Quarterly Bulletin

2009 Q3 | Volume 49 No. 3

BANK OF ENGLAND

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Foreword

The regular *Markets and operations* report in this edition of the *Quarterly Bulletin* reviews recent developments in global capital markets and the Bank's official operations. The report describes the continued increase in prices of most financial assets over the quarter and the improvement in conditions in bank funding markets. These developments were aided by the increased confidence of market participants that the outlook for future economic growth had improved and the risk of adverse 'tail events' had diminished. However, the prospective economic recovery remained fragile and, as a result, the actions of governments and central banks continued to be an important factor underpinning the improved sentiment in financial markets.

The financial crisis has put a spotlight on the macroeconomic environment that preceded it. A number of articles in this edition of the *Bulletin* discuss various aspects of the economic environment both before and after the start of the financial crisis.

The build-up of global macroeconomic imbalances, underpinned by large flows of capital from high-saving countries to low-saving countries, contributed to a number of vulnerabilities in the global economic system. The global growth in credit and debt leading up to the crisis was supported by these international capital flows. Similarly, these flows helped to sustain the increased leverage of financial institutions across much of the developed world and contributed to the heightened reliance of many on wholesale markets for funding. They also underpinned the creation of a large variety of financial products, the risk characteristics of which were not always fully understood. In turn, these factors contributed to the high leverage and low savings of households in many countries, including our own. These vulnerabilities were central to the nature and severity of the financial crisis that we have endured over the past two years. *Global imbalances and the financial crisis* discusses these vulnerabilities and the contribution of global imbalances to the crisis. It also discusses how these imbalances have evolved since its onset and the implications of the crisis for global imbalances going forward.

Household saving considers possible explanations for the decline in the UK saving ratio in the years before the crisis. Much of the decline prior to the crisis may be explained by falling real interest rates, looser credit conditions, rising asset prices and greater macroeconomic stability; all factors that were related to the build-up of global imbalances. The article also discusses how the weaker economic environment and the tightening in credit availability associated with the financial turbulence are likely to have altered households' views of the appropriate balance between saving and spending.

Since the start of the financial crisis, sterling has depreciated significantly. Such sharp exchange rate movements can have important implications for the prospects for UK inflation where it is important to consider the reasons behind the change in the exchange rate. *Interpreting recent movements in sterling* discusses the potential causes of the sharp fall in sterling since the

beginning of the financial crisis. There is considerable uncertainty about the precise role that different factors played in contributing to that depreciation. Nonetheless, it seems that perceived changes in the relative cyclical prospects of the United Kingdom, the risk attached to holding sterling assets and the apparent need for the UK economy to rebalance all played a role. Other shorter-term factors such as the unwinding of carry trades also appear to have affected currency markets.

Another important feature of the global economy in recent years has been the unprecedented swings in the price of oil. The rise in oil prices prior to the crisis boosted commodity-exporting countries' income. With the expenditure of oil-producing countries lagging their income, this contributed to the build-up of global imbalances. Most commentators agree that a significant part of the increase in the oil price during this period was due to rapid growth in demand from emerging market economies. However, there is less of a consensus about the role of other possible drivers, such as institutional factors and speculative activity. *What can be said about the rise and fall in oil prices* analyses the main explanations for the rise and fall in oil prices between 2003 and the end of 2008. It argues that the differing trends in demand and supply are consistent with the sustained rise in the oil price between 2003 and 2007. But the rapid rise and subsequent fall in prices in 2008 is more difficult to explain. Empirical evidence suggests that financial flows into oil markets have not been an important factor over the period as a whole, but the evidence is not sufficient to rule out the possibility that such flows might have played a role in 2008.

A core purpose of the Bank is to contribute to financial stability. This entails detecting and seeking to mitigate threats to the UK financial system. Such threats are detected through the Bank's surveillance and market intelligence functions. To improve its understanding of market participants' views about risks and the prospects for financial stability, the Bank has recently launched a formal survey which will be conducted twice a year. *Bank of England Systemic Risk Survey* reports the results of the first full survey conducted in May 2009. Survey respondents identified economic downturn, borrower defaults and pressures in funding markets as the risks they were most concerned about. The results from the survey were previously presented in the June 2009 *Financial Stability Report*. This article discusses those results in more detail.

On 8 June, the Bank of England and the Centre for Economic Policy Research jointly hosted a Monetary Policy Roundtable. This was the second in a regular series intended to provide a forum for economists to discuss key issues affecting the design and operation of monetary policy in the United Kingdom. A report in this *Bulletin* summarises the main points made by participants at the Roundtable.

Spencer Dale
Chief Economist and Executive Director — Monetary Analysis and Statistics.

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

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The contents page, with links to the articles in PDF, is available at
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Except where otherwise stated, the source of the data used in charts and tables is the Bank of England or the Office for National Statistics (ONS). All data, apart from financial markets data, are seasonally adjusted.

Recent economic and financial developments

Markets and operations

This article reviews developments in global financial markets since the 2009 Q2 *Quarterly Bulletin* up to end-August 2009. The article also reviews the Bank's official operations.

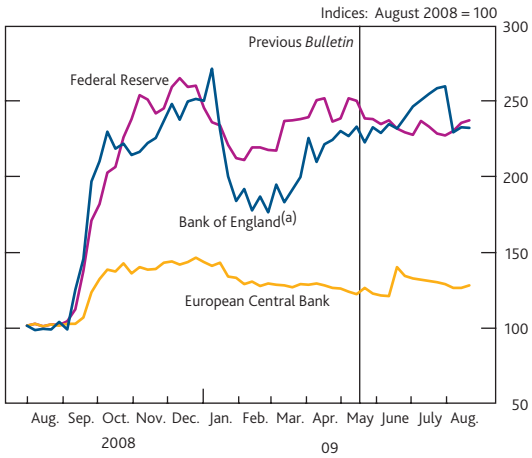
Global financial markets(1)

Overview

Most prices of risky assets rose further, continuing the recovery that began in March. This appeared to reflect increased confidence by market participants that, while economic activity had contracted by more than previously anticipated, the prospects for future economic growth had improved and the downside risks to financial markets had diminished.

The actions of governments and central banks remained an important factor underpinning this recovery in financial markets, through policies aimed at boosting nominal demand, injecting liquidity to strengthen financial system stability and through measures to support improved market functioning. At its August meeting, the UK Monetary Policy Committee (MPC) extended the size of its asset purchase programme to £175 billion. In addition, the Bank widened the scope of its Asset Purchase Facility to include secured commercial paper. Elsewhere, the European Central Bank (ECB) implemented its plan to purchase covered bonds and offered unlimited one-year refinancing operations. And the US Federal Reserve and the Bank of Japan continued with their respective programmes of asset purchases and other refinancing facilities.

Chart 1 Central bank total liabilities



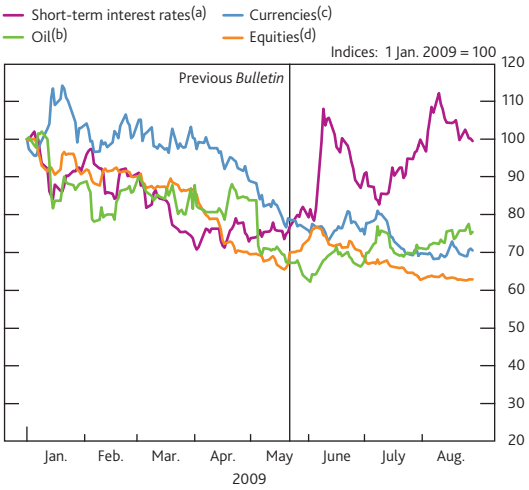
Sources: Bank of England and Bloomberg.

(a) Excludes loans and associated deposits in course of settlement.

These operations contributed to sustained increases in the size of central bank balance sheets (**Chart 1**), and accompanied a significant expansion in government balance sheets of many major economies, reflecting fiscal support measures.

Uncertainty about the future path of risky asset prices generally fell further over the quarter. However, implied volatilities on short-term interest rates rose (**Chart 2**), which could reflect increased uncertainty about the timing and pace at which accommodative monetary policy measures might be withdrawn.

Chart 2 International twelve-month option-implied volatilities



Source: Bloomberg.

(a) Average for sterling Libor, Euribor and US dollar Libor.
(b) WTI crude oil.
(c) Average for euro-US dollar, euro-sterling and sterling-US dollar exchange rates.
(d) Average for FTSE 100, DJ Euro Stoxx 50 and S&P 500 indices.

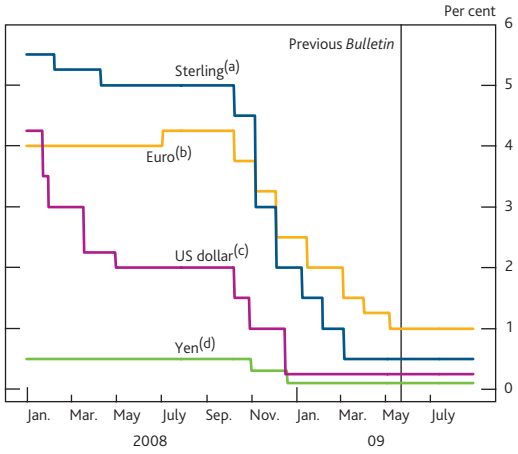
Recent developments in international capital markets

Monetary policy implementation

Monetary policies in most major economies remained stimulative. Given their forecasts for, and continued uncertainties about, the macroeconomic outlook, many central banks maintained official interest rates at low levels (**Chart 3**).

(1) The data cut-off for this section is 28 August.

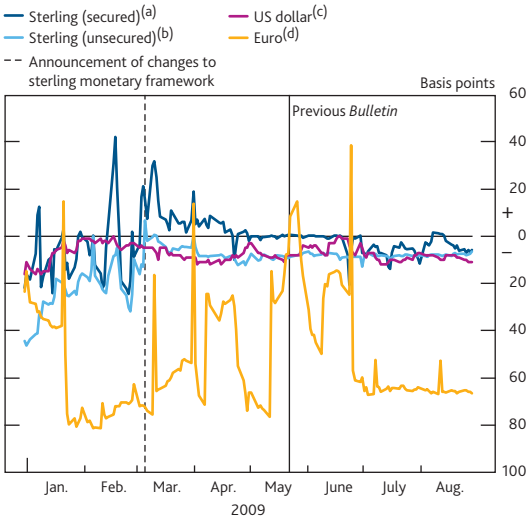
Chart 3 International official interest rates



Source: Bloomberg.

(a) Bank Rate.
(b) ECB main refinancing rate.
(c) Federal funds rate. From December 2008 the series is the upper bound of the Federal Reserve's current 0%–0.25% target range.
(d) Bank of Japan uncollateralised overnight call rate.

Chart 4 Spread of overnight interest rates to policy rate



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

(a) Spread of weighted average secured overnight rate to Bank Rate.
(b) Spread of weighted average unsecured overnight rate to Bank Rate.
(c) Spread of weighted average unsecured overnight rate (Fed funds effective rate) to the rate at which the Federal Reserve remunerates reserves holdings (also the upper bound of the Federal Reserve's 0% to 0.25% target range).
(d) Spread of weighted average unsecured overnight rate (EONIA) to policy rate.

In addition, central banks continued to undertake unconventional monetary policy measures. The wide range of policies adopted since the failure of Lehman Brothers in 2008 reflected differences in the objectives of each policy measure. These included supporting market functioning, injecting liquidity to strengthen financial system stability and increasing the supply of money to boost nominal demand.

In the United Kingdom the MPC voted at its meeting on 6 August that it would further extend its programme of asset purchases from £125 billion to a total of £175 billion, to be completed by the time of its November meeting. More details of these asset purchases are provided on pages 168–71.

The ECB, following their pre-announcement on 7 May, began its purchase programme of covered bonds, the aims of which were to ease funding conditions, encourage lending and improve market liquidity. And on 24 June the ECB offered its first unlimited twelve-month refinancing operation, in which it lent €442 billion. In the United States and Japan, the respective central banks continued their programmes of asset purchases.

Short-term interest rates

The implementation of unconventional monetary policy initiatives, particularly those injecting extra central bank reserves, tended to push down overnight market interest rates. These rates typically traded below policy rates in the United Kingdom and the euro area and within the US Federal Reserve's target range of 0–25 basis points (**Chart 4**).

In the United States, asset purchases injected reserves in excess of required reserve balances and contractual clearing balances. Over the period, the Federal Reserve banks paid interest of 0.25% on depository institutions' balances.

However, not all money market participants were eligible to be paid interest by the US Federal Reserve and overnight interest rates tended to trade below 0.25%.

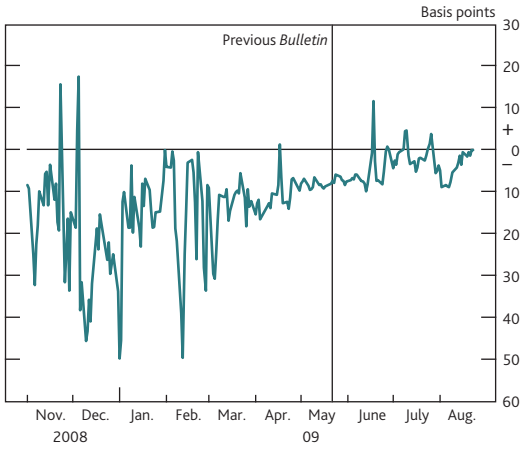
In the euro area, the ECB's twelve-month refinancing operation injected considerable excess reserves. This resulted in overnight market interest rates tending to trade between the ECB's policy rate and the rate paid on the marginal deposit facility where the excess reserves were placed.

In the United Kingdom, where since 5 March all reserves balances held by commercial banks at the Bank were remunerated at Bank Rate, sterling overnight interest rates generally traded close to Bank Rate. But have mostly been lower since mid-June.

For most of the period, sterling unsecured overnight interest rates continued to be lower than corresponding secured overnight interest rates (**Chart 5**). Banks might usually be expected to charge a premium for the credit risk associated with unsecured interbank lending compared to a secured transaction of equivalent maturity. However, as noted in previous *Bulletins*, money markets are to some extent fragmented. For example, some institutions are generally only able to participate in the secured repo markets, while other institutions may predominantly be active in unsecured markets. This may mean that there are in practice a number of market participants unable to utilise the unsecured market to finance secured lending and so earn a 'risk-less' spread.

Near-term expectations of future overnight rates, as indicated by overnight index swap (OIS) rates, fell reflecting perceptions

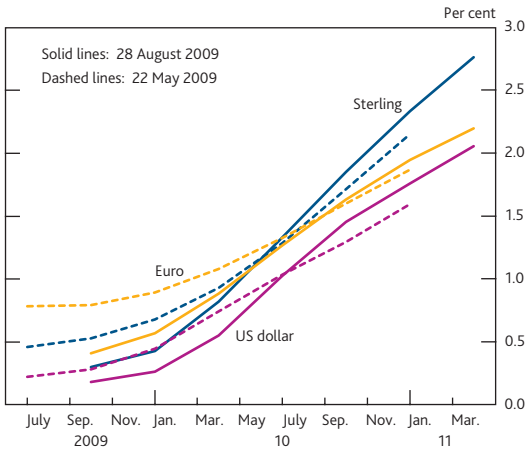
Chart 5 Spread between secured and unsecured sterling overnight interest rates



Sources: BrokerTec and Bank calculations.

that central banks would maintain official interest rates at low levels at least into 2010 Q1. However, expectations for the latter part of 2010 and for 2011 rose, and so OIS curves steepened internationally (**Chart 6**). At least in part this was likely to reflect expectations for quicker increases in future policy rates once central banks in the major economies start to withdraw their monetary stimulus. Similarly, against the background of surveys suggesting upward revisions to GDP growth forecasts for 2010 (**Chart 7**), Reuters' surveys indicated that the future paths for expected policy rates steepened, although by less than implied by the profile of market interest rates.

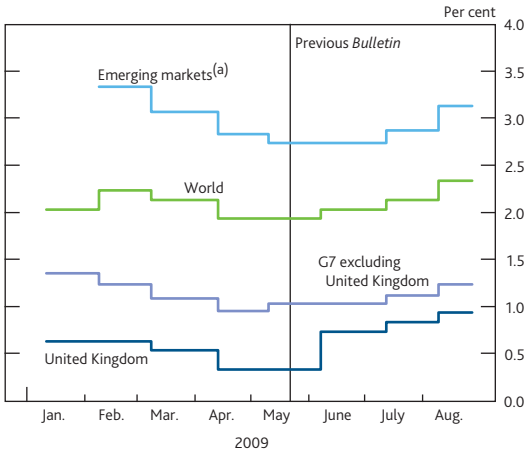
Chart 6 OIS forward rates



Sources: Bloomberg and Bank calculations.

One possible explanation for the larger increase in market interest rates may have been increased uncertainty about future official rates and hence greater term premia, possibly linked to uncertainty about the timing and execution of policy tightening. Perhaps consistent with that, short-term interest rate option-implied volatility generally rose at horizons of six and twelve months (**Chart 8**).

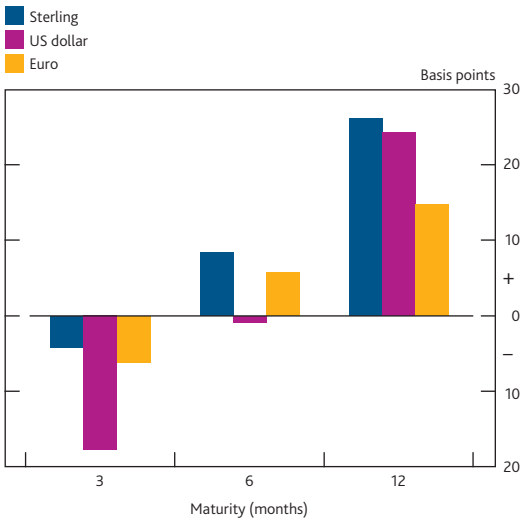
Chart 7 Expected real GDP growth for 2010



Source: Consensus Economics.

(a) Simple average of GDP forecasts for Asia Pacific excluding Japan, Eastern Europe and Latin America.

Chart 8 Changes in short-term interest rate implied volatility since previous *Bulletin*



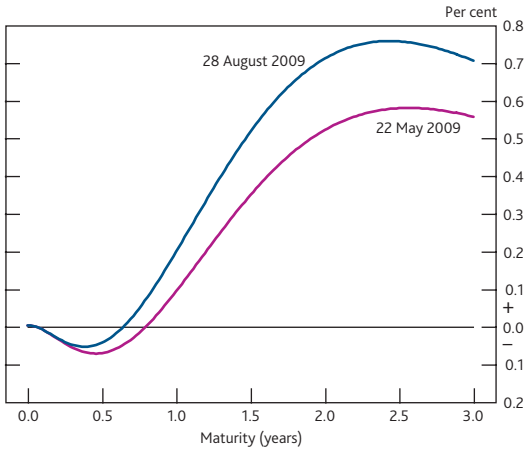
Sources: Bloomberg and Bank calculations.

These short-term interest rate options reference London interbank offered rates (Libor), however. This means the pickup in implied volatility could be due to uncertainty about the Libor-OIS spread (ie the additional risk premia embedded in Libors) rather than uncertainty about expected future policy rates. One way to gauge uncertainty about future policy rates is to employ a model-based decomposition of the yield curve at short horizons.(1) Such a decomposition would seem to indicate that term premia on sterling short-term OIS rates may indeed have risen over recent months (**Chart 9**).

Another factor influencing the steepness of the OIS curve may have been a positively skewed distribution of possible future

(1) For information on empirical term structure models, see 'Recent advances in extracting policy-relevant information from market interest rates', 2008 Q2 *Quarterly Bulletin*, pages 157–66.

Chart 9 Model-derived term premia for sterling short-dated interest rates[a]

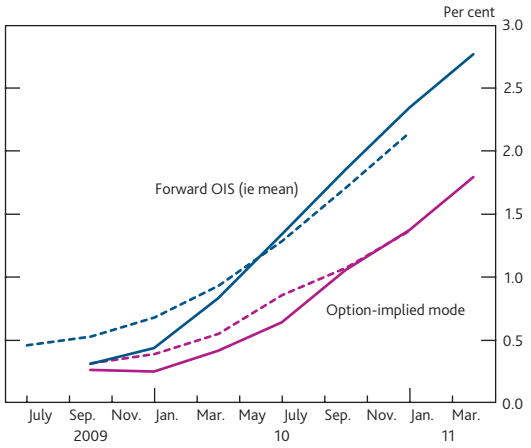


Source: Bank calculations.

(a) For more details on how term premia can be estimated, see Joyce, Lildholdt and Sorensen (2009), 'Extracting inflation expectations and inflation risk premia from the term structure: a joint model of UK nominal and real yield curves', *Bank of England Working Paper no. 360*.

policy rates given that in practice nominal rates are likely to be constrained to be at least zero. Indeed, an estimated modal expectation for sterling OIS rates (**Chart 10**), which reflects the most likely outcome, was some distance below the mean expectation (see box on pages 158–59 for more details on deriving probability distributions for OIS rates). Moreover, the degree of skewness of the indicative implied distribution for twelve-month OIS rates increased somewhat over the quarter.

Chart 10 Sterling OIS forward and option-implied modal interest rate curves[a]



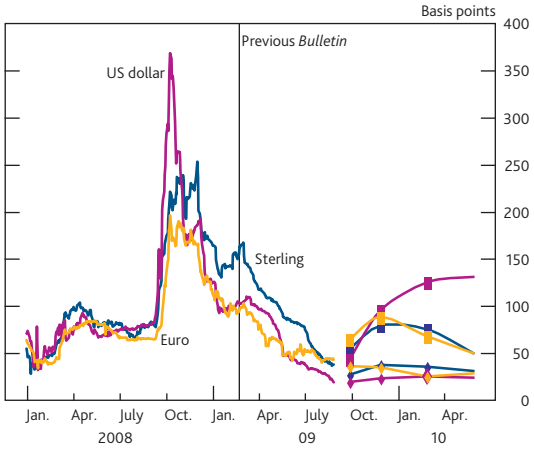
Sources: Bloomberg and Bank calculations.

(a) Solid lines refer to data as at 28 August. Dashed lines refer to 22 May.

Bank funding markets

Conditions in domestic interbank funding markets reportedly continued to improve over recent months. Libor fixings (the most widely used benchmark for interbank rates) fell further and the spread between term Libors and equivalent-maturity OIS rates narrowed to their lowest levels since March 2008, prior to the collapse of Bear Stearns (**Chart 11**).

Chart 11 Three-month Libor-OIS spreads[a][b]



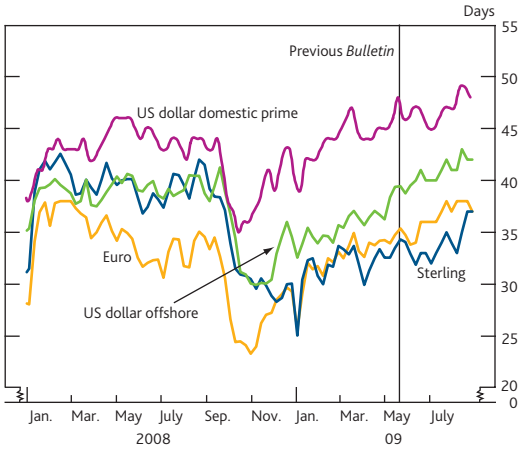
Sources: Bloomberg, British Bankers' Association and Bank calculations.

(a) Forward spreads derived using data as at 28 August.
(b) The squares are implied forward spreads using forward Libors derived from spot Libor rates. The diamonds are implied forward spreads using forward Libors derived from forward rate agreements.

Forward spreads implied by derivatives settling on Libor (forward rate agreements) suggested that three-month Libor-OIS spreads were expected to stay close to their end-August levels. However, forward spreads inferred from spot Libor rates of different maturities continued to suggest otherwise, implying that term premia on longer-term Libor fixings remained elevated (**Chart 11**). This indicates that banks wishing to borrow for longer maturities were not necessarily benefiting in full from the reductions in expected three-month Libor fixings.

Moreover, contacts suggested that interbank lending volumes remained low, even relative to levels seen prior to the failure of Lehman Brothers in September 2008. And though money market funds increased the maturities at which they were prepared to lend (**Chart 12**), contacts said that lending at maturities greater than three months remained patchy.

Chart 12 Money market funds' assets weighted average maturity



Source: iMoneyNet.

Contacts suggested that one possible driver of the reductions in Libors related to improved perceptions about the

An indicative decomposition of the option-implied probability distribution for Libor

Forward overnight index swap (OIS) rates are typically thought to provide the best estimates of the mean expectation for Bank Rate. In fact, OIS forward rates represent the mean of the risk-neutral probability distribution of possible outcomes for future unsecured overnight interest rates, which typically trade close to Bank Rate. This distribution will differ from that actually held by market participants to the extent that investors demand compensation for uncertainty surrounding future outturns for overnight rates. That is, OIS rates may include term premia.

Moreover, if the perceived distribution of possible outcomes is skewed such market-based estimates of mean expectations will not coincide with expectations of the most likely outcome, ie modal expectations. In particular, if nominal rates were in practice constrained to be at least zero per cent, then the distribution of future possible overnight rates is likely to be positively skewed, with the mode some distance below the mean.(1)

While maintaining a risk-neutral set-up, this box sets out a way of using financial prices to provide an indicative market-based measure of the probability distribution around future overnight rates and hence Bank Rate.

Option prices can often be used to infer market participants' views about the distribution of possible outcomes for future asset prices. But unfortunately options on OIS rates are not available. Instead, short-term interest rate options refer to the London interbank offered rate (Libor). And that means that the implied probability distributions that the Bank regularly produces will reflect both market expectations of future Bank Rate and the premium which compensates investors for the credit and liquidity risk associated with interbank lending.

Nevertheless, options on Libor can still be informative. Libor can be thought of as comprised of two parts: the OIS rate and the Libor-OIS spread. That is, *Libor* = OIS + (*Libor-OIS*). In a similar way, a probability distribution for Libor can be seen as combining the distributions for these two components.

The following process can be used to produce a simple, indicative decomposition of the option-implied probability distribution for Libor, into distributions for OIS rates and the risk premia in Libor (ie the Libor-OIS spread).

Step 1 — choose candidate underlying distributions for the OIS rate and the Libor-OIS spread. This requires an assumption about their functional forms. In practice, these distributions should be bounded below by zero. For simplicity they are both assumed to be independently log-normally distributed, with means equal to the forward OIS rate and the forward Libor-OIS spread.

Step 2 — aggregate together the OIS rate and Libor-OIS spread distributions assumed in step one to give the distribution of the sum:

OIS + (*Libor-OIS*).

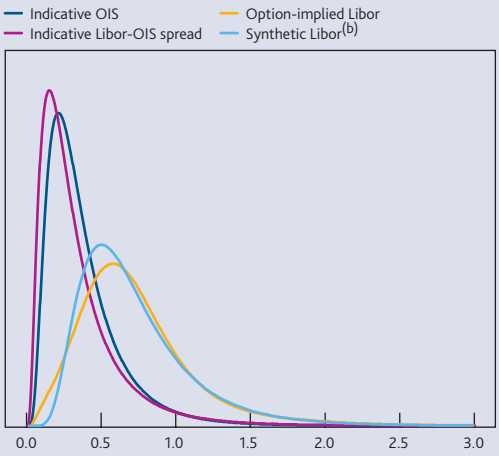
This uses a mathematical operation called a convolution.

Step 3 — compare the aggregate distribution from step two to the option-implied Libor distribution.(2)

Step 4 — iteratively search through different combinations of the distributions for OIS rates and Libor-OIS spreads, to find the combination that best replicates the option-implied Libor distribution.(3) That combination comprises the indicative distributions for OIS rates and Libor-OIS spreads.

Chart A shows the decomposition for three-month Libor in December 2009 on 28 August. The dark blue line represents the indicative OIS rate distribution. The positive skew means that the modal OIS expectation was approximately 5 basis points below the mean expectation. The magenta line shows the indicative distribution for the Libor-OIS spread.

Chart A Option-implied probability distributions for three-month Libor, OIS rates and Libor-OIS spreads(a)



Source: Bank calculations.

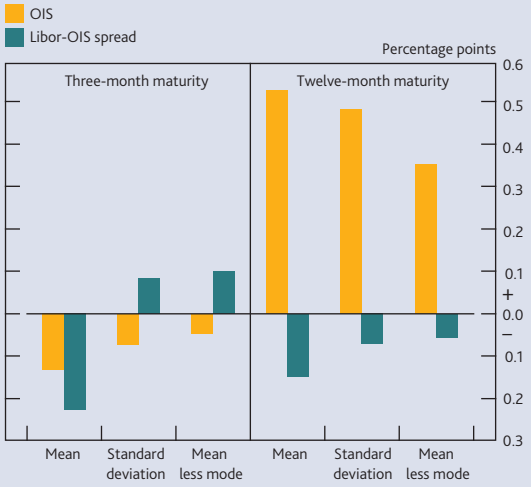
(a) Based on options on the December 2009 Libor futures contract.
(b) Aggregate of indicative distributions for OIS rates and Libor-OIS spreads.

The light blue line is the synthetic Libor distribution formed by aggregating the dark blue and magenta lines. This seems to broadly mimic the usual option-implied Libor distribution, shown by the yellow line in the chart.(4) But the fit is clearly not perfect and as a result any inferences about the estimated probability distribution can only be indicative.

Although only indicative, this decomposition can potentially provide a useful framework for apportioning the amount of uncertainty around future interbank interest rates into that driven by the uncertainty around Bank Rate and that driven by the uncertainty around the Libor-OIS spread. It also provides a consistent framework for measuring the difference between mean and modal market expectations of Bank Rate (a measure of the skewness of the implied distribution for future OIS rates), and how that difference has evolved over time.

Chart B compares the change between 22 May and 28 August in the estimated three-month and twelve-month distributions for sterling OIS rates and Libor-OIS spreads. It suggests that while the falls in sterling three-month Libor over this period were driven by falls in both OIS rates and Libor-OIS spreads, the shapes of the estimated probability distributions for three-month OIS rates and Libor-OIS spreads were both broadly unchanged. In contrast, the pickup in twelve-month forward Libors and OIS rates was accompanied by a widening and an increase in skew of the estimated distribution for OIS rates, while the distribution of the Libor-OIS spread was little changed. This perhaps suggests investors became more uncertain about future Bank Rate at that horizon than about the additional risk compensation embedded in Libors.

Chart B Changes in the implied distributions for OIS rates and Libor-OIS spreads since previous *Bulletin*

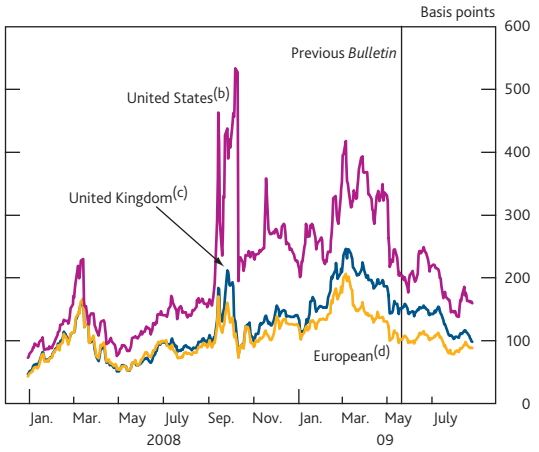


Source: Bank calculations.

(1) This issue was discussed in the box 'Assessing expectations of Bank Rate' in the August 2009 *Inflation Report*, page 41.
(2) Distributional similarity is measured here using the Kolmogorov-Smirnov statistic.
(3) Because each log-normal distribution is defined with two parameters, and there are two restrictions, this iterative search represents a constrained optimisation over the two remaining degrees of freedom.
(4) As is true here, the convolution of two density functions can look quite different from each individual density function. For example, if one knew that both the OIS rate and Libor-OIS spread in three months' time would lie between 0.25% and 0.75%, this would imply a Libor rate between 0.5% and 1.5% — that is, the Libor distribution would be twice as wide as the individual OIS and Libor-OIS spread distributions, and have a possible maximum (1.5%) twice as big.

creditworthiness of financial institutions, as evidenced by falls in international banks' credit default swap (CDS) premia (**Chart 13**), and hence lower required risk compensation for interbank lending.

Chart 13 Major international banks' credit default swap premia[a]



Source: Markit Group Limited.

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

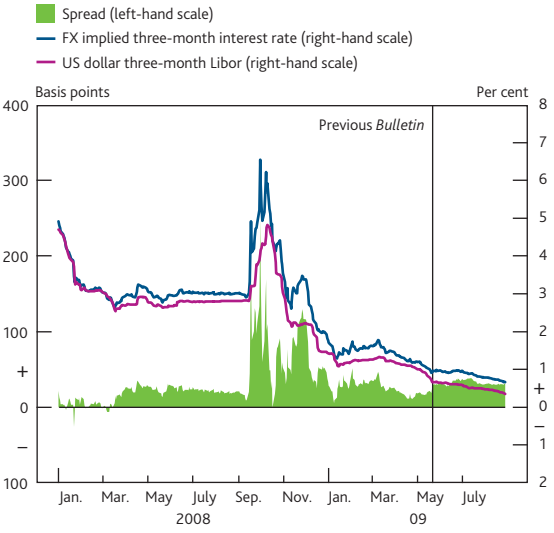
But falls in CDS premia do not seem to explain fully the falls in Libor fixings. Market contacts suggested central bank asset purchases and refinancing operations possibly contributed to lower Libor fixings. Though an imperfect substitute for interbank lending, the recent increase in banks' holdings of central bank reserves may have led to an easing in banks' required funding through interbank markets.

Conditions in cross-currency swap markets also remained more stable than during the acute period of stress in interbank funding markets that occurred towards the end of 2008. This improvement coincided with reduced demand for the Bank's US dollar refinancing operations. But the spread between the implied interest cost of borrowing US dollars via cross-currency swaps and US dollar domestic Libor remained elevated compared to historical levels (**Chart 14**).

As well as reflecting a residual risk premium linked to the possibility of future US dollar funding shortages, contacts also suggested an increase in the supply of euros (perhaps as a result of official operations) may have contributed to the continued relative high cost of swapping euros into US dollars. In addition, balance sheet constraints among financial institutions still reportedly prevented them exploiting the apparent arbitrage opportunity to eliminate or at least narrow the relative cost of offshore and onshore US dollar funding.

Conditions in banks' longer-term funding markets continued to improve. In the United Kingdom, the volume of unguaranteed

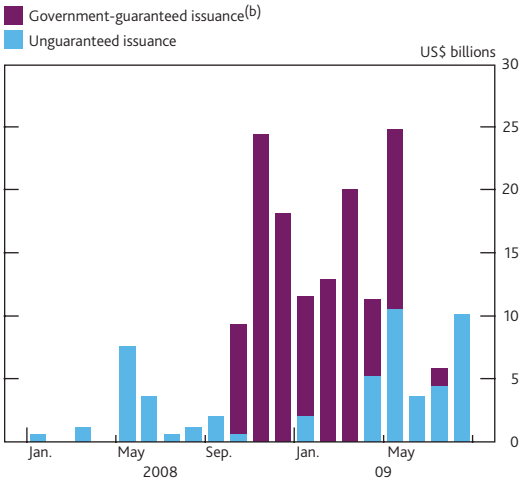
Chart 14 Three-month US dollar Libor rates and implied three-month rates from exchange rate forwards[a]



Sources: Bloomberg, Reuters and Bank calculations.

(a) For more details, see 2008 Q2 *Quarterly Bulletin*, page 134, Chart 26 and BIS *Quarterly Review*, March 2008, pages 73–86.

Chart 15 UK bank senior debt issuance[a]



Source: Dealogic.

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

debt issuance increased, reflecting reports of improved investor demand for unguaranteed debt (**Chart 15**).

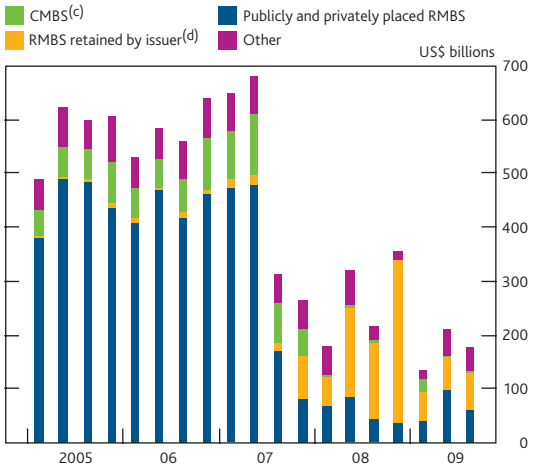
Robust investor demand helped narrow spreads for unguaranteed bank debt, reducing the cost of issuance. Contacts also suggested banks may have preferred to issue unguaranteed debt as a signal of financial soundness and to issue at maturities beyond those allowed under Credit Guarantee Scheme rules.

