are executed as soon as payment instructions are received. Banks instead make decisions about where they want to sit in the 'payment network'. To be more precise, one bank is randomly picked in each period, and is given the choice between becoming a direct member of the RTGS system, or to arrange for a correspondent to execute their payments. If a bank joins the RTGS system, its payment activity generates liquidity costs. If instead it becomes a client of a correspondent, the client bank incurs no liquidity costs, but pays a fee to the correspondent for its service. The correspondent's payment activity changes as a result of taking on a client, and hence so does its liquidity cost. We specify a stylised but realistic 'protocol' for the negotiation of these fees.

By virtue of the internalisation and liquidity pooling effects, total liquidity costs for a correspondent and its customer together are no larger than the sum of the standalone costs, thus giving incentives to tier. On the other hand, banks make their decisions sequentially and, depending on their payment activity, they may find it convenient to join different correspondents. Hence, more than one correspondent bank may coexist. After a possibly long (but finite) number of 'days', the system reaches a steady state where a non-trivial network of client-correspondent relationships is formed. We simulate this model, calibrating it to data on the UK CHAPS system, and we look at the resulting networks. As mentioned above, the model produces networks which reproduce some features of the real CHAPS client-correspondent network. We perform some comparative statics exercises, suggesting how the payment network would change, if the central bank changed the price of liquidity.

## Liquidity-saving mechanisms and bank behaviour

## Summary of Working Paper no. 400 Marco Galbiati and Kimmo Soramäki

Interbank payment systems form the backbone of financial architecture; their safety and efficiency are of great importance to the whole economy. Most large-value interbank payment systems work in RTGS (real-time gross settlement) mode: each payment must be settled individually by transferring the corresponding value from payer to payee in central bank money. As such, all settlement risk is eliminated.

But an RTGS structure may incentivise free-riding. A bank may find it convenient to delay its outgoing payments (placing it in an internal queue) and wait for incoming funds, in order to avoid the burden of acquiring expensive liquidity in the first place. As banks fail to 'internalise' the systemic benefits of acquiring liquidity, RTGS systems may suffer from inefficient liquidity underprovision.

Inefficiencies may also emerge for a second reason. Payments queued internally in segregated queues are kept out of the settlement process and do not contribute to 'recycling' liquidity. A tempting idea is therefore to pool these pending payments together in a central processor, which could look for cycles of offsetting payments and settle them as soon as they appear. This would save liquidity, and might also reduce settlement time: payments could settle as soon as it is technically possible to do so. Segregated queues may instead hold each other up for a long time, not 'paying to each other' because none is doing so.

Such central queues are called 'liquidity-saving mechanisms' (LSMs). There are a number of studies on plain RTGS systems, but only a few on RTGS systems augmented with LSMs. Our work contributes to this line of research.

We first model a benchmark system, ie a plain RTGS system where each bank decides: (i) the amount of liquidity to use; and (ii) which payments to delay in an internal queue (payments are made as banks randomly receive payment orders, which need be executed with different 'urgency'). The benchmark model is then compared to an RTGS-plus-LSM system, where banks decide: (i) the amount of liquidity to use in RTGS as above; and (ii) which payments to submit to the LSM stream, where payments are settled as soon as offsetting cycles form.

A necessary caveat is that we consider a specific LSM, comparing it to a specific model of internal queues. Other LSMs, perhaps associated with different settlement rules, may yield different outcomes. For example, one could think of a system where *all* payments (even those sent to the RTGS stream) are first passed through the LSM. Then, if LSM settlement does not happen instantly because a cycle has not formed, the urgent RTGS payments are immediately settled by transferring liquidity. This is another way of interacting between the

LSM and RTGS streams — one of the many possible ones not considered here.

We first look at the liquidity/routing choices of a social planner willing to minimise overall costs, defined as the sum of liquidity costs and delay costs. In the plain RTGS system, the planner's choice is dichotomous: if the price of liquidity exceeds a certain threshold, the planner delays all payments in the internal queues. Otherwise, it delays none, while asking banks to provide some liquidity. In this case, payments could still be queued in the RTGS stream for a while, if banks run out of liquidity. A similar dichotomy appears in the system with an LSM: the planner uses either only the LSM (when liquidity costs exceed a given threshold), or only the RTGS stream, increasing liquidity in RTGS as the liquidity price falls. Thus, from a central planner perspective, the LSM enhances the operation of the system only in extreme circumstances.

However, payment systems are not run by a 'central planner', but are populated by independent banks interacting strategically. We therefore look at the equilibrium liquidity/routing choices. A typical equilibrium here has banks routing part of their payments to RTGS, and part into the LSM, with the reliance on the LSM increasing with the price of liquidity. Despite the fact that such an outcome is inefficient (the planner would choose either of the two streams, never both), it can still be better than the one emerging without the LSM. So, an LSM may lead to a 'second-best' outcome, improving on the vanilla RTGS system.

The system with an LSM however also possesses some 'bad' equilibria. These feature the somehow paradoxical mix of high liquidity usage, intense use of the LSM, and costs which exceed those of the vanilla RTGS system. The reason behind the existence of such equilibria is probably the following: if many payments are sent in the LSM, this can be self-sustaining, in the sense that each bank finds it convenient to do so. However, the RTGS stream may become less expedite (as fewer payments are processed there), which may in turn imply that the equilibrium level of liquidity is also large. This suggests that LSMs can be useful, but they may need some co-ordination device, to ensure that banks arrive at a 'good' equilibrium.

Most of our results (above all, the ability of an LSM to improve on a vanilla RTGS system) depend on a key parameter: the price of liquidity. We do not perform any calibration of the model's parameters, so we cannot say if our LSM is advisable for any specific system. However, LSMs in general are likely to become increasingly desirable. Indeed, in the wake of the recent financial crisis, banks are likely to be required to hold larger amounts of liquid assets relative to their payment obligations. This may increase their interest in mechanisms that reduce the liquidity required to process a given value of payments.

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## Reports

## Chief Economists' Workshop: state-of-the-art modelling for central banks

By Andy Blake and Céline Gondat-Larralde of the Bank's Centre for Central Banking Studies.<sup>(1)</sup>

Since 2004 the Bank's Centre for Central Banking Studies has organised an annual Chief Economists' Workshop to provide a forum for leading central bank practitioners and academic thinkers to exchange views. The recent financial crisis has put many aspects of central banks' activities under the spotlight, and this year's Workshop offered a critical appraisal of the economic modelling frameworks used by central banks. Efforts are under way to build upon advances in research and improve those frameworks. But, at the same time, economists will need to remain humble about the inevitable limitations of their models, which will continue to be just one of many inputs to the policymaking process.