A number of European banks successfully completed subordinated debt issues. In addition, some banks continued to buy back or exchange subordinated capital instruments that

were trading below par, to boost core capital ratios. However, prospects for hybrid subordinated debt issuance were more uncertain. Contacts said this reflected concerns about future regulatory changes and speculated that going forward, hybrid debt would be less important in banks' capital structures.

In other bank funding markets, global issuance of asset-backed securities (ABS) remained low by historical standards (**Chart 16**). But this was partly offset by private issuance to be used in the various official schemes to provide short-term liquidity in securitisation markets. In the United States, ABS issuance under the Federal Reserve's Term Asset-Backed Securities Loan Facility (TALF) continued to make up the majority of US ABS issuance.

Chart 16 Global issuance of asset-backed securities(a)(b)



Sources: Dealogic and Bank calculations.

(a) Non-retained residential mortgage-backed security (RMBS) issuance has been proxied by issuance that is eligible for inclusion in underwriting league tables, while retained issuance has been proxied by issuance that is not eligible for inclusion.
(b) Quarterly issuance. 'Other' includes auto, credit card and student loans ABS.
(c) Commercial mortgage-backed securities.
(d) This includes RMBS used as collateral in central bank operations.

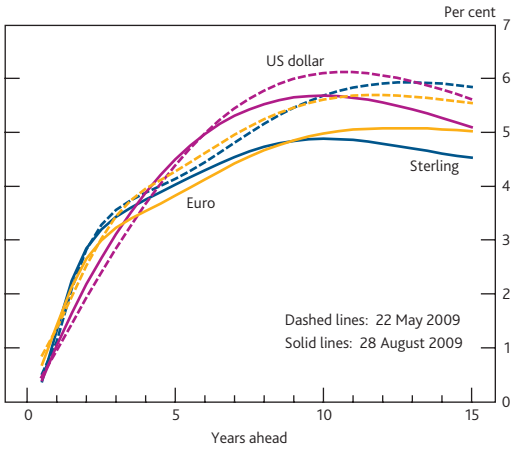
In the United Kingdom in August, the Bank launched a secured commercial paper facility as part of its Asset Purchase Facility (APF), in which the APF would stand ready to buy qualifying asset-backed commercial paper in both primary and secondary markets. And in the euro area, by the end of August the ECB had purchased 15% of its planned €60 billion of purchases of covered bonds, which market contacts thought was helpful in encouraging primary issuance and contributed to the narrowing of spreads on covered bonds.

Besides the various official policy actions to directly support ABS markets, contacts also highlighted a number of other factors, which might help foster recovery in demand for securitised instruments. These included the adoption of simpler securitisation structures, increased credit enhancement, and better-quality loan pools.

Long-term interest rates

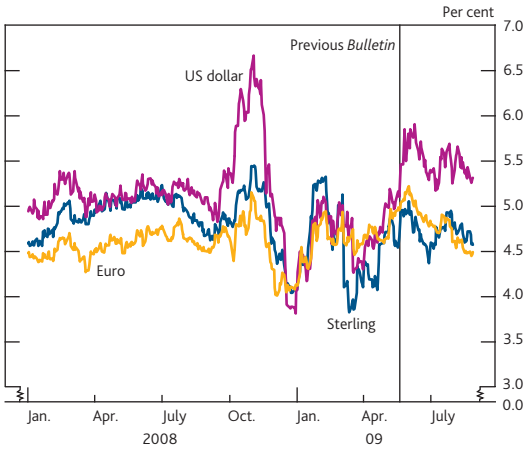
International government bond yields generally ended the period lower, particularly at longer maturities (**Chart 17**). However, long-term forward rates continued to be volatile (**Chart 18**). Contacts said this reflected the impact of various factors at different times, including news about economic activity, changes in investor risk appetite and policy announcements.

Chart 17 International nominal forward interest rates(a)



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

Chart 18 International five-year nominal interest rates, five years forward(a)



(a) Derived from the Bank's government liability curves.

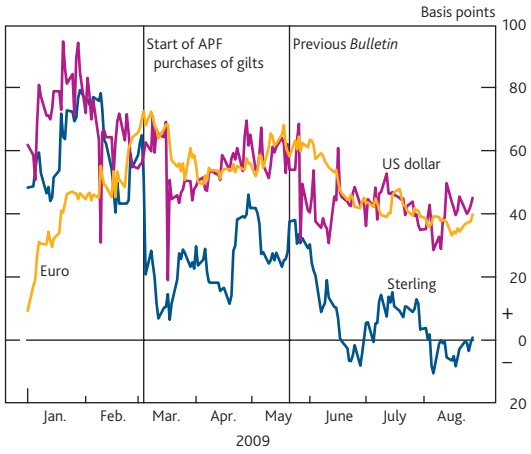
For example, yields were affected by central bank actions, such as the purchases of US Treasuries by the US Federal Reserve and gilts by the Bank of England. In the United Kingdom, gilt yields fell following the MPC's announcement on 6 August that it would extend its purchase programme by £50 billion. Gilt yields fell again following the publication of the MPC minutes on 19 August, which revealed that some members voted for a larger increase.

Official purchase schemes could be thought to affect government bond yields by inducing investors to rebalance

their asset portfolios. Specifically, central bank purchases may, in the absence of substitute assets, encourage investors to pay more for particular bonds, which, other things being equal, would reduce their yields.

Since this factor should not affect OIS rates, its impact may be evident from moves in the spread between bond yields and equivalent-maturity OIS rates (to the extent that the latter proxy default-free rates). Indeed, **Chart 19** shows that since the MPC's asset purchase programme was announced, gilt-OIS spreads have narrowed. The fact that these spreads fell further than equivalent spreads in other currencies may reflect the relatively large size of the Bank's gilt purchase programme. The MPC's £175 billion purchase programme represents around 30% of the outstanding stock of gilts, while the US Federal Reserve's intended purchase of $300 billion of US Treasuries represents less than 5% of the outstanding stock.

Chart 19 International ten-year bond yields[a] less OIS rates



Sources: Bank of England and Bloomberg.

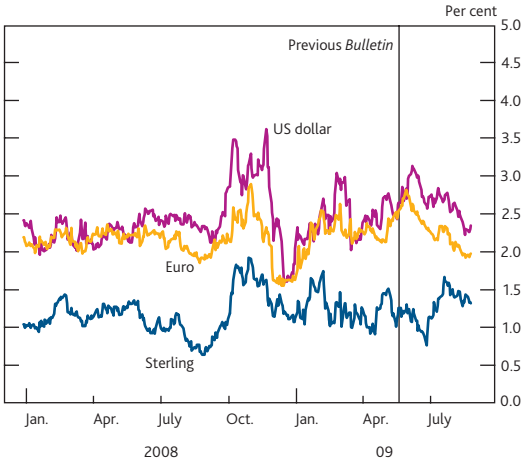
(a) Nominal ten-year spot yields.

Moves in government bond yields may also reflect changes in investors' perceptions of macroeconomic prospects (which themselves could be affected by policy announcements about the scale of asset purchases). However, contacts suggested that, in general, perceptions of the macroeconomic outlook improved over the period, which, all other things being equal, would have tended to increase bond yields.

International long-term real forward rates ended the period slightly higher in sterling and a little lower in US dollar and euro (**Chart 20**). More generally, long-term real interest rates remained relatively stable across currencies and there were few signs that the projected sharp increases in fiscal deficits in a number of countries had materially pushed up the long-term real cost of government borrowing.

Similarly, despite the significant expansion in central bank balance sheets and associated increases in base money,

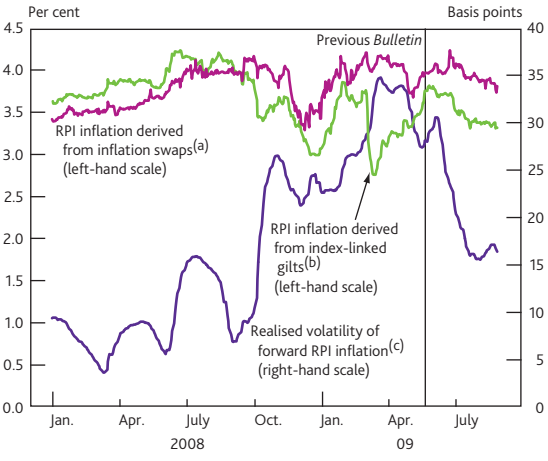
Chart 20 International five-year real interest rates, five years forward[a]



(a) Derived from the Bank's government liability curves.

long-term inflation forwards remained broadly stable internationally. Indeed, sterling inflation forwards — as implied by both index-linked gilts and inflation swaps — fell slightly over recent months. Sterling inflation forward rates were also less volatile than in previous periods (**Chart 21**), which market contacts attributed to improved liquidity conditions in inflation-linked bond markets. And a forward-looking measure derived from options prices suggested that the implied probability of extremely low or high future RPI inflation in the United Kingdom generally fell. (See box on page 163 for more discussion of this measure.)

Chart 21 Sterling five-year inflation, five years forward



(a) Derived from the Bank's inflation swap curve.
(b) Derived from the Bank's government liability curve.
(c) Rolling standard deviation of forward RPI inflation derived from the Bank's government liability curve, based on a three-month estimation window.

EME and corporate credit markets

Yields on bonds issued in emerging market economies (EMEs) and by firms in industrial economies also fell, and generally by more than interest rates on government bonds issued by the major economies. As a result, spreads on EME sovereign and both investment and non-investment grade corporate bonds

UK RPI inflation options

Options which have pay-offs linked to the level of the UK retail price index (RPI) or year-on-year RPI inflation outturns have existed for some time. But they typically trade between private counterparties (ie are 'over-the-counter') rather than on a recognised exchange and as a result, information on their prices have not been widely available. Recently, however, some investment banks have started to publish indicative prices for these types of options. This box reviews these data and what they imply about investors' views about future developments in retail prices in the United Kingdom.

RPI inflation options are the most frequently traded and take two forms: inflation caps, which pay out when annual inflation is above a pre-determined level, or 'strike'; and inflation floors, which pay out when inflation is below a pre-determined level. Prices for caps and floors are normally quoted for maturities of 3 to 30 years, with strike prices for floors typically from 0% to 3%, and for caps from 3% to 6%. In exchange for an upfront premium, the purchaser of a cap at 5% will receive an interest payment on the notional value of the option that is the maximum of zero, and the annual rate of RPI inflation minus 5%. So if the purchaser bought an option worth a notional amount of £100 million and inflation was 6% in the first year, the payout for that year would be £1 million, ie (6%–5%) * £100 million.

According to contacts, the majority of trading in RPI inflation caps and floors arises from the need for pension funds to hedge their liabilities. Specifically, a large proportion of UK pension funds' liabilities must be revalued each year by the annual RPI inflation rate — to compensate pension scheme members for any erosion in the real value of the payouts — up to a maximum of 5%. At the same time, the value of future pension liabilities cannot typically be reduced in the event that RPI inflation turns negative (ie the aggregate price level falls over any one-year period). This process of annual revaluation of liabilities is known as limited price indexation (LPI).

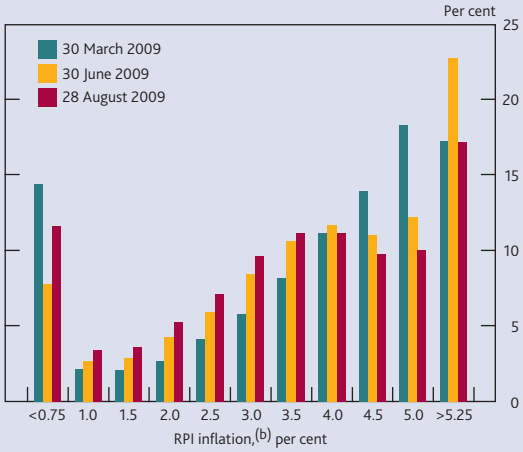
Pension funds will typically look to hedge their exposure to inflation indexation using regular RPI-linked financial instruments, such as index-linked gilts and inflation swaps. But these instruments offer an imperfect hedge should inflation increase above 5% (since the uplift in their liabilities are typically capped at that level) or if annual RPI inflation is negative (in which case their liabilities do not fall but they will have to pay out on a swap or lose principal on a bond). Hence caps and floors can be used to achieve an improved hedge against the effects on indexation of their liabilities.

There are some institutions/organisations that are natural suppliers of RPI inflation protection, such as the UK government and utility companies, whose revenues are often linked in some way to RPI inflation. But in contrast there are few natural providers of protection against some form of constrained RPI inflation (ie LPI) and therefore no natural supply of RPI inflation options. Instead, the supply of RPI floors has largely relied upon the ability of the sellers of those options to absorb the risk (given they are exposing themselves to inflation volatility). Relatedly, market activity in UK inflation caps and floors has typically been low compared to other inflation-linked products and options on other measures of inflation; notably euro-area CPI.

The general reduction in risk-taking in inflation-linked markets, particularly through 2008, reportedly led to a fall in activity in inflation option markets. This reduction in activity was exacerbated when RPI inflation became more volatile. Trading in inflation floors was also affected once it became clear that RPI inflation would turn negative in 2009 leading to losses for some market makers.

Despite the low level of market activity, prices of RPI inflation caps and floors were still quoted. Hence it is possible to use these to obtain an illustrative average implied probability distribution for annual RPI inflation. One method of achieving this is by comparing the prices of caps and floors for different strike prices at different maturities to create histograms which show the indicative (risk-neutral) probabilities attached to inflation being within the different ranges. **Chart A** shows the development of such an average indicative market-implied probability distribution for RPI inflation over 2009 at the five to seven-year horizon. In general the distribution suggests that the average probability attached to high RPI inflation outcomes fell compared with earlier in the year, while the probability attached to outcomes less than 4% generally rose. However, these developments may not solely reflect changes in the true probabilities attached to particular inflation outcomes but could arise from changes in investors' desired compensation for bearing inflation risk.

Chart A Average probability distribution of annual RPI outturns for 5–7 years ahead implied from options(a)

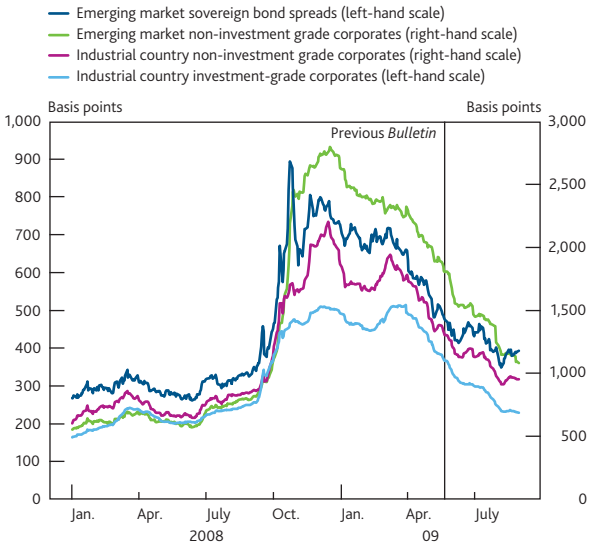


Sources: RBS and Bank calculations.

(a) Implied from prices of options on UK RPI inflation.
(b) Probability that RPI inflation will fall within a 0.5% range, centred on x-axis value (except for the distribution tails which extend for noted value onwards).

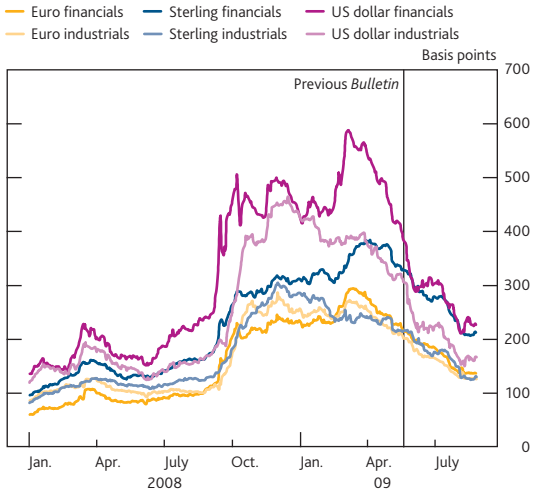
narrowed further (**Chart 22**). Among investment-grade companies, the narrowing in spreads was similar on securities issued by financial and non-financial companies (**Chart 23**).

Chart 22 International bond spreads



Sources: JPMorgan Chase and Co. and Merrill Lynch.

Chart 23 Investment-grade corporate bond spreads(a)



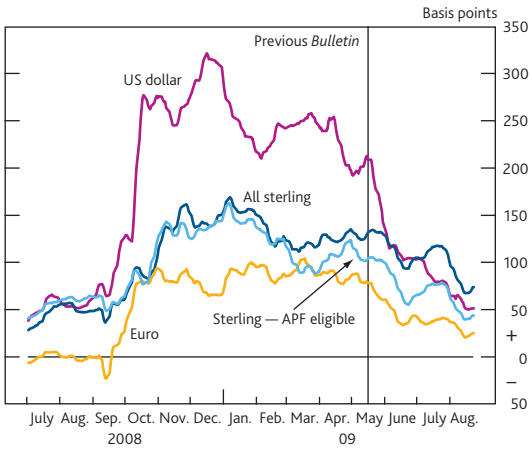
Source: JPMorgan Chase and Co.

(a) Spreads of corporate bond yields over equivalent-maturity swap rates.

According to contacts, the narrowing in credit spreads reflected perceived improvements in the macroeconomic outlook, some pickup in investor risk appetite as well as an improvement in market liquidity. Indeed, a simple model decomposition suggests that the narrowing in EME sovereign bond spreads since Autumn 2008 was more than accounted for by increased risk appetite and improved market liquidity (see box on page 165).

Consistent with improved liquidity conditions in corporate bond markets, the difference between corporate bond spreads and CDS premia — the CDS-bond basis — implied a reduction in illiquidity premia in corporate bond spreads, particularly for corporates that had issued in US dollars (**Chart 24**).(1) More generally, contacts reported improved functioning in corporate bond markets, with some increase in market-making activity.

Chart 24 Non-bank corporate bond-CDS basis(a)



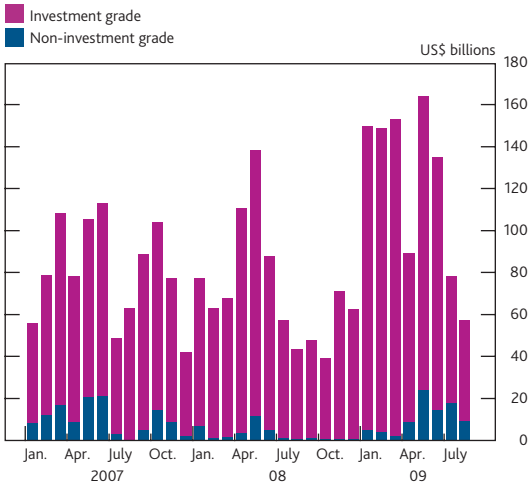
Sources: JPMorgan Chase and Co., UBS Delta and Bank calculations.

(a) Five-day moving average. Note that the US dollar series is not strictly comparable to the sterling and euro series. The sterling and euro measures are constructed as asset swap spreads less CDS premia for the median non-bank investment-grade corporate bond, whereas the US dollar series is the median of eleven different sectoral bond-CDS basis indices.

In the United Kingdom, the improvement in corporate credit conditions was aided by APF purchases of corporate bonds, with contacts noting that the reduction in gilt yields had also made corporate assets more attractive for investors.

Coinciding with stronger investor demand for corporate debt, gross bond issuance by non-financial companies remained robust into the third quarter (**Chart 25**). There was also a

Chart 25 Global non-financial corporate gross bond issuance



Source: Dealogic.

(1) See the box, 'Liquidity in corporate bond markets', August 2009 *Inflation Report*, page 16.

What might lie behind the recent narrowing in EME bond spreads?

Credit spreads on emerging market economies' (EMEs) sovereign bonds have narrowed markedly since Autumn 2008, and approached levels last seen prior to the collapse of Lehman Brothers. This box uses a simple regression model to investigate how much of this can be attributed to a better economic outlook for EMEs (and hence lower compensation for default risk) and how much reflects an improvement in the investment environment linked to an increase in risk appetite and overall market liquidity.

A model of EME bond spreads

In an earlier *Bulletin*,(1) a simple econometric model of monthly EME sovereign bond spreads was presented. This model related aggregate sovereign EME bond spreads movements to three explanatory variables:(2)

- EME economic fundamentals measured by country-weighted sovereign credit ratings (*RAT*).
- A forward-looking measure of equity price volatility (*VIX*) to proxy for investors' risk appetite.
- A measure of financial market liquidity — the short-term US interest rate.

Since then the model has been revised to include instead a broader measure of liquidity (*LIQ*).(3) Importantly, the revised model was better able to capture movements in EME bond spreads during the marked turbulence in financial markets witnessed since last autumn.

More formally, the 'new' regression model on the (log of the) EME bond spread (*LSP*) can be written as:

$$LSP_t = \alpha + \underset{(-)}{\beta_1} RAT_t + \underset{(-)}{\beta_2} LIQ_t + \underset{(+)}{\beta_3} VIX_t + \xi_t$$

where the terms in brackets represent the expected signs of the coefficients and ξ_t captures random disturbances that cannot be accounted for by the model.

Chart A shows that over the past ten years this simple model can explain movements in EME bond spreads reasonably well, including during the period of marked turbulence last autumn. Indeed the three explanatory variables accounted for 92% of the variation in spreads over this period.

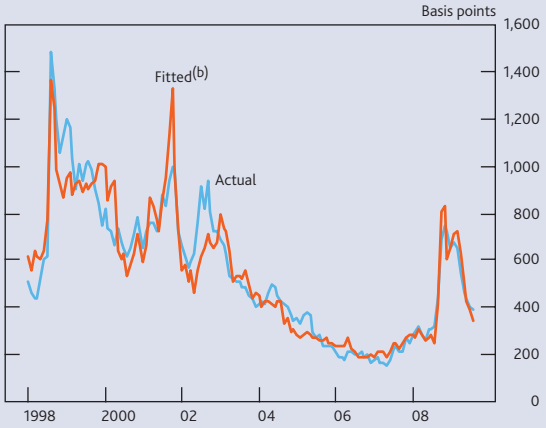
Accounting for the change in EME bond spreads

This regression model is a reduced form rather than a structural relationship, which means that it is difficult to attach a causal link between spreads and the various potential explanatory variables. That is, the model will capture the statistical comovement between variables, but will not necessarily explain why they move together. Moreover, in practice the interaction between spreads and indicators of EMEs' credit standing and financial market conditions may be more dynamic than this simple parsimonious equation would suggest. So the model should be thought of as representing the long-run or 'equilibrium' relationship between the variables.

Nevertheless, based on past empirical regularities, the model may be helpful in assessing the extent to which movements in spreads reflect changes in economic fundamentals and market conditions.

Table 1 provides the model-based decomposition of the narrowing in EME spreads since their local peak last November. It suggests that the narrowing of spreads is consistent with the increase in investor risk appetite and, to a lesser extent, in market liquidity. According to the model, these factors have more than offset the effects of the apparent deterioration in economic fundamentals over the period as indicated by ratings changes, which, other things being equal, would have tended to widen bond spreads. The role of increased risk appetite and improved market liquidity was also reflected in bond spreads narrowing most for lower-rated sovereigns.

Chart A EME bond spreads:(a) actual and fitted



Sources: Bloomberg, IMF, JPMorgan Chase and Co. and Bank calculations.

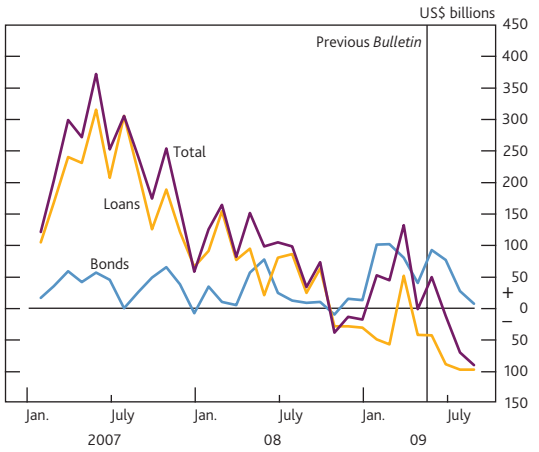
(a) Refers to the composite JPMorgan Emerging Markets Bond Index Global excluding defaulted bonds.
(b) The fitted values are based on a regression of log values of EME sovereign bond spreads on ratings, a measure of market liquidity and the VIX index over the January 1998 to August 2009 period.

Table 1 Accounting for the change in EME spreads, November 2008–August 2009

Basis points contribution of:	
Credit rating (*RAT*)	+105
Market liquidity (*LIQ*)	-175
Risk appetite (*VIX*)	-405
Unexplained	+115
Total change in actual bond spreads	-360

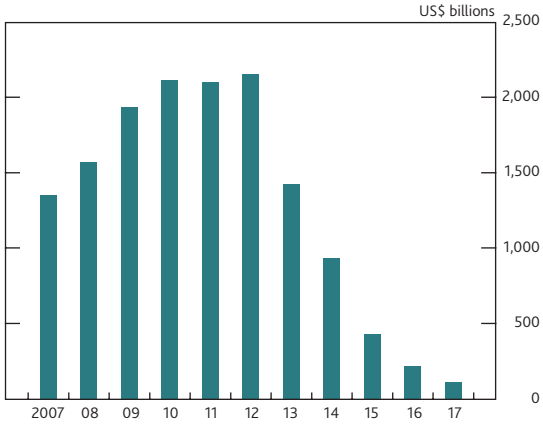
(1) See the box 'A simple model for emerging market bond spreads' on pages 14–15 of the Spring 2006 *Quarterly Bulletin*.
(2) The index for EMEs used in the estimations is JPMorgan Chase and Co.'s Emerging Market Bond Index Global excluding defaulted bonds.
(3) The index is an unweighted average of eight liquidity measures. See 'Financial market liquidity', *Financial Stability Report*, April 2007, page 18.

Chart 26 Global non-financial corporate net debt financing



Source: Dealogic.

Chart 27 Maturity profile of global loans to non-financial corporates



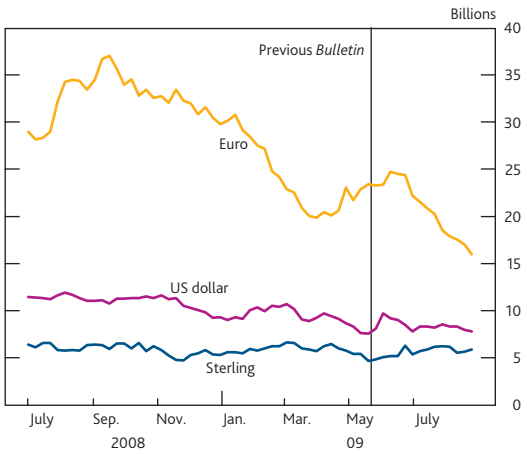
Source: Dealogic.

pickup in issuance by non-investment grade corporates, a market which effectively closed from end-2008 until recently.

Some of the recent issuance of corporate bonds was reported to have been used to repay bank loans. Overall, firms' net total debt external financing turned negative in 2009 Q2 (**Chart 26**). Some of this balance sheet deleveraging by corporates could be linked to reduced supply of long-term bank credit. But it could also be that companies wanted to decrease the risk that they might find it difficult to refinance some of their loans maturing over the next few years (**Chart 27**).

Commercial paper issuance by non-financial firms in Europe was relatively muted (**Chart 28**), despite the reported limited availability of short-term bank credit. This could perhaps reflect continued low business activity and the impact of de-stocking on the need for working capital. It may also be related to corporates having improved access to the corporate bond market to raise longer-term funds.

Chart 28 Total European non-financial corporate commercial paper outstanding

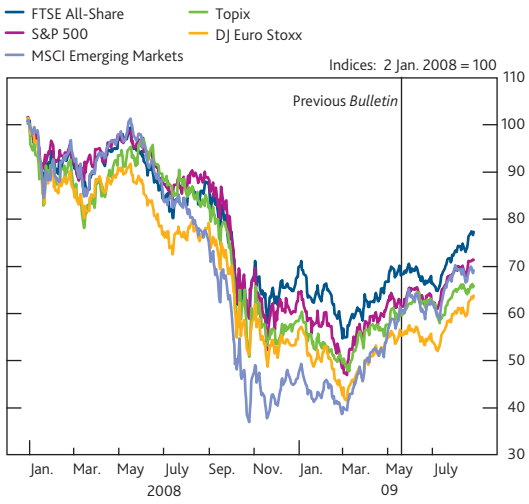


Source: Dealogic.

Equity markets

Accompanying the pickup in corporate bond issuance, firms' issuance of equity capital remained strong. This occurred against the backdrop of further increases in global equity indices (**Chart 29**), with the recovery in equity prices being relatively broad-based across countries. Despite the recent rally, however, equity prices remained well below their levels prior to the failure of Lehman Brothers in September 2008.

Chart 29 International equity indices (in US dollars)[(a)]

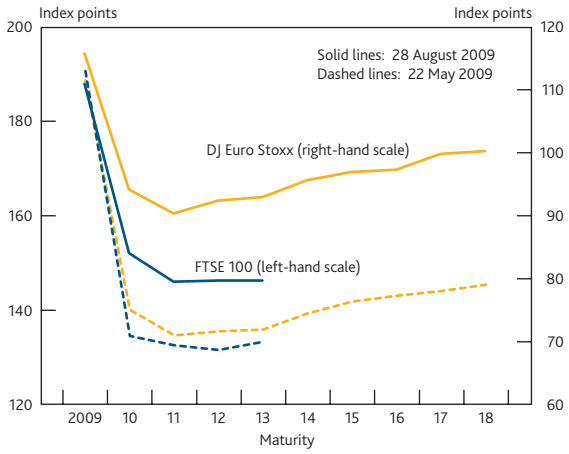


Source: Bloomberg.

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

Recent increases in equity prices coincided with investment analysts starting to revise upwards their expectations for near-term corporate earnings, given signs of some improvement in the macroeconomic outlook. The August Bank of America/Merrill Lynch survey suggested that global fund managers believed that global corporate earnings could rise by at least 10% over the next year. Similarly, dividend yields inferred from dividend swap prices rose markedly across all maturities from 2010 onwards (**Chart 30**).

Chart 30 Dividend swap prices[a][b]

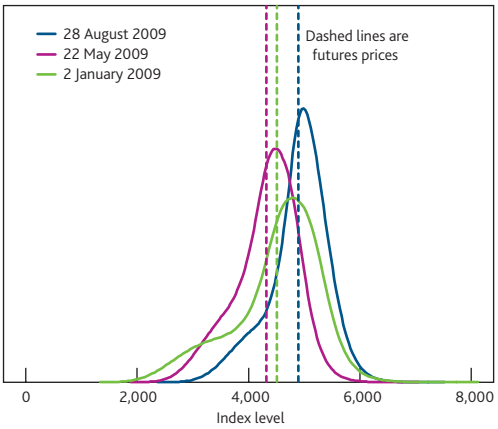


(a) From exchange-traded futures contracts.
(b) For more details on dividend swaps, see box on 'Dividend swaps', *Bank of England Quarterly Bulletin*, 2008 Q4, page 371.

However, the increases in implied dividends could be partly related to reduced compensation for uncertainty surrounding future dividends rather than a shift up in expectations of future payouts. More generally, to the extent that investors' perceptions about macroeconomic uncertainty have fallen, perhaps linked to the various policy stimulus packages put in place, the recent continued pickup in global stock prices could reflect further reductions in required equity risk premia.

Consistent with lower compensation for risk, information from options prices indicated that the implied distribution of future equity prices narrowed and became slightly less negatively skewed, implying that investors were less concerned about large future falls in equity indices (**Chart 31**).

Chart 31 Three-month option-implied FTSE 100 probability density functions[a]



Sources: Euronext.liffe and Bank calculations.

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

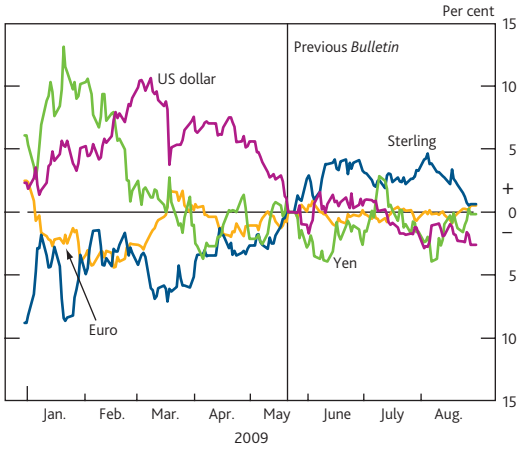
Foreign exchange

Information from options prices indicated that investors' perceptions of uncertainty surrounding future exchange rates also declined further (**Chart 2** on page 154). This was true for currencies of industrialised and emerging market countries.

Accompanying the falls in currency volatility, liquidity conditions in foreign exchange markets reportedly continued to improve over recent months. In particular, in the interdealer segment of the market, transaction costs (as measured by bid-ask spreads) drifted lower, further unwinding the increases in late 2008.

In terms of the levels of exchange rates, the major currencies ended the period little changed. The sterling effective exchange rate (£ERI) had appreciated through June and July but this was reversed in August. The most persistent move over the quarter was the depreciation of the US dollar, continuing a trend that began in early March (**Chart 32**).

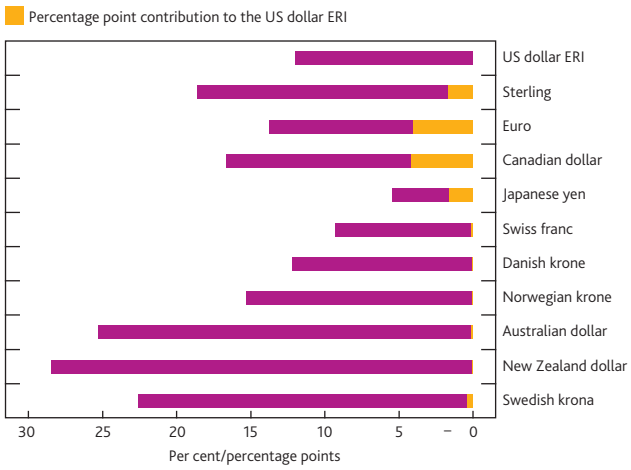
Chart 32 Cumulative changes in international ERIs since 2 January 2009



According to contacts, the US dollar's continued depreciation was partly linked to the revival in global risk appetite that might have underpinned the pickup in corporate bond, equity and other risky asset prices. They noted further unwinds of the US dollar inflows witnessed in late 2008, when the US dollar was said to have benefited from 'safe haven' flows and the repatriation of funds back to the United States.

The depreciation of the US dollar since March was especially marked against the Australian and New Zealand dollars (**Chart 33**), with market contacts noting that the inflows into these currencies partly reflected the resurrection of so-called carry trades (involving borrowing in low-yielding currencies to invest in overseas assets with higher nominal returns, see box on pages 206–07 of this *Bulletin*) as investors' appetite for risk recovered further.

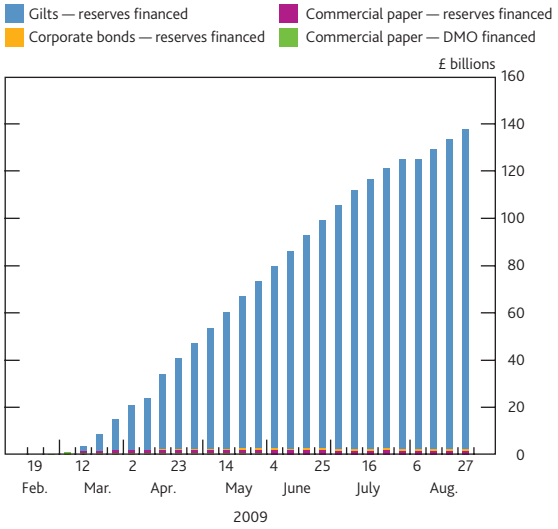
Chart 33 Changes in US dollar bilateral exchange rates and the US dollar ERI since 9 March 2009[a]



Sources: Bloomberg and Bank calculations.

(a) 9 March 2009 was the local peak in the US dollar ERI.

Chart 34 Cumulative APF asset purchase by type[a]



(a) Amounts are in terms of the proceeds paid to counterparties, less redemptions valued at initial purchase price, rounded to the nearest million. Data based on settled transactions.

Bank of England operations

Asset purchases[1]

In the week prior to the August MPC meeting, the Bank completed the programme of private and public sector asset purchases financed by the issuance of central bank reserves that had been announced on 5 March and extended to £125 billion on 7 May. On 6 August, the MPC voted to continue with this programme of asset purchases and to increase its size by £50 billion to £175 billion. **Table A** and **Chart 34** summarise asset purchases by type of asset.[2]

Table A Asset purchases by type (£ millions)

Week ending[a]	Commercial paper	Gilts	Corporate bonds	Total[b]
21 May 2009[c][d]	2,240	63,994	625	66,859
28 May 2009	701	6,501	48	7,250
4 June 2009	85	6,509	41	6,635
11 June 2009	458	6,388	10	6,856
18 June 2009	263	6,476	26	6,765
25 June 2009	130	6,500	24	6,654
2 July 2009	80	6,500	49	6,629
9 July 2009	34	6,505	48	6,587
16 July 2009	186	4,500	21	4,707
23 July 2009	25	4,498	0	4,523
30 July 2009	0	4,004	0	4,004
6 August 2009	0	0	0	0
13 August 2009	75	4,197	3	4,275
20 August 2009	166	4,200	10	4,376
27 August 2009	399	4,200	19	4,618
Total financed by Treasury bills	–	–	–	–
Total financed by central bank reserves[d]	1,573	134,971	938	137,482
Total asset purchases[d]	1,573	134,971	938	137,482

(a) Week-ended amounts are in terms of the proceeds paid to counterparties, on a trade-day basis, rounded to the nearest million. Data are aggregated for purchases from the Friday to the following Thursday.
(b) Weekly values may not sum to totals due to rounding.
(c) 21 May 2009 measured as amount outstanding as at 21 May 2009.
(d) In terms of proceeds paid to counterparties less redemptions at initial purchase price on a settled basis. Amounts outstanding may be less than total purchases due to assets maturing during the period.

Gilts

Gilt purchases financed by the issuance of central bank reserves began on 11 March. Initially, the Bank offered to purchase conventional gilts with a minimum residual maturity of five years and a maximum residual maturity of 25 years.

Following the MPC's decision on 6 August to purchase an additional £50 billion of assets over the subsequent three months, the Bank announced that it would extend the range of gilts eligible for purchase to include all conventional gilts with a minimum residual maturity of greater than three years. In addition to conducting auctions to purchase gilts on Monday and Wednesday each week, the Bank would hold an additional auction, normally on Tuesday. The Bank would normally offer to purchase gilts with a residual maturity of 10–25 years on Mondays, of greater than 25 years on Tuesdays and 3–10 years on Wednesdays. The Bank also announced, in a joint statement with the Debt Management Office (DMO), an arrangement for a significant amount of the gilts acquired by the Bank via the APF to be made available for on-lending to the market by the DMO through the DMO's normal repo market activity (see box on page 169).

As of 27 August, £135 billion of gilts had been purchased, of which £65.6 billion were in the 3–10 year residual maturity range, £65.2 billion in the 10–25 year maturity range and £4.2 billion with a maturity greater than 25 years (**Chart 35**).

(1) The data cut-off for this subsection is 27 August.
(2) The objectives and operation of the APF are described in more detail in the 2009 Q2 *Quarterly Bulletin*.

Gilt lending

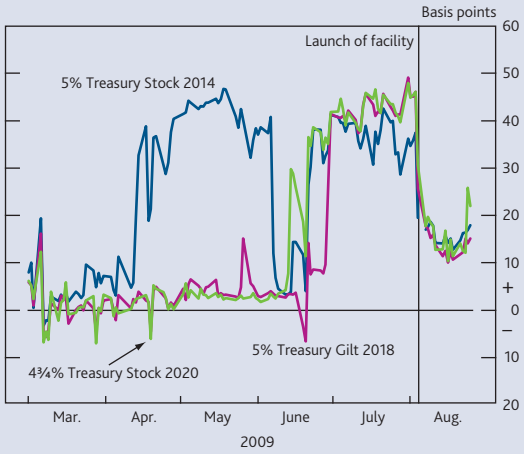
On 6 August, the Bank and the Debt Management Office (DMO) announced that, from 7 August, the Bank would make available to the DMO a significant amount of the gilts purchased via the Asset Purchase Facility (APF) for on-lending to the market through the DMO's normal repo market activity.

The purpose of this arrangement is to relieve any frictions in the functioning of the market in specific gilts arising from the Bank's purchases. The DMO may lend the gilts for a term of up to one week. In return for the loan of specific APF gilts, the DMO delivers to the Bank UK government securities of equivalent value, so that the APF's holdings of UK government securities are unaffected. There is no net impact on the DMO's cash management operations.

The amount available is at least 10% of the APF's holdings of each stock, and more where the APF's holding is greater than 50% of the 'free float'.(1) In addition, the Bank is prepared to make the APF's gilts available for use in the DMO's Standing, and Special Repo Facilities.(2)

Market participants suggested that the impact of the lending facility could be seen in the repo rates for the three bonds that had been eligible for the DMO's Special Repo Facility (the 5% 2014, 5% 2018 and 4.75% 2020). For each of these three bonds, the spread between its weighted average overnight repo rate and the general secured overnight repo rate was consistently over 30 basis points in July and early August. This meant that to obtain any of these specific bonds, market participants would in return have had to lend cash at a rate significantly below the general secured overnight rate. On the first day this facility was available, spreads on these bonds fell below 20 basis points and subsequently remained below the levels seen in July and early August (**Chart A**).

Chart A Spread to GC overnight rate of gilts available in Special Repo Facility



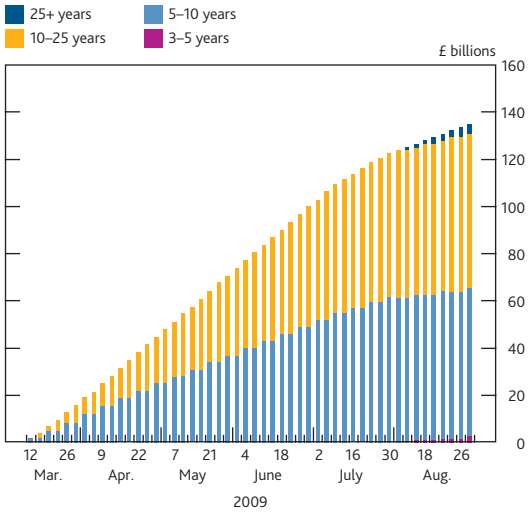
Source: BrokerTec.

A further consequence of the launch of this facility has been the fall in usage of the DMO's Standing and Special Repo Facilities. Between 1 July and 6 August, the average total daily use for these facilities had been around £2 billion, with over 95% of the usage involving the three bonds highlighted in the chart. Since the launch of this facility, there was no use of either facility, as market participants were able to access the bonds via the new facility at rates closer to the secured overnight rate, thus reducing the spread. On 28 August, the DMO announced the suspension of the Special Repo Facility.

The Bank will publish the daily average aggregate value of gilts lent by the APF to the DMO during each calendar quarter, on the second Wednesday after the end of the quarter at 10 am.

(1) Total issue size of the gilt minus government holdings.
(2) The Standing Facility allows any gilt to be borrowed overnight at a current rate of 0.10%, with a simultaneous reverse repo trade executed at Bank Rate. In the event of persistent dislocation, the DMO may establish a Special Repo Facility. This operates in a similar way, but certain terms (eg maturity or repo, price and/or eligible gilts) may vary.

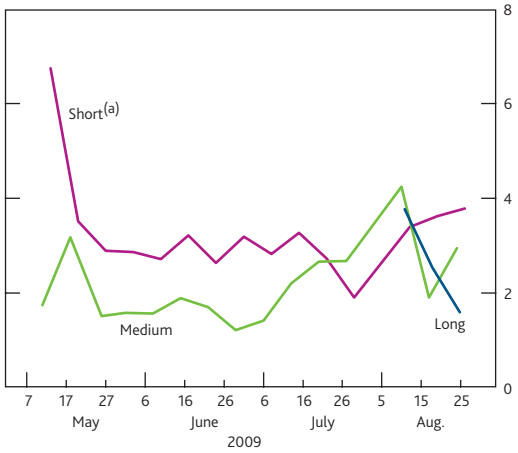
Chart 35 Cumulative gilt purchases[a] by maturity



(a) Data based on settled transactions.

These gilt purchases took place over 50 auctions, which varied in size up to a maximum of £3.5 billion. The auctions following the 6 August MPC decision were reduced in size to £1.4 billion. Cover in the auctions varied, but averaged 3.3 in the 3–10 year auctions, 2.4 in the 10–25 year auctions and 2.6 in the auctions for gilts with a maturity greater than 25 years (**Chart 36**).[1]

Chart 36 Cover ratios in APF gilt auction



(a) On 6 August, the short-maturity bucket changed from 5–10 years to 3–10 years. The medium and long-maturity buckets are 10–25 years and greater than 25 years respectively.

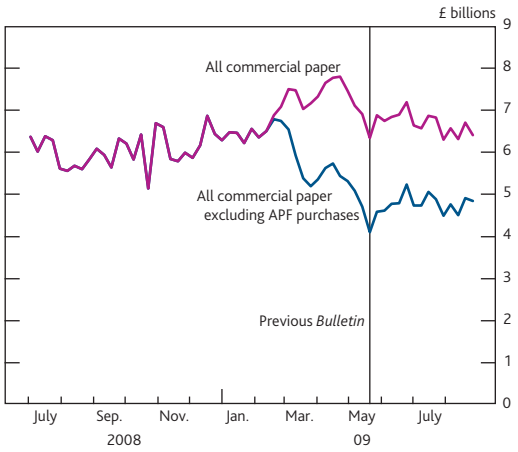
As purchases progressed, the Bank acquired a sizable proportion (around 70%) of the free float (the total issue size of the gilt minus government holdings) in four gilts. These gilts were subsequently suspended from auctions until further notice.[2]

Commercial paper

Over the review period, 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.

As of 27 August, APF holdings of CP amounted to £1.6 billion, down from £2.2 billion as of 21 May. Between 21 May and 27 August gross purchases of £2.6 billion were more than offset by redemptions of £3.3 billion. While APF holdings over the period fell, the total amount of sterling-denominated CP outstanding for UK corporate and non-bank financial firms was slightly higher than on 21 May (**Chart 37**).

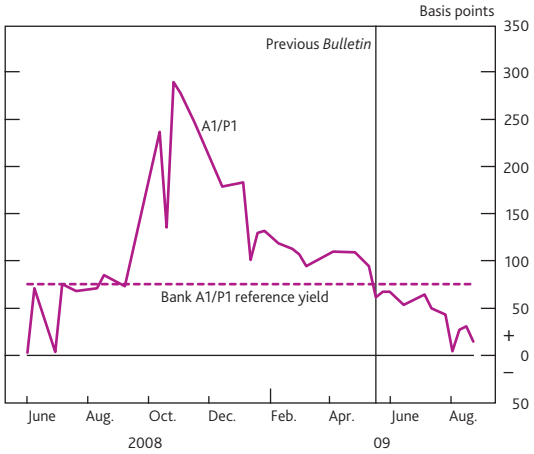
Chart 37 Sterling commercial paper outstanding for UK corporates and non-bank financial firms



Sources: CP Ware and Bank calculations.

Sterling primary market CP spreads narrowed further since the previous *Bulletin* (**Chart 38**). The narrowing of spreads, combined with the fall in APF net purchases and the increase in the total amount of sterling-denominated CP outstanding for UK corporate and non-bank financial firms, would seem to suggest that some issuers found it more economic to issue to investors rather than use the APF.

Chart 38 Primary market spreads on sterling three-month A1/P1-rated corporate commercial paper[a]



Source: Euroclear.

(a) Spread to OIS rates.

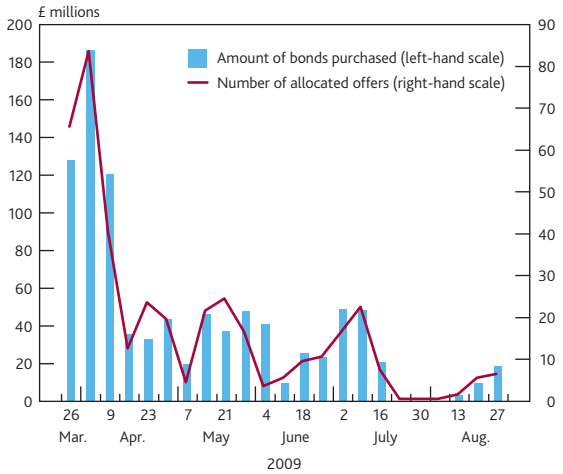
(1) Further details of individual operations are available at www.bankofengland.co.uk/markets/apf/gilts/results.htm.
(2) The suspended gilts were the 5% 2014, 4.75% 2020, 8% 2021 and 4% 2022 gilts.

Corporate bonds

The Bank continued to offer to purchase high-quality corporate bonds, through auctions, typically on Tuesdays, Thursdays and Fridays.

From Thursday 16 July to Thursday 6 August the Bank did not make any purchases in its corporate bond auctions. This largely reflected a decline in offers over this period with the Bank receiving no offers in five consecutive auctions from 24 July to 4 August. Contacts suggested that continued strong investor demand combined with little primary market issuance during the summer had resulted in investors finding it more difficult to obtain sterling corporate bonds. These factors may in part explain the reduction in activity in the Bank's auctions during July and early August, and consequently the fall in the number of successful offers (**Chart 39**).

Chart 39 Weekly purchases of sterling corporate bonds[a]



(a) Weekly (Friday-Thursday) amounts in terms of the proceeds paid to counterparties, on a trade-day basis.

As of 27 August, total corporate bond purchases were £0.9 billion, compared to £0.6 billion on 21 May. The portfolio had been acquired through 386 purchases of 118 bonds from 50 issuers, spread over auctions from 25 March to 27 August.(1) This reflected the aim of the Bank to make frequent but relatively small purchases to help improve the function of the secondary market, to help to reduce liquidity premia on high-quality corporate bonds, and so improve firms' access to capital markets.

Credit Guarantee Scheme

The Bank did not make any purchases of bank debt issued under the Credit Guarantee Scheme from the secondary market, but stands ready to do so should conditions in that market deteriorate.

Secured commercial paper facility

On 3 August, the Bank launched a secured commercial paper (SCP) facility to support the provision of working capital to non-investment grade companies that are ineligible for the Bank's CP facility. The purpose of the SCP facility is to help improve the functioning of the private market by standing ready to make primary market purchases and by acting as a backstop for secondary market investors.

SCP issuers are programmes that are administered by sponsors, which it is anticipated will typically be banks. To be eligible for purchase by the APF, SCP must be backed by underlying assets that are short term and provide credit to companies (for example, trade receivables or equipment leases) or consumers (for example, credit cards or short-term loans), where the credit would support economic activity in the United Kingdom. Programmes that include assets such as term asset-backed security bonds, emerging market transactions and synthetic assets are likely to be ineligible for the SCP facility.

Eligible SCP programmes must have a minimum initial short-term credit rating of A1/P1/F1 from at least two of Standard & Poor's, Moody's and Fitch.

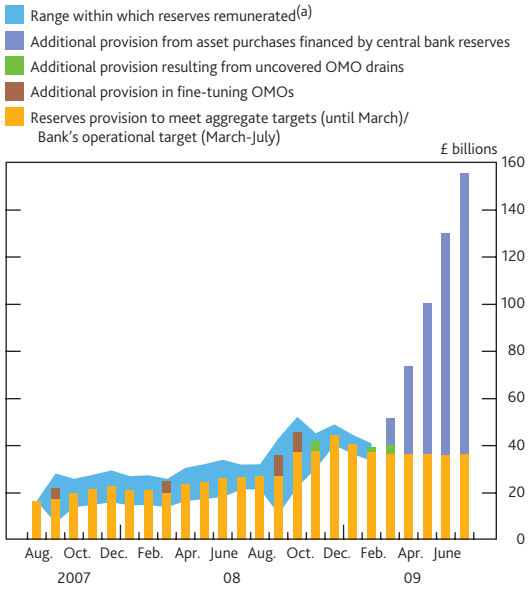
There were no programmes that were immediately eligible for the SCP facility. As part of the consultation process, banks indicated that it would take a number of months to set up programmes that would be eligible for the SCP facility. As with the CP facility, it is intended that the facility would operate for as long as the highly abnormal conditions in corporate credit markets persist, and the Bank intends to give twelve months notice of any withdrawal of the facility.(2)

Operations within the sterling monetary framework(3)

Following the introduction of asset purchases financed by the creation of central bank reserves, the Bank's operational approach initially aimed to ensure a net supply of reserves around the aggregate level of reserves targets initially set by participants for the March maintenance period, plus the amount of reserves injected via the Bank's programme of asset purchases (**Chart 40**). In the light of the revealed demand for central bank reserves, the Bank announced on 6 August that it would amend its operational approach to the provision of reserves. The Bank would continue to offer reserves in long-term repo open market operations (OMOs) but would cease to offer reserves in a weekly short-term OMO. The level of reserves would thus be determined by (i) the level of reserves injected via asset purchases, (ii) the reserves supplied in long-term repo OMOs, and (iii) the net impact of other sterling ('autonomous factor') flows across the Bank's balance sheet.

(1) Sum of corporate bonds purchased, less redemptions valued at initial purchase price.
(2) The SCP facility is described in more detail in the Market Notice available at www.bankofengland.co.uk/markets/marketnotice090730.pdf.
(3) This subsection and the subsection describing other market operations, cover operations from 7 May to 5 August. On 5 March, the usual system, in which banks chose monthly reserves targets to achieve on average over a maintenance period, was suspended. However, this article continues to use the term 'maintenance period' for convenience to refer to the period between one MPC decision date and the next.

Chart 40 Aggregate reserves targets and reserves provision



(a) Since 5 March, all reserves balances held by reserves banks have been remunerated at Bank Rate.

Long-term repo OMOs

Repo operations at six, nine and twelve-month maturities were offered against collateral routinely accepted in the Bank's short-term OMOs and Operational Standing Facilities (OSFs). In addition, the Bank continued to provide liquidity insurance by conducting extended-collateral long-term repo OMOs with a three-month maturity against a wider range of collateral. The results of these operations are shown in **Table B**.

All three-month extended-collateral long-term repo OMOs over the review period were uncovered, resulting in a decline in the stock of long-term repo OMOs outstanding (**Chart 41**). In light of revealed demand for funds in these operations, the

Chart 41 Factors affecting the supply of reserves (maintenance period averages)

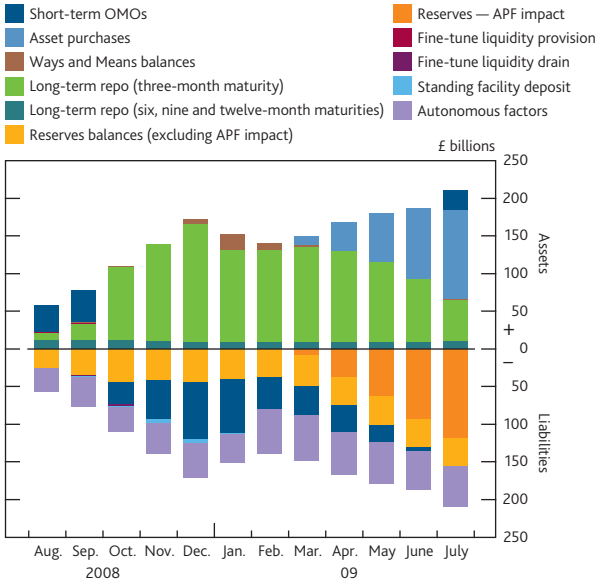


Table B Extended-collateral three-month long-term repo operations

19 May 2009	
On offer (£ millions)	20,000
Cover	0.54
Weighted average rate(a)	0.868
Lowest accepted rate(a)	0.600
Tail(b)	0.27
2 June 2009	
On offer (£ millions)	20,000
Cover	0.45
Weighted average rate(a)	0.722
Lowest accepted rate(a)	0.600
Tail(b)	0.12
16 June 2009	
On offer (£ millions)	20,000
Cover	0.53
Weighted average rate(a)	0.729
Lowest accepted rate(a)	0.600
Tail(b)	0.13
30 June 2009	
On offer (£ millions)	20,000
Cover	0.42
Weighted average rate(a)	0.602
Lowest accepted rate(a)	0.600
Tail(b)	0.00
14 July 2009	
On offer (£ millions)	15,000
Cover	0.09
Weighted average rate(a)	1.097
Lowest accepted rate(a)	0.600
Tail(b)	0.50
4 August 2009	
On offer (£ millions)	15,000
Cover	0.55
Weighted average rate(a)	0.898
Lowest accepted rate(a)	0.600
Tail(b)	0.30

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

Bank reduced the amount on offer from £20 billion to £15 billion from the operation on 14 July. A further reduction from £15 billion to £10 billion was announced on 6 August. In contrast, all operations at six, nine and twelve-month maturities against routine OMO collateral were covered (**Table C**).

For the period under review, the Bank continued to announce two minimum bid rates applicable to its extended-collateral three-month long-term repo OMOs. The minimum rate for bids against routine OMO collateral was set equal to the higher of the equivalent-maturity OIS rate shortly before the operation and the maximum bid rate in the Bank's short-term OMOs. The minimum bid rate for bids against the wider

Table C Long-term repo operations

	Six-month	Nine-month	Twelve-month
19 May 2009			
On offer (£ millions)	750	400	200
Cover	4.00	4.00	4.00
Weighted average rate[(a)]	0.567	0.603	0.708
Highest accepted rate[(a)]	0.590	0.650	0.730
Lowest accepted rate[(a)]	0.551	0.551	0.701
Tail[(b)]	0.02	0.05	0.01
16 June 2009			
On offer (£ millions)	750	400	200
Cover	3.27	3.81	3.10
Weighted average rate[(a)]	0.596	0.654	0.753
Highest accepted rate[(a)]	0.650	0.700	0.753
Lowest accepted rate[(a)]	0.550	0.651	0.753
Tail[(b)]	0.05	0.00	0.00
14 July 2009			
On offer (£ millions)	750	400	200
Cover	2.33	2.63	3.25
Weighted average rate[(a)]	0.501	0.601	0.741
Highest accepted rate[(a)]	0.501	0.601	0.741
Lowest accepted rate[(a)]	0.501	0.601	0.741
Tail[(b)]	0.00	0.00	0.00

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

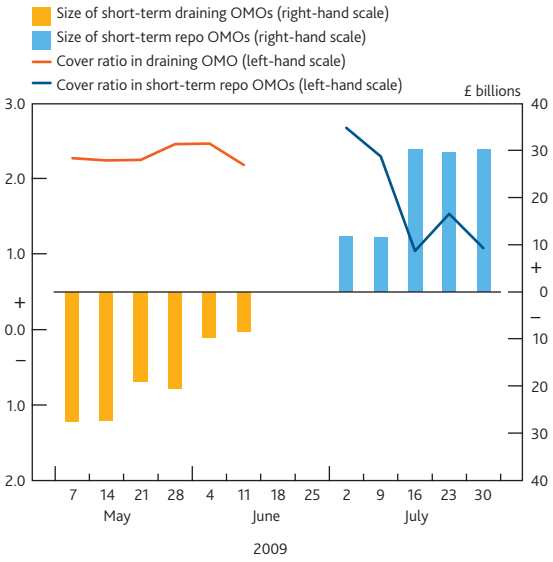
collateral pool was set 50 basis points higher than for bids against narrow collateral. On 6 August the Bank announced a change in the process for determining the minimum bid rate. For routine OMO collateral, the minimum bid rate would be set at the higher of the equivalent-maturity OIS rate and Bank Rate. For bids against the wider collateral pool, the minimum bid rate remained 50 basis points higher than that for routine OMO collateral.

Short-term operations

Following the introduction of asset purchases financed by the creation of central bank reserves, initially the Bank continued to conduct weekly short-term OMOs to drain reserves by issuing one-week bills, such that the level of reserves would be around the aggregate level of reserves targets initially set by participants for the March maintenance period, plus the amount of reserves injected via the Bank's programme of asset purchases. These operations to drain reserves were variable-rate operations.

The size of these weekly operations to drain reserves fell from £27.5 billion in the operation on 7 May to £8.4 billion on 11 June, as fewer reserves were supplied in the Bank's long-term repo operations (**Chart 42**). A further reduction in the reserves supplied in the long-term repo OMO on 16 June resulted in aggregate reserves reaching a level broadly in line with the Bank's operational target at the time. Consequently, the Bank chose not to conduct a short-term OMO on 18 and 25 June.

Chart 42 Size of short-term OMOs and cover ratio[(a)]



(a) Size of OMOs shown as weekly average amounts outstanding.

Further net maturities in long-term repo OMOs resulted in aggregate reserves, excluding those injected via asset purchases, falling below the level implied by the Bank's operational target at the time. As a result, the Bank reverted to supplying reserves via variable-rate short-term operations from 2 July (**Chart 42**). These operations were suspended on 6 August in line with the revised operational approach described above.

Operational Standing Facilities

As part of the changes to the sterling monetary framework introduced on 5 March, the Bank announced that, if Bank Rate was set at 0.5% or below, the rate paid on the Operational Standing Deposit Facility would be zero, while the rate charged on the Operational Standing Lending Facility would continue to be set at 25 basis points above Bank Rate.

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

Discount Window Facility

In October 2008, the Bank introduced a Discount Window Facility (DWF) as part of the framework for its operations in the sterling money markets. The DWF is a permanent facility to provide liquidity insurance to the banking system and allows eligible banks and building societies to borrow gilts against a wide range of collateral.

On 7 July the Bank announced that the average daily amount outstanding in the Discount Window Facility between 1 January and 31 March 2009 was £0 million.

Other market operations

One objective of the Bank's market operations is to reduce the cost of disruption to the liquidity and payments services supplied by commercial banks. The Bank does this by balancing the provision of liquidity insurance against the costs of creating incentives for banks to take greater risk, and subject to the need to control the risk to its balance sheet.

Within the sterling monetary framework, the Bank provides liquidity insurance through the provision of reserves accounts, extended-collateral long-term repo OMOs and the Discount Window Facility described above. Liquidity insurance has also been offered in other operations: US dollar repo operations and the Special Liquidity Scheme.

Special Liquidity Scheme

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

US dollar repo operations

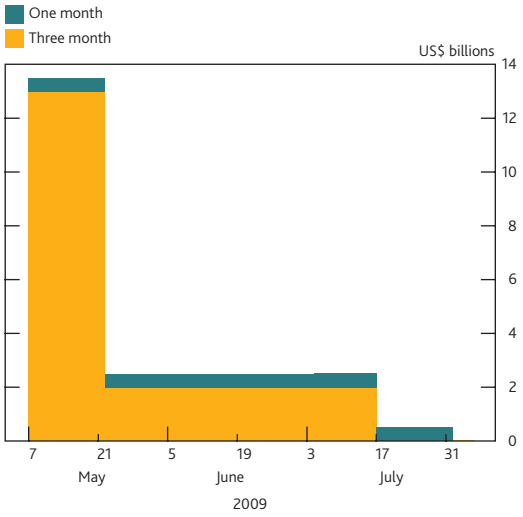
In concert with other central banks, since 18 September 2008 the Bank has offered US dollar financing to financial institutions funded by a swap with the Federal Reserve. These measures are designed to improve the liquidity conditions in global financial markets.

There were no bids in the Bank's one-week dollar operations. Bids also declined for funds at longer maturities. This led to a corresponding fall in the total stock outstanding; most recently in August, when funds offered in July matured, reducing the outstanding total in all US dollar repo operations to £525 million (**Chart 43**). The fall in the outstanding total is represented in a fall in 'other assets' on the Bank's balance sheet (**Chart 44**) with a corresponding fall in US dollar deposits from the Federal Reserve Bank of New York (included in 'other liabilities' in **Chart 45**).

The Bank had previously offered US dollar financing at one-week, one-month, and three-month maturities. In light of the generally reduced use of these operations, the Bank announced on 25 June that — while the swap lines between the Federal Reserve and the Bank had been extended to 1 February 2010 — the one-month operation would be suspended following the operation on 28 July.

As previously announced, since 6 April, the Bank, along with other central banks, has had swap arrangements in place that would enable the provision of foreign currency liquidity by the Federal Reserve to US financial institutions. Should it be required, the Bank would provide sterling via a swap arrangement with the Federal Reserve, similar to that which underpins the Bank's US dollar repo operations.

Chart 43 US dollar repo: stock outstanding by maturity[a]



(a) Stock outstanding is shown from settlement date.

Bank of England balance sheet

The Bank of England uses its balance sheet for policy purposes. The expansion of its balance sheet since 2007, and more especially since 2008, reflects the extraordinary policy measures that it has adopted.

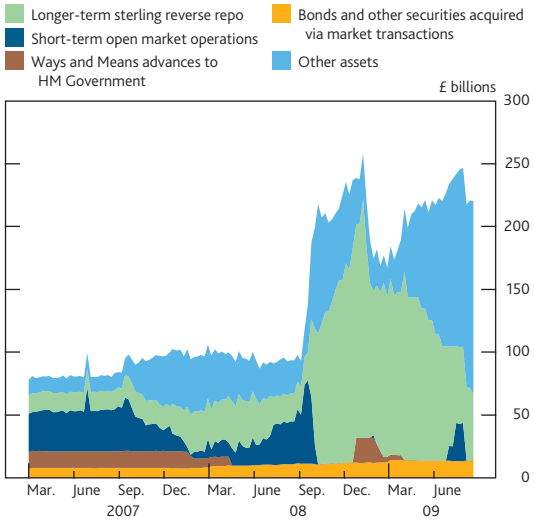
Purchases of commercial paper, corporate bonds and gilts under the APF described above, have since 5 March been the main factor in the expansion of the Bank's balance sheet. APF transactions are undertaken by a subsidiary company of the Bank of England, the Bank of England Asset Purchase Facility Fund Limited (BEAPFF). The BEAPFF borrows from the Bank to pay for the purchases it makes. It is this lending to the BEAPFF that appears on the Bank's balance sheet as an asset under 'other assets' (**Chart 44**). On the Bank's balance sheet the liability corresponding to this asset was initially a deposit from the government's Debt Management Office. This deposit appeared under 'other liabilities' (**Chart 45**). Following the decision by the MPC on 5 March to use the APF as a monetary policy tool, the Bank financed its lending to BEAPFF by the creation of central bank reserves. This is reflected in an increase in the level of reserves balances (**Chart 45**).

Over the period 27 May to 26 August, the Bank of England's balance sheet averaged £227 billion. While this was down from a high in 2008 Q4, it represented a rise from Q2. This increase reflected purchases of commercial paper, corporate bonds and gilts under the APF, and the subsequent increase in reserve balances on the liability side. These increases to the balance sheet were partially offset by the reduced size of reserves provided in extended-collateral long-term repo OMOs and the decreasing size of the Bank of England's US dollar repo operations.

Foreign reserves

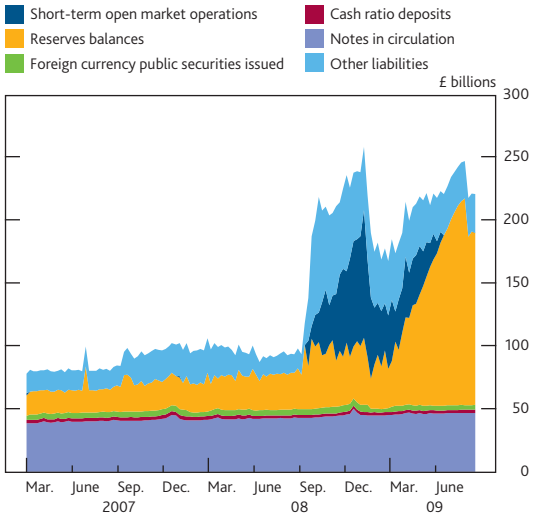
As part of the monetary policy framework introduced by the Chancellor of the Exchequer in 1997, the Bank of England holds its own foreign exchange reserves in support of its monetary policy objective. These reserves are separate from the Government's foreign exchange reserves, which the Bank manages as HM Treasury's agent. The assets held in the Bank's reserves are included in 'bonds and other securities acquired via market transactions' (**Chart 44**). They are financed with medium-term foreign currency securities issued by the Bank (**Chart 45**). At the end of July the Bank's foreign exchange reserves comprised £3.9 billion of assets.

Chart 44 Bank of England consolidated balance sheet: assets[a]



(a) Excludes loans and associated deposits in course of settlement.

Chart 45 Bank of England consolidated balance sheet: liabilities[a]



(a) Excludes loans and associated deposits in course of settlement.

Capital portfolio

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

The portfolio currently includes around £2.9 billion of gilts and £1 billion of other debt securities. Since April 2009, both the size of the purchases (£43 million, previously £20 million) and the frequency (bi-monthly rather than monthly) have increased reflecting developments in the Bank's capital and reserves. Over the period from 7 May to 5 August, gilt purchases were made in accordance with the quarterly announcements on 1 April 2009 and 1 July 2009.

Developments in market structure

NYSE Liffe launches new options on short-term interest rates

On 27 July, NYSE Liffe (a London-based derivatives exchange within the NYSE Euronext group) launched new two-year options on sterling and euro short-term interest rates.

As for existing options with shorter maturities, the new options settle on futures contracts referencing three-month market interest rates. Sterling futures contracts settle on three-month Libor and euro contracts settle on three-month Euribor. Option contracts therefore help investors hedge or speculate on future levels of short-term interest rates.

The introduction of the new two-year options followed strong growth in market activity for the existing shorter-maturity options; with average daily volume in both sterling and euro contracts having increased more than 30% on the same period of 2008. In addition, there was a considerable increase in the traded volume of futures contracts with two-year maturities, which were up about 40% on the same period last year. Increased activity in these contracts was said to reflect market views that central banks would maintain interest rates at low levels in the near term but more uncertainty about their levels in the medium term, which drove demand for hedging and speculative positions.

Research and analysis

Global imbalances and the financial crisis

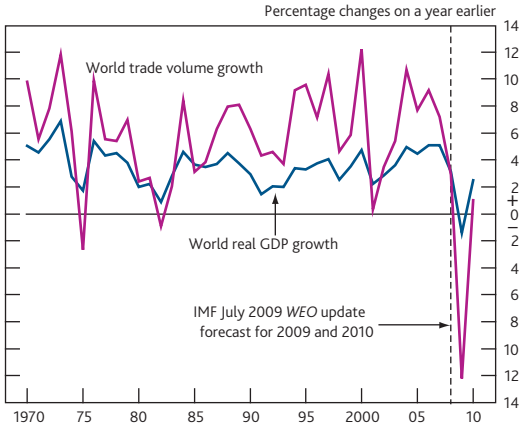
By Mark Astley, Julia Giese, Michael Hume and Chris Kubelec of the Bank's Monetary Analysis Division.[1]

The recent financial crisis has put the spotlight on the rapid rise in credit which preceded it and the macroeconomic context in which it developed. This article examines the contribution of international savings and investment imbalances to the crisis and how these imbalances have evolved since its onset, focusing on the UK experience as a deficit country over the past decade. It also briefly discusses some implications of the crisis for global imbalances over the medium term.

Introduction

The global economy has, since the second half of 2007, experienced a deep financial crisis. This has been reflected in significant falls in asset prices, a sharp contraction in global output and precipitous falls in international trade flows (**Chart 1**). There have been significant negative effects on the United Kingdom, with UK real GDP falling by 5.5% between 2008 Q1 and 2009 Q2.

Chart 1 Global GDP and world trade

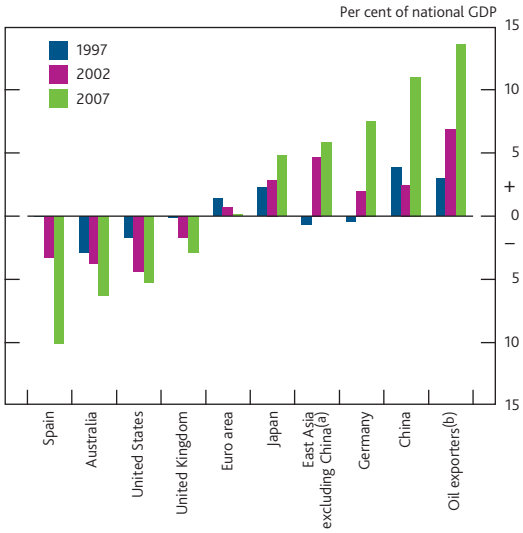


Source: IMF April 2009 *World Economic Outlook (WEO)* and July 2009 update.