In May 2010, the Centre for Central Banking Studies at the Bank of England held its seventh Chief Economists' Workshop, taking as its theme 'state-of-the-art modelling for central banks'. The event featured three keynote academic speakers as well as talks by participants on the macroeconomic and financial models currently in use or being developed to meet the various challenges faced by central banks.<sup>(2)</sup> Central to the discussions was the question of how central banks should respond to the potential deficiencies in their modelling frameworks highlighted by the recent financial crisis. This article summarises the main points raised during the Workshop.<sup>(3)</sup>

Economic history teaches us that crises are a common feature of economic development.<sup>(4)</sup> Yet, when they eventually take place, they have been often treated as surprise events or episodes of 'bad luck'. Occasionally, crises do trigger a rethink of economics, both as a discipline and for its practitioners. For example, after the Great Depression of the 1930s, modern macroeconomic theory emerged, following Keynes's work and subsequently underpinned by the formal mathematical framework initiated by Hicks and Samuelson. There was also a significant improvement in the collection of macroeconomic data across countries, including national accounts. These theoretical and empirical advances allowed policymakers after World War II to develop a workable framework for macroeconomic policy to guide their fiscal and monetary decisions.

### The academic challenge raised by the crisis

The recent financial crisis has already triggered debate about the state of macroeconomics and financial economics.<sup>(5)</sup> One of the leading commentators to predict the fallout from the credit bubble as early as the mid-2000s was Nouriel Roubini (Stern School of Business, New York University). As a keynote speaker at the Workshop, he provided a comprehensive critique of macroeconomics.

Roubini argued that standard macroeconomic models — such as those taught in universities — do not deal well with the possibility of crises.<sup>(6)</sup> Most economic or financial crises result from structural imbalances that have built up over time rather than a sudden and unexpected shock — meaning that they are, to some extent, 'predictable' (even if the exact timing of their unravelling is not). But standard models are largely based on equilibrium concepts.<sup>(7)</sup> As such they have, for example, limited market frictions, few externalities and

<sup>(1)</sup> The authors would like to thank Garreth Rule and Francesco Zanetti for their help in producing this article.

<sup>(2)</sup> The keynote speakers were Professors Nouriel Roubini (Stern School of Business, New York University), Andrew Lo (Sloan School of Management, Massachusetts Institute of Technology) and Alan Kirman (GREQAM, Université Aix-Marseille III). Some of the Workshop's material is available on the Bank's website at www.bankofengland.co.uk/publications/events/ccbs\_cew2010/introduction.htm.

<sup>(3)</sup> This article reports the views of participants at the Workshop and does not necessarily reflect the views of the authors, the Bank or Monetary Policy Committee members.

<sup>(4)</sup> For a historical analysis of financial crises, see Reinhart and Rogoff (2009).(5) For a summary of the debate within academia on the impact of the crisis on economic

thought, see Krugman (2009), Cochrane (2009) and Spaventa (2009) among others. (6) See Roubini and Mihm (2010) for more.

<sup>(7)</sup> In particular, these models typically focus on steady-state analysis and examine the dynamics of variables near the steady state.

contain an overly simplified financial system with complete, efficient markets, thereby implying no asset price bubbles. In addition, they do not explicitly include either political economy constraints or principal-agent issues. All of these factors were important contributors to the recent financial crisis. Over the past two decades, significant progress has been made to deal with each of these weaknesses.<sup>(1)</sup> But these microeconomic or partial-equilibrium modelling advances have been made in a piecemeal manner and are yet to be embedded into a new, single paradigm.

Roubini emphasised that academic research should prioritise developing macroeconomic models that are better at modelling the complexity of the dynamics in the financial sector, and its interactions with the real economy. In particular, it is important to understand better the effect of asset price movements on financial intermediaries' balance sheets and their leveraging/deleveraging cycle, and ultimately on the market's liquidity in a macroeconomic context.<sup>(2)</sup>

## The convergence of central banks' modelling frameworks during the Great Moderation

Prior to the recent financial crisis, there was an emerging consensus within macroeconomic theory. This period was characterised by an unusually high degree of macroeconomic stability, with most developed countries experiencing steady output growth and low and stable inflation. Within the economic community, a 'new neoclassical synthesis' emerged, combining the strengths of the various competing approaches developed over previous decades.<sup>(3)</sup> This new generation of macroeconomic models — known as dynamic stochastic general equilibrium (DSGE) models — has become increasingly popular as policy tools in central banks. They are now widely used to help assess the causes of both cyclical and structural changes within the economy as well as to forecast the main macroeconomic variables and the effect of monetary policy changes.

These DSGE models contain features from a broad range of economic thought. They borrow from new classical models, relying on microeconomic foundations to describe decision-making by agents based on their preferences and the constraints they face. DSGE models also include 'New Keynesian' features, assuming that prices cannot costlessly and instantaneously adjust. This, in turn, gives a role to monetary policy.<sup>(4)</sup> At the heart of DSGE models are the intertemporal choices made by agents and, hence, the role played by expectations in determining current macroeconomic outcomes. These features mean that these models are well suited to exploring the interaction between policy actions and agents' behaviour, something that the older generations of macroeconomic forecasting models could not (Lucas (1976)).<sup>(5)</sup>

## Improving current policy modelling frameworks

Before the financial crisis, DSGE models typically contained only a very rudimentary description of the financial sector. In part, that was because up until then there was little evidence that financial variables played an important role in explaining business-cycle fluctuations. But it also reflected more fundamental difficulties in modelling financial system behaviour, particularly in stressed conditions when the risk of spillover, contagion and adverse feedback loops come to the fore.<sup>(6)</sup> These factors mean that financial crises may have a larger effect than crises not originating in financial markets, a feature that is difficult to incorporate into a general equilibrium model.<sup>(7)</sup>

The recent crisis has clearly demonstrated, however, that the behaviour of the financial sector can have important implications for both the real economy and monetary policy. The macroeconomic models used in central banks ahead of the crisis were not built to analyse or deal with a sudden breakdown of credit markets as witnessed in late 2008, and nor were the majority of the alternatives that were available.

Consequently, policymakers face an important challenge to their stylised modelling framework.<sup>(8)</sup> Central banks have been at the forefront of developing and operationalising sophisticated versions of these models. As a result, many DSGE models now include one or more financial frictions. For example, they may incorporate a financial-accelerator mechanism (as developed by Bernanke *et al* (1996)) to reflect the role that businesses' assets used as collateral for borrowing can play in amplifying shocks. Financial intermediaries have also been introduced into a DSGE framework by incorporating credit spreads that are affected by banks' balance sheets.<sup>(9)</sup>

The reaction of modellers to the crisis marks an important development in macroeconomic modelling. In a recent paper, Christiano *et al* (2010) argue that the current generation of models is quite capable of explaining the key channels through which monetary policy operates, for example providing a

<sup>(1)</sup> For an example of these, see Vayanos and Woolley (2008), who offer a rational theory of market momentum and reversal based on delegated portfolio management.