While the proximate causes of the crisis lie within financial markets, the build-up of substantial global macroeconomic imbalances over the past decade may also have contributed significantly.[2][3] One imbalance of the UK economy, discussed in previous *Inflation Reports*,[4] has been the persistent UK current account deficit which has accompanied sustained growth of UK domestic demand.

One manifestation of global imbalances is that during the period of robust global growth preceding the crisis, a number of other advanced economies experienced growing current account deficits, most notably the United States (**Chart 2**).[5]

Chart 2 Global imbalances in the run-up to the crisis



Source: IMF April 2009 *WEO*.

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

In contrast, commodity exporters and many East Asian economies (EAEs) experienced growing current account surpluses with the largest increases being in the oil-exporting economies and China.

The financial crisis has been a key influence on the prospects for UK inflation. From a monetary policy perspective, it is therefore important to try to understand why the crisis happened, including the contribution of global imbalances.

(1) The authors would like to thank Phillip Butler, Ed Dew, Abigail Hughes, Kirsty Knott, Ana Lasaosa, Alison Schomberg, Kyriaki Voutsinou and Pawel Zabczyk for their help in producing this article.
(2) See, for example, Bean (2009), Tucker (2008a, b, 2009).
(3) Surveys of the causes of the crisis can be found in Acharya and Richardson (2009) and Bank for International Settlements (2009).
(4) See, for example, boxes in the August 2001 and May 2006 *Reports*. The August 2009 *Report* discusses global imbalances, which are also examined in a box in the May 2002 *Report*.
(5) Japan and Germany were important exceptions and the euro area as a whole was broadly in balance.

Large global imbalances can be undesirable. For example, the continuation of these imbalances poses a risk of large corrections in asset prices and exchange rates, and these can have important implications for growth and inflation.(1)

The link between the financial crisis and these global imbalances is complex. This article discusses some of the factors underlying global imbalances. It shows how they were linked to international capital flows, which contributed to a fall in global real interest rates and an extended global credit boom. Importantly, however, other factors such as financial innovation and the underpricing of risk exacerbated those effects during the boom period, giving rise to vulnerabilities in the global economy. This article also considers the role these vulnerabilities may have played in amplifying the scale and impact of the subsequent financial crisis. The adjustments of global imbalances which have accompanied the financial crisis and some of the factors which may affect their longer-term evolution, are also discussed.

How were global imbalances and the credit boom linked?

Various forces simultaneously contributed to the combination of global imbalances and a global credit boom. This section first examines the causes of increased international capital flows, which may have been an important contributory factor, before discussing the mechanisms which generated and amplified the effect on credit supply and demand.

Global savings and investment

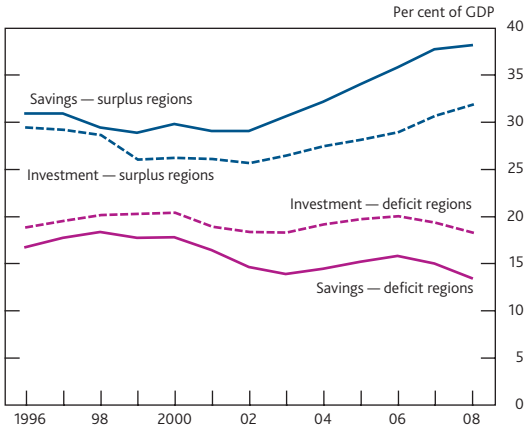
A country's current account balance represents the difference between the savings and investment flows in that country. Non-zero current account balances are associated with international capital flows — countries running current account deficits (surpluses) experience capital inflows (outflows). So the global current account imbalances in recent years (**Chart 2**) have been associated with substantial capital flows from the high-saving EAEs and commodity producers to lower-saving western countries.

Economic theory suggests that international capital flows should reflect differences in rates of return on investments across countries. If a particular country offers relatively high expected returns it will tend to attract more capital from abroad, thereby allowing its investment to exceed domestically available savings, and resulting in a current account deficit.

From this perspective, the international pattern of current accounts and capital flows in recent years appears puzzling. Faster-growing economies, for example those in East Asia, would typically be expected to offer higher rates of return on investment than the more mature industrialised economies. So the net capital flows from East Asia (and commodity producers) towards industrialised countries seem to suggest that international capital had been 'flowing uphill'.(2)

So what accounts for those capital flows and current account imbalances? Examining changes in the saving and investment patterns in different regions, the counterparts to the capital flows and current account positions, provide some initial information. In particular, at an accounting level, the dominant drivers of the 'uphill' capital flows over the past decade have been the high and rising savings of the current account surplus countries (EAEs and oil producers) and the lower and falling savings of the current account deficit economies (**Chart 3**). Changes in investment rates in different regions, such as the falls in Asian investment following the 1997–98 currency crisis, and their subsequent rise, have been more muted.

Chart 3 Savings and investment rates in current account deficit and surplus regions(a)



Source: IMF *WEO*.

(a) Surplus regions are those with current account surpluses greater than 1% of GDP in 2008 and include Commonwealth of Independent States and Mongolia, Developing Asia, Japan, Middle East and Newly Industrialised Asia; deficit regions are those with current account deficits greater than 1% of GDP in 2008 and include Central and Eastern Europe, Sub-Sahara Africa, United Kingdom and United States.

What caused the East Asian countries and commodity producers to become exporters of capital?

The contribution of EAEs and commodity producers to global imbalances reflects both their high savings and the tendency to direct those savings to countries such as the United States and the United Kingdom. Both structural and macroeconomic factors appear to have contributed to the high savings rates, while policy choices and levels of financial market development help account for the direction of the flows.

The low degree of social security provision is an important structural factor contributing to high savings in East Asia. In

(1) See the July 2009 Monetary Policy Committee minutes and the July 2006 *Financial Stability Report*, for example.
(2) See Prasad, Rajan and Subramanian (2007), for example.

the case of China, for example, Chamon and Prasad (2009) argue that precautionary motives are one of the strongest candidates for explaining rises in the household savings rate. For example, they discuss how private sector education and health expenditures have increased significantly in recent years, in part because the government has scaled back public sector support in these areas.

But there were also a number of macroeconomic influences. The rapid acceleration in global growth, given sluggish growth in commodity supply, led to marked increases in oil prices — see Saporta, Trott and Tudela (2009)(1) — and the prices of other commodities which boosted commodity-exporting countries' income from net trade. And, as was the case alongside the 1970s' and 1980s' oil price rises, expenditure in commodity-exporting countries lagged behind that rise in income.

Another important macroeconomic factor was the large contribution of exports to the growth of the EAEs. An increase in exports leads directly to an increase in domestic income but is not necessarily associated with an increase in domestic spending. To the extent that this extra income is not spent it will tend to create excess saving. But why were the exports of the EAEs so strong? And why did they direct their excess savings to industrialised countries, such as the United States and the United Kingdom, instead of using them to finance more investment at home?

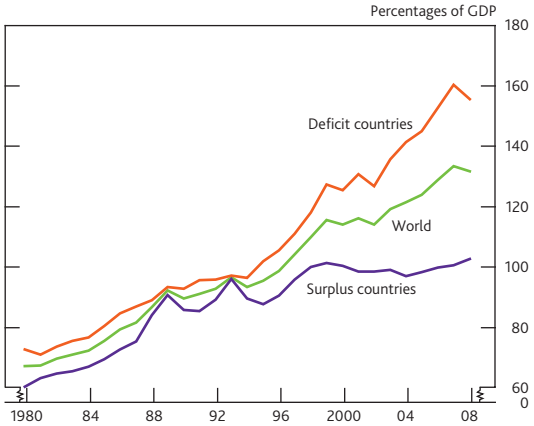
An important factor was the adoption of managed exchange rate policies by some EAEs,(2) whereby a particular level of their currency was targeted, usually against the US dollar. This policy was prompted, in part, by the aim of spurring economic development through exports, thereby addressing extensive rural underemployment.(3)(4) The desire to accumulate foreign exchange reserves as insurance against a repeat of the 1997–98 Asian currency crises was an additional motivation.(5) Another factor may have been the slow pace of financial development in many EAEs which meant that there was a dearth of domestic investment opportunities (see Caballero *et al* (2008)). This may have necessitated savings being channelled to the deeper and more liquid financial markets in western economies.

The managed exchange rate policy was implemented through foreign exchange interventions. Countries running current account surpluses would normally be expected to experience some upward pressure on their currencies. But many EAE monetary authorities offset this pressure by selling domestic assets and accumulating foreign currency reserves, principally US dollar-denominated bonds. This policy was sustainable because, in contrast to countries selling foreign exchange reserves to forestall currency depreciations, there is no fundamental constraint to the amount of foreign exchange reserves that a country can accumulate in preventing its currency from appreciating. Orientating monetary policy towards managing the exchange rate rather than domestic price stability will, however, tend to eventually be associated with upward pressure on inflation if the monetary policy of the anchor country (the United States in this case) is too loose for the pegging country. But for example in China's case this was not a problem because its productivity growth was sufficiently fast to maintain inflation at a low level, and upward wage pressure was limited by the rapid increase in its workforce.(6)

The global credit boom

The past decade was also characterised by rapid growth in credit in deficit countries, underpinning a global credit boom (**Chart 4**). The excess savings in EAEs and commodity exporters may have contributed to this. Bernanke (2005) has argued that the low and falling savings rates in deficit countries which accompanied the credit boom, were principally the outcome of an endogenous process by which the excess savings of the surplus countries — the 'global savings glut' — were recycled. The mechanism by which this occurred was a downward adjustment in the level of global real interest rates which restored equilibrium between saving and investment. For example, since the mid-1990s, UK long-term real interest rates derived from index-linked instruments declined by more than 2 percentage points. Real long-term interest rates have also fallen in other countries (**Chart 5**).(7)

Chart 4 Private sector loans(a)

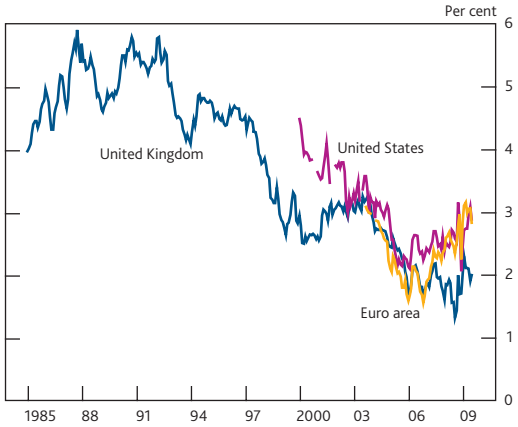


Sources: European Central Bank, IMF and Bank calculations.

(a) Claims on the domestic private sector by banks and, where available, other financial corporations.

(1) Tucker (2008b) discusses the role of the entry of energy-intensive developing countries.
(2) This was most apparent for China. Other EAEs also, however, had significantly less volatile exchange rates than the euro or the yen (Committee on the Global Financial System (2009)).
(3) For a discussion of the choice of exchange rate regimes in emerging Asian economies see, among others, Calvo and Reinhart (2002).
(4) This was particularly the case for China, whose exports rose by over 27% per annum between 2002 and 2008.
(5) A strategy recommended by, for example, Feldstein (1999).
(6) Inflation did, however, rise significantly in oil-exporting countries.
(7) Shiller (2007) argues that although real long-term interest rates in the G7 declined over this period they only fell back to their long-run historical average. Others, such as Bems, Dedola and Smets (2007) and Bracke and Fidora (2008) have argued that monetary factors were important from the early 2000s onwards. For an overview of these and other factors see Hume and Sentance (2009).

Chart 5 Real long-term interest rates[a][b]

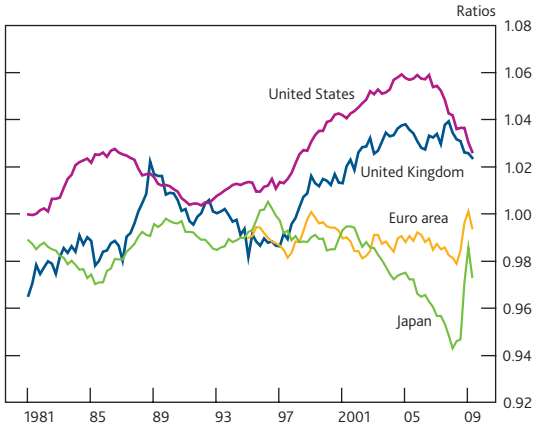


(a) United States and United Kingdom derived from index-linked securities. Euro area derived from inflation swaps. Ten-year real forward rates for the United Kingdom and the euro area, nine-year forward rates for the United States.
(b) UK data are adjusted for RPI.

But there were a number of factors other than international capital flows which may have contributed to the falling saving rates in deficit countries. For example, Berry, Waldron and Williams (2009) discuss the effect on the UK household saving rate of demographic factors and pensions, greater macroeconomic stability (via lower precautionary saving flows), rising asset prices, and looser credit conditions (which are discussed further below). Moreover, Bean (2008) argues that the downward pressure on real long-term interest rates may itself have been reinforced by loose monetary policy in some countries.[1]

Counterparts to the decline in saving rates were strong domestic demand and wider current account deficits. For example, in the United States and the United Kingdom, domestic demand began to grow more rapidly than GDP in the late 1990s (**Chart 6**). This interacted with exchange rate appreciations and the entry of low-cost producers such as China in the world trading system to produce wider current account deficits.

Chart 6 Domestic demand to GDP ratios



Sources: Thomson Datastream and Bank calculations.

As consumption and investment increased in deficit countries demand for credit also increased, underpinning the global credit boom. However, as Berry, Waldron and Williams (2009) note, the rapid build-up in credit in the United Kingdom did not necessarily imply a boom in household consumption. Rather, as Nickell (2004) points out, much of the credit was used to finance purchases of housing and financial assets rather than goods and services. The credit boom was therefore closely linked to balance sheet expansion. From this perspective, while capital flows likely added to the growth of credit, they do not seem large enough to take the lion's share of the blame (see Bean (2009)).

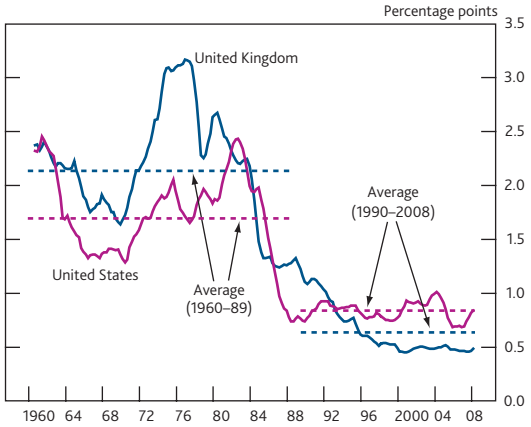
However, in addition to their interaction with macroeconomic factors, capital flows may have further contributed to the credit expansion by encouraging a 'search for yield' by financial market participants. Although some of the capital flows were used to fund loans to households and firms directly, the majority were used to purchase existing safe assets, such as government bonds, which caused real long-term interest rates to fall (**Chart 5**).[2] This not only encouraged other investors to buy riskier assets but may also have contributed to the balance sheet expansion. The low interest rate environment seems to have interacted with strong competitive pressures on banks and asset managers to maintain returns, leading to a 'search for yield' in financial markets.[3] The October 2008 *Financial Stability Report* discussed how this was evident in reduced discrimination between assets of differing credit quality and the development of increasingly complex financial instruments employing leverage to generate higher returns.

Investors reportedly justified this 'search for yield' with the perception that financial market risks had declined. One element of this — lower credit risk premia — was underpinned by the continued stability of both macroeconomic and financial variables (often known as the 'great moderation', **Chart 7**). The low inflation environment associated with this stability also permitted a loosening in global monetary policy following the stock market crash in 2000–01. This may have increased confidence in the stabilising power of monetary policy, and hence in continued stability going forward. Financial market participants were lulled into a false sense of security by extrapolating only from recent benign data, thereby attaching low probabilities to adverse outcomes. This 'disaster myopia' may have contributed to the price of risk being set too low (see Haldane (2009)).

The credit expansion was also facilitated by the decline in perceived liquidity risk. Illiquid financial markets can be defined as containing a shortage of investors willing to purchase assets at the prevailing price when other investors attempt to sell. This can mean that the price received for an

(1) See also Taylor (2007), among others.
(2) See, for example, Warnock and Warnock (2005).
(3) See Tucker (2008b) and October 2008 *Financial Stability Report*.

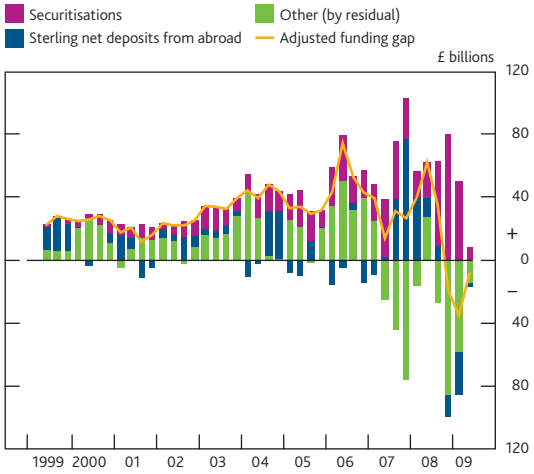
Chart 7 Volatility of real GDP growth[a]



Sources: ONS, Thomson Datastream and Bank calculations.

(a) Five-year rolling average of annualised volatility of quarter-on-quarter growth rate. 2008 data are to Q2.

Chart 8 Sources of UK banking sector funding[a]



(a) Quarterly data, six-month totals.

asset is less than its underlying value. The years preceding the financial crisis were characterised by abundant liquidity in financial markets.

An important driver of the apparent declines in both credit and liquidity risk was financial innovation, driven in part by increased competitive pressures associated with the 'search for yield', and made possible by financial liberalisation in many advanced markets. A first form of innovation was the securitisation of mortgages, corporate loans and other assets. This 'created' higher-quality financial securities that were viewed in many cases as being less risky than the underlying assets, in part because they pooled a wide range of assets together.

An associated innovation was that banks changed their funding models. In particular, banks sold the new types of securities to end-investors via the so-called 'shadow banking system', encompassing structured investment vehicles (SIVs) and conduits, which provided a framework for lending and borrowing without accepting deposits. This was termed the 'originate to distribute' model: aiming to spread the risks associated with securitised assets off their balance sheets, banks sold them to SIVs, which then aimed to sell them on to end-investors.(1) At the same time, banks increasingly relied on wholesale funding markets, including in selling the securitised assets, see the October 2008 *Financial Stability Report*. The magenta bars in **Chart 8** show that the share of funding by UK banks derived from securitisations increased between 2000 and 2008.(2)

In summary, the credit boom in deficit countries was one of the mechanisms which ensured that global saving and investment balanced. The capital flows associated with global imbalances were an important element of this. By reducing real long-term interest rates on safe assets these flows encouraged other investors to invest in riskier assets such as securitised assets and expand their balance sheets. If western financial markets had not responded in this way the global real interest rate may have needed to have fallen even further in order to bring global savings and investment into balance.

Why did the financial crisis occur? What were the main channels and mechanisms?

The risks posed to the world economy by global imbalances had been widely discussed by policymakers, academics and market participants. It was, however, often thought that the correction of global imbalances would, in part, occur via a dollar depreciation following a slowing of international capital flows to the United States.(3)

This section discusses why it was the processes analysed above — and not a dollar depreciation — that eventually resulted in the financial crisis which engulfed the global economy. It first summarises the vulnerabilities generated during the build-up of imbalances and then considers the triggers of the financial crisis.

Increased vulnerabilities

The processes discussed in the previous section generated substantial vulnerabilities to the global economy. On one hand, they led to high leverage in both the international financial system and the real economies of countries such as the United Kingdom and the United States. At the same time, they were linked to the underpricing of both credit and liquidity risk.

(1) Tucker (2007) discussed the risk of those exposures flowing back onto banks' balance sheets. In the United States shadow banks also played a more direct role in lending, with the share of non-bank loans to households and non-financial corporations in the total rising from the late 1990s.
(2) Note that these data overstate the role of securitisations in bank funding somewhat, since they include securitisations retained on banks' balance sheets.
(3) See, for example, Blanchard *et al* (2005) and Obstfeld and Rogoff (2007). However a number of authors had argued that these imbalances were sustainable in the medium term. See, for example, Dooley *et al* (2004, 2008, 2009).

The high leverage in the real economy was concentrated in the household sector.(1) Much of the debt was secured against housing assets which had rapidly increased in price and thereby created a vulnerability to house price falls. In addition, in the United Kingdom, although income gearing of households remained low in aggregate this masked considerable variation across households.(2) This created a vulnerability to a change in economic conditions.

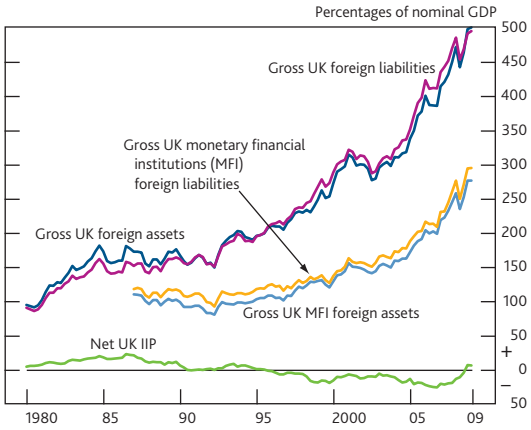
High leverage of financial institutions also generated its own vulnerabilities. With such high leverage, changes in market conditions can have an amplified effect on both the asset prices and the health of financial institutions (see the October 2008 *Financial Stability Report*).

The funding structure of financial institutions, with its reliance on wholesale markets and the use of securitised assets (**Chart 8**), was a related vulnerability. In particular, this funding model relied on the continued functioning of those markets. This funding often came from foreign investors and this, together with banks' increased lending overseas and the growth of the shadow banking system, generated the further vulnerability of increased and complex cross-border linkages between both financial institutions and between countries more generally. Such complex international linkages potentially give rise to unappreciated, but potent, interconnections between firms in the global financial system.

Associated with both of those vulnerabilities, at a global level banking flows accounted for more than half of the gross capital flows across countries (see the June 2009 *Financial Stability Report*). The UK banking sector was active in this process of rising international leverage, with its gross international asset and liabilities rising to nearly three times GDP in recent years (**Chart 9**). Those banking sector flows represented around half of the United Kingdom's substantial total foreign gross asset and liability positions, although the net foreign position of both the UK banking sector and the UK as a whole were significantly smaller.(3)

High leverage and overreliance on wholesale markets for funding were exacerbated by the mispricing of risk in the financial system discussed in the previous section. This vulnerability stemmed, in part, from the fact that the end-investors who purchased the securitised assets had less information about the underlying risk of these securities than the banks who originated the lending. And the originating banks may not have faced as strong incentives to assess and monitor risk as end-investors would have liked. Added to that, the scenarios which investors were considering when pricing (securitised) assets were too narrow, being based upon the patterns of recent history. It had also not been envisaged that the liquidity that helped fund these assets could dry up as quickly as it did.

Chart 9 UK international investment position (IIP) and the role of financial institutions



Triggers and amplification mechanisms

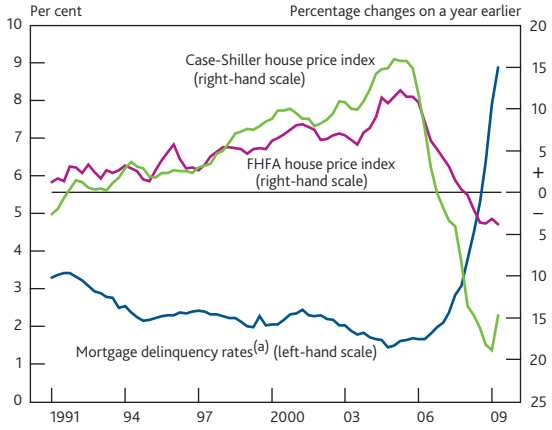
The financial crisis affecting the global economy over the past two years reflects the vulnerabilities of the financial and macroeconomic situation being exposed. Indeed, Bean (2008) argues that the capital flows from surplus countries and the consequent introduction of securitised products and larger role for the shadow banking system represented 'fuel for the fire' of the financial crisis.

The crisis was triggered by growing delinquencies and a loss of confidence in the US housing market (see the October 2007 *Financial Stability Report*). As has already been discussed, the credit risk associated with securitised assets, including those backed by mortgages, had been underpriced. This was particularly the case for sub-prime borrowers who did not fulfil traditional credit standards and were hence riskier to lend to. Notwithstanding, lenders had extended mortgages with temporarily low interest rates. As those deals expired many sub-prime borrowers were unable to refinance at the same low rates, which initiated a spiral of rising delinquency rates and falling house prices (**Chart 10**). Since US mortgages were the underlying asset in a large proportion of securitised assets, this undermined confidence in markets for securitised assets more generally.

This caused a large-scale reassessment of the quality of securitised assets. The previous assumption that such assets had similar risk characteristics to more traditional assets such as government and corporate bonds was exposed as false. Not only were defaults higher than expected but they were also more correlated. Coval *et al* (2008) explain that the structure of securitised assets meant that their prices fell considerably more than traditional assets. More generally, asset price correlations tend to increase during a crisis, and because banks

(1) See Hume and Sentance (2009).
(2) See the box on page 21 of the November 2008 *Inflation Report*.
(3) Astley, Pain and Smith (2009) discuss the potential maturity and currency mismatches on the UK external balance sheet and the relatively large size of the UK banking sector compared with those in other countries.

Chart 10 US housing market indicators



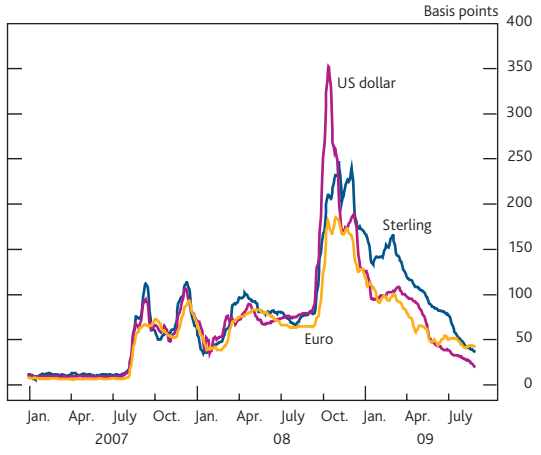
Sources: Federal Housing Finance Agency (FHFA), Federal Reserve and Standard & Poor's.

(a) Mortgage delinquency rates are defined as the proportion of loans past due 30 days or more and still accruing interest as well as those in non-accrual status, measured as a percentage of end-of-period loans.

may not have taken this effect fully into account, they may have underestimated their balance sheet risks (see Haldane (2009)).

As the extent of the credit risk mispricing became clear, the markets for securitised assets broke down amid sudden repricings of risk. The complexity of securitised assets led to investor uncertainty over which financial institutions were most exposed to falls in their value. This increased perceptions of counterparty risk in interbank credit markets, leading to a substantial increase in the cost of interbank lending (**Chart 11**), with low transaction volumes.

Chart 11 Three-month Libor-OIS spreads(a)



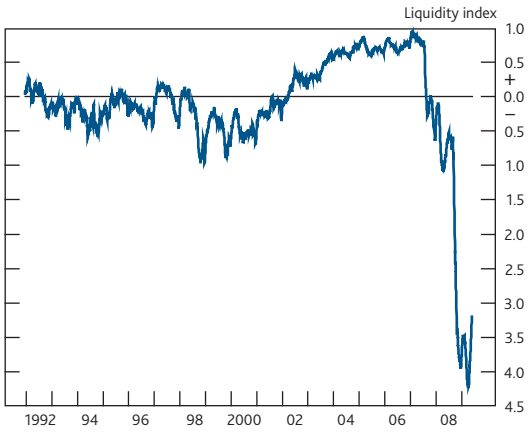
Sources: Bloomberg and Bank calculations.

(a) Spread of three-month London interbank offered rate (Libor) to three-month overnight index swap (OIS) rates. Five-day moving average.

These market developments adversely affected the funding of financial institutions, particularly those with a heavy reliance on issuance of securitised assets and the continued liquidity of wholesale markets for funding, such as Northern Rock building society.(1) In September 2007, the Chancellor announced a Government guarantee for the existing depositors of Northern Rock,(2) prior to the temporary nationalisation of that institution in February 2008.

But more generally, the strong and complex interlinkages in the international financial system meant that the initial trigger of problems in the US housing market affected financial institutions in a large number of countries. Globally, financial institutions responded by hoarding liquid assets (see Tucker (2008b)). The dramatic fall in market liquidity (**Chart 12**) was an important mechanism amplifying the negative effects on prices of securitised assets and other risky assets of the initial repricing of risk.

Chart 12 Financial market liquidity(a)



Sources: Bank of England, Bloomberg, Chicago Board Options Exchange, Debt Management Office, London Stock Exchange, Merrill Lynch, Thomson Datastream and Bank calculations.

(a) The liquidity index shows the number of standard deviations from the mean. It is a simple unweighted average of nine liquidity measures, normalised on the period 1999–2004. The series shown is an exponentially weighted moving average. The indicator is more reliable after 1997 as it is based on a greater number of underlying measures.

Such adverse dynamics were exacerbated by the high leverage of financial institutions. In particular, the elevated fears over the adequacy of financial institutions' capital contributed to a number of financial institutions around the world liquidating asset positions in order to attempt to rebuild their capital. But such deleveraging generated further sharp asset price falls — there were few willing purchasers of such assets since many potential buyers were suffering from the same problems.(3)

There have also been adverse feedback cycles between financial markets and the real economy. In particular, as discussed in the October 2008 *Financial Stability Report*, falling asset prices and uncertainty about their values together with a deteriorating economic outlook caused concerns about banks' capital positions.(4) This contributed to banks tightening credit conditions, which in turn further weakened economic prospects.

(1) Box A in the October 2007 *Financial Stability Report* provides a detailed discussion of the funding crisis at Northern Rock and the UK authorities' initial response.
(2) See the October 2007 *Financial Stability Report*.
(3) Brunnermeier (2009) discusses the loss spirals that can be associated with leveraged positions. Adrian and Shin (2008) find strong correlation between US banks' leverage and the size of their balance sheets.
(4) Capital ratios did, however, remain above regulatory minima. See the October 2008 *Financial Stability Report*, pages 26–27.

This combination of deleveraging flows, adverse feedbacks between financial markets and the macroeconomy and increasing pressures in interbank funding markets reached a significant stress point with the failure of Lehman Brothers, a major US securities house, in September 2008.(1)

At that time the international financial system came close to breakdown, see King (2009). In the latter part of 2008 and early 2009 this prompted exceptional interventions by governments and central banks in a number of countries to help stabilise the banking system. Such actions included liquidity insurance, asset protection and capital investment in banking sectors combined with cuts in official interest rates to historic lows and, in the United Kingdom, the introduction of a large-scale asset purchase programme.

How has the crisis affected global imbalances?

The financial crisis has generated a severe, and relatively synchronised, global recession driven by a collapse in confidence and demand (see the June 2009 *Financial Stability Report* and recent *Inflation Reports*). UK real GDP fell by 5.5% between 2008 Q1 and 2009 Q2. The global downturn has, at least temporarily, reversed some of the forces contributing to global imbalances, leading to some limited rebalancing. This section discusses that macroeconomic adjustment, with an emphasis on recent developments in the United Kingdom. Whether rebalancing will persist in a structural sense is the subject of the next section.

Adjustment in the United Kingdom and other deficit countries

The previous section discussed how a number of financial institutions around the world liquidated asset positions during the crisis in order to attempt to rebuild their capital positions. Much of that international retrenchment showed up in cross-border flows, with banks' lending abroad falling more sharply than domestic lending, consistent with some 'home bias' in bank lending (see the June 2009 *Financial Stability Report*). UK banks also liquidated international asset positions, which largely accounted for the United Kingdom's significant sales of foreign assets during the crisis (**Chart 13**). Nevertheless, UK bank leverage remains high (see the June 2009 *Financial Stability Report*).

The international cross-border capital repatriation was one of the factors that contributed to reduced credit supply to UK residents. There was a sharp reduction in credit made available directly to UK residents by foreign banks, which had played a key role in the expansion of lending to UK residents prior to the crisis (see the May 2009 *Inflation Report*). And alongside the sharp rises in interbank interest rates (**Chart 11**), the capital repatriation may have adversely affected UK banks' ability to access funds in wholesale markets — during the crisis there was a sharp outflow of foreign capital from UK monetary and financial institutions (**Chart 13**). The need for UK banks to rebuild their capital positions also contributed to UK banks reducing the supply of credit to UK residents. The sharp fall in lending by UK banks to UK corporates and households (**Chart 14**), however, appears in part to have reflected lower demand for bank loans as UK activity contracted (see the August 2009 *Inflation Report*).

This reduction in the availability of credit was associated with a sharp contraction of UK domestic demand during the crisis (**Charts 6** and **15**), thereby in part reversing the imbalance characterising the UK economy prior to the crisis. Moreover,

Chart 13 UK international capital flows

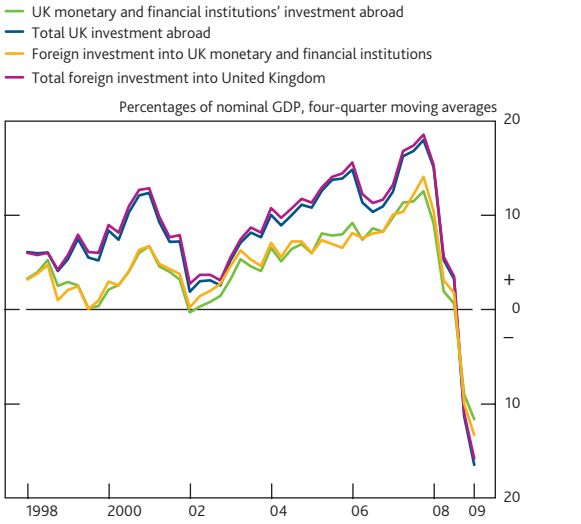
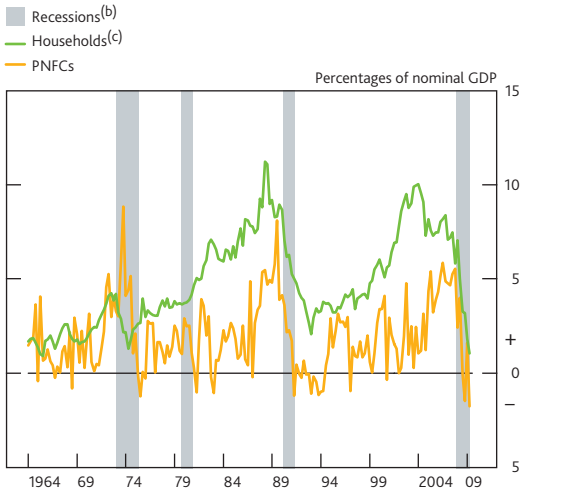


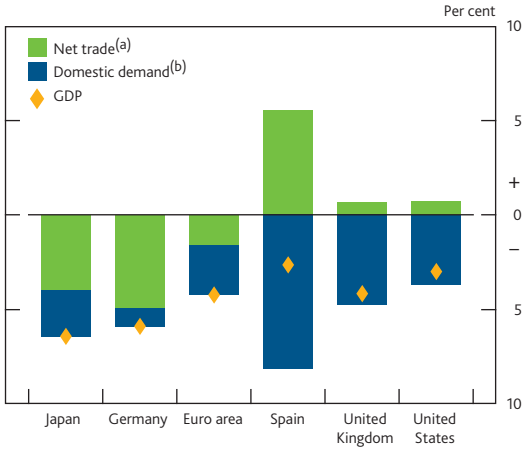
Chart 14 Net bank lending to private non-financial corporations (PNFCs) and households(a)



(a) Sterling lending excluding the effects of securitisations and loan transfers.
(b) Recessions are defined as two consecutive quarters of falling output (at constant market prices) estimated using the latest data. The recessions are assumed to end once output began to rise, apart from the 1970s where two separate occasions of falling output are treated as a single recession.
(c) Sum of: secured lending to households; unsecured lending to households; and lending to unincorporated businesses and non profit making institutions serving households, over the periods where data are available.

(1) See the October 2008 *Financial Stability Report* for a detailed description of this period.

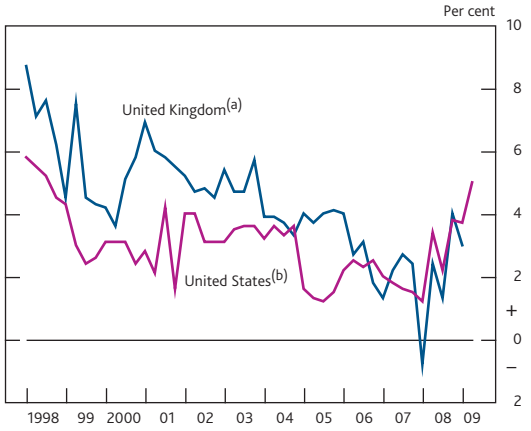
Chart 15 Cumulative change in real GDP and contributions of components over 2008 Q4 and 2009 Q1



Sources: Thomson Datastream and Bank calculations.

(a) Contributions of net trade to GDP.
(b) Contributions of domestic demand to GDP.

Chart 16 Household saving ratios



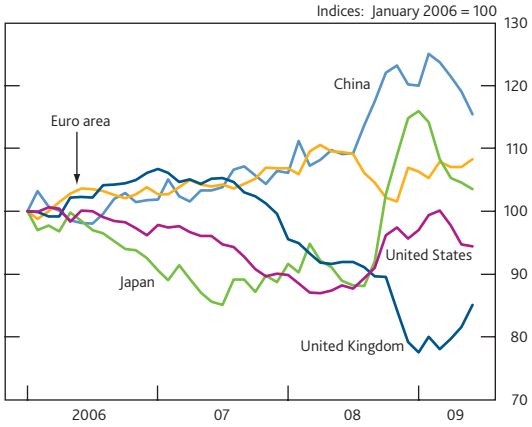
Sources: Bureau of Economic Analysis and ONS.

(a) Percentage of households' post-tax income.
(b) Percentage of disposable personal income.

the constrained credit supply contributed to falls in UK house prices which started in late 2007 and to a flattening out in the household debt to income ratio. UK household savings also rose during the crisis (**Chart 16**), reflecting tighter credit conditions and other factors such as increased job uncertainty (see Berry, Waldron and Williams (2009)).

As discussed above, the counterpart to the strength of UK domestic demand prior to the crisis was persistent external deficits. But the UK current account deficit was narrower during the crisis period than in 2006 and 2007. UK net trade improved during the crisis, despite the collapse in world trade (**Chart 1**), as the weakness of UK demand contributed to UK imports falling by more than UK exports. The improvement in UK net trade also in part reflected the 20% depreciation of the sterling effective exchange rate which occurred between August 2007 and June 2009 (**Chart 17**). This depreciation appears to have been driven by a combination of the impact of deleveraging flows, concerns about UK relative

Chart 17 Real effective exchange rates(a)



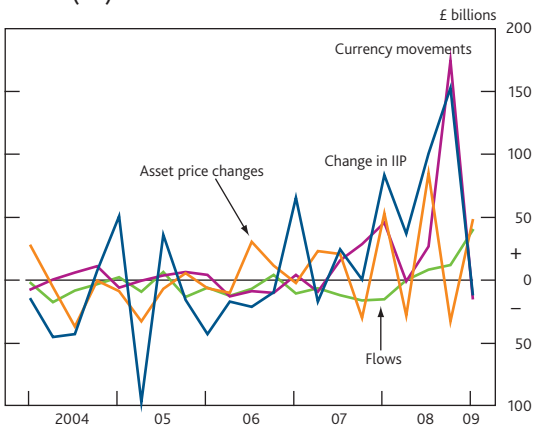
Sources: Bank for International Settlements and Bank calculations.

(a) Broad indices based on CPI.

macroeconomic prospects and the riskiness of UK assets, and perceptions of the need for the UK economy to rebalance. But there remains considerable uncertainty about the precise sources of the depreciation and their timing — see Astley, Pain and Smith (2009).

As well as stimulating net trade, sterling's depreciation during the crisis increased the sterling value of UK net external asset holdings (**Chart 18**). Indeed, those positive valuation effects from sterling's depreciation played an important role in shifting the United Kingdom from a net external debt position in 2008 Q3 to a net external asset position by 2009 Q1 (**Chart 9**). Those revaluation effects reflected the fact that the majority of UK external assets were denominated in foreign currencies, while UK liabilities were predominately in sterling, combined with the extremely large gross external assets and liabilities.(1) As such, in recent years fluctuations in the UK net external asset position have been more affected by movements in sterling and other asset prices than by the

Chart 18 Reconciliation of changes in UK net external assets (IIP)



Note: 'Other changes' category omitted.

Sources: Bank calculations based on Bank of England, IMF and ONS data.

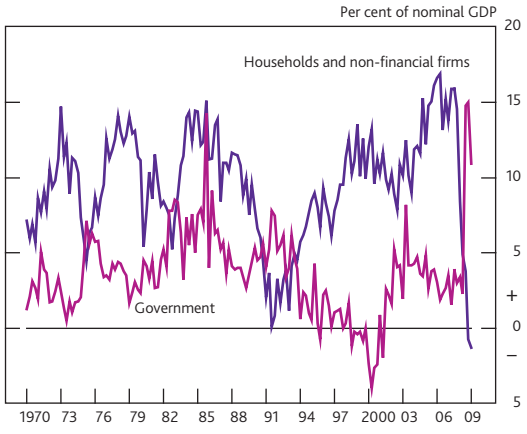
(1) See Whitaker (2006) for a discussion of the composition of UK assets and liabilities as well as substantial measurement issues surrounding the data.

negative 'flow' effects of persistent current account deficits (**Chart 18**).

Other exchange rates also moved sharply during the crisis. Even though the crisis originated in the United States, the dollar appreciated as the crisis intensified (**Chart 17**). This seems in part to again reflect deleveraging flows (see Astley, Pain and Smith (2009)). In particular, large-scale sales of foreign assets by US institutional investors, as they sought to repatriate funds, accounted for the financing of the US current account deficit in 2008 Q4 and 2009 Q1 (see the June 2009 *Financial Stability Report*). Despite declining from their high pre-crisis levels, foreign purchases of US assets on the whole also remained positive during the crisis, due in part to the US dollar's status as a reserve currency.

Other aspects of the US adjustment to the financial crisis are, however, more similar to the United Kingdom, with some rebalancing of the economy again being apparent. In particular, a sharp slowdown in lending and the wealth losses from asset price falls were associated with a significant rise in the US household savings ratio (**Chart 16**). This private sector retrenchment was, however, offset by higher government borrowing, associated with cyclical falls in revenue and financial sector support (**Chart 19**). With national savings remaining broadly unchanged, the narrowing of the 2009 Q1 US current account to its smallest deficit since 1999 (**Chart 20**) was to a large extent due to a sharp decline in private investment. The significant fall in oil prices in the second half of 2008 also meant that the value of imports decreased significantly.(1)

Chart 19 US net borrowing



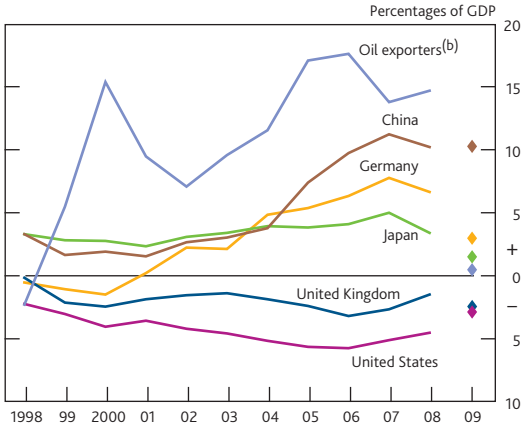
Sources: Bureau of Economic Analysis, Federal Reserve and Bank calculations.

Adjustment in surplus countries

The lower oil price has also played an important role in reducing the current account surpluses of oil-exporting countries. The IMF forecasts that their combined surplus will all but disappear in 2009 (**Chart 20**).

For China, a large importer of oil, lower oil prices on their own would imply a higher trade surplus because the value of oil imports falls. But over past quarters, China's trade surplus has declined as total imports fell by less than exports. In 2009 Q2, the trade surplus narrowed to its lowest level in three years. Some of this may be due to the appreciation of China's real effective exchange rate, having pegged the renminbi closely to the US dollar throughout the crisis (**Chart 17**). But China's substantial fiscal stimulus also appears to have succeeded in keeping domestic demand, particularly investment, growing at a robust pace.(2)

Chart 20 Current account balances(a)



Sources: IMF April 2009 *WEO*, various national accounts and Bank calculations.

(a) For Germany, Japan, United Kingdom and United States diamond is 2009 Q1 observation, for China and oil exporters is the IMF April 2009 *WEO* forecast for 2009.
(b) Oil exporters include OPEC countries, Norway and Russia.

The pattern of a smaller fall in imports than exports was mirrored in other surplus countries such as Germany and Japan. Over 2008 Q4 and 2009 Q1, these countries experienced sharper contractions in activity than the deficit countries, in part reflected by the fact that the fall in world demand has been disproportionately concentrated in intensively internationally traded items such as capital goods and consumer durables (see May 2009 *Inflation Report*). Output was driven down by the stark fall in exports relative to imports, with domestic demand falling by less (**Chart 15**). This is in contrast to deficit countries such as the United States and United Kingdom where the decline in output was more than driven by domestic demand. As a result, the current account surpluses of Germany and Japan have narrowed sharply since the onset of the crisis (**Chart 20**).

Will the crisis have lasting effects on global imbalances?

The crisis has been unprecedented in several respects,(3) so there are considerable uncertainties surrounding the likely

(1) Oil prices fell from around $130/barrel in July 2008 to around $40/barrel in December 2008 — see Saporta, Trott and Tudela (2009). They subsequently rose however, to around $70/barrel in June 2009.
(2) See the World Bank's quarterly update on China in June 2009.
(3) See Reinhart and Rogoff (2008) and Borio (2008).

path of adjustment, and previous crises may not provide a reliable guide to the pattern of adjustment.

The previous section showed how the recent partial correction in global imbalances was driven by several factors including a more pronounced fall in domestic demand in deficit countries than surplus countries, exchange rate adjustment in some countries such as the United Kingdom, and a steep drop in commodity prices. But if the correction of global imbalances is to persist as the global economy recovers, some structural rebalancing in global demand is also likely to be required. Whether increased private saving in deficit countries will be sustained is a major uncertainty in this regard. Another uncertainty is whether the changes in saving behaviour required for rebalancing are taking hold in the EAEs. Some reforms encouraging household consumption in surplus countries are already under way but are likely to take some time to affect behaviour.

One lesson from the crisis is that the persistence of global imbalances may also depend on the ability of deficit countries to supply enough high-quality assets to meet the demands of investors. In the short run, increased supply of government bonds resulting from the expansionary fiscal policies pursued in deficit countries has provided an ongoing source of asset supply to meet the investment demand from surplus countries. However, to the extent that savers in surplus countries may become more reluctant over time to invest funds in deficit-country government bonds this would tend to raise the cost of borrowing in deficit countries. This shift in the relative cost of borrowing could be an important part of the process by which a rebalancing of demand from deficit to surplus countries is achieved over the medium term.

Conclusion

Global imbalances contributed to the financial crisis and resulting recession through associated large capital flows. Such capital flows contributed to a misallocation of funds and the mispricing of risk. Being a small open economy with a large financial sector, the UK economy was greatly affected and its recent experience is best understood in an international context.

Relative price changes were important: sterling's depreciation improved the United Kingdom's net external asset position and, alongside slowing demand, helped support net trade and hence some narrowing of the UK current account deficit. This shift was mirrored in other countries, resulting in some partial correction of global imbalances.

But whether such rebalancing in the United Kingdom and the global economy can be sustained depends on structural forces, including the extent to which consumers in deficit countries remain restrained and domestic demand in surplus countries picks up.

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Household saving

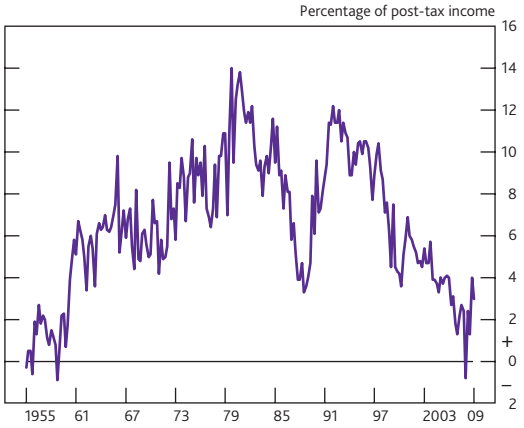
By Stuart Berry and Richard Williams of the Bank's Structural Economic Analysis Division and Matthew Waldron of the Bank's Conjunctural Assessment and Projections Division.[1]

Household decisions on whether to save or spend play a key role in the outlook for aggregate demand. A range of factors could help to explain the fall in the household saving ratio over the period 1995 to 2007. Declines in long-term real interest rates, looser credit conditions, rising asset values and greater macroeconomic stability are all likely to have reduced the incentive or the need to save. Lower household saving was also offset to some extent by higher corporate saving. Since 2007, the financial crisis and subsequent recession have unwound some of these factors and may continue to lead to a rise in household saving.

Introduction

Household consumption accounts for around two thirds of aggregate spending in the UK economy. So decisions by households on whether to spend or save are a key influence on the economic outlook. The share of their income that households saved fell steadily over much of the period 1995 to 2007 (**Chart 1**).

Chart 1 Household saving ratio



More recently, the economic environment has changed substantially with credit conditions tightening sharply and a global slump in confidence leading to a recession across much of the world. In the United Kingdom, output has fallen by around 5½% over the past year. These developments are likely to have altered households' views of the appropriate balance between saving and spending. By the end of 2008 and early 2009, the saving ratio had picked up a little relative to 2007 and early 2008. The August 2009 *Inflation Report* also highlighted the outlook for household saving as a key uncertainty (page 43). The Monetary Policy Committee (MPC) considered it likely that the saving ratio would rise further.

This article considers some of the factors that are likely to have driven the changes in saving outlined above. The next two sections set out the theoretical underpinnings for household spending and saving decisions. Subsequent sections then consider possible explanations for the decline in the saving ratio between 1995 and 2007 and the potential impact on saving of the recent global financial turbulence, before concluding.[2]

What is household saving?

Households' saving represents the balance between their current income and their current consumption. By not spending some of their current income on consumption, or alternatively by borrowing, households can accumulate financial assets, such as deposits and shares, and housing assets. This identity for funds raised and assets accumulated can be written as:

$$\underbrace{S + D}_{\text{Funds raised}} = \underbrace{A + H}_{\text{Assets accumulated}}$$

where S is saving; D is the net acquisition of debt; A is the net acquisition of financial assets; and H is the net acquisition of housing assets.[3]

(1) The authors would like to thank Stephen Burgess for help in producing this article.
(2) For discussion of the contribution of international savings and investment imbalances see Astley, Giese, Hume and Kubelec (2009) in this edition of the *Quarterly Bulletin*.
(3) Net acquisition means acquisition minus disposal. For example, the net acquisition of financial assets is the purchases minus the sales of financial assets. Similarly, the net acquisition of debt is new borrowing minus the repayment of the principal on existing debt.

In practice, some households will be borrowing to increase the funds they have available for consumption while others will be saving. In aggregate, though, households tend to save, and do so mainly to finance investment in housing. Accumulating more financial assets raises households' stock of net financial wealth, while accumulating debt reduces it, other things being equal. Of course, wealth may also change independently of households' saving decisions, as changes in financial asset prices will alter the value of the stock of assets.

Consumption and saving theory

There are many reasons why different households' incomes and spending decisions may vary. This section abstracts from these different saving motives at the individual household level and focuses on the macroeconomic determinants that help to explain why aggregate household saving can vary over time.

Permanent income

Following the work of Friedman in the 1950s, modern consumption theory has been built on the life-cycle/permanent-income model. In that model, households base their current spending decisions on their so-called permanent incomes, the income they would expect to receive on average over their entire lifetimes. This approach recognises that households are to some degree forward looking and that they would prefer a smoother consumption path to a more variable one.

The permanent-income model has clear implications for saving behaviour. If income is higher now than it is expected to be in the future, then households will save today. If income is lower now than it is expected to be in the future, then households will dissave (by borrowing or selling existing assets). For example, in an economic downturn in which current incomes temporarily fall below future incomes, households will run down their savings to support current consumption. Although simple, this logic is powerful and may be able to explain some of the historical swings in saving and spending. For example, Attanasio and Weber (1994) provide evidence that part of the consumption boom and decline in the saving ratio in the late 1980s was due to rising optimism on the part of households about their future income prospects.

Interest rates

The risk-free real interest rate is a key determinant of the amount of real spending that a household can achieve in the future by forgoing consumption today and saving. Here, risk-free means there is no possibility of a borrower defaulting on loan repayments. A higher real interest rate encourages consumers to postpone consumption because it increases the real return to saving (and the real cost of borrowing). It also redistributes income from borrowers to savers. If savers are less likely to spend that income than borrowers, this could also push down on aggregate spending and increase the saving ratio.

Anticipated changes in the real interest rate should already be factored in to households' spending plans and so would not be associated with a large change in saving. But an unanticipated increase in the real interest rate, for example, would tend to lead to a fall in current spending and an increase in the saving ratio. The strength of that effect will depend on households' preferences over the timing of their spending. Households may choose not to postpone much spending in response to an unanticipated rise in real rates if they prefer a very smooth consumption profile over time.

Credit conditions

Some households may not be able to borrow as much as they want to finance their desired consumption. In practice, banks charge a higher rate on borrowing, and pay a lower rate on deposits, than the risk-free rate assumed in the standard permanent-income model. And some households that are deemed to be less creditworthy may face a much higher cost of borrowing or may be denied access to credit altogether. If credit becomes more expensive or more difficult to obtain, then borrowing and spending will be lower and so aggregate saving will be higher. That means that changes in the price or quantity of credit may be important drivers of the aggregate saving ratio in a similar way to changes in the risk-free real interest rate.

Uncertainty

Uncertainty about future income may also play an important role in shaping households' consumption and saving decisions (see for example Leland (1968) and Carroll (2001)). In the absence of perfect insurance markets, risk-averse consumers will wish to maintain a buffer of savings as a precaution against unexpected falls in income. That will help them to avoid undesirable swings in spending and smooth their consumption. A rise in uncertainty, for example if households believe there is a larger risk of losing their job, is likely to lead to an increase in the amount of precautionary saving that households choose to undertake.

Wealth

A household's financial wealth forms part of its lifetime resources so an increase in its value, for example as equity prices rise, would tend to encourage households to spend more and save less. Of course, the extent to which a change in asset prices is associated with a change in consumer spending also depends on why asset prices changed (Millard and Power (2004)). For example, if equity prices rose because of a fall in the volatility of equity returns — implying a fall in the compensation for holding riskier assets such as shares instead of government bonds — then consumption and the saving ratio may not change. The dividends paid and household permanent incomes would be unchanged.

There are a number of reasons why households may not respond, or may respond only slowly, to movements in wealth.

Asset prices can be volatile and households may not expect recent changes to persist. Moreover, around half of households' financial assets are tied up in life assurance and pension funds. Changes in the value of those assets may be less visible to households. Corporate ownership is also likely to be unevenly distributed. For example, the British Household Panel Survey suggests that only around 25% of households own equities directly. Such households are likely to be wealthier and so may be less likely to increase their spending in response to a rise in the value of their assets than if corporate ownership were more evenly distributed across the population.

Some studies suggest that the long-run marginal propensity to consume out of wealth in the United Kingdom is around 0.04–0.06. That suggests that if wealth increases by £1, consumption increases by around 4 to 6 pence per year (see Bertaut (2002), Boone *et al* (2001) and Ludwig and Sløk (2002)). But such estimates are subject to considerable uncertainty.

Housing assets are rather different from financial assets because households also obtain a stream of housing services from them. As Benito *et al* (2006) highlight, declines in house prices make some people better off (those expecting to trade up or potential first-time buyers) and some people worse off (those expecting to trade down). So it is not clear that changes in the value of housing assets should have any impact on aggregate consumption through an ordinary wealth effect.

Changes in house prices could still affect aggregate consumption and saving through a number of other channels. In particular, a rise in house values means that households have more collateral against which to borrow. That can make it easier for households to obtain credit. If that leads them to spend more, it would temporarily reduce the household saving ratio. Housing equity can also form part of a household's precautionary saving balances. For example, in the event of job loss, a household may be able to withdraw equity from their home to tide them over until they find another job. An increase in house prices can therefore reduce the need to hold alternative forms of precautionary saving like financial assets, allowing households to spend more and save less.

Government and corporate saving

Households are also likely to be influenced by how much other sectors of the economy are saving. Saving by companies and the government should ultimately flow back to households via lower taxes or higher dividends. Therefore, in principle, it should be the overall level of saving in the economy — or national saving — that households care about.

The theory of Ricardian equivalence, dating back to the work of Ricardo (1820), suggests that households view their own saving and government saving as perfect substitutes. So if the government borrows to fund a tax cut, households should anticipate that this will require higher taxes in the future (for unchanged government spending). They will save the tax cut to pay for the future increase in taxes and maintain a smooth profile for consumption. Lower government saving (or higher government borrowing) is therefore offset by higher household saving. A similar argument applies to corporate saving as well.

In practice, while government and corporate saving are likely to be important influences on household saving, they are likely to be imperfect substitutes. So the level of household saving is important as well as national saving.

One important assumption for Ricardian equivalence is that perfect capital markets exist. As noted earlier, some households are likely to be constrained in the amount of credit they can obtain, so they may be currently consuming less than they would ideally like. For those households, a tax cut allows them to increase their current consumption towards the desired level. So if some households are credit constrained, they will spend the extra income from a tax cut rather than save it, and lower government saving would be only partly offset by higher household saving.

Ricardian equivalence also assumes that households care about their children's well-being and that they leave bequests (Barro (1974)). Tax rises that are expected to occur beyond the lifetime of the current generation will only lead to an increase in household saving now if households care about their children who will have to pay the extra taxes. Intergenerational altruism is likely to be imperfect in practice, although there is no consensus about the extent of that imperfection (see for example Modigliani (1988) and Kotlikoff (1988) for two alternative views). Other assumptions required for full Ricardian equivalence to hold, such as that taxes do not distort the allocation of resources, may also be unrealistic.

The relationship between household saving and corporate saving is likely to be affected by the ownership of companies. As noted earlier, much of the corporate sector is owned indirectly by households through pension funds, and ownership is unevenly distributed. That could make the response of household saving to changes in corporate saving more muted. Furthermore, a substantial part of the UK corporate sector is owned by overseas investors — almost half of UK quoted shares. So not all UK corporate saving will flow back to UK households. Conversely, some UK households own shares in overseas companies, either directly or indirectly, so corporate saving in other countries may also affect household saving in this country.

Inflation

Some household assets are fixed in nominal terms, such as deposits. Inflation erodes the real value of these assets. To compensate for this loss, a higher inflation rate is usually

associated with a higher nominal interest rate and higher interest receipts. But households must save rather than spend those higher interest receipts for the real value of their wealth to be maintained. Higher inflation should therefore lead to higher saving. If the higher inflation was not anticipated, it may not be reflected in longer-term interest rates and so interest receipts may not fully compensate households for the fall in the real value of their assets. They would then need to reduce their consumption to finance the additional saving. Large swings in inflation could therefore generate significant changes in the saving ratio.

Demographics

The life-cycle/permanent-income model implies that households' saving behaviour is likely to differ systematically over their lifetimes. The model predicts that households should borrow when they are young and their incomes are relatively low, save for retirement during middle age when their incomes are higher, and then run down that saving during retirement. Although the simple life-cycle model cannot explain all aspects of the data, empirical evidence supports that broad life-cycle pattern of saving (eg Banks and Blundell (1994)).

Changes in the age structure of the population over time can therefore affect the aggregate saving ratio. For example, the passing of the large baby-boom generation through middle age into retirement would be expected to be associated with a decline in the saving ratio as the 'baby-boomers' move from a stage of their life in which they are saving to a stage of their life in which they are dissaving. Other demographic trends may affect aggregate household saving too. For example, rising life expectancy would encourage higher saving to the extent that households have to fund longer retirements than they had previously expected. Over long periods of time, these demographic changes can be powerful drivers of saving. But they are likely to be very slow moving, reflecting gradual changes in the demographics themselves.

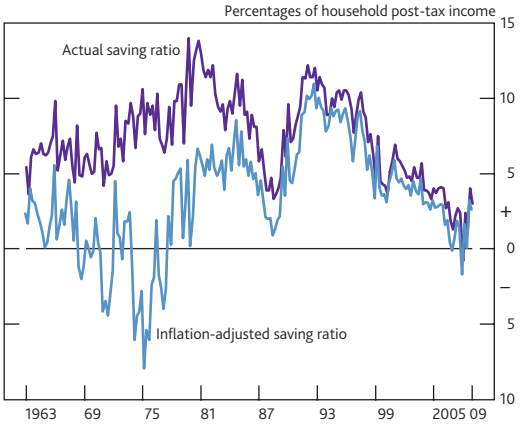
Why did household saving fall between the mid-1990s and 2007?

The household saving ratio fell from around 10% in the mid-1990s to around 2% by mid-2007, before the financial crisis began. That does not necessarily imply a boom in household consumption. As Nickell (2004) pointed out, while consumption growth was strong in the late 1990s, this has not been true since 2000. The average quarterly growth rate of real household consumption between 2000 and 2007 was around 0.7%, in line with the average rate since 1975. And over the same period, nominal household consumption fell slightly as a share of GDP. The fact that the consumption share fell despite the falling saving ratio can be explained by the fact that household disposable incomes also fell as a share of GDP over that period. Even if consumption was not unusually strong, households did choose to save less. Using the key determinants set out above, this section briefly considers some potential explanations for that decline in saving.

Was saving low in 2007?

By mid-2007 the household saving ratio was low by historical standards. But that does not take into account the impact of inflation. Since inflation targeting began in the early 1990s, inflation has been lower and more stable than it was during the 1970s and 1980s. **Chart 2** presents a measure of the household saving ratio that has been adjusted for inflation. This strips out the saving required to maintain the real value of nominal assets as it is eroded by inflation. It shows that the saving ratio was low during the 1970s once the high levels of inflation were taken into account, and the saving ratio in the early 1990s looks relatively high. The subsequent decline in the late 1990s and through much of the current decade could simply be saving returning to more normal levels. But it could also be that households did not respond fully to the high inflation in the 1970s and so using an average of saving ratios for comparison which includes that period may be misleading.

Chart 2 Inflation-adjusted household saving ratio[(a)]



Sources: ONS and Bank calculations.

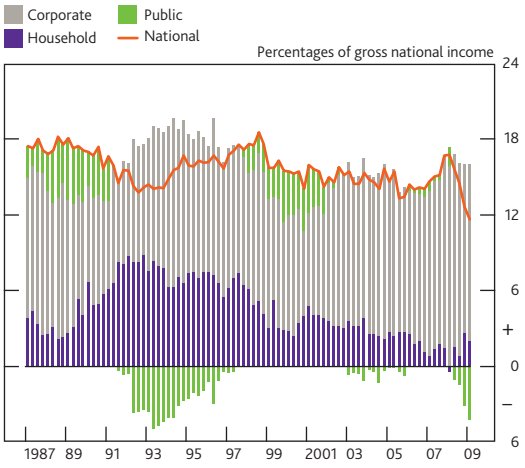
(a) Saving adjusted for the impact of inflation on the real value of assets and debt held by the household sector which are fixed in nominal terms. Percentage of inflation-adjusted post-tax income. See Davey (2001).

As noted earlier, households' saving decisions are also likely to be influenced by corporate and government saving. National saving was much more stable than household saving from the mid-1990s to 2007, mainly due to rising corporate saving (**Chart 3**). To the extent that corporate saving is a substitute for household saving, that may have been a factor in households' decisions to reduce their saving ratio. But as Whitaker (2007) points out, national saving was still low relative to the level required to finance enough investment to maintain the capital stock.

Factors pulling down on household saving

From the mid-1990s to 2007, changes in a number of the key determinants of household saving are likely to have encouraged households to save less. Between 1997 and 2006,

Chart 3 Sectoral breakdown of national saving

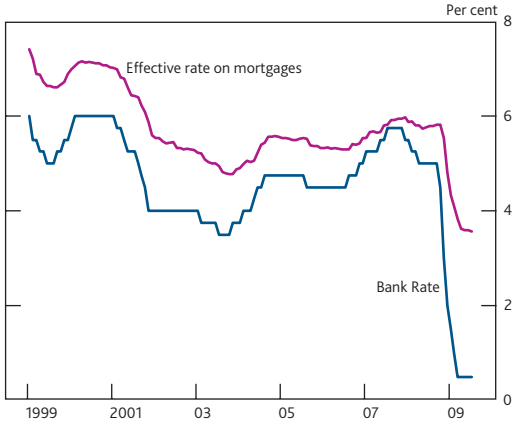


UK long-term real interest rates (as measured by index-linked gilts) fell by over 2 percentage points. Analysis using a disaggregated model of household behaviour in Benito *et al* (2007) suggests that this might explain a fall in the saving ratio of around 4 percentage points, or half of the decline in the household saving ratio over that period.

The late 1990s and early 2000s were also characterised by stable non-inflationary growth. The unemployment rate fell sharply in the late 1990s and remained stable at around 5% for much of this decade. Greater macroeconomic stability is likely to have reduced precautionary saving by households as the risks of an unexpected fall in income were lower.

In the earlier part of this decade, the supply of credit appeared to increase substantially. Spreads between Bank Rate and mortgage rates narrowed from over 100 basis points at the start of the decade, to around 50 basis points at the end of 2006 (**Chart 4**). The average loan to income ratio on new mortgage lending also rose over this period. Cheaper and easier access to credit is likely to have made some households bring forward consumption and therefore reduce aggregate saving.

Chart 4 Effective interest rate on the stock of outstanding mortgages and Bank Rate



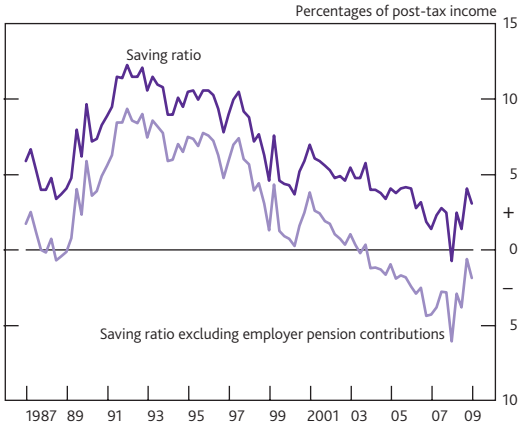
Rising asset prices may also have encouraged households to save less. Capital gains on their existing stock of assets acted to offset the decline in saving, so that households' net financial wealth was still at around the same level, relative to income, at the end of 2006 as it was a decade earlier. On average, households had been drawing down on their net financial wealth over that period as debt accumulation (mainly associated with homeownership) outstripped new purchases of financial assets. Without the capital gains, therefore, saving may have needed to be higher to maintain households' financial wealth. Rapid increases in house prices may also have facilitated lower saving by providing more collateral against which to borrow.

Survey data from the British Household Panel Survey on the balance sheets of individual households suggest that it was older households that gained the most from asset price rises. But it appears to be younger households that reduced their saving the most. That might suggest that asset prices played less of a role in reducing saving, unless those gains were eventually expected to be passed down from the older generation.

Factors pushing up on household saving

There are some other factors that might have worked in the opposite direction over the 1995 to 2007 period. Demographics may have been pushing up on the saving ratio. The proportion of middle-aged households has been rising over the past decade, and they are typically expected to save more than younger or older households. In addition, employers boosted their pension contributions substantially in the earlier part of this decade. Excluding such contributions, the saving ratio would have fallen even more sharply over that period (**Chart 5**). Theory suggests households would have factored these additional payments into their own saving decisions — so if companies had not boosted their contributions, households may have boosted theirs, leaving the saving ratio unaffected. But if households did not fully

Chart 5 Household saving ratio and employer pension contributions



Sources: ONS and Bank calculations.

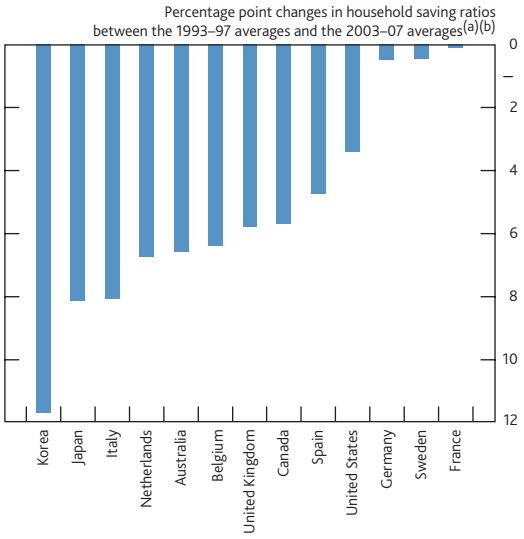
factor them in, the company contributions will have raised the saving ratio.

The decline in household saving in an international context

Many of the factors that are likely to have pulled down on household saving in the United Kingdom are likely to be related to some extent. For example, lower long-term real interest rates could be associated with rising asset prices and looser credit constraints. Many of the factors are also global in nature. Falling real interest rates, rising asset prices and greater macroeconomic stability were present in many countries. The loosening in credit conditions also appears to have been an international phenomenon. As the IMF (2009) indicated: 'While the credit boom in the 1920s was largely specific to the US, the boom during 2004–07 was global, with increased leverage and risk-taking in advanced economies and many emerging economies'.(1)

This is consistent with a fall in saving ratios across many countries, although there is a large dispersion in the size of the falls (**Chart 6**). This dispersion suggests the influence of these factors may have varied across countries and that there may also be a role for country-specific influences driving the behaviour of saving.

Chart 6 Changes in saving ratios across countries



Source: OECD.

(a) The UK data do not incorporate revisions arising from the June 2009 *Blue Book*.
(b) Data for the United Kingdom and Spain are on a gross basis, including consumption of fixed capital (for example housing depreciation). Data for all other countries are net of fixed capital consumption. Data include saving by non-profit institutions serving households (NPISH) except for France and Japan.

In summary, there are a range of factors that are likely to have pushed down the household saving ratio in the United Kingdom between the mid-1990s and 2007. The decline over that period may not, therefore, be surprising. But that is not to say that such a low level of saving by historical standards will persist. Many of the factors that have acted to push down saving can unwind, as is shown in the next section.

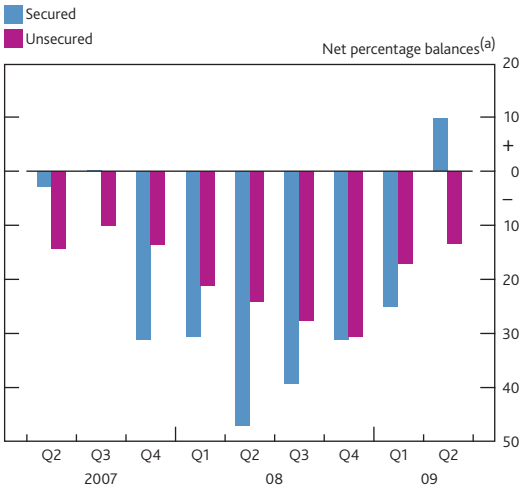
The potential impact of the financial turbulence since 2007

The abrupt change in financial conditions and the economic outlook over the past two years is likely to have led to a marked change in households' perceptions of their own financial position.(2) That could have important consequences for their spending and saving decisions. By the end of 2008 and early 2009, the saving ratio had picked up a little relative to 2007 and early 2008. This section looks at some of the key factors that may lead to a change in saving behaviour, most of which represent a reversal of the factors outlined above that are likely to have pushed down on saving in the past.

Tighter credit conditions

As the financial crisis has unfolded, banks have become much less willing to extend credit to households (**Chart 7**). This tightening in credit conditions has taken the form of a rising cost of borrowing relative to risk-free interest rates and greater quantity constraints (for example larger deposits being required on mortgage loans). This may make some households less willing or able to spend as much as they might otherwise have done, thereby increasing saving.(3)

Chart 7 Bank of England *Credit Conditions Survey*: availability of credit to households



(a) Net percentage balances are calculated by weighting together the responses of those lenders that answered the question. A negative balance indicates that less credit has become available over the past three months.

Furthermore, households may be more concerned that credit will be expensive or difficult to obtain should they need it in the future. The spread over risk-free rates charged on new mortgages has risen by around 2½ percentage points over the past two years. If at least part of that is expected to persist this could lead to higher precautionary saving.