<sup>(2)</sup> For instance, see Brunnermeier and Sannikov (2010) for a recent example of this academic research on macroeconomic models with a financial sector.

<sup>(3)</sup> See Mankiw (2006) for a summary of the macroeconomic modelling advances since the Great Depression. The term 'new neoclassical synthesis' was coined by Goodfriend and King (1997) to describe this consensus view.

<sup>(4)</sup> See, for example, Woodford (2003).

<sup>(5)</sup> The 'Lucas Critique' argues that traditional macroeconometric models were liable to give unreliable predictions about the effects of changes in economic policy. Their estimated parameters were functions of the policy regime, rather than underlying structural behaviour, and therefore may have changed if policy changed.

<sup>(6)</sup> For instance, see Brunnermeier (2009) for an analysis of amplifying mechanisms arising from leveraged positions of financial intermediaries.

<sup>(7)</sup> See International Monetary Fund (2008) for a review of past episodes of financial stress and their implications for economic activity (Chapter 4).

<sup>(8)</sup> See Bean (2009).

<sup>(9)</sup> See Cúrdia and Woodford (2009a,b).

plausible account of pricing frictions. Further work is of course necessary and some of the weaknesses highlighted by the crisis can be improved upon as part of central banks' ongoing research programmes.

## A more pluralistic approach to modelling for monetary and financial stability?

A single framework may not be able to incorporate the right balance between richness and parsimony that policymakers need to address both monetary and financial stability issues. Some economists clearly favour more pluralism in modelling approaches. For instance, Solow (2008), commenting on the state of macroeconomics, noted that his 'general preference is for small, transparent, tailored models, often partial equilibrium, usually aimed at understanding some little piece of the (macro-)economic mechanism'. As he went on to say, '(o)ne of the advantages of this alternative style of research is that it should be easier to accommodate relevant empirical regularities derived from behavioral economics as they become established'.(1)

This pluralistic approach is consistent with central banks' current modelling frameworks, which typically draw on a suite of models. One of the effects of the crisis could be to induce a different sort of pluralism in economic research as economists explore new modelling techniques to complement those already available — for instance, by borrowing tools from other sciences or fields. Indeed, Workshop participants suggested a number of alternative modelling paradigms, as discussed below.

#### The economy as a system of interacting agents

Some of the assumptions chosen for microeconomic foundations of DSGE models may prevent economists from taking into account the direct interaction between individuals. This was explored further in a keynote session by Alan Kirman (GREQAM, Université Aix-Marseille III).<sup>(2)</sup> In this context, the economy can be viewed as a complex system composed of different agents who do not necessarily follow the generally accepted behavioural rules, such as rational behaviour. Since agents interact with each other both directly and indirectly, behaviour at the aggregate level is intrinsically different from the average behaviour of individuals. It is difficult therefore to embed this within a model with a typical representative agent, such as standard DSGE models. Instead, it is important to understand better the network governing the interaction between agents. Both the structure and evolution of this network can have significant implications for macroeconomic performance, and the emergence of crises in particular.

This approach can be extended to other systems such as the financial sector. The recent crisis has shown that the financial system was much more complex and adaptive than economists had modelled.(3)

Some of the risks to the financial sector as a whole (or 'systemic risk') come from within the system, ie they are 'endogenous'. This contrasts with most other systems — such as ecosystems or electrical grids — in which risk is typically exogenous and unpredictable. It is the role of both financial institutions and markets to create, intermediate and manage risks across states of the world and over time. But in doing so, financial companies potentially contribute to systemic risk. Financial institutions are highly connected with each other, both directly and indirectly, domestically and internationally. Partly because of the complexity of these interlinkages, financial institutions do not always take into account the impact that their own actions might have on other financial institutions. The response of those institutions can in turn create adverse feedback loops within the system.<sup>(4)</sup>

This 'network risk' has been particularly difficult to trace. That in part reflects inadequate data on the connections between financial institutions, which in turn partly reflects the low frequency of severe stress episodes during which those connections are typically revealed. But it also reflects a lack of information on how domestic financial systems are joined together globally.<sup>(5)</sup>

Initiatives are, however, already under way to improve our understanding of this 'network risk'. Efforts are being made to improve both the quantity and quality of data available to market participants and authorities. This will provide a better snapshot of the structure of the network, making it easier to spot potential weak points. In addition, economists have drawn on network techniques from other disciplines — such as ecology or epidemiology - to understand how characteristics of the financial network structure (such as the degree of interconnectedness between financial institutions) can influence the impact of shocks and how they spread. While this strand of work is fairly new, it typically shows that tipping points exist at which robust systems can suddenly swing into fragility.(6)

#### The challenges in quantifying systemic risk

Network models typically include limited modelling of the behaviour of financial institutions, and in particular banks. As a result, they have limited ability to track or explain various sources of risks (eg credit risk, market risk, interest income risk)

<sup>(1)</sup> The article by Solow (2008) is a response to Chari and Kehoe (2006) on how modern macroeconomic theory has been shaping policy

<sup>(2)</sup> See Kirman (2010).

<sup>(3)</sup> These systems are 'complex' in the sense that they are made up of multiple, interconnected elements, and 'adaptive' because they can change and learn from experience. The ecosystem is an example of a complex adaptive system. Haldane (2009) explores what other disciplines that use models based on similar complex networks can tell us about financial systems.

<sup>(4)</sup> For an analysis on the sources of systemic risk, see Bank of England (2009a).

<sup>(5)</sup> For more on authorities' needs regarding data on interconnections within the financial system, see page 46 of Bank of England (2009b). (6) The financial sector is typically modelled as a set of nodes (representing individual

institutions) interlinked by a network of counterparty exposures. Each node, which represents an individual financial institution, is endowed with a very simplified balance sheet. See Gai and Kapadia (2010) or Haldane (2009) on financial networks.

faced by banks, how they interact and how they affect the real economy. To complement the results of network models, policymakers are developing suites of partial-equilibrium models of the banking sector, which can be used to track overall risks in the system over time or run system-wide stress tests to assess its resilience to specific adverse scenarios.<sup>(1)</sup>

One of the main modelling challenges is to account for some of the systemic feedback and contagion effects that emerged during the crisis. For instance, banks sought to raise their liquidity buffers as the crisis deepened and uncertainty increased, and this had a snowballing effect on the liquidity available to the system as a whole. Some recently developed models (for example, the Bank's Risk Assessment Model for Systemic Institutions (RAMSI)) attempt to include several of these feedback effects even though those are still difficult to validate statistically.<sup>(2)</sup> In contrast to most system-wide stress tests that were developed before the crisis, which did not typically include systemic feedbacks, these new models can actually generate system-wide instability. But while these various models have led to promising results, it is too early to say which one(s), or which combination, could become the central organising framework for central banks' assessment of systemic risk in the future.