(1) For a discussion of some of these factors see Astley, Giese, Hume and Kubelec (2009) in this edition of the *Quarterly Bulletin*.
(2) As noted earlier, an international perspective on the credit crisis is provided in Astley, Giese, Hume and Kubelec (2009) in this edition of the *Quarterly Bulletin*.
(3) Higher spreads have been more than offset by the decline in Bank Rate, so the effective rates paid on new borrowing have fallen. But quantity restrictions mean that less credit is available at these prices.

Increased job uncertainty

As noted earlier, the level of precautionary saving undertaken by households also depends on the risk of a significant fall in income. As the recession has deepened, job losses have become more widespread. The unemployment rate has risen by around 2½ percentage points over the past two years. Households' expectations of how unemployment will change in the future have also risen (**Chart 8**). A rise in saving may be even more likely given that the current recession followed a prolonged period of economic stability and low unemployment, when households may have kept precautionary saving at a low level.

Chart 8 Households' expectations of unemployment

Source: Research carried out by GfK NOP on behalf of the European Commission.

(a) Net balance of households expecting unemployment in the United Kingdom to rise over the following twelve months.

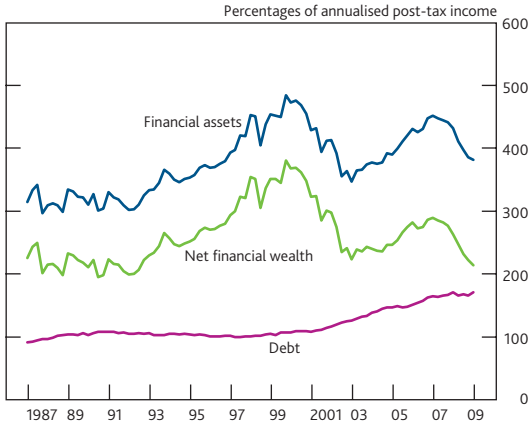
On the face of it, an increase in precautionary saving while the economy is in recession may seem counterintuitive. Instead, households might be expected to run down their saving to smooth their consumption. But during the recession in the 1990s, saving increased sharply. The saving ratio rose from a trough of just over 3% in 1988 Q3 to a peak of just over 12% in 1992 Q1. Concerns about households' future financial position may at times outweigh the desire to maintain earlier consumption levels.

Falling asset prices

The financial turbulence over the past two years has been accompanied by sharp falls in asset prices. That has reduced the value of assets held by households and hence reduced their wealth (**Chart 9**). Net financial wealth fell by around a quarter in the two years to 2009 Q1, although the subsequent rebound in financial asset prices is likely to have recovered part of those losses. The decline in wealth may lead households to look to increase their saving for a period to rebuild their balance sheet.

It is difficult to assess how much, if at all, households might seek to rebuild their wealth. This will depend on a variety of factors, including expectations of key drivers such as future incomes. Nevertheless, net financial wealth relative to

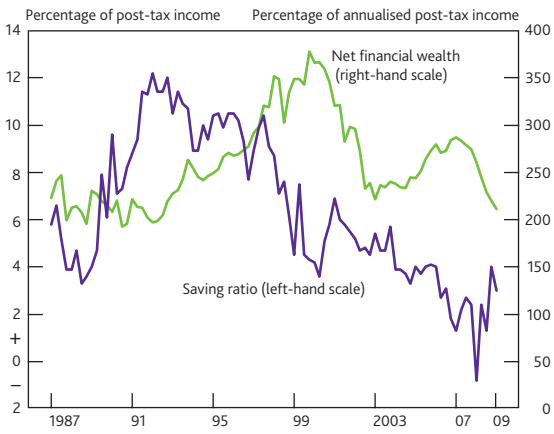
Chart 9 Household sector balance sheet



post-tax income is currently low compared with its average over the past 20 years.

The stock of wealth held by households is large relative to their income, and so saving flows are only likely to have a gradual impact. For example, even if households saved as much as 10% of their income, it would take them nine years to bring wealth back up from its 2009 Q1 level to the average over the past 20 years (assuming no further changes in asset prices and households continued to invest around 4 percentage points of their saving in new housing). This might suggest, therefore, that a sharp adjustment in saving is required in response to movements in asset prices. But in practice, sharp changes in saving are not always seen. For instance, although the saving ratio fell in the late 1990s as asset prices rose, it remained little changed as asset price falls reduced net financial wealth again in the early part of this decade (**Chart 10**).

Chart 10 Household net financial wealth and the saving ratio



The value of housing assets has also declined sharply over the past two years. Although, as noted earlier, this is less likely to have an impact through an ordinary wealth effect, lower house values mean that households have less collateral against which to borrow. Hellebrandt *et al* (2009) estimated that around 7%–11% of owner-occupier households with

mortgages were in negative equity in Spring 2009, meaning the value of their mortgage exceeded the value of their house, and hence had no collateral against which to borrow more. The proportion of households with high loan to value ratios (in excess of 75%) is also estimated to have increased sharply over the past two years. This is likely to interact with tightening credit conditions to make it harder or more expensive to obtain credit, leading to lower consumption and higher saving.

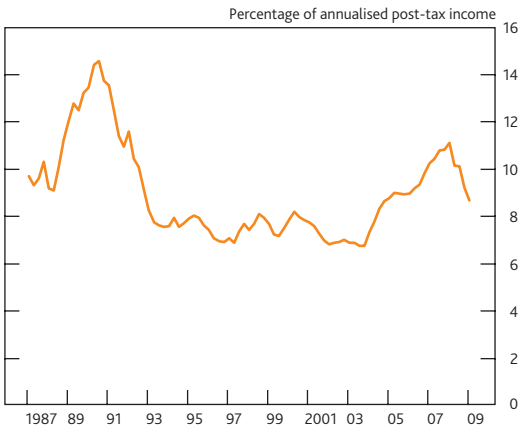
Reassessment of debt levels

Households may also seek to increase saving to repay debt, although as this section highlights, aggregate debt levels can also adjust in other ways over time. In principle, it should be households' net financial wealth that matters for consumption and saving. But gross balance sheet positions may also matter (see Benito *et al* (2007)). Even if high debt levels are backed by assets, they make households more vulnerable to changes in asset prices or financing costs. Debt levels have risen substantially over the past decade, to around 1.7 times annualised post-tax income, compared with one times income for most of the 1990s. Given the sharp increase in asset price volatility during the recent financial turbulence, households may seek to reduce their debt levels.

Households may be less likely to try to reduce their debt levels rapidly provided they can continue to service those debts. A standard measure of affordability — income gearing — has improved since early 2008. That is, the proportion of household income devoted to paying debt interest has fallen back recently and is now close to the average of the past fifteen years (**Chart 11**). This reflects falls in Bank Rate, which have brought down interest costs in spite of increasing spreads of lending rates over Bank Rate. Of course, debt may become less affordable if Bank Rate were to rise.

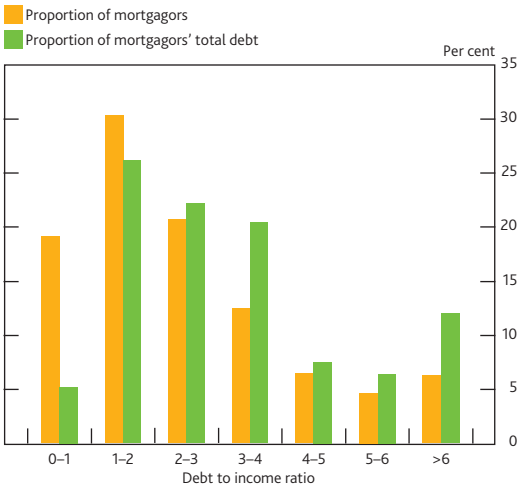
The distribution of debt across households can also be important. Even if average debt levels appear manageable, a significant minority of mortgagors for example have relatively high debt to income ratios (**Chart 12**). But any adjustment depends on how far such households might seek to reduce their ratios. For example, if all those with ratios above five sought to reduce them to five that would require a reduction in aggregate debt of around 6% (around 10% of annualised post-tax income). That could imply a significant increase in saving, even if the adjustment took place over a few years. Furthermore, unsecured bank credit levels, although much smaller, have also risen, by around 6% of annualised post-tax income since the start of the decade. An adjustment in those debt levels could also imply a significant increase in saving.

Chart 11 Household income gearing[a]



(a) Interest payments as a percentage of household post-tax income. The interest payment series excludes the adjustments made by the ONS to account for financial intermediation services indirectly measured (FISIM).

Chart 12 Distribution of mortgagors' total debt to income ratios



Sources: NMG Research survey 2008 and Bank calculations.

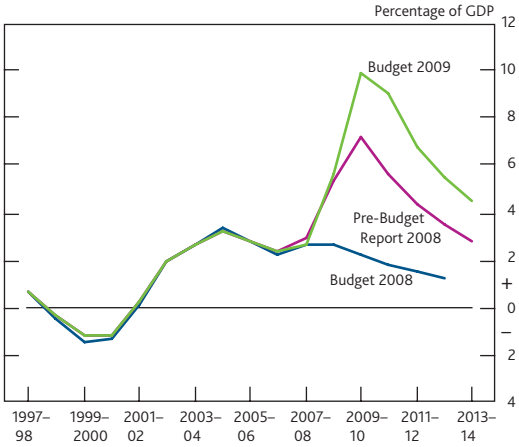
Household saving does not necessarily need to rise for debt levels to be reduced. Some households may be able to sell financial assets and use the proceeds to repay debt, although the scope for this may be limited because many debtors are unlikely to have substantial asset holdings. Aggregate debt levels could also fall as declines in house prices feed through. Households entering the housing market now have to take out lower mortgages than those who bought when prices were high. It can take some time for this to feed through to the entire stock of mortgages given that turnover in the housing market is relatively low (a house might typically change hands only once every ten years or so). Furthermore, some existing mortgages will have been taken out before the sharp increases in house prices earlier this decade. So when those houses are sold, the new mortgages may still be higher than the previous ones. Aggregate debt levels may not fall that far, therefore, as they are still responding to earlier house price increases as well as the subsequent falls.[1] This link between the housing market and debt levels also suggests that any desire by households to reduce mortgage debt levels could feed through to lower house prices.

(1) For a more detailed description of mortgage debt dynamics, see Hamilton (2003).

Higher government borrowing

As noted earlier, Ricardian equivalence can mean that increases in public sector borrowing lead to greater saving by the private sector. Cyclical swings in public sector borrowing can help households to smooth their consumption over the cycle, for example as lower taxes and higher benefits cushion the falls in incomes during a recession. In that case, private saving may not adjust. But structural changes in public sector borrowing are more likely to provoke a change in private saving. Over the past year, projections of cyclically adjusted public sector net borrowing have been revised up sharply (**Chart 13**). In the August 2009 *Inflation Report*, the MPC noted that households might feel that they need to save more to meet a higher future tax burden, given the fiscal consolidation that will be necessary in the years ahead.

Chart 13 HM Treasury projections of cyclically adjusted public sector net borrowing



Source: HM Treasury.

As noted earlier, credit constraints may mean that households are less likely to increase their saving in response to higher government borrowing. The number of credit-constrained households is likely to be higher than usual in the current environment. In the 2008 NMG survey of households conducted for the Bank, the number of households reporting that they had been put off spending by concerns about credit availability had risen to 16%, from 10% in 2006. To the extent that tax cuts allow households to spend more without accessing credit, this could reduce the impact of higher government borrowing on household saving somewhat.

Lower expected future income

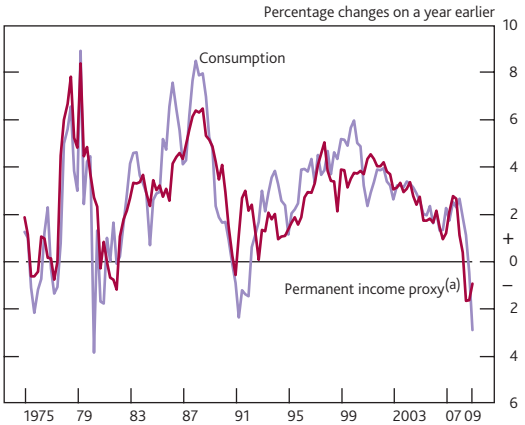
The recession may also have influenced households' expectations of their future income and hence permanent income. In the August 2009 *Inflation Report*, the MPC expected growth in the productive supply capacity of the economy to be eroded. For example, capital spending is likely to be weaker and some unemployed individuals may choose to leave the labour market altogether. If households have revised down their expectations of future income relative to current income, this would lead them to save more now to smooth their consumption path.

It is difficult to measure households' expectations of future income. But a number of indicators might be expected to provide a guide to any changes in permanent income. Survey measures of consumer confidence should reflect changes in households' financial position. And households might be expected to rein in spending on durable goods particularly sharply in response to a change in permanent income. This is because durable goods provide a flow of services that households consume over a length of time — so any desired change in the flow of services requires a larger swing in expenditure to adjust households' stock of durables.(1) Persistent changes in actual income growth might also signal a change in permanent income rather than temporary fluctuations. **Chart 14** shows a measure constructed from these indicators and scaled to match the mean and variance of household consumption. This proxy measure of permanent income has fallen sharply since the start of the financial crisis, which might suggest that households have revised down estimates of their permanent income.

Monetary policy

Over the past year, monetary policy has been providing a substantial stimulus to the economy that should act to smooth any adjustment in household saving. Bank Rate is close to zero and the asset purchases being undertaken by the Bank of England should act to push up asset prices. Low interest rates encourage households to spend rather than save, and higher asset prices will increase households' wealth. As a result, monetary policy will tend to cushion the extent to which saving may rise in the near term.

Chart 14 Household consumption and a proxy measure of permanent income



Sources: Research carried out by GfK NOP on behalf of the European Commission, ONS and Bank calculations.

(a) Average of three measures: a four-quarter moving average of post-tax labour income growth, the share of durables in total household spending and consumer confidence. Each measure has been scaled to match the mean and variance of household consumption.

(1) Spending on durables could be thought of as an additional part of household saving, in addition to accumulating financial assets and investing in housing. Instead of purchasing a durable good, households could choose to rent items for a period and use the money not spent on the good to accumulate financial assets.

Conclusion

Household decisions to spend or save reflect a wide range of factors, and they will be affected both by current developments and changes in households' expectations for the future. The household saving ratio declined over the period 1995 to 2007, reaching historically low levels. Much of that may be explained by falling real interest rates, looser credit conditions, rises in asset prices and greater macroeconomic stability. Lower household saving may also have been offset to some extent by higher corporate saving.

More recently, the financial crisis and the subsequent recession have led to tightening credit conditions, falling asset prices and greater job insecurity. Households may respond by increasing their precautionary saving. They may also save more if they are concerned about higher taxes in the future to reduce the fiscal deficit. Finally, households may seek to rebuild their balance sheets. All of these effects are, however, highly uncertain. History does not provide a clear guide. Saving increased sharply in the early 1990s recession and remained high for some time. But in the 1970s, the response of saving was muted and when adjusted for inflation, the saving ratio fell and was actually negative at times.

The persistence of the different influences on saving will vary: some factors currently pushing up on saving may be temporary, whereas others are more likely to persist. For example, increased job uncertainty might be expected to be a temporary feature of the recession. But job uncertainty could be persistently higher if households now believed that the economic stability from the mid-1990s to the mid-2000s was unusual.(1) One influence that is likely to persist is that credit conditions are likely to remain tighter than in the period leading up to the financial crisis, although not as tight as at present.

Any adjustment in saving is likely to have important consequences for the economic outlook, given the importance of household spending within aggregate demand. Indeed, any attempt to reduce consumption is likely to push down on output and hence household incomes. That could actually make it harder for households to increase their saving — an effect known as the paradox of thrift. The substantial stimulus provided by monetary policy is not designed to prevent an adjustment in saving from taking place, but it should smooth the path of spending, and reduce the disruption to output and therefore inflation.

(1) Back in 2004, it had already been suggested that this 'nice' (non-inflationary consistently expansionary) decade would come to an end. See King (2004).

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Interpreting recent movements in sterling

By Mark Astley and James Smith of the Bank's Monetary Instruments and Markets Division and Darren Pain of the Bank's Foreign Exchange Division.[1]

The sterling effective exchange rate has depreciated significantly since the start of the financial market crisis in August 2007. Movements in sterling affect UK monetary policy via their potential impacts on CPI inflation prospects, where it is important to consider the reasons behind the change in the exchange rate. Sterling's movements potentially reflect a wide range of factors in the United Kingdom and overseas, in both the real economy and in financial markets. Indicative evidence suggests that sterling's depreciation reflected a combination of perceived changes to UK relative cyclical prospects, the perceived riskiness of UK assets and the apparent need for the UK economy to rebalance, the effects of which may have been amplified by financial market factors. But there is substantial uncertainty about the precise role of each factor.

Introduction

The sterling effective exchange rate index (£ERI) has depreciated significantly since the beginning of the financial market crisis. Despite a 10% appreciation in the first half of 2009, at the end of June 2009[2] the £ERI was around 20% lower than in August 2007. These recent moves represent a significant departure from the decade of relative stability for sterling which preceded the crisis.

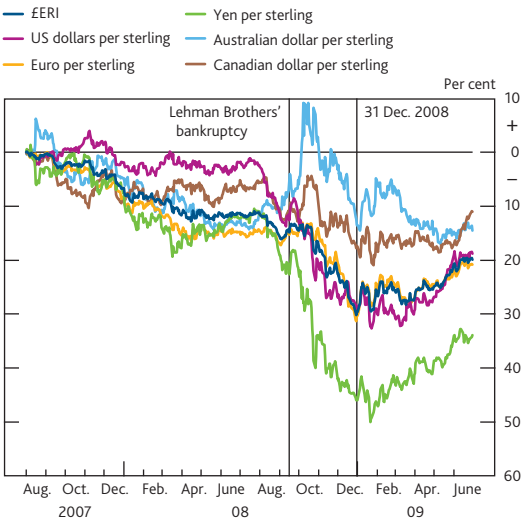
Such sharp shifts in the exchange rate raise important issues for UK monetary policy. In particular, sterling's movements affect the relative price of UK imports and exports and, more generally, changes in the value of a currency can be accompanied by moves in other asset prices. These developments will affect the balance of aggregate supply and demand in the UK economy. But, as discussed below, it is important to consider the underlying reasons behind the change in the exchange rate when assessing the overall impact of a movement in sterling on CPI inflation, the policy objective of the UK Monetary Policy Committee (MPC).

Disentangling the different influences on exchange rates can be difficult, as many factors may have an effect simultaneously. This article nonetheless discusses the potential causes of sterling's sharp depreciation during the financial crisis. It draws on indicative evidence about developments in the real economies in the United Kingdom and abroad, as well as in financial markets.

Sterling's recent movements

Chart 1 shows developments in sterling exchange rates between August 2007 and June 2009. Overall, sterling's moves seem to have occurred in three broad phases, which themselves have echoed developments in other currencies and in financial markets more generally.

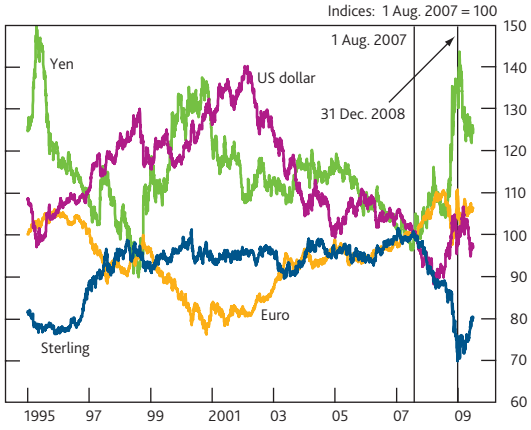
Chart 1 Cumulative change in selected sterling exchange rates since August 2007



(1) The authors would like to thank Phillip Butler and Philip Thomas for help in producing this article.
(2) The data cut-off for this article was 30 June 2009.

In the initial phase, during the first year of the crisis, the depreciation in the £ERI was largely accounted for by falls against the euro and the yen, with sterling little changed against the US dollar. Indeed, the sterling and US dollar effective exchange rates depreciated by similar amounts during this period (**Chart 2**). This would tend to suggest that the UK and the US economies were initially perceived to be similarly affected by the financial crisis. By contrast the euro and yen effective rates appreciated over this period, consistent with the euro area and Japan being initially perceived to be relatively less affected.

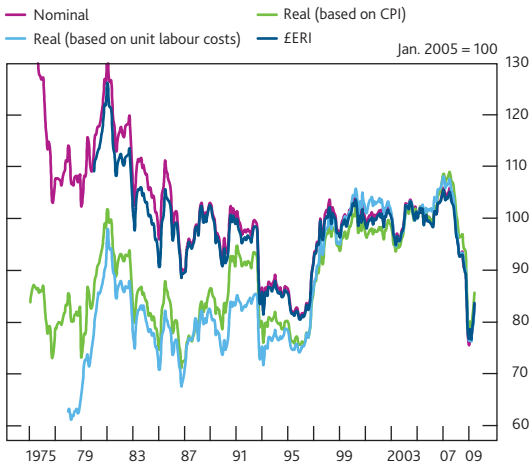
Chart 2 International effective exchange rates



Sources: Bank of England and IMF.

The second, and sharpest, phase of sterling's depreciation occurred in the final few months of 2008, as the financial crisis intensified substantially following the bankruptcy of Lehman Brothers in September 2008. In fact, the 20% £ERI depreciation in 2008 Q4 was the sharpest quarterly fall in sterling since the end of the Bretton Woods system of fixed exchange rates in the early 1970s (**Chart 3**). But the pattern of global currency movements differed from the initial phase. The US dollar, and especially the yen, appreciated sharply at the end of 2008 while the euro was little changed (**Chart 2**).

Chart 3 Sterling nominal and real effective exchange rates



Note: All measures are from the IMF except the £ERI.

Sources: Bank of England and IMF.

The third phase was sterling's appreciation in the first half of 2009: the £ERI rose by around 10%, reversing around half of the depreciation in the last quarter of 2008. The sharp US dollar and yen appreciations of late 2008 were also partly reversed in 2009.

Despite the rebound in the first half of this year, at the end of June 2009 the £ERI remained close to its lowest level since the mid-1970s. Over longer periods of time it is more appropriate to examine real exchange rates, which adjust for relative movements in consumer prices or labour costs across countries. On this basis, sterling's depreciation over the past two years has taken the real value of sterling back to around its level in the mid-1990s, which itself was close to the average level in the preceding 20 years (**Chart 3**).

How are exchange rates determined?

Before turning to the potential causes of sterling's recent depreciation, this section sets out in broad terms what determines currency movements, based on some key insights from the extensive academic literature.

The dual role of exchange rates within the economic system

The nominal exchange rate is the price of one country's money relative to the price of another country's — it converts a price in one currency area into a price in another. In this way, exchange rate movements may alter international relative prices. But importantly currency movements do not happen in isolation. Rather they are related, in one way or another, to relative changes in the domestic or foreign economies.(1)

Specifically, exchange rates will move to equilibrate demand and supply in markets for both internationally traded goods and services and financial assets. Consequently, currencies will be affected by the underlying factors influencing both types of markets — with currencies' longer-term movements typically determined by shifts in international demand and supply of goods and services, but their shorter-term changes often more related to financial market developments. This 'dual' role is an important feature of currencies, but can complicate their interpretation.

(1) This is often referred to as exchange rates being 'endogenous' to the economic system.

The role of exchange rates in international goods and services markets

According to the 'law of one price', tradable goods and services should cost the same in different countries, once converted into a common currency. This is because, abstracting from the costs of transporting goods between countries, deviations from common prices would imply profitable opportunities for trade, which if exploited would tend to put pressure on the nominal exchange rate to adjust in order to equalise common currency prices. For example, if goods were cheaper overseas, UK imports would tend to rise with the consequent higher demand for foreign currency putting downward pressure on sterling.

The law of one price underpins the purchasing power parity (PPP) theory of exchange rates. This argues that if aggregate UK tradable prices are higher than those abroad, this will tend to put downward pressure on sterling and *vice versa*. So, if all goods were tradable, the real exchange rate would tend to remain broadly constant over time. But in practice there are some goods and services that are non-tradable (for example, haircuts) and some tradables that are not perfect substitutes. As a result, there can be large and persistent movements in the real exchange rate (**Chart 3**). These can reflect real economic developments — changes in real aggregate demand and supply conditions — that affect the relative price of tradable and non-tradable goods and services.

For example, if the demand for UK-produced traded goods were to fall, perhaps because of a decrease in domestic spending, the real £ERI would tend to depreciate in order to help eliminate the nascent spare capacity in the United Kingdom. The depreciation would increase the price competitiveness of UK exports and make imports more expensive, tending to cause spending to shift away from imported goods and towards domestically produced goods.

Supply-side developments can also influence the path of the real exchange rate. If there was an economy-wide rise in UK supply growth, relative to that abroad, this would also be expected to cause a real sterling depreciation, since the United Kingdom will again have more goods to sell and a depreciation should help facilitate that.(1) The effects of such supply developments on currencies can, however, be complicated by the wealth effects that they can generate. For example, if UK households anticipate a rise in future productivity they are likely to respond immediately, bringing forward the rise in spending implied by higher future income. In that case, the associated increase in domestic demand for goods produced in the United Kingdom — including tradable goods — may increase their price and produce a real sterling appreciation in the near term.(2)

The role of exchange rates in international asset markets

Exchange rate movements also affect the returns on financial assets in different countries. So if capital is able to flow freely between countries, it is reasonable to assume that expected returns on identical assets in different countries will be the same when converted via the nominal exchange rate. If expected returns were not initially equalised, arbitrage opportunities would stimulate capital flows to eliminate them. Exchange rates are therefore affected by differences in, and changes to, relative returns in international asset markets. An example of this, which focuses on returns in international bond markets, is the uncovered interest parity (UIP) condition. This argues that the currencies of countries with relatively high interest rates should be expected to depreciate in the future, so as to equalise expected returns across countries.

The role exchange rates play in asset markets is linked to future returns on different assets. This means that exchange rates are 'forward-looking' variables. Their values should incorporate financial market participants' current collective view about the future path of the determinants of asset returns across countries, with those determinants including the real supply and demand factors discussed above. Exchange rates should move when market participants acquire new information about those underlying determinants, for example when there is 'news' in a particular data release. And since exchange rates are international relative prices it is the 'news' in the domestic economy relative to the foreign economy that should affect them. If two economies are perceived to be equally affected by an economic development, their bilateral exchange rate should not tend to change.

Long-run sustainable exchange rate and short-run dynamics

Currency movements can also be thought of in terms of shifts in the long-run sustainable exchange rate and their shorter-term dynamics.

The long-term sustainable real exchange rate ensures that the relative prices of domestic and foreign goods and services (tradable and non-tradable) are consistent with a macroeconomic equilibrium. That is, where resources are optimally allocated and any international capital flows, generated by differences between current domestic spending and income, can be sustained. For example, creditors would believe that a debtor country's borrowing can be repaid from future earnings. Shifts in the sustainable exchange rate are most frequently linked to real economy factors, although they

(1) This will occur via a combination of the lower UK prices associated with lower production costs and a nominal sterling depreciation.
(2) The effects of a supply development on the real exchange rate will also depend on whether it affects the whole economy, as assumed above, or whether it has different effects on the traded and non-traded sectors of the economy (via what is known as the Balassa-Samuelson effect).

can also potentially reflect shifts in preferences for different financial assets.

But when such shifts occur the actual exchange rate often may not jump straight to the new sustainable value. Rather there is a dynamic adjustment path towards that new long-run level, which determines currency movements in the near term. In principle, such shorter-term exchange rate movements should be consistent with the asset markets parity condition (UIP) discussed above and hence be affected by factors influencing financial markets. Shorter-term exchange rate movements can, however, be hard to rationalise in terms of returns on financial assets — currencies' relatively high volatility often appears puzzling(1) and it can be difficult to detect supportive evidence for the UIP condition.

Short-term volatility in exchange rates is sometimes linked to the possible different speeds of adjustment in various markets — for example, some authors suggest that the general stickiness of prices for goods and services, combined with flexible asset prices, may cause exchange rates to 'overshoot' their eventual long-run sustainable levels (see Dornbusch (1976)).

Alternatively, such volatility and the difficulties with finding support for UIP could reflect the impact of risk premia, which will arise if domestic and foreign assets are perceived to have different risk characteristics that change over time.(2) If this is the case, currencies which at times are considered more 'risky' may be expected to appreciate more quickly than otherwise in order to compensate risk-averse investors for bearing extra currency risk. Exchange rates can therefore be affected by changes in investors' risk appetite (see the box on pages 206–07). In addition, shorter-run currency movements can be influenced by transitory factors affecting financial markets such as shifts in speculative flows.

The interaction between monetary policy and the exchange rate

The objective of UK monetary policy is to meet the Government's inflation target. In pursuit of this objective, the MPC does not attempt to control movements in sterling exchange rates. Nevertheless, movements in sterling exchange rates can have implications for inflationary pressure in the economy, and so can influence the policy decisions of the MPC. The forward-looking nature of exchange rates also means that they can potentially provide useful timely information on market participants' views of future economic prospects.

A key insight, however, is that the movements in UK CPI inflation associated with a sterling exchange rate movement depend on the type of underlying development affecting the UK or foreign economies and hence driving the currency change. This dependence on the type of underlying development may reflect both the direct impact of an exchange rate movement on import prices and the wider effects of the underlying development on inflationary pressures. In particular, sterling depreciations tend to put upward pressure on CPI inflation by raising import prices, while the reverse is true for sterling appreciations. But this direct impact may depend on whether sterling's move is perceived to be driven by temporary or more persistent factors. An example of the importance of considering the wider effects of the underlying development is that if a sterling depreciation reflects lower demand for UK traded goods relative to supply then the higher margin of spare capacity would tend to put downward pressure on domestic prices, ameliorating the upward pressure on CPI inflation arising via higher import prices. In the medium to long run, however, inflation is determined by monetary policy, rather than by movements in relative prices such as exchange rate changes.

Policy decisions by the MPC can also affect sterling exchange rates. Indeed, exchange rate movements are an important part of the monetary policy transmission mechanism (Bank of England (1999)). As with all asset market developments, only unexpected changes that cause changes to the expected path of policy (typically Bank Rate or more recently the programme of asset purchases under the Asset Purchase Facility)(3) should move exchange rates. As the MPC alters monetary policy in response to changes in inflationary pressure, it will alter the relative returns on sterling assets or prompt shifts in portfolios. These will, in the absence of changes to risk premia or the long-run real exchange rate, cause the nominal exchange rate to adjust in the short run, as part of the process of equilibrating goods and asset markets.

Factors contributing to sterling's recent moves

In light of the above discussion, in particular the importance of discerning the causes of currency movements, this section reviews the possible underlying developments which could have led to sterling's depreciation since the start of the financial crisis in August 2007. It first examines sterling's depreciation from August 2007 to end-2008 before briefly discussing sterling's appreciation in 2009.

There are important interconnections between the different candidate explanations, which makes it difficult to differentiate between them. Furthermore, there is considerable uncertainty about the underlying causes of

(1) This is often termed the exchange rate 'disconnect' puzzle.
(2) Other potential explanations, including the possible irrationality of market participants and the impact of large but infrequent events, have been explored in the literature.
(3) The portfolio shifts generated by the Asset Purchase Facility will potentially affect sterling to the extent that different financial assets are considered to be imperfect substitutes. The different risk characteristics discussed above is one reason why assets can be imperfect substitutes.

Interest parity, risk premia and the carry trade

Under the asset market approach to exchange rate determination, exchange rates should move to equalise returns on assets denominated in different currencies.

Covered versus uncovered interest parity

In principle if there is perfect capital mobility, investors have the choice of holding assets denominated in domestic currency, paying a rate of interest i_t or investing in assets denominated in foreign currency, that pay a foreign interest rate i_t^*. In reaching a decision, the investor with say one unit of domestic currency should compare the return of $1+i_t$ units of the domestic asset with the alternative strategy of converting at today's exchange rate into S_t units of foreign currency, investing in foreign assets to accumulate $S_t(1+i_t^*)$ units of foreign currency, and then converting the proceeds back into domestic currency at the end of the investment period.

If the domestic and foreign assets differ only in their currencies of denomination, and if investors have the opportunity to cover themselves against exchange rate uncertainty by arranging to reconvert from foreign to domestic currency at a pre-agreed forward exchange rate F_t (in units of foreign currency per unit of domestic currency), then market equilibrium requires the condition of covered interest parity (CIP):

$$1+i_t = \frac{S_t(1+i_t^*)}{F_t} \qquad (1)$$

If condition **(1)** did not hold, and assuming markets operated perfectly, profitable arbitrage opportunities could be exploited without incurring any risks. For example, suppose $S_t=F_t$ but $i_t^*>i$. At the start of the period a domestic investor could borrow funds at i_t, convert into S_t units of foreign currency and simultaneously agree to sell F_t units of foreign currency at the end of the period thereby locking in a riskless profit.

Investors also have the opportunity to leave their foreign currency positions uncovered at time t and to wait to convert back into domestic currency at the prevailing exchange rate at say $t+1$, S_{t+1}. This leads to the so-called uncovered interest parity (UIP) condition:

$$1+i_t = E_t\left[\frac{S_t(1+i_t^*)}{S_{t+1}}\right] = S_t(1+i_t^*)E_t\left[\frac{1}{S_{t+1}}\right] \qquad (2)$$

Taking logs and rearranging, a simplified version of equation **(2)** can be represented as:

$$E_t s_{t+1} - s_t = i_t^* - i_t \qquad (2')$$

where lower-case variables imply logs.

Equation **(2')** implies that the domestic currency should be expected to appreciate (depreciate) to offset any positive (negative) differential between foreign and domestic interest rates.

Unlike F_t the value of S_{t+1} is unknown at time t, and so the attractiveness of holding an uncovered position must be assessed in terms of the likelihood of different outcomes for S_{t+1}. In fact, if assets are perfectly substitutable (ie the assets are identical in terms of liquidity, maturity, default risk etc), UIP is equivalent to combining the CIP condition with the assumption investors care only about the average return of their investment over time and not in any particular period (ie they behave as if they are risk-neutral).

Role of risk premia

In practice however, domestic and foreign assets are not perfect substitutes. In particular, a key distinguishing factor is their perceived riskiness. If assets denominated in different currencies have different risk characteristics, investors may be willing to earn lower expected returns on assets that are perceived to be less risky. Correspondingly, they will hold very risky assets only if the expected return is relatively high.

More formally, when domestic and foreign assets are imperfect substitutes, the UIP condition must be amended — the exchange rate should adjust to equilibrate the risk-adjusted returns on domestic and foreign currency assets:

$$E_t s_{t+1} - s_t = i_t^* - i_t + \rho_t \qquad (3)$$

The risk premium, ρ_t, represents the additional compensation that a domestic investor would require to cover the potential that the foreign currency may depreciate (correspondingly, the domestic currency may appreciate) by more than implied solely by interest differentials. Such a change in the exchange rate would increase the cost of converting back to domestic currency at $t+1$ and thereby reduce overall returns on foreign currency assets.

Finance theory would suggest that the risk premium will depend on how well the returns from investing in assets of a particular currency co-vary with investors' overall wealth. If a currency tends to depreciate at the same time as the prices of other assets fall then investors will tend to demand a higher premium to invest in assets denominated in that currency

since their total wealth will be hit should the currency fall in value. In contrast, if changes in a particular currency are typically negatively correlated with other asset prices then investors may be willing to accept a lower return because it offers a form of insurance and enables the investor to preserve his wealth.

Carry trades

The strict UIP condition implies that exchange rates should move to ensure that expected returns are equalised. In fact, in practice high interest rate currencies do not typically depreciate as much as the interest differential with other currencies would suggest and indeed often appreciate. This empirical regularity has given rise to a prominent investment strategy whereby investors sell low interest currencies ('funding' currencies) and invest in high interest rate currencies ('target' currencies) — so-called carry trades.

One interpretation of the carry trade is that investors essentially take a bet against UIP over the horizon of their investment and they earn a risk premium for holding assets that might depreciate against them. In this way, they hope that they can close out their position before any change in exchange rates and thereby enjoy the profit implied by the interest differential between high and low rate currencies.

Although the presence of time-varying currency-specific risk premia might explain the popularity of carry trade strategies, there is no general agreement on the origins of these premia. Some authors argue that investors in high interest rate currencies can typically be prone to sudden currency crashes and it is this risk for which investors demand compensation and that underlies the positive returns to the carry trade.