## The limits of statistics and the importance of embedding uncertainty in central banks' models

New models can enhance our understanding of economic behaviour but it is optimistic to believe that they will generate the certainty available in other sciences. Unfortunately, as emphasised by Aikman *et al* (2010), 'policymakers are often expected to anticipate the unpredictable'.

In a keynote presentation, Andrew Lo (Sloan School of Management, Massachusetts Institute of Technology) argued that while disciplines such as physics can derive laws that satisfactorily account for the overwhelming majority of available evidence in the field, economics is different because it does not rest on the same level of uncertainty. Models of economic systems and financial markets simply cannot be as predictive as (most of) those in physics.

Building on Knight's (1921) distinction between risk and uncertainty, Lo developed a taxonomy to characterise uncertainty levels in order to help economists understand better the limitations of their own models.<sup>(3)</sup> Without being able to conduct controlled experiments, verifying any economic theory can only be approached indirectly. This is a major factor in what Lo termed irreducible uncertainty. The uncertainty faced by both economists and policymakers is, at best, only 'partially reducible' given the nature of both agents' behaviour and economic data. Models can be constructed that are robust in some circumstances, but they can never be expected to explain outliers or satisfactorily account for tail risk. Once uncertainty has reached irreducible levels, any model is then outside of its 'domain of validity'. In this context, 'failures' of economic models can almost always be attributable to a mismatch between the level of uncertainty and the methods/econometric tools used to manage it.

There are two potential, non-mutually exclusive, responses to this challenge. In the medium term, policymakers' objective is to develop further their understanding of economic processes and, hence, build better models to reduce uncertainty further. But in the short run, they also have to devise strategies to manage the risks that they believe cannot be fully modelled or understood. In reality, both approaches are simultaneously applied. Improving a model can be challenging but may be worth the effort. But inevitably, given the nature of economics, there will always be uncertainty. And any user of models, whether an academic or a policymaker, needs to understand the limits of what their models can be used for. The 'physics envy' that economists suffer from should ultimately help them by making them more humble about the limitations of their own models and improving their understanding of the uncertainties they face.

By running a system-wide stress test, policymakers analyse the impact of an adverse scenario at the level of the financial system, as opposed to analysing it at the level of an individual institution.

<sup>(2)</sup> For more on the Bank's RAMSI, see Aikman et al (2009). The Oesterreichische Nationalbank was one of the first to develop such an integrated quantitative framework for systemic risk analysis ('Systemic Risk Monitor') by combining standard models for market and credit risks with an interbank network model to account for the possibility of default cascades.

<sup>(3)</sup> Lo and Mueller (2010) splits uncertainty into five levels: 'perfect certainty', 'risk without uncertainty', 'fully reducible uncertainty', 'partially reducible uncertainty' and the final 'irreducible uncertainty'.

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## Monetary Policy Roundtable

On 14 July, the Bank of England and the Centre for Economic Policy Research hosted the fourth Monetary Policy Roundtable. These events are intended to provide a forum for economists to discuss key issues affecting the design and operation of monetary policy in the United Kingdom.<sup>(1)</sup> As always, participants included a range of economists from private sector financial institutions, academia and public sector bodies. At this fourth Roundtable there were four discussion topics:

- what have we learnt about inflation dynamics?
- · quantifying the effects of quantitative easing;
- global prospects and the impact on the UK economy; and
- monetary and fiscal policy.

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

## What have we learnt about inflation dynamics?

UK inflation had been elevated during the past few years, even after excluding the impact of rising energy prices. And it had been higher than many forecasters, including the MPC, had expected. That had contrasted with other economies' experiences, for instance the euro area and the United States, where inflation had been lower and where measures that exclude the direct effects of food and energy had been trending downwards. Speakers discussed what factors might account for these divergent patterns and what they might imply for the inflation outlook.

UK inflation outturns could be rationalised by the influence of factors that might prove to be temporary or by changes in the process determining inflation. Temporary factors operating in the United Kingdom included the significant exchange rate depreciation and changes to VAT. If those effects were the main explanations, then inflation could be expected to fall back as their influence waned and the role of spare capacity in pushing down inflation became more apparent. Most agreed that the exchange rate depreciation had been a key factor accounting for the relative resilience of UK inflation. It was suggested by one speaker that lags between changes in the exchange rate and consumer prices could potentially be quite long: history indicated that it took some time for prices to adjust to the levels charged by overseas competitors following major shifts in the exchange rate. Others argued that the lags from the exchange rate to CPI inflation were variable and would depend on the circumstances that applied at the time. Ultimately, the impact on inflation would depend on the reason for the change in the exchange rate.

It was also noted that the level of spare capacity might be lower than many currently judged. In particular, the financial crisis might have impaired potential supply by more than had been expected. Furthermore, the effect of a given level of spare capacity on inflation might have changed. Alternatively, inflation expectations may have risen.

The existence of slack in parts of the economy was clear, notably in the labour market. It was more difficult to assess spare capacity within businesses. Assessing how capacity might be affected by firms' decisions to 'mothball' some parts of their operations presented a particular challenge.

International evidence pointed to spare capacity having its expected effect in bearing down on inflation. So, for some, this was evidence that spare capacity was having a similar impact in the United Kingdom, and that this would become apparent once the effects of the temporary factors pushing up inflation had worn off. An increase in inflation expectations was a risk, nonetheless. Certain survey evidence had pointed to some crystallisation of that risk, but that might have reflected temporary moves in actual inflation.

Although inflation had been persistently above target recently, the statistical properties of inflation pointed to a significant reduction in the persistence of inflation over time. This was an important feature of inflation dynamics and had changed across different monetary regimes. In particular, lower inflation persistence seemed to coincide with inflation targeting. If that was due to a better anchoring of inflation

Roundtables are held twice a year: the next Roundtable is scheduled for December 2010.

<sup>(2)</sup> This summary was originally published on the Bank of England's website on 23 August 2010. For both this and previous summaries, see www.bankofengland.co.uk/publications/other/monetary/roundtable/index.htm.

expectations it highlighted the importance of keeping inflation expectations fixed around the inflation target.

## Quantifying the effects of quantitative easing

More than a year had passed since the Bank had begun its programme of quantitative easing (QE). Attempts to quantify the precise impact of QE had been hampered by the lack of an observed counterfactual: what the economic and financial environment would have been like had QE not taken place. Participants identified two main transmission mechanisms through which QE could have affected the economy: by influencing gilt yields and other asset prices; and by increasing the money supply.