However, other authors have failed to find evidence that carry trade returns are related to standard underlying risk factors. The carry trade investor should only be rewarded if there is a chance that his return on the trade would negatively affect the overall value of his investment portfolio or wealth. But empirical studies have shown that returns to carry trades often tend to co-move negatively with other asset returns and therefore should not in principle command any risk premia.

An alternative explanation for the profitability of carry trades is that they reflect some form of market imperfection. For example, some authors suggest that transaction costs or asymmetric information in foreign exchange markets stop investors ensuring that the strict UIP condition holds, at least continuously and it is this that sustains the positive returns to carry trades.

exchange rate movements, so the evidence presented below is necessarily only indicative. This section, therefore, also draws on the market intelligence which the Bank routinely gathers in discussions with market participants.

Negative news about relative UK prospects

There have been extensive discussions among policymakers, market participants and in the financial press about the adverse consequences of the financial crisis on global economic growth prospects. But for this to account for sterling's depreciation it requires that investors believed the crisis would have a more negative effect on cyclical growth prospects in the United Kingdom compared with overseas. Such a perceived relative UK cyclical slowdown would cause sterling to depreciate in order to help boost exports and encourage domestic residents to switch demand away from imports and thereby reduce any emerging spare capacity in the UK economy.

There are several reasons for thinking that the United Kingdom might have been relatively more affected by the crisis than some other countries, at least in its initial stages. In particular, the tightening of credit conditions associated with the financial crisis was thought by market contacts to potentially have a larger impact on the UK economy than on other countries because of the relatively high debt levels of UK households (**Table A**). Similarly, the United Kingdom could have been perceived to be particularly vulnerable to the impairment of wholesale funding markets given the relatively large size of the UK financial sector (**Chart 4**) and its dependence on these markets (see King (2008) and Astley, Giese, Hume and Kubelec (2009)).

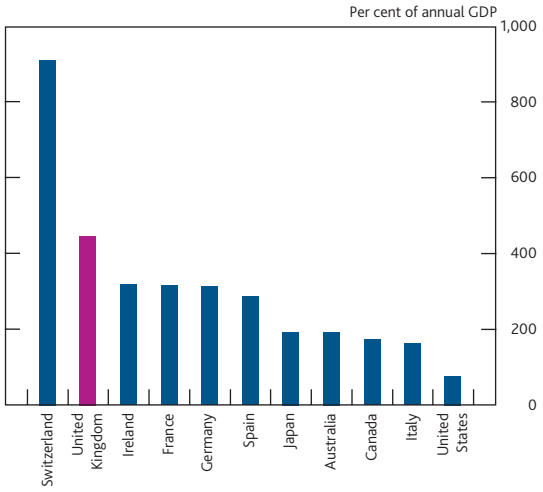
Table A Household indebtedness in G7 countries

	Per cent of nominal disposable income		Percentage point change
	1997	2007	1997–2007
Canada	109.6	138.9	29.3
France	67.4	100.1	32.7
Germany	105.0	102.2	-2.9
Italy	42.9	72.5	29.6
Japan	132.1	127.7	-4.4
United Kingdom	107.1	185.7	78.5
United States	96.2	141.0	44.8

Source: OECD *Economic Outlook*.

There is some empirical support for this story in the Consensus survey of economic forecasters — expectations for UK domestic growth in 2009–11 were revised down by more than their foreign counterparts (**Chart 5**). Moreover, in the first phase of sterling's depreciation, UK cyclical demand prospects were perceived to have deteriorated against the euro area and Japan by similar amounts, which is consistent with sterling's similar depreciation against the euro and the yen during this period (**Chart 1**). And a significant fall in perceived

Chart 4 Total bank assets relative to GDP[a]

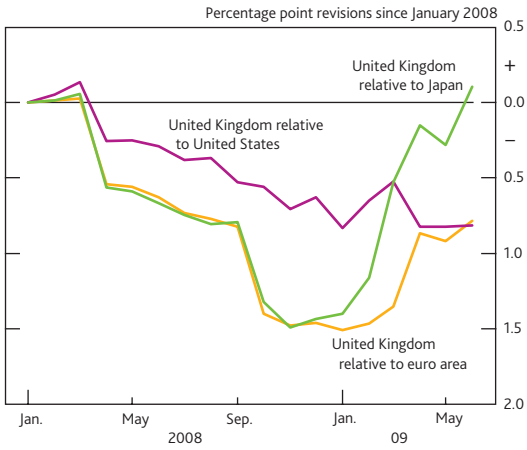


Sources: Bankscope published by Bureau van Dijk Electronic Publishing, International Monetary Fund, *The Banker* and Bank calculations.

(a) End-2007 data, except for the United Kingdom, which are at end-2008. Data for all countries except the United Kingdom are from *The Banker's* ranking of the world's largest 1,000 banks. This measure will underestimate the size of banking systems that have a large proportion of banking sector assets outside of the list. UK data are from Bankscope.

UK relative prospects in 2008 Q4 coincided with the sharpest phase of sterling's depreciation. There were initially relatively small falls in perceptions of UK cyclical prospects relative to those in the United States, which is somewhat consistent with sterling's initial relative stability against the US dollar, although those relative prospects subsequently fell further.

Chart 5 Revisions to Consensus domestic demand growth forecasts for 2009–11[a][b]



Sources: Bureau of Economic Analysis, Consensus Economics, Eurostat and ONS.

(a) Revisions since January 2008 to Consensus expectations for the weighted sum of investment and private consumption growth in the United Kingdom less that in the other country.
(b) Average of projections for end-2009, end-2010 and end-2011.

Any negative reassessment of the cyclical outlook in the United Kingdom relative to abroad would also, given the MPC's objective of keeping CPI inflation close to the Government's target, likely prompt a reduction in market expectations of future sterling interest rates (relative to foreign interest rates). To the extent that such a shift in expectations prompted a reduction in prospective returns on UK assets relative to those in other countries that would tend to cause sterling to depreciate. **Chart 6** shows an indicative measure of relative UK cyclical prospects derived from relative interest rate 'news' (ie unexpected shifts in relative returns on sterling and foreign currency assets). The main messages have some similarities with those from **Chart 5**. In the first year of the crisis, the news was again most negative, and broadly similar, against the euro area and Japan, broadly consistent with relative changes in the different sterling bilateral exchange rates over this period. The positive news against the United States was, however, hard to reconcile with sterling's initial stability against the US dollar.

Chart 6 Cumulative relative interest rate 'news' and cumulative changes in the £ERI since August 2007

Notes: Interest rate 'news' is calculated from the uncovered interest parity (UIP) condition. Unanticipated movements in sterling relative to international interest rates are cumulated from 1 August 2007. For more information see Brigden, Martin and Salmon (1997).

Sources: Bloomberg and Bank calculations.

Moreover, weighting together the relative interest rate 'news' against all the major bilateral exchange rates, it seems that by the end of June 2009 relative interest rate news might account for only around a third of the £ERI depreciation. Sterling's sharp depreciation in 2008 Q4 seems hardest to rationalise.

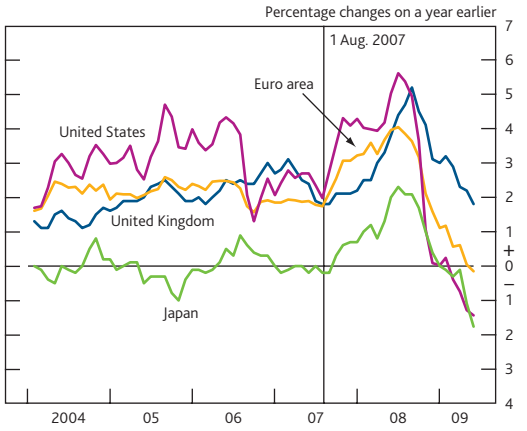
Higher UK relative inflation

Another possible factor behind sterling's depreciation could be movements in inflation rates across countries. If a country's inflation rate persistently exceeds corresponding rates abroad then, according to the purchasing power parity theory, the nominal exchange would tend to depreciate in order to keep the real exchange rate broadly unchanged. Any such adjustment would, however, likely take place over longer periods of time and would also be affected by the perceived monetary policy reaction.

UK consumer price inflation has fallen by less than that in other major economies during the crisis (**Chart 7**). The difference was, however, substantially smaller than the fall in the nominal value of sterling, so the real £ERI has depreciated

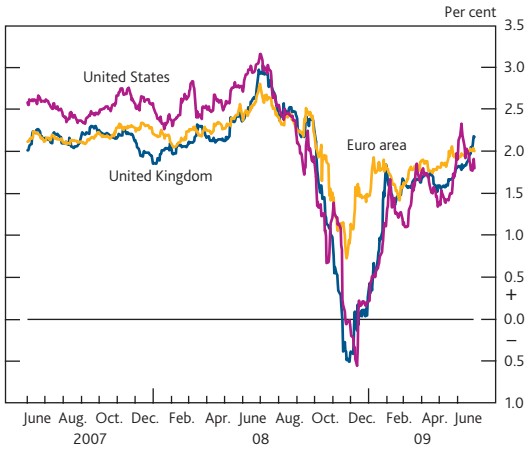
substantially (**Chart 3**). Moreover, the relatively high UK CPI inflation over the past year or so in part reflects the rise in import prices associated with sterling's depreciation (see the August 2009 *Inflation Report*), so it is difficult to tell a causal story. There is also little evidence from index-linked securities that expectations of UK inflation have risen relative to those in other countries (**Chart 8**).(1)

Chart 7 International consumer prices



Sources: Bureau of Labour Statistics, Eurostat, Ministry of Internal Affairs and Communications and ONS.

Chart 8 International forward-looking inflation measures(a)(b)



(a) Based on five-year inflation spot rates derived from inflation swaps.
(b) UK series adjusted down by 80 basis points to reflect UK inflation swaps referencing RPI inflation, whereas US and euro-area series reference CPI inflation.

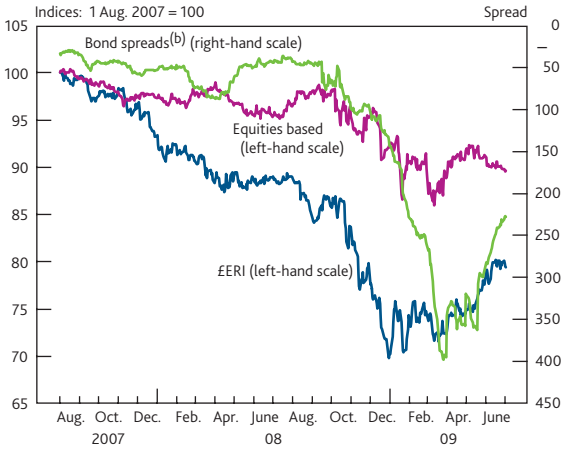
A rise in the risk premia on sterling assets

Increased investor concern about the uncertainty of future returns on sterling-denominated assets, relative to those on non-sterling assets, might also have contributed to sterling's depreciation. As discussed above, such concerns would cause investors to demand additional compensation to hold sterling assets. This can be brought about via expectations of a larger future appreciation of sterling relative to the expected path implied by interest rate differentials. And in order to deliver this, sterling would tend to depreciate when the risk concerns arose (see the box on pages 206–07 for further discussion).

It is possible that increases in investors' required risk compensation on sterling assets could be related to the concerns about UK relative cyclical prospects. For example, if there were greater uncertainty about the magnitude and duration of the recession in the United Kingdom, relative to other countries, this might have prompted investors to demand greater compensation for the increased uncertainty surrounding returns on sterling assets, at least temporarily until the longer-run effects of the financial turmoil became clearer.(2)

The Bank's market contacts have mentioned several reasons for thinking that sterling assets may have been perceived to have become relatively more 'risky' during the financial crisis. First, increased investor worries about UK banks' access to both short-term liquidity and long-term capital and the potential wider implications for credit extension in the United Kingdom, coupled with the relatively large size of the UK financial sector, might have prompted them to demand a higher risk premia on sterling assets. And indeed, **Chart 9** shows that there has been some correlation between sterling's depreciation and the relatively larger moves in market indicators of financial sector soundness, especially following the failure of Lehman Brothers last autumn. That said, the financial sector accounts for only around 8% of UK value added, of which only around 60% is related to the activities of the monetary and financial institutions that were most directly affected by the crisis.

Chart 9 £ERI and indicative measures of relative UK financial sector soundness(a)(b)



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

(a) Growth in UK bank equity prices relative to growth in FTSE All-Share less growth in international bank equity prices relative to growth in global equity index.
(b) Difference in the option-adjusted spread on sterling bonds issued by financial companies and the weighted average option-adjusted spread on bonds issued by financial companies in US dollars, euros, Japanese yen, Canadian dollars and Australian dollars. A negative spread indicates a widening in UK bond spreads in relation to global spreads.

(1) Changes in expected inflation rates across countries tend to give a potential guide to future trends in the nominal exchange rate rather than being associated with a change in the current exchange rate.
(2) There may also be links between the risk premium explanation and a potential change in the perception of the long-run sustainable level of sterling as part of the rebalancing of the UK economy discussed below.

A second potential reason for increased risk premia on sterling assets could be that investors have become more worried about the potentially large exposure of the UK Government to the financial sector, and more generally the sustainability of the UK fiscal position.

Finally, contacts have expressed some concerns about the composition of the UK external balance sheet, and in particular the potential maturity and currency mismatches. The maturity mismatch arises because the United Kingdom has a net external asset position in longer-term direct investment but a net external liability position in shorter-term financial instruments such as bank deposits. That net mismatch is, however, small relative to the gross asset and liability positions. And, prior to the financial crisis, the UK banking sector's gross external assets in the form of loans, currency and deposits were around nine times the net liability position (**Table B**). The currency mismatch issue is related, apparently arising from the UK banking sector's external liabilities featuring, prior to the crisis, foreign currency deposits of around 160% of UK GDP. Again, however, the net currency mismatch on such banking sector positions was substantially smaller than the gross position. And for the UK external balance sheet as a whole, a higher proportion of assets are denominated in foreign currency than are liabilities. Sterling's depreciation during the crisis has therefore resulted in a significant improvement in the UK external balance sheet (international investment position), see Astley, Giese, Hume and Kubelec (2009).

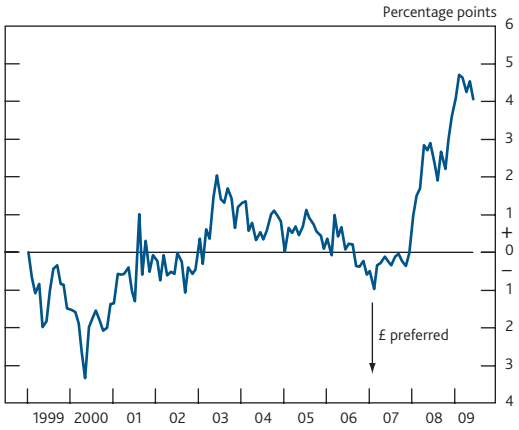
Table B Composition of UK external balance sheet for 2007 Q2 (percentage of nominal GDP)

	Gross assets	Gross liabilities	Net assets (+) or liability (-)
Total	**420.2**	**442.4**	**-22.2**
of which:			
Foreign direct investment	58.7	42.1	16.6
Equity	53.7	60.9	-7.2
Debt securities	65.3	71.2	-5.9
Other	240.9	269.1	-28.2
of which:			
Loans	60.9	72.6	-11.7
Currency and deposits	179.0	195.1	-16.1

Sources: ONS and Bank calculations.

Is there any other evidence to corroborate and quantify these risk premia concerns of market contacts? It is difficult to measure exchange rate risk premia — they depend on investors' perceptions about the uncertainty of future returns on sterling assets relative to foreign assets and investors' risk aversion, which are themselves unobservable. Nevertheless, **Chart 10** shows a simple proxy indicator. The measure compares Consensus survey expectations for sterling with the path implied by forward interest rates. If sterling assets were considered to be more 'risky' than those denominated in other currencies, the path of survey expectations for the exchange rate should lie above that implied by forward interest rates indicating that survey respondents expected to receive higher returns to investing in sterling. This measure suggests that sterling risk premia increased somewhat in the first year of the crisis, but then rose substantially further as the crisis intensified in the final months of 2008.

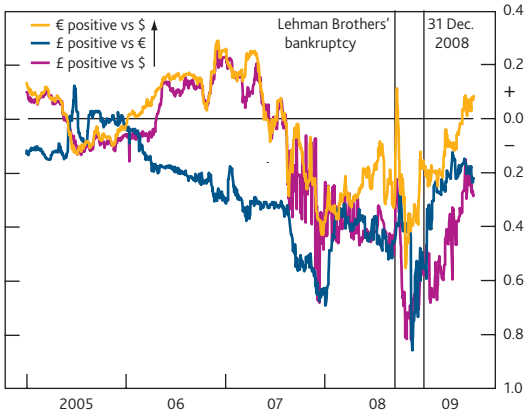
Chart 10 Survey-based indicative measure of £ERI risk premium



Sources: Consensus Economics and Bank calculations.

This proxy measure is clearly imperfect, making it difficult to draw firm conclusions. But forward-looking measures of currency uncertainty inferred from option prices also increased substantially during the crisis for a range of sterling bilateral exchange rates, again particularly at the end of 2008. More specifically, the implied probability distribution for sterling bilateral exchange rates widened sharply and became significantly more negatively skewed in late 2008 relative to other currencies (**Chart 11**). This could be consistent with increased risk premia on sterling assets since it suggests that sellers of options demanded increased compensation to provide protection against large falls (compared with large rises) in the value of sterling.

Chart 11 Option-implied skewness of foreign exchange returns (twelve month)



Sources: BBA, ICAP and Bank calculations.

Other financial market factors

The Bank's market contacts have also suggested that sterling's sharp depreciation at the end of 2008 in part reflected the unwinding of the 'carry trade' foreign exchange trading strategy (investing in relatively high interest rate currencies, by borrowing in low interest rate currencies, see the box on pages 206–07) which had been popular in the run-up to the financial crisis. The significant increases in risk aversion, rises in financial market volatility and reduction in cross-country interest rate differentials which occurred towards the end of 2008 adversely affected the attractiveness of such trades. This reportedly caused a repatriation of funds invested overseas. Sterling was, along with other currencies, thought to have been affected by this process because it had previously been a relatively high yielding currency in such trades and had hence reportedly been supported somewhat. Financial institutions' general deleveraging following the failure of Lehman Brothers — see Astley, Giese, Hume and Kubelec (2009) — also reportedly contributed to a reversal of capital flows.

This unwinding of carry trades may also have contributed to the end-2008 appreciations of the Japanese yen and US dollar (**Chart 2**) which had previously been popular 'funding' currencies. Demand for the US dollar is also reported to have been amplified by a general 'flight to quality' as, in an environment of heightened risk aversion, investors sought a safe haven for their funds in highly liquid US assets such as government securities. Moreover, the Bank's contacts report that foreign investors facing falls in the value of their US dollar assets sought to hedge their foreign currency liabilities by buying US dollars, which could also have contributed to the end-2008 US dollar appreciation.

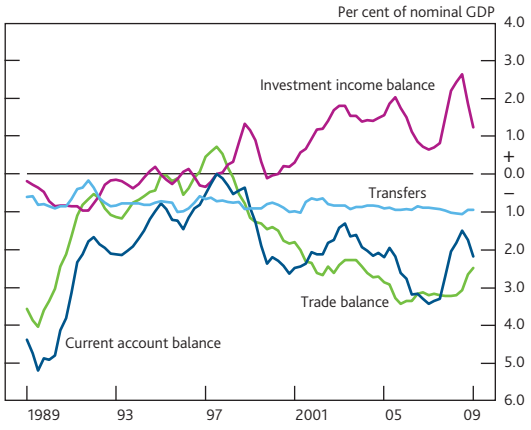
The combination of strong demand for US dollar funds and heightened fears about financial institutions' ability to meet their contractual obligations in the wake of the failure of Lehman Brothers, triggered a number of pricing anomalies and illiquid conditions in financial markets in late 2008.(1) That could also have boosted required illiquidity premia on sterling and contributed to its depreciation. The foreign exchange market is typically highly liquid but in 2008 Q4 contacts reported that transaction costs in the interdealer foreign exchange market (as measured by bid-ask spreads)(2) picked up sharply, especially for sterling trades. And intraday volatility spiked higher for sterling bilateral exchange rates.

Need for UK economy to rebalance — changes in the long-run sustainable real exchange rate

A final possible explanation for sterling's depreciation, discussed in the February 2009 *Inflation Report*, is that it is part of the process of rebalancing activity in the UK economy away from domestic demand and towards net trade.

Since the mid-1990s, the United Kingdom has consistently run current account deficits averaging around 2% of GDP (**Chart 12**) as collectively UK corporations, UK households and the UK government borrowed from overseas to finance their consumption and investment plans. Provided foreign investors were content to build up claims on the future earnings of UK residents in the form of financial assets, such an imbalance of domestic expenditure over savings was sustainable. But the financial crisis may have led overseas investors to reassess their willingness or ability to purchase sterling assets and thereby finance the UK trade deficit. As a result, the long-run sustainable real sterling exchange rate, the rate consistent with a balance of UK real aggregate demand and supply and a sustainable external net asset position, may have fallen.

Chart 12 UK current account balance and component balances(a)



(a) Four-quarter moving averages.

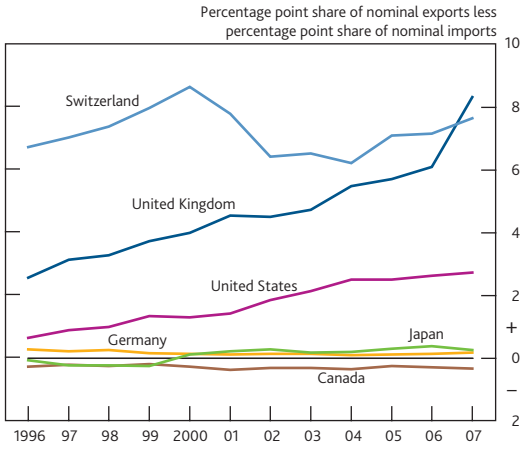
Put another way, it is possible that in the years prior to the crisis the real £ERI had moved above its long-run sustainable level. Indeed, as discussed in King (2002), given persistent current account deficits, the continued strength of sterling over the past decade has perhaps been surprising.(3) So the financial crisis may have prompted some reassessment of the factors which were previously perceived to have supported that high level of sterling; the depreciation has taken the real sterling exchange rate back to its mid-1990s' level (**Chart 3**). That change in perceptions, triggering a fall in the long-run real value of sterling so as to bring about an improvement in the UK trade balance, could relate to the international demand for UK goods and services or the United Kingdom's supply potential.

(1) See the June 2009 *Financial Stability Report* and the box 'Pricing anomalies in financial markets' in the 'Markets and operations' article in the 2009 Q1 *Quarterly Bulletin*.
(2) Bid-ask spreads are the difference between the price quoted by a market maker for an immediate sale (bid) and an immediate purchase (ask).
(3) King (2002) argued that such current account deficits could not be sustained indefinitely and that the required shifts in resources between sectors might be accompanied by considerable movements in sterling.

There are several reasons why market participants might perceive that the financial crisis has prompted a fundamental shift in demand away from UK goods and services. First, in an extension of the previous cyclical story, the potentially more pronounced effect on the UK financial sector relative to other countries could be perceived to have led to a permanent fall in UK households' and firms' income. This would reduce the sustainable growth rate of domestic spending, causing a fall in the demand for UK goods (relative to foreign goods) since UK residents consume more UK-produced goods than foreign goods.

Second, the crisis could also be perceived to have caused a persistent fall in the global demand for financial services. This would lower demand for UK goods and services because UK net exports are relatively concentrated in financial services (**Chart 13**).

Chart 13 Trade specialisation in financial services



Note: Specialisation defined as the share of financial services in nominal exports less share of financial services in nominal imports.

Source: OECD.

And third, the crisis could have been perceived to have reduced the United Kingdom's ability to generate significant foreign investment income relative to other countries. Such income has been significant in recent years, offsetting, to some extent, the UK trade deficit (**Chart 12**). That occurred despite the United Kingdom having a reported net foreign debt position, and reflected both the UK banking sector's ability to attract low interest rate deposits and the relatively high returns on the United Kingdom's direct investments abroad — see Whitaker (2006) and Kubelec, Orskaug and Tanaka (2007).(1) The financial crisis could be perceived to have permanently reduced the supply of those low-cost funds while weaker global growth prospects could undermine the future returns on UK foreign investments.

On the supply side, recent *Inflation Reports* have discussed how the financial crisis and associated recession are also likely to have adversely affected UK productive capacity. This reflects a number of effects including more restricted access to credit, higher corporate bankruptcies and, allied to greater macroeconomic uncertainty, lower investment. According to the Consensus survey, however, prospects of future UK labour productivity growth have been revised down by less than those in the United States and euro area during the crisis (**Table C**). Those measures may, however, imperfectly capture market participants' expectations of future productivity. Moreover, changes to cross-country productivity prospects have an ambiguous effect on exchange rates — as discussed above, the effect depends on the relative impact of wealth effects versus pressures on costs and prices. As such, there are considerable uncertainties about the contribution of supply-side developments to sterling's recent movements.

Table C Revisions to survey expectations of future productivity growth since August 2007(a)

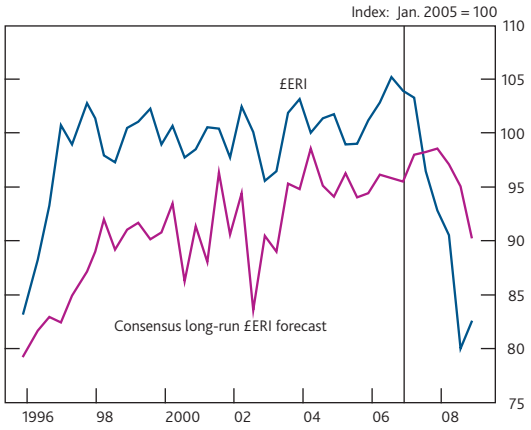
		Year of projection (percentage points)		
Country	Revisions up to	2011	2012–16	2017–21
United Kingdom	Aug. 2008	0.1	0.1	0.0
	Feb. 2009	-0.2	-0.2	-0.2
Euro area	Aug. 2008	-0.4	-0.4	-0.4
	Feb. 2009	-0.3	-0.6	-0.6
United States	Aug. 2008	-0.8	-0.7	-0.3
	Feb. 2009	-0.2	-0.5	-0.5

Source: Consensus Economics.

(a) Forecasts of real output per employee.

Overall, it is difficult to assess exactly how far any prospective rebalancing of the UK economy may have prompted a fall in the long-run sustainable value of sterling. **Chart 14** illustrates that Consensus survey respondents have revised down their five-year £ERI forecasts by around 10% during the financial

Chart 14 £ERI and Consensus five-year £ERI forecasts(a)



Sources: Bank of England and Consensus Economics.

(a) Vertical line refers to the date of the June 2007 survey (the survey conducted closest to the start of the crisis). The £ERI series refers to the observations on the day of each survey.

(1) An alternative interpretation is that this pattern reflects the mismeasurement of the UK external net asset position — see Nickell (2006).

crisis.[1] Notably, in a reversal of the pattern in recent years, the actual £ERI now lies significantly below those longer-term forecasts. This might suggest that, at least according to the available survey responses, the long-run value of sterling may not have fallen by as much as the £ERI.

Sterling's appreciation in 2009

Sterling has appreciated by over 10% since the start of 2009 (to end-June), unwinding around a third of its total depreciation since August 2007. So does this reflect the reversal of previously discussed factors or new factors affecting sterling?

There is some evidence that UK relative cyclical prospects are perceived to have improved. In particular, both the Consensus survey and relative interest rate news (**Charts 5** and **6**) suggest some improvement in perceptions of the near-term macroeconomic outlook in the United Kingdom relative to both the euro area and Japan. This could be linked to the apparent change in the nature of the global crisis from one concentrated in financial markets to one having a large adverse effect on world trade. The UK economy is relatively less specialised in manufactured goods than some euro-area countries or Japan and so could be perceived to be less vulnerable (see pages 22–23 of the May 2009 *Inflation Report*).

As explained above, if sterling's depreciation reflected risk premia considerations, sterling would have been expected to appreciate more quickly than was previously the case in order to generate the increase in expected returns on sterling assets required by investors. So sterling's appreciation in 2009 could to some extent simply reflect a realisation of higher sterling returns, although the magnitude of such risk premia effects is itself subject to considerable uncertainty.

Sterling's appreciation in 2009 has, however, also coincided with rises in the prices of 'risky assets' such as equity prices and a general fall in forward-looking measures of volatility. These developments could reflect the perceived positive impact of the unprecedented monetary and fiscal policy responses to the crisis in reducing the risks to the financial sector. But the Bank's financial market contacts also report that there has been some reduction in market participants' required compensation for taking on risk.

Accompanying the improvement in market sentiment and reduced volatility in the first half of 2009, market contacts also report that there were signs that carry trade activity increased somewhat and that liquidity conditions in foreign exchange markets improved. Both factors could be consistent with sterling's appreciation as well as the depreciation in the US dollar and the yen in 2009.

It seems unlikely, given the evidence presented in **Chart 14**, that investors have revised up their estimates of the long-run sustainable level of sterling based on developments thus far in 2009.

An additional factor in 2009 has been that the MPC, along with other central banks, started a programme of asset purchases. As explained in recent *Inflation Reports*, sterling will tend to depreciate if this policy causes portfolios to be rebalanced away from UK assets. However, there may also be pressures for sterling to appreciate if the policy stimulus is perceived to improve UK relative cyclical prospects. The impact on sterling will, again, depend on how UK developments compare with those in other countries.

Conclusion

This article has discussed sterling's significant depreciation during the financial crisis. Such sharp exchange rate movements can, given the MPC's inflation-targeting remit, have important implications for UK monetary policy if they are associated with changes in the prospects for CPI inflation. Any such revision to inflation prospects will depend on the underlying developments affecting the United Kingdom and foreign economies and hence causing sterling's depreciation.

On balance it appears that a combination of factors, related to the financial crisis, contributed to sterling's depreciation although there is substantial uncertainty about the precise contribution of each factor. There is some evidence that concerns about UK relative cyclical prospects played a role, especially in the first year of the crisis, although this does not appear to account for all of sterling's depreciation. Such adverse cyclical developments may, however, tend to offset some of the upward pressure on UK inflation from higher UK import prices. There are also signs that elevated risk premia contributed to sterling's depreciation, particularly during the period of sterling's sharpest fall in 2008 Q4. Indeed, although the magnitude of such risk premia effects is uncertain, sterling's appreciation in the first half of 2009 could in part simply reflect the realisation of higher required sterling returns. If this were the case, the impact on inflationary pressure in the United Kingdom would not only depend on what underlies the rise in risk premia but also on the horizon over which higher returns are realised. Other shorter-term factors such as carry trades unwinding, illiquid market conditions and international capital flows driven by safe-haven motives also appear to have affected currencies in late 2008, with sterling's appreciation in 2009 coinciding with a dissipation of some of those factors. It is also possible that sterling's depreciation may be part of a more prolonged process of rebalancing of the UK economy, generating a fall in the long-run sustainable real exchange rate, although it is again difficult to obtain direct evidence about this possibility.

(1) The fall was largest against the euro.

Given the uncertainty about the precise sources of sterling's depreciation, the MPC has to apply judgement in assessing the implications of the depreciation. In doing so the MPC considers a broad range of evidence including developments in financial markets and indicators of international economic developments. Moreover, the MPC's policy decisions are affected by the balance of risks to inflation prospects.

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What can be said about the rise and fall in oil prices?

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The price of oil rose steadily between the middle of 2003 and the end of 2007, rose further and more rapidly until mid-2008 and fell sharply until the end of that year. Commentators agree that a significant part of the increase in the oil price over that period was due to rapid demand growth from emerging markets, but there are substantial differences of view about the relative importance of other factors, and limited work thus far in explaining the large fall in oil prices in the second half of 2008. The purpose of this article is to analyse the main explanations for the rise and fall in oil prices in the five years until the end of 2008. It argues that shocks to oil demand and supply, coupled with the institutional factors of the oil market, are qualitatively consistent with the direction of price movements, although the magnitude of the rise and subsequent fall during 2008 is more difficult to justify. The available empirical evidence suggests that financial flows into oil markets have not been an important factor over the period as a whole. Nonetheless, one cannot rule out the possibility that some part of the sharp rise and fall in the oil price in 2008 might have had some of the characteristics of an asset price bubble.

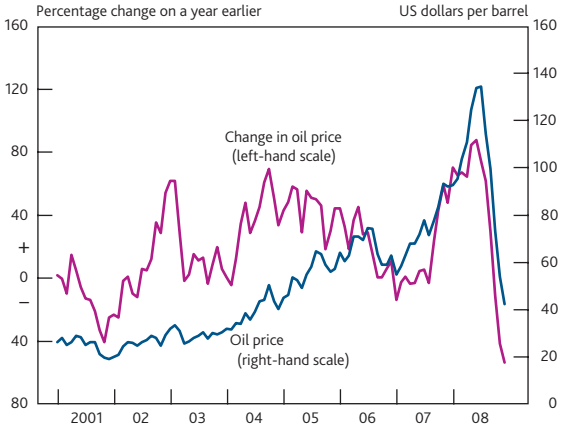
Introduction

The past six years have seen unprecedented swings in the price of oil. 'Dated Brent' crude oil prices rose steadily between the middle of 2003 and the end of 2007, before the pace of increase picked up sharply in the first half of 2008 (**Chart 1**). By July 2008, prices had risen by more than 50% in nominal terms over a six-month period, but they then collapsed, ending 2008 no higher than they had been at the end of 2004.

There has been no shortage of interest in, and explanations for, the remarkable rise and fall in oil prices. Most commentators agree that part of the increase over the five years to the start of 2008 was due to rapid demand growth from fast-growing emerging economies.(2) But there are substantial differences of opinion about the relative importance of other factors, with some stressing shocks to fundamentals and others focusing more on the role of speculative activity and asset price bubbles.

The purpose of this article is to analyse the main explanations that have been put forward. It discusses explanations that stress demand and supply shocks with those that emphasise the role of speculative activity in the oil market and considers whether conclusions reached about the 2003–07 period also hold for 2008. Although the underlying factors considered here are also relevant in analysing the behaviour of oil prices in 2009,(3) the focus of this analysis is the five-year period up until the end of 2008.

Chart 1 Dated Brent oil price(a)



Sources: Bloomberg and Bank calculations.

(a) Monthly averages.

The paper is organised as follows. The next section reviews the predictions of economic theory about the prices of exhaustible commodities, such as oil. The article then considers whether

(1) The authors would like to thank Dan Nixon for his help in producing this article.
(2) See Chapter II of the IMF April 2006 *World Economic Outlook*.
(3) In the first eight months of 2009 prices increased by around 75%.

shocks to demand and supply are consistent with the behaviour of oil prices since 2003 and follows with an assessment of the role of asset price bubbles and speculative flows. The final section concludes.

Economic theory and oil price dynamics

Oil has two key characteristics that differentiate it from other goods. First, it can be stored away. Second, it is exhaustible. Both of these characteristics have important implications for oil price dynamics.

Storability

The seminal paper on the effect of storability on commodity price behaviour is Working (1949). Market participants can purchase a futures contract which promises to deliver one barrel of oil in the following period. Alternatively, they can buy a barrel of oil in the spot market in the current period, and exploit its storability by holding it as inventory. They will then incur the costs of storage and forego the interest from not saving the money in a bank. The benefit they get in return is a 'convenience yield', which is the flow of services gained by holding the oil rather than a futures contract. There is always a risk that a futures contract will not be able to deliver the physical oil when needed. Large users of oil prefer to hold it rather than a promise of it in the future (oil refineries cannot produce petrol using financial contracts). This means that the futures price of oil for delivery one period ahead can be written as:

$$f_t = s_t(1+i_t) + sc_t - cy_t \qquad (1)$$

where f_t is the futures price, s_t is the spot price, sc_t is the storage cost, cy_t is the convenience yield and i_t is the one-period rate of interest.

It follows that the level of inventories market participants hold in the oil market will in part reflect the exploitation of all profitable deviations between futures prices and spot prices by drawing down or building up inventory. At the same time, the level of oil inventories will also reflect 'fundamentals' as market participants will respond to shocks to the net balance of oil demand and supply by changing their inventories. For example, in response to a positive but temporary demand shock oil refineries might draw down their inventories, which in turn will smooth the spot price response to the shock. By contrast, a permanent demand shock would lead them to increase their desired level of inventories, and hence the spot price and the futures price will rise.