Participants noted the inconsistency between the perception that shocks to the supply of and demand for gilts could have had local effects on the yield curve and the predictions from most standard economic models. But if, for example, markets consisted of investors with preferences for specific maturities in addition to risk-averse arbitrageurs, then demand and supply shocks could affect gilt yields by changing the price of risk. In general, discussants agreed that QE had had a clear impact on gilt yields, as they had fallen markedly around QE announcements. The immediate reaction of individual gilts to QE announcements in 2009 also seemed to suggest segmentation: gilt-OIS spreads had decreased significantly more for gilts included in the QE purchase range than outside it, although the effects had lessened over time.

There was, however, a range of views among discussants about the exact impact of QE on gilt yields. In a recent Bank of England Working Paper that had examined the reaction of market prices over a relatively short interval around each QE announcement, the authors had concluded that QE might have depressed gilt yields by around 100 basis points.<sup>(1)</sup> There was a range of uncertainty around these calculations, as estimated effects of QE from event studies were inevitably sensitive to the chosen interval for evaluating the policy. Some participants thought that this estimate might have been too large, and that the impact of QE had been confined to temporary flow effects. Gilt yields and gilt-OIS spreads had edged up since Autumn 2009 which lent some support to that argument. Others believed that the true impact of QE had been larger than the Bank's estimate, as UK gilt yields had been lower than those in other countries with similarly high projected government debt issuance. Some remarked that QE could have caused interest rates first to fall and then to rise, if it had served to increase growth prospects or had led to higher inflation expectations.

The reduction in government bond yields should have had an impact on the interest rates faced by the private sector. But it was noted that falls in long-term interest rates would have been likely to affect firms more than households, as businesses had tended to issue longer-term debt while households had been more exposed to short rates. There was some consensus that QE had affected corporate bond yields, as they had fallen around the time of QE announcements as well, and that it had aided the recovery in equity prices. QE was also thought to have played a role in the recent pickup that had been seen in equity and corporate bond issuance.

Some participants thought that QE had boosted the supply of money as broad money growth had not decreased by as much as might have been expected given how much nominal spending had fallen. There was some evidence that those who had sold gilts to the Bank of England may have been buying banks' equities and long-term debt with the proceeds. This would have reduced deposits, but would have been beneficial for the economy as it would have increased banks' capital and so lessened the pressure on banks to shed assets. Other participants expressed some concerns about the fact that broad money growth had still fallen after QE.

Participants discussed the potential future impacts of withdrawing the current level of monetary stimulus. Participants welcomed clarification on the approach to exit given during the Governor's Mansion House speech. It was likely that the MPC would use Bank Rate as the active instrument, raising it first, before conducting asset sales in an orderly programme over a period of time. A reasonable benchmark for the impact of asset sales was that they would be the mirror of QE asset purchases, but several arguments were advanced by participants as to why this might not be the case. First, the extent of banking sector impairment, which might have diminished the effect of QE, might be lower in future. Second, markets might interpret the announcement of any programme of sales as a signal about future Bank Rate tightening. And third, the sales might coincide with a period of strong gilt issuance by the Debt Management Office. Overall, there was broad agreement that QE would continue to be a valid monetary policy instrument if it had to be used again, even if the circumstances were different.

## Global prospects and the impact on the UK economy

In the aftermath of the financial crisis, global growth had appeared to be returning. Global output had regained its pre-crisis peak in 2010 Q1. But this had been largely due to strong growth in China and other emerging markets. Advanced economies had recovered a little, but growth had remained relatively subdued.

Joyce, M, Lasaosa, A, Stevens, I and Tong, M (2010), 'The financial market impact of quantitative easing', Bank of England Working Paper no. 393.

Some participants were relatively upbeat about the outlook for global growth. Final demand was playing its part in the recovery so far, which had not been completely accounted for by the rebuilding of inventories after sharp de-stocking during the downturn. The position of the corporate sector had looked comparatively healthy across many advanced economies, given the extent to which output had fallen. And although the fiscal retrenchment envisaged in 2011 was large, it was not unprecedented.

But leading indicators of output growth had fallen back recently, indicating that the global economy might have been losing momentum. And it was agreed that the risks to the outlook were largely to the downside. A major downside risk had arisen over the past few months as fears about the sustainability of some European sovereigns' debt positions had increased. There was also a risk that fiscal consolidation or new banking sector regulations could be implemented too quickly or be overly severe. And, as yet, there had not been a resolution to the problem of 'global imbalances'.

In the euro area, sovereign bond spreads over German bunds had picked up for a number of countries, as market participants' concerns over the sustainability of debt positions had risen. One participant pointed out that this had to be seen in the context of the remarkable compression of spreads that had occurred in the previous ten years. But any debt restructuring could give rise to a new source of solvency risk for banks. The uncertainty surrounding which banks were exposed to these problems had raised interbank rates. And one participant noted that economists did not yet fully understand issues of contagion — the degree of interconnectedness had meant that even problems in small entities could spill over and affect the entire financial system. It was essential that these problems were resolved rapidly to prevent a further slowing in growth.

Large fiscal consolidations had been announced around the world, particularly in Europe. It was considered likely that these would slow GDP growth, but there could be some helpful offset if borrowing costs fell. One participant noted that the costs of greater regulation on the banking sector would probably be small in the long run, and indeed there would be benefits as the probability of crises occurring and the economic costs of any crisis would be lowered. But the risk of another banking sector crisis could increase in the short run if rules were introduced rapidly.

Participants discussed the outlook for global imbalances. There were a range of outcomes, but three main paths were suggested by one participant. First, the world could rebalance as countries that had run current account surpluses consumed more. Second, rebalancing could occur alongside stagnation in global growth as countries which had traditionally run current account deficits grew less rapidly, with no offset from demand in surplus countries. Third, domestic demand in the United States could, with support from monetary and fiscal policy, continue to support global growth, at least in the short run, with little global rebalancing. The participant considered the third outcome most likely.

Other participants suggested that continued Asian growth would help the world rebalance. It was thought by some that greater domestic demand in Asia would allow countries to 'decouple' somewhat from advanced economies. Nevertheless, the demand provided would probably be insufficient to increase output in the rest of the world substantially.

The outlook for UK exports was dependent on the extent of the global recovery. Exports had not yet picked up and it was not clear why the United Kingdom had not seen a bigger impact from the strength of global demand in 2010 Q1 and the depreciation of sterling. Some participants thought that the financial crisis might have led to problems with exporters gaining access to credit, so businesses had increased margins to generate cash flow. But most suggested that the impact from sterling's depreciation would eventually become apparent, it was just taking time to orientate the UK economy towards the tradables sector.

## Monetary and fiscal policy

Participants debated the extent to which UK monetary and fiscal policy were co-ordinated. One view was that central bank independence in 1997 had not created a co-ordination problem. The Government set the monetary policy maker's goals, so there was no tension between the two institutions' aims. And the MPC took the Government's fiscal projections as given in its forecast. So the Chancellor could determine the policy mix, as long as the MPC's reaction function was known. The presence of an HM Treasury observer at MPC meetings allowed the Government to be informed of the reaction function. A contrary view was that there was little public evidence on how this co-ordination took place and it was possible that there was a co-ordination issue. For example, both the Government and the MPC were reluctant to discuss publicly hypothetical policy responses, which would be one route via which reaction functions could be better understood.

Participants discussed how the formation of the Office for Budget Responsibility (OBR) was likely to affect the co-ordination of monetary and fiscal policy. The creation of the OBR had the advantage of increasing confidence that the economic forecasts on which fiscal policy was based were not affected by political expediency. But the new arrangements had posed new challenges. The OBR had itself acknowledged that presenting forecasts based on the market profile for interest rates was a challenge. For one thing, such interest rate projections might embody expectations of future fiscal policy, or the likely monetary policy response to them, that the OBR did not share.

Participants debated the potential effects of fiscal policy on the economy. The decision over the appropriate degree of fiscal consolidation faced a difficult trade-off. On the one hand, there was considerable evidence that high debt and deficits pushed up long-term interest rates, and so a significant consolidation could be beneficial for growth on account of lower long-term interest rates. On the other, the contraction itself would probably reduce demand. By how much was hard to say: the range of academic estimates of the 'fiscal multiplier' was quite wide. Two factors suggested that the planned contraction in UK fiscal policy could have a larger effect than those measured historically. First, monetary policy might not be able to loosen as much to compensate. Second, many countries were contracting at the same time. In a small open economy, a contraction might normally be expected to lead to a real exchange rate depreciation and an increase in external demand. But this stimulus would be limited if many of the United Kingdom's trading partners were reducing demand at the same time.

Participants discussed the academic literature on the optimal design of fiscal policy. This literature identified several factors that policymakers needed to weigh up. On the one hand,

there was the motive to ensure that taxes were not volatile from one period to the next, because such volatility was costly for the private sector. This motive led to the optimal fiscal policy being one that did not attempt to correct for past shocks that had driven debt up. On the other hand, there were likely to be limits to either the willingness or the ability of governments to levy taxes to service ever higher stocks of debt, and so there was a motive to correct shocks to debt to prevent it from becoming unboundedly large. A third force pulling on the optimal fiscal policy was the concern that not acting to reduce government debt might crowd out private investment. Furthermore, there was the question of intergenerational equity. One perspective on this was that risk should be shared out across generations: a single generation should not be expected to bear all the costs of having the bad luck to experience a war or a financial crisis directly. Finally, the design of the optimal fiscal policy was bound up with the debate about optimal monetary policy. A very high stock of (nominal) debt might increase the perceived temptation for the government to force the central bank to reduce its real burden with a burst of inflation, a perception which could lead to rising inflation expectations.
## Speeches

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### Bank of England speeches

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

#### Patience and finance

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

www.bankofengland.co.uk/publications/speeches/2010/ speech445.pdf

Andrew Haldane discussed the roles of patience and impatience in financial decision-making, drawing on lessons from economics, history, psychology and neurology. Andrew considered how these two traits have evolved and influenced the financial system. There is ample evidence of self-improving financial cycles, with China being one example. But the United States and United Kingdom have shown increasing excess volatility and misalignment in asset markets, consistent with a self-destructive cycle of increasing impatience. Falling average holding periods of assets, high dividend payout ratios and high implied discount rates for assets are also consistent with increasing impatience. In terms of potential public policy implications, countries embarking on financial liberalisation need to walk a fine line between increased saving, investment and growth, and increased volatility and consumption, which calls for careful sequencing of financial reform. Providing incentives for longer duration of asset holdings and promoting financial pre-commitment devices such as trust and pension funds may also help curb impatience.

#### Monetary policy after the fall

Charles Bean, Deputy Governor, August 2010.

www.bankofengland.co.uk/publications/speeches/2010/ speech444.pdf

In this paper presented to the Federal Reserve Bank of Kansas City Economic Symposium in Jackson Hole, Deputy Governor Charles Bean drew some lessons from the crisis for the future conduct of monetary policy. He provided evidence that relatively low policy rates, in the United States especially, contributed modestly to the rapid growth in credit and house prices during the run-up to the crisis, and that the Great Moderation also appeared to have played a part. In both the United States and the United Kingdom, unconventional monetary policies in the form of large-scale asset purchases appeared to have met with some success in lowering longer-term yields, but he argued that it would be better to return to relying on a short-term interest rate once normal times return. He found unconvincing the argument that the target inflation rate should be increased so as to provide more room for manoeuvre, while evidence suggested that the gains from moving to price-level targeting were likely to be modest. While the case for 'leaning against the wind' (raising policy rates higher than required to meet immediate inflation objectives in order to cool a credit/asset price boom) was stronger in the light of the crisis, the collateral damage to output from a policy sufficiently aggressive to make enough of a difference was likely to be high. He concluded that deployment of a macroprudential policy toolkit focused more closely on the underlying source of credit market exuberance was more promising.

#### Monetary policy and financial stability

David Miles, Monetary Policy Committee member, July 2010.

www.bankofengland.co.uk/publications/speeches/2010/ speech443.pdf

In this speech, Professor David Miles discussed recent developments in monetary policy and argued that there are better tools than interest rates to achieve financial stability. Given that the rapid expansion in banks' balance sheets coincided with a period of historically low levels of interest rates, some have argued that monetary policy should be used to reduce the chances of banking crises in the future. Professor Miles suggested that higher capital requirements bring great economic benefit via a reduction in the probability of financial crises. Meanwhile, he found little theoretical or empirical evidence suggesting that higher capital requirements would be associated with a significant loss of output. He argued that the fragility of the banking system can be significantly reduced without incurring a large cost. Using capital requirements to help maintain financial stability and monetary policy to help maintain price stability is an efficient allocation of instruments to goals.

The contribution of the financial sector — miracle or mirage? Andrew Haldane, Executive Director for Financial Stability, July 2010.

www.bankofengland.co.uk/publications/speeches/2010/ speech442.pdf

In this speech, Andrew Haldane discussed the importance of understanding and measuring the contribution made by the financial sector to economic well-being. The contribution of the financial sector over time can be gauged from the national accounts. But the measures do not adjust for risk, which is key for a sector such as banking. Adjusting for risk would better capture the contribution of the financial sector to the economy. But even then, this would still provide no assessment of the ability of the financial system to price risk correctly. Strategies such as leveraging up of the underlying equity in the business and increasing assets held at fair value may have disguised the risks that banks assumed in their hunt for yield ahead of the crisis. Better aggregate statistics and bank-specific performance measures could help mitigate such risk illusion and distinguish productivity miracles and mirages.

#### The financial crisis reform agenda

Andrew Bailey, Executive Director for Banking Services and Chief Cashier, July 2010.

www.bankofengland.co.uk/publications/speeches/2010/ speech441.pdf

In this speech, Andrew Bailey discussed the recently announced proposals to change the arrangements for financial regulation in the United Kingdom, and the future resolution of problems in large banks.

Andrew reviewed the role of the Bank as prudential supervisor of banks pre-1997. Andrew emphasised that in its new role as a prudential regulator the Bank will focus in judging and dealing with the build-up of excessive risk in the financial system. This approach will require the exercise of skilled judgement and the ability to use that judgement to influence management and boards.

On resolution, Andrew emphasised that banks should not operate on the basis of a dependency on public money if they get into trouble. Moreover, it was a mistake to allow capital instruments for banks that do not absorb losses unless the bank enters an insolvency process. An alternative worth exploring, drawing on the tools used to restructure non-banks, is creditor recapitalisation or 'bail-in'. Such an approach could incentivise banks to hold larger loss-bearing capital buffers to insulate creditors.

## UK monetary policy — how long should 'the song remain the same'?

Andrew Sentance, Monetary Policy Committee member, July 2010.

www.bankofengland.co.uk/publications/speeches/2010/ speech440.pdf

In this speech, Andrew Sentance discussed his views on economic prospects and outlined his current policy thinking, having voted for a rise in interest rates at the June meeting of the MPC. He argued that the current economic situation was very different from the outlook facing the MPC when the current policy stance was put in place. The global economy had bounced back strongly, money spending was rising healthily in the United Kingdom, business surveys were generally positive and inflation had been running above target. He suggested that the absence of large margins of spare capacity together with the depreciation of sterling could help explain why inflation had not fallen back as expected by the MPC a year ago. To keep monetary policy in tune with these developments, there should be a gradual rise in interest rates as recovery progressed.

#### The British recovery in international comparison

Adam Posen, Monetary Policy Committee member, June 2010.

www.bankofengland.co.uk/publications/speeches/2010/ speech439.pdf

In this speech, Dr Adam Posen offered his views on UK economic recovery in a comparative context. He noted that the impact of the negative shock that hit the UK economy was not very different from that which hit similar economies and, with the exception of the United States, the subsequent recovery has also not been too dissimilar. Where the United Kingdom stands out is in experiencing rising inflation despite deflationary pressures. Dr Posen argued that it is difficult to attribute the rise in inflation in the United Kingdom solely to 'one-off' relative price shocks. Instead, he considered the possibility that the persistent overshooting of the inflation target over the past few years may have resulted in an upward creep in the public's inflation expectations. In his view, the overshooting of the inflation target is a result of the stance of monetary policy having been appropriately set to prevent a terrible downside risk such that it appears too loose if the risk does not materialise. He argued that the UK economy is tentatively in the state of recovery, but still subject to significant downside risks.

#### Why is CPI inflation so high?

Paul Fisher, Executive Director for Markets, June 2010.

www.bankofengland.co.uk/publications/speeches/2010/ speech438.pdf

Paul Fisher described two sets of factors that pushed inflation above target and set out his views on the appropriate monetary policy response. First, the downwards pressure on inflation from the recession did not appear to be as strong as it might have been. That was evident from the business surveys, which suggested the degree of spare capacity in firms was rather less than implied by the fall in output. Second, there had been a series of shocks to relative prices (from changes to the VAT rate, higher oil prices and a falling exchange rate) which combined to put temporary upwards pressure on inflation. Given the expected degree of spare capacity in the economy, and as the temporary factors boosting inflation wore off, it was most likely that inflation would fall back to below target. It was therefore not sensible to offset the recent rise in inflation by tightening policy. The Governor's speech at the Mansion House Mervyn King, Governor, June 2010.

www.bankofengland.co.uk/publications/speeches/2010/ speech437.pdf

In this speech, the Governor outlined the Bank's priorities for monetary and financial stability. For monetary stability, he said that the priority remained keeping inflation low and stable. Although for the past three years inflation had been volatile, and for much of the time above the 2% target, this could be more than accounted for by sharp changes in oil prices, VAT and the impact of sterling's depreciation. These factors had clearly led to higher inflation for a period, but, by themselves would not lead to persistent inflation. Indeed, as the fall in demand had created a significant margin of spare capacity in the economy, there was a significant risk that inflation would be dragged below the 2% target in the medium term. But there were also upside risks — especially if the period of above-target inflation led to a de-anchoring of inflation expectations. The Governor stressed that no one should doubt the determination of the Monetary Policy Committee to meet its target and it would not hesitate to withdraw stimulus when it judged necessary.

The priority for financial stability was accepting the new responsibilities announced by the Chancellor — operation of microprudential banking regulation via a new subsidiary of the Bank and macroprudential policy to mitigate risks within the financial system as a whole. The Governor highlighted two lessons from the financial crisis. First, that putting prudential regulation into the same organisation as the oversight of consumer protection and market control did not work in practice. Separating them was the right direction of reform. A second lesson was that, in a crisis, the Bank could not effectively perform its role as lender of last resort without first-hand knowledge of the health of the banks to which it might need to provide support.

The Governor explained that the Bank would bring a new culture to regulation, avoiding overly legalistic regulation and

using judgement and discretion to maintain financial stability of the banking system as a whole. Banks would face bottom-up institution-specific capital requirements, as well as system-wide policy measures that would vary over the economic cycle. A new Financial Policy Committee would make judgements on system-wide instruments.

The Governor ended by noting that it was absolutely necessary to have a framework for both monetary stability and financial stability. One without the other was not enough.

## When central banks buy bonds — independence and the power to say no

Adam Posen, Monetary Policy Committee member, June 2010.

www.bankofengland.co.uk/publications/speeches/2010/ speech436.pdf

In these comments, Dr Posen countered those who argue that large-scale purchases of government bonds or private sector securities by central banks compromises their independence from elected officials, their reputation and subsequently their counterinflationary credibility. He highlighted empirical work suggesting the only aspects of central bank independence to matter for inflation outcomes were whether the governor could be fired (without cause) and whether the central bank can be forced to purchase government bonds directly (monetise debt). 'Central bank independence is about the ability to say no to demands for bond purchases when they are economically unjustified, no more, no less.' Excessive worrying about reputations and appearances can be counterproductive. In the current environment, when the nominal interest rate is at or close to zero and the transmission mechanism is damaged, buying bonds is the only means central banks have to counter deflationary pressures. 'Getting unduly caught up in protecting the appearance of central bank independence ... will not do any good because it is not that appearance which delivers desirable results ... it will prevent pursuing the right policy option.'

# Appendices

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## Contents of recent Quarterly Bulletins

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

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

#### Articles and speeches

Speeches are indicated by (S)

#### 2007 Q1

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

#### 2007 Q2

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

- A perspective on recent monetary and financial system developments (S)
- Recent developments in the UK economy: the economics of walking about (S)

#### 2007 Q3

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

#### 2007 Q4

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

#### 2008 Q1

- Capital inflows into EMEs since the millennium: risks and the potential impact of a reversal
- Recent developments in portfolio insurance
- The Agents' scores: a review
- The impact of low-cost economies on UK import prices
- The Society of Business Economists' survey on MPC communications

- The Governor's speech in Bristol (S)
- The impact of the financial market disruption on the UK economy (S)
- The return of the credit cycle: old lessons in new markets (S)
- Money and credit: banking and the macroeconomy (S)
- Financial markets and household consumption (S)

#### 2008 Q2

- Public attitudes to inflation and interest rates
- Recent advances in extracting policy-relevant information from market interest rates
- How do mark-ups vary with demand?
- On the sources of macroeconomic stability
- A review of the work of the London Foreign Exchange Joint Standing Committee in 2007
- Sovereign wealth funds and global imbalances (S)
- Monetary policy and the financial system (S)
- Inflation and the global economy (S)
- Does sterling still matter for monetary policy? (S)
- Strengthening regimes for controlling liquidity risk: some lessons from the recent turmoil (S)
- Inflation, expectations and monetary policy (S)

#### 2008 Q3

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

#### 2008 Q4

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

#### 2009 Q1

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

#### 2009 Q2

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

#### 2009 Q3

- Global imbalances and the financial crisis
- Household saving
- Interpreting recent movements in sterling
- What can be said about the rise and fall in oil prices?
- Bank of England Systemic Risk Survey
- Monetary Policy Roundtable

#### 2009 Q4

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

#### 2010 Q1

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

#### 2010 Q2

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

#### 2010 Q3

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

### 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. 387 Shocks to bank capital: evidence from UK banks at home and away (March 2010) Nada Mora and Andrew Logan

No. 388 An economic capital model integrating credit and interest rate risk in the banking book (June 2010) *Piergiorgio Alessandri and Mathias Drehmann* 

No. 389 Liquidity-saving mechanisms in collateral-based RTGS payment systems (June 2010) *Marius Jurgilas and Antoine Martin* 

No. 390 Technology shocks, employment and labour market frictions (June 2010) Federico S Mandelman and Francesco Zanetti

No. 391 Deep habits and the cyclical behaviour of equilibrium unemployment and vacancies (June 2010) *Federico di Pace and Renato Faccini* 

No. 392 Time-varying inflation expectations and economic fluctuations in the United Kingdom: a structural VAR analysis (June 2010) Alina Barnett, Jan J Groen and Haroon Mumtaz

No. 393 The financial market impact of quantitative easing (July 2010) Michael Joyce, Ana Lasaosa, Ibrahim Stevens and Matthew Tong

No. 394 How do individual UK producer prices behave? (July 2010) *Philip Bunn and Colin Ellis*  No. 395 New insights into price-setting behaviour in the United Kingdom (July 2010) Jennifer Greenslade and Miles Parker

No. 396 Using estimated models to assess nominal and real rigidities in the United Kingdom (July 2010) *Gunes Kamber and Stephen Millard* 

No. 397 Evolving macroeconomic dynamics in a small open economy: an estimated Markov-switching DSGE model for the United Kingdom (July 2010) *Philip Liu and Haroon Mumtaz* 

No. 398 The sterling unsecured loan market during 2006–08: insights from network theory (July 2010) Anne Wetherilt, Peter Zimmerman and Kimmo Soramäki

No. 399 Liquidity costs and tiering in large-value payment systems (July 2010) Mark Adams, Marco Galbiati and Simone Giansante

No. 400 Liquidity-saving mechanisms and bank behaviour (July 2010) Marco Galbiati and Kimmo Soramäki

#### External MPC Unit discussion papers

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

#### www.bankofengland.co.uk/publications/externalmpcpapers/ index.htm.

The following papers have been published recently:

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

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

#### Monetary and Financial Statistics

Monetary and Financial Statistics (Bankstats) contains detailed information on money and lending, monetary and financial institutions' balance sheets, banks' income and expenditure, analyses of bank deposits and lending, external business of banks, public sector debt, money markets, issues of securities, financial derivatives, interest and exchange rates, explanatory notes to tables and occasional related articles.

*Bankstats* is published on a monthly basis, free of charge, on the Bank's website at:

www.bankofengland.co.uk/statistics/ms/current/index.htm.

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

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

www.bankofengland.co.uk/statistics/ms/articles.htm.

#### Financial Stability Report

The *Financial Stability Report* is published twice a year. Its purpose is to encourage informed debate on financial stability; survey potential risks to financial stability; and analyse ways to promote and maintain a stable financial system. The Bank of England intends this publication to be read by those who are responsible for, or have interest in, maintaining and promoting financial stability at a national or international level. It is of especial interest to policymakers in the United Kingdom and abroad; international financial institutions; academics; journalists; market infrastructure providers; and financial market participants. It is available at a charge, from Publications Group, Bank of England, Threadneedle Street, London, EC2R 8AH and on the Bank's website at:

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

#### **Payment Systems Oversight Report**

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

#### Handbooks in central banking

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

www.bankofengland.co.uk/education/ccbs/handbooks/ index.htm.

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

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

www.bankofengland.co.uk/markets/money/publications/ redbookjan08.pdf.

#### The Bank of England Quarterly Model

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

www.bankofengland.co.uk/publications/other/beqm/ index.htm.

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

## Cost-benefit analysis of monetary and financial statistics

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

www.bankofengland.co.uk/statistics/about/cba.htm.

#### **Credit Conditions Survey**

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

www.bankofengland.co.uk/publications/other/monetary/ creditconditions.htm.

#### **Trends in Lending**

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

Copies are available on the Bank's website at:

www.bankofengland.co.uk/publications/other/monetary/ trendsinlending.htm.

#### **Quarterly Bulletin**

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

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

#### **Inflation Report**

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

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

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

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

#### **Publication dates**

Copies of the *Quarterly Bulletin, Inflation Report* and *Financial Stability Report* can be bought separately, or as combined packages for a discounted rate. Current prices are shown overleaf. Publication dates for 2010 are as follows:

Inflation Report

#### Quarterly Bulletin

Q1	15 March	February	10 February
Q2	14 June	May	12 May
Q3	20 September	August	11 August
Q4	13 December	November	10 Novembe

#### 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	2010						
	<i>QB, IR</i> and <i>FSR</i> package	QB and IR package	IR and FSR package	QB only	<i>IR</i> only	FSR only	
United Kingdom							
First class/collection <sup>(1)</sup>	£31.50	£27.00	£13.50	£21.00	£10.50	£5.25	
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