Exhaustibility

The seminal paper on the impact of exhaustibility on oil price dynamics is Hotelling (1931). Hotelling's main insight was that for a planned path of oil extraction to be optimal, producers must be indifferent between selling an additional barrel of oil in one period and investing the proceeds at the prevailing market rate of interest or waiting and extracting the barrel in the following period. Otherwise producers would benefit from moving resource extraction between periods. It follows that the price of the exhaustible resource net of marginal extraction costs ('net price') should be expected to increase at the rate of interest between one period and the next. This condition is known as Hotelling's rule, and it produces a path for the expected net oil price (Hotelling's path). This path will be consistent with an expected path for future demand. A different path for future expected demand will produce different paths for net prices (still increasing at the rate of interest but from a different level).

The empirical applicability of Hotelling's rule has often been limited. One reason for this is that it applies to the price net of costs rather than the actual price paid in the market. And each expected path for the net price can be consistent with a variety of expected paths for actual prices, depending on what is expected to happen to marginal extraction costs. Second, shocks to demand and supply will cause the expected net price to move between different Hotelling paths over time. It follows that in order to analyse oil price movements in the post-2003 period, it is necessary to identify the demand and supply shocks that may have moved prices on to different Hotelling paths.

Shocks to demand and supply

This section considers whether unexpected changes in demand and supply can explain the fluctuations in oil prices between 2003 and 2008. In doing so, the analysis relies on official estimates of demand and supply and their revisions by the US Energy Information Administration (EIA) and the International Energy Agency (IEA) over a two-year horizon. In interpreting this analysis, it is useful to bear in mind that although the EIA and IEA estimates are widely monitored by market participants, they are not necessarily the market's view. Moreover, prices today will be affected by the market's view about the balance between demand and supply well beyond two years.

This article attempts to assess whether the direction of price movements was in accordance with the news about net demand. But it does not attempt to measure the scale of the effects of news on net demand on the oil price. To do so one would need to estimate a model of oil prices that performs well in terms of out-of-sample forecasting and, crucially, allows for the identification of demand and supply shocks. Given the relatively poor forecasting success of existing efforts (see the box on page 217), this article does not seek to estimate such a model.

Modelling oil prices — a brief review of the literature

The vast literature on modelling oil prices can be broadly grouped into two classes. The first includes futures prices and often interest rates, storage costs and measures of the convenience yield as explanatory variables so as to capture arbitrage opportunities between spot and futures markets. Some authors (eg Longo, Manera, Markandya and Scarpa (2007) and Zeng and Swanson (1998)) have found that forecasts from such models outperform those from simple time-series benchmarks, such as autoregressive or random walk models. But these results are far from unanimous and, in any case, spot and futures prices are jointly determined by current and expected demand and supply. As such, it is difficult to identify demand and supply shocks in these models.

The second class of models estimates oil prices as a function of oil market fundamentals. Such models can be set up as a vector autoregression (VAR) (eg Kilian (2008)), but typically tend to be single reduced-form equations, and explain oil prices in terms of proxies for demand, supply and extraction costs. But oil prices respond to both current and prospective demand and supply. And this implies two minimum requirements for such models to identify demand and supply shocks. First, they must include forward-looking explanatory variables. And second, explanatory variables should be that component of changes in fundamentals that comes as news to the market. That is, given that oil prices behave like asset prices, it is not strong demand growth, but stronger-than-expected demand growth that should push prices up. Data constraints, especially at higher frequencies, make it difficult to estimate such models.

Given these limitations, perhaps it is unsurprising that even when models of this type compare favourably to time-series benchmarks in terms of estimation, they do not have a similar advantage when it comes to forecasting (Dées, Gasteuil, Kaufmann and Mann (2008) and Longo *et al* (2007)). Longo *et al* (2007) find that forecasting power is greatly improved if financial variables such as futures prices are also included to form 'mixed models'. But, as explained above, the inclusion of financial variables limits the usefulness of a model for judging whether price changes have been consistent with fundamentals. And, in any case, it is not possible to attribute price movements to demand or supply news, when unexpected changes are not isolated in the estimation process. An alternative method used to explain price movements is to combine estimates of the price and income elasticities of oil demand and the price elasticity of supply with actual growth rates in income and oil market fundamentals to back out an implied path for prices. But the ability of such models to capture year-on-year variation in prices is poor (eg OECD (2008)). Again, this is likely to be related to the omission of expectations of future supply and demand, which also means that such models fail to identify demand and supply shocks. For this reason, there is no attempt to invert the model of oil demand (described in the box on page 218) in a similar way.

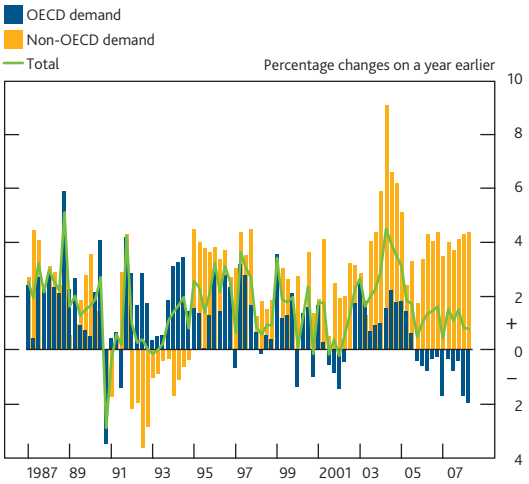
Oil demand

Over 2003–07 growth in final demand for oil averaged 2.0% per year (**Chart 2**), 0.8 percentage points faster than during the preceding five years, and 1.2 percentage points faster than its average since 1980. And around 90% of demand growth during this period came from non-OECD economies. Indeed, OECD demand has been falling year on year since the end of 2005.

A significant proportion of this increase in oil demand was unexpected. Between 2002 and 2005, the six month ahead forecast of oil demand from the IEA was on average 2% lower than the eventual outturn (**Chart 3**), and the same was true for other reputable forecasters. Moreover, more than two thirds can be accounted for by underestimation of the strength of demand from non-OECD Asia and the Middle East.

One reason for this underestimation was errors in expectations of income growth. The IMF forecasts of GDP growth in non-OECD Asia, for example, were repeatedly revised upwards over 2003–05: calendar-year growth turned out on average 1.6 percentage points stronger than anticipated a year earlier. And oil demand in these regions seems to be particularly sensitive to income growth. Income elasticities of demand[1] for non-OECD countries are at least double those for OECD countries. These estimates, which are outlined in the box on page 218, suggest that, between 2002 and 2007, income growth in non-OECD countries generated 5.2 million barrels

Chart 2 Final oil demand



Source: International Energy Agency *Oil Market Report*, January 2009.

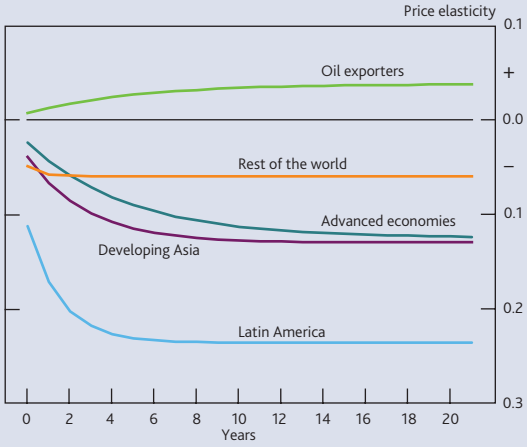
(1) Income elasticity of demand measures the responsiveness of demand, in this case the demand for oil, to a change in income. Similarly, price elasticity of demand measures the reaction of demand to a change in price.

Income and price elasticities of oil demand

This box summarises estimates of income and price elasticities of oil demand, from both external sources and a new model estimated at the Bank. The income elasticity of oil demand measures the responsiveness of oil demand to changes in income and the price elasticity of oil demand measures how changes in the oil price affects oil demand. Available external estimates tend to report two data points for oil demand elasticities — the 'short run' and the 'long run' — but rarely the full time path of the demand response. The approach presented here — a dynamic panel method — allows for a progressive build-up of effects over time. The model is estimated for over 100 countries divided into five regions (advanced economies, developing Asia, oil-exporter countries, Latin America and rest of the world) over 1984–2004. Oil consumption per capita is regressed against one lag of itself, current GDP per capita and the real price of oil (instead of the preferred, but not widely available, domestic fuel price). All variables are included in logs, and income per capita is expressed in dollars using market rates.

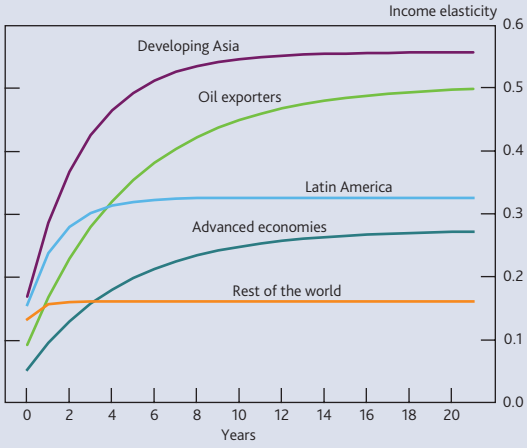
The results are shown in **Charts A** and **B**. Long-run elasticities are higher (by between two and five times depending on the region) than short-run elasticities, and income elasticities are bigger than price elasticities (at least double, and for some regions substantially more). These results are broadly in line with external estimates (**Tables 1** and **2**). Oil demand in less-developed countries tends to respond much more strongly to rising income relative to the advanced economies (**Chart B**): developing Asia and oil exporters' long-run income elasticity is double the income elasticity of advanced countries. As shown in **Chart A**, the price elasticity for oil exporters is positive; this may reflect the fact that an increase in crude oil prices translates into higher export revenues, in turn boosting demand, although this result is not statistically significant. In practice, the sensitivity of oil demand to changes in the international price of crude oil may be unstable, because price changes in the international oil market are not always immediately passed through to domestic retail prices — for which comprehensive data are unfortunately not available.

Chart A Estimated price elasticity of oil demand



Source: Bank calculations.

Chart B Estimated income elasticity of oil demand



Source: Bank calculations.

Table 1 IEA price and income elasticity of oil demand

	Advanced economies	Developing Asia	Oil exporters	Latin America	Rest of the world
Price elasticity					
Short run	-0.02	-0.03	0.05	-0.03	-0.03
Long run	-0.12	-0.11	-0.25	-0.21	-0.28
Income elasticity					
Short run	0.04	0.14	0.08	0.09	0.09
Long run	0.22	0.49	0.39	0.73	0.94

Note: Based on annual data from 1979 to 2005.

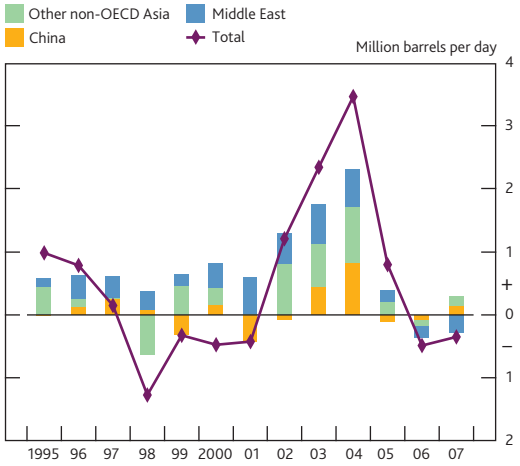
Source: IEA *World Energy Outlook*, 2006.

Table 2 Bank price and income elasticity of oil demand

	Advanced economies	Developing Asia	Oil exporters	Latin America	Rest of the world
Price elasticity					
Short run	-0.02	-0.04	0.01	-0.11	-0.05
Long run	-0.12	-0.13	0.04	-0.24	-0.06
Income elasticity					
Short run	0.05	0.17	0.09	0.16	0.13
Long run	0.27	0.56	0.50	0.33	0.16

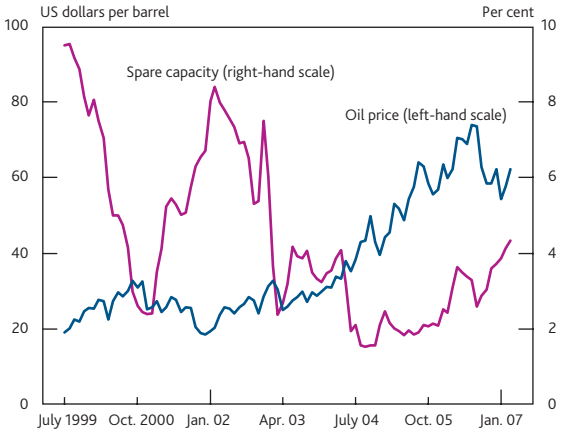
Source: Bank calculations.

Chart 3 Six month ahead oil demand forecast errors(a)



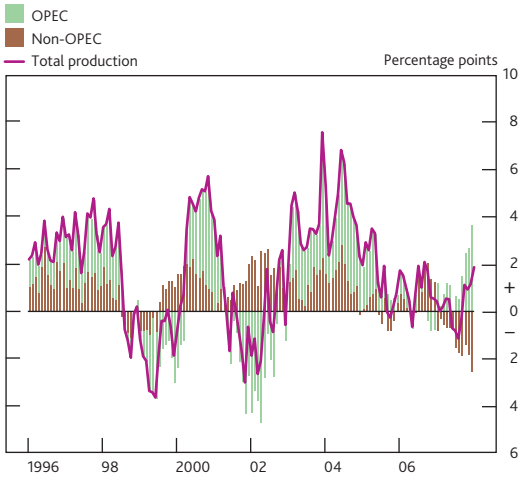
(a) Difference between oil demand outturns and forecasts made six months before the start of that year, where possible. For the period 1996–2001, some forecasts are four or five months ahead only.

Chart 4 OPEC spare capacity as percentage of total oil demand



Sources: Bloomberg, Energy Information Administration and Bank calculations.

Chart 5 Annual crude oil production growth



Source: International Energy Agency *Oil Market Report*, January 2009.

per day (mbd) of additional oil demand, while income growth added only 1.8mbd in developed economies.

Estimates of price elasticities of demand, also outlined in the box on page 218, suggest that the rising price of oil should have limited demand increases by more than was seen in the data. Two reasons can explain the muted response of demand to rising oil prices. First, the extensive use of oil price subsidies in non-OECD countries has dampened substitution effects, keeping oil demand higher than it otherwise would have been.(1) Second, the fact that the transportation sector represents a higher share of oil consumption in advanced economies today than it has over the period when price elasticities were estimated, might have limited the effect of increasing prices on demand.(2) The ability to substitute oil for other fuels is both more limited and more gradual in the transport sector than in any other oil-consuming sector.(3)

Oil supply

As documented above, growth in final demand for oil picked up during 2003 and 2004. This initial increase in demand was largely met by increases in OPEC production. In early 2002, OPEC had spare capacity equivalent to around 8% of global oil demand (**Chart 4**) and was therefore in a position to increase output with relatively little delay. And, indeed, between the end of 2002 and mid-2005, OPEC increased quotas by 6.3mbd (29%).

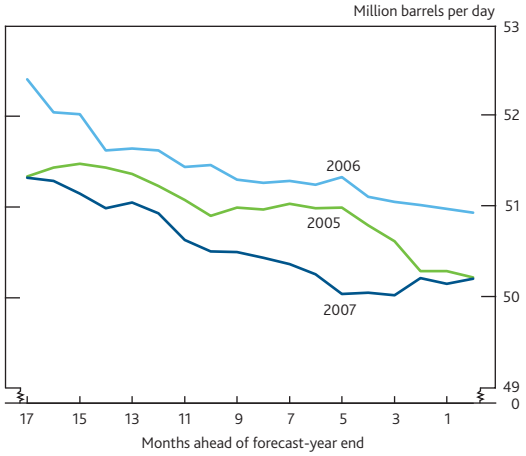
Since 2005, however, total annual oil production growth averaged less than 1%, down from 3.3% over the preceding two and a half years (**Chart 5**). Indeed, by mid-2005 OPEC had little remaining spare capacity, with only 1.5mbd available to it. Also, non-OPEC production actually declined in 2007 by 2%.

This lower non-OPEC production growth appears to have been largely unexpected, with the international agencies revising down their forecasts for production year after year. In its predictions for 2005–07, the IEA, for example, revised down its forecast for annual non-OPEC oil production by an average of 2.4% between its first published forecast and the final outturn (**Chart 6**).

The response of production to rising oil prices was surprisingly muted. It is possible to point to a number of reasons why. The 1990s and early 2000s were years of relatively low returns on capacity investment in the oil industry and, because prices were expected to stay low, there was little prospect of returns increasing. This led to a decade of low investment and a

(1) A recent study by the IMF (2008b) suggests that one quarter of low and middle-income countries failed to pass through even one half of the price increase in gasoline, diesel and kerosene to domestic consumers between end-2003 and end-2007.
(2) For example, the share of the transportation sector in total oil consumption in the United States has increased from 56% in 1980 to 63% in the mid-1980s and to 70% in the late 2000s.
(3) Cabinet Office (2008) also highlight the increasing share of transport fuels as one reason why oil demand had been so slow to respond to increases in crude oil prices.

Chart 6 Evolution of IEA non-OPEC oil production forecasts for particular years[a]



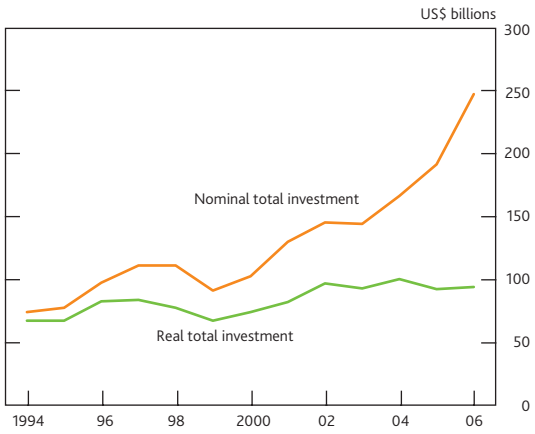
Source: International Energy Agency *Oil Market Report*, several years.

(a) IEA forecasts have been adjusted so as to not be distorted by countries leaving or joining OPEC within a particular year.

depletion of much spare capacity. Moreover, the subsequent need for investment meant that any supply response to increased demand would be constrained by the industry's lengthy lags from investment to production.

That is not to say that investment did not take place: between 2003 and 2006, nominal capital expenditure in oil exploration increased by 70% (**Chart 7**).(1) But a large proportion of this investment went towards covering escalating industry costs.(2) As **Chart 7** shows, when nominal investment expenditure is deflated by an appropriate sectoral cost index, it shows that real investment increased by relatively little. And much of that gross investment is likely to have been absorbed by the need to maintain production in existing fields rather than adding new capacity. The IEA (2008) projects that half of global energy investment over the next 25 years will be devoted to maintaining the current level of supply capacity.

Chart 7 Total investment of oil companies[a]



Source: IMF.

(a) Real investment is nominal capital investment in exploration deflated by the US oil cost producer price index (weighted average of oil and gas wells drilling services, operational support services, and oil and gas fields' machinery and equipment indices).

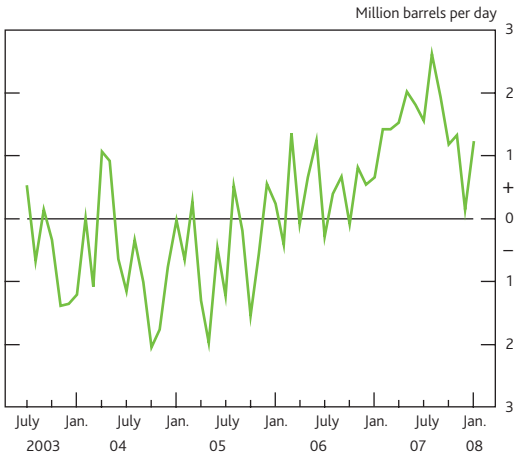
Marginal costs per barrel are typically much lower for OPEC than non-OPEC, but restrictions on, and disincentives against investment by foreign oil companies in OPEC countries, coupled with geopolitical instability, have prevented net marginal returns from being equalised globally. This has resulted in less efficient levels of production.

To sum up, until 2005, what increase there was in the growth rate of total oil production was accounted for by OPEC running down much of its existing spare capacity. Thereafter, total oil production growth did not keep pace with the rise in total demand, with non-OPEC production outturns repeatedly surprising on the downside.

Oil market balance

Bringing demand and supply factors together paints a picture of increasing tightness in the crude oil market from the second half of 2003 onwards. The market moved from a position in which demand could only be met by depleting OPEC spare capacity, to one in which there was excess demand (**Chart 8**). This picture is starker if OPEC production is stripped out, making it clear that supply growth was maintained by using up existing capacity rather than expanding that capacity — with an unambiguous increase in market tightness over the whole period (**Chart 9**).

Chart 8 Oil market tightness



Notes: Consumption has been seasonally adjusted. Market tightness is defined as total consumption (excluding stocks) minus non-OPEC production and OPEC production.

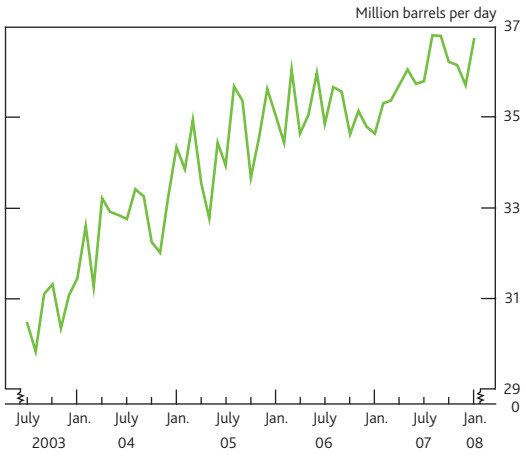
Sources: Energy Information Administration and Bank calculations.

Moreover, the extent of this tightness was unexpected, with adverse surprises about both demand and supply. **Chart 10** plots how the implied expectation of oil market balance in each of the years from 2003 to 2007 evolved over time. A

(1) Defined as total investment by 53 national and international oil companies, IMF (2008a).

(2) Production costs increased as higher demand for offshore drilling met with a limited supply of deep-water rigs; higher prices for metals and other raw materials also put pressure on costs — indeed *The Economist* metals index, a measure of metals prices, more than tripled over 2003–07. And a limited supply of graduates and an ageing workforce produced a shortage of trained engineers, procurement and construction managers.

Chart 9 Balance of consumption and non-OPEC production

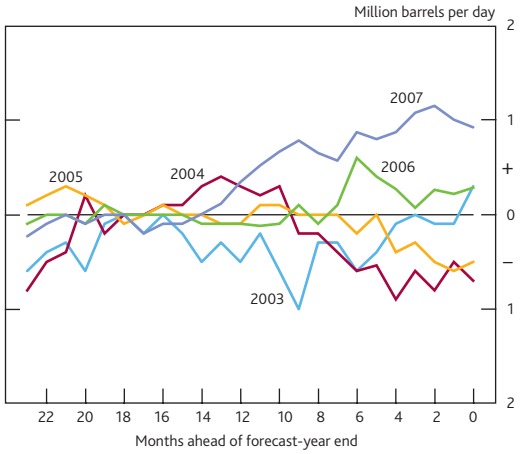


Note: Total consumption (excluding stocks, seasonally adjusted) minus non-OPEC production.

Sources: Energy Information Administration and Bank calculations.

rising profile indicates that the market turned out to be tighter than forecasters had been expecting. In the first three years, there was seemingly little news about increases in oil market tightness, though as discussed this was largely the result of OPEC raising quotas. But 2006 and 2007 did indeed turn out significantly tighter than forecasters had been anticipating previously.

Chart 10 Revisions to market tightness forecast



Sources: Energy Information Administration and Bank calculations.

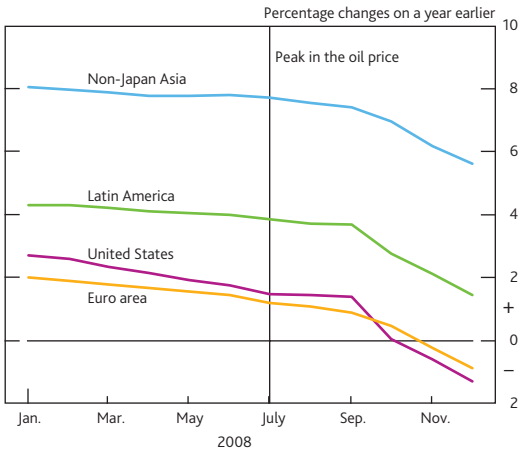
The analysis therefore suggests that shocks to oil demand growth, coupled with the surprisingly inelastic response of supply to higher prices, are directionally consistent with the increase in oil prices over 2003–07.

Demand and supply during 2008

Whereas oil prices increased steadily over 2003–07, 2008 was characterised by a particularly sharp rise in prices followed by an even sharper fall. The nominal price of dated Brent crude oil increased by 49% in the first half of 2008, reaching a peak above $145 per barrel in early July (**Chart 1**). But by the end of 2008 it had fallen back by about 70% to $42 per barrel, 57% down on its price at the beginning of 2008. Is it possible to identify news to current and prospective demand and supply that might be consistent with these remarkable movements in prices?

Consensus forecasts for GDP growth in the advanced economies in 2009 declined throughout 2008, and much more rapidly after the collapse of Lehman Brothers in September (**Chart 11**). However, for much of the year, expectations of growth in non-OECD countries held up well. Reflecting this, IEA and EIA forecasts for non-OECD oil demand over 2008–09 remained robust. This resilience in non-OECD consumption meant that overall IEA demand forecasts for 2008 were only 1.2% lower in June than they had been at the beginning of the year, despite a revision of -2.2% for the OECD.

Chart 11 Consensus forecasts for GDP growth in 2009



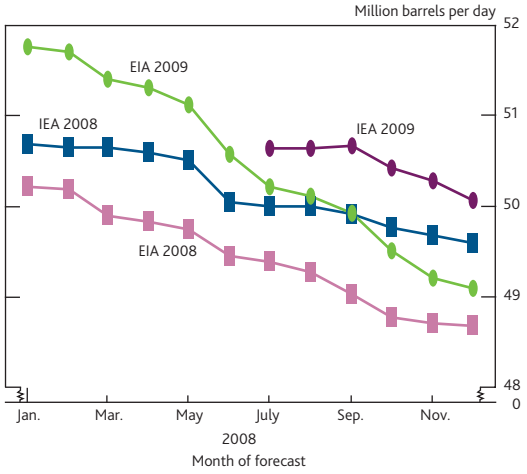
Sources: Bloomberg and Consensus Economics.

Over the second half of the year, however, prospects for income growth across the world, and in emerging markets in particular, deteriorated markedly. This led the IEA to lower its projections for global oil demand by 1.2% for 2008 and by 1.6% for 2009.

Taken together therefore, the news on demand is consistent with falling prices in the second half of 2008, but they do not provide much support for the rapid rise in prices in the first half of the year, nor do they explain why the fall in prices began in July.

On supply, as had been the case during much of 2006 and 2007, non-OPEC production continued to weaken during 2008 (ending the year 1% below where it started), and forecasts for non-OPEC supply continued to be revised down throughout the year (**Chart 12**). Moreover, once prices began to fall in mid-2008, OPEC took action to cut back on its production quite swiftly, with a cumulative cut in quotas of 13% of OPEC production or just under 6% of total world supply — the largest in the organisation's history.

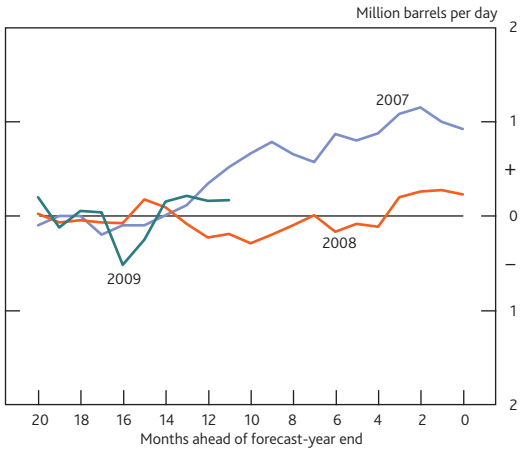
Chart 12 Non-OPEC supply forecasts made in 2008



Sources: Energy Information Administration and International Energy Agency.

So the downside news on supply continued to be material throughout 2008. But, once demand and supply expectations are brought together, it turns out that revisions to views on supply were of the same order of magnitude as revisions to demand (**Chart 13**). In other words, expectations about the oil market balance made in 2008 have not proven to be overly pessimistic.

Chart 13 Revisions to market tightness forecast



Sources: Energy Information Administration and Bank calculations.

Based on news about the balance of demand and supply in 2008, therefore, it seems that one can justify neither the rise in prices in the first half of 2008, nor the fall in prices in the second half.

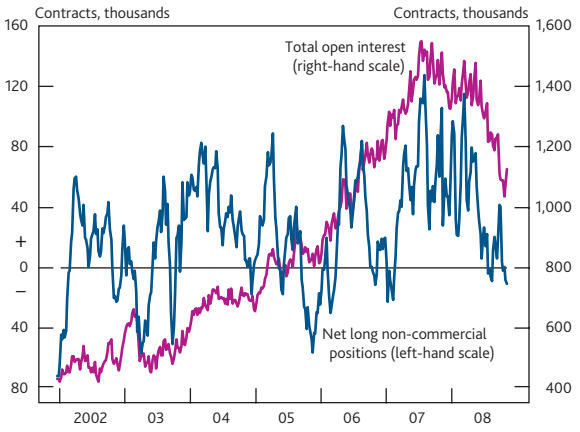
But one further observation is worth making. As in 2003–04, the rebalancing of demand and supply during 2008 was brought about by shifts in OPEC spare capacity. Indeed, spare capacity reached a record low during the spring of 2008, before rising again in the autumn as demand started to deteriorate. Market participants could have been concerned in the first half of the year about the ability of OPEC to act as a buffer against further upward pressure on prices. And they could have been sceptical in the second half of the year about OPEC's ability to enforce new quota levels. This could have contributed to the sharp rise in oil prices during the first half of 2008 and the rapid fall during the second half.

Speculative flows and asset price bubbles

The analysis so far suggests that it is difficult to be fully confident about whether the evolution of oil prices since the beginning of 2003 is entirely consistent with news about demand and supply. This section asks whether other factors could have played an important role.

Some commentators have suggested that the remarkable increase and fall in the oil price in 2008 was due to an asset price bubble which originated at the time that the mortgage price bubble burst in the United States (Caballero, Farhi and Gourinchas (2008)). Others have suggested that financial flows into the futures market from investors who do not use oil futures to hedge their consumption or production plans (so-called 'speculative' flows) have pushed prices above the level warranted by the current and projected balance of supply and demand (eg Masters (2008)). These commentators point to the dramatic increase in financial flows into the futures market since 2006 (see the evolution of non-commercial net long positions, a proxy of speculative financial flows, in **Chart 14**). If they are right, some part of the fall in oil prices since July last year may reflect an unwinding of this overvaluation. This section looks at how plausible such arguments are both theoretically and in light of the available data.

Chart 14 Financial flows



Sources: Bloomberg and Bank calculations.

Asset price bubbles

Broadly speaking, economists have identified two reasons for asset price bubble creation — 'irrational exuberance' and rational expectations of price movements not warranted by fundamentals that are shared widely and are fulfilled in equilibrium.

The proponents of the irrational exuberance argument (Shiller (2005, 2008)) describe asset price bubbles as the result of a simple feedback mechanism. In the first phase, asset prices start to rise, say due to a temporary demand or supply shock. The success of some market participants attracts public attention that fuels interest in the rest of the market (and not necessarily limited to financial investors). Less sophisticated investors enter the market and bid up prices, causing further enthusiasm based on the extrapolation of recent price movements far into the future. At some point, pessimism can take hold and cause the process to reverse. This theory depends on the assumption that a significant number of investors behave irrationally, an assumption that mainstream economic theory has tried to eschew in the past.

By contrast, rational bubble models do not require market participants to behave irrationally. One such model, with an application to the oil market, has recently been put forward by Caballero *et al* (2008). The authors argue that there has been a fundamental scarcity of investment assets across the globe — with only a few countries, such as the United States and the United Kingdom, having the ability to produce 'good assets', attracting large flows from countries with excess savings, such as China and the Middle East. They argue that these capital flows led to low real interest rates in asset-producing countries, accompanied by the development of an asset price bubble in non-storable assets such as US mortgage securities.

This bubble burst in August 2007 when unexpected losses on these assets revealed that they were riskier than investors had thought. In the first phase of the ensuing crisis, the bursting of this bubble exacerbated the global asset shortage and led investors to increase rapidly their demand for other sound and liquid financial instruments. The combination of low real interest rates and existing spot market tightness made oil a desirable destination for funds. And so, in essence, the argument is that the bubble relocated from the US mortgage market to the oil market. Eventually, when it became clear that the outlook for the world economy, and therefore oil market fundamentals, was much weaker than had been thought, the oil price bubble burst.

Although theoretically elegant, this account does not explain the timing of the asset price bubble expanding and then bursting. As **Chart 1** shows, there is no visible change in the rate of increase in oil prices in the immediate aftermath of the sub-prime shock in August 2007. Moreover, as discussed above, the point at which expectations about global economic prospects really began to deteriorate was in September 2008, whereas oil prices started falling in July.

Can 'speculative' flows move prices away from fundamentals?

Investors who trade in the futures markets for speculative purposes tend to avoid taking costly delivery of the physical commodity — they instead either settle their futures contracts for cash, or sell them before they expire. For example, between 2003 and May 2008 only around 2% of West Texas Intermediate oil futures contracts on the New York Mercantile Exchange resulted in physical delivery (Interagency Task Force on Commodity Markets (2008)). This means that speculative position-taking in the futures market can only impact spot oil prices significantly if it affects spot market participants' expectations of future spot prices. And if spot market participants are rational, this requires that financial flows are thought to contain new information on the prospective balance of demand and supply.

In practice, spot traders are not capable of distinguishing perfectly the proportion of financial flows originating from investors with new information about fundamentals from the proportion that comes from uninformed 'noise' traders (eg passive investors taking positions for portfolio allocation reasons or for liquidity purposes). So over short horizons — limited by the lags before publicly available information on demand and supply dispels this uncertainty — the activity of 'noise' traders can cause spot traders to update their beliefs regarding fundamentals. And it is therefore possible for them to cause spot prices to diverge, for a limited time, from the level warranted by prospective market tightness.(1) The August 2008 *Inflation Report*, for example, suggested that while purely speculative activity might have sometimes amplified oil price movements in the short term, sustained price changes had tended to reflect market fundamentals.

The best publicly available data on financial flows into and out of commodity markets are from the US Commodity Futures Trading Commission (CFTC). The data disaggregate positions by investor type. Specifically, investors are reported as 'commercial' if they are primarily involved in the market to hedge their main business activity, which typically involves the production or consumption of oil. Otherwise, they are 'non-commercial'.

The net long non-commercial (NLNC) position can be used as a proxy measure of speculative financial flows (**Chart 14**). To assess whether these flows cause movements in oil prices, VARs are estimated that relate price changes in one-month, three-month and one-year futures contracts to changes in NLNC positions.(2) The model is estimated over two samples:

(1) There are a number of theoretical models in the market microstructure literature that demonstrate how imperfect information about the composition of aggregate order flow between 'informed' orders and 'uninformed' orders can cause temporary deviations of financial prices away from fundamentals (O'Hara (1995) and Lyons (2001)). Recent research has emphasised that the proportion of trades from investors trading on the basis of news on fundamentals (fundamentalists) in a market responds endogenously to the perceived misalignment of prices relative to their warranted levels (Redrado, Bastourre, Carrera and Ibarlucia (2008) and Reitz and Slopek (2008)). In these models, the confidence with which fundamentalists can predict the direction of future price movements is increasing in the extent of this misalignment, limiting further the extent through which deviations from warranted levels can persist.

(2) Details of the VARs are available upon request. The number of VAR lags is decided using information criteria. Alternative VARs are estimated as robustness checks using different sample lengths in addition to those reported in the main text.

2003–06 and 2006 to mid-November 2008, in order to investigate whether the importance of these flows changed over the period considered. In neither sample is there support for the hypothesis that financial flows occur before changes in prices, evidence — albeit limited — that financial flows do not cause prices to change. These results are entirely consistent with those of other studies including a report by the Interagency Task Force on Commodity Markets (2008) that used confidential CFTC data on investor positions that enable a more accurate identification of flows originating from 'speculators' and other investors than the publicly available data (IMF (2006) and Haigh, Hranaiova and Overdahl (2005)).(1)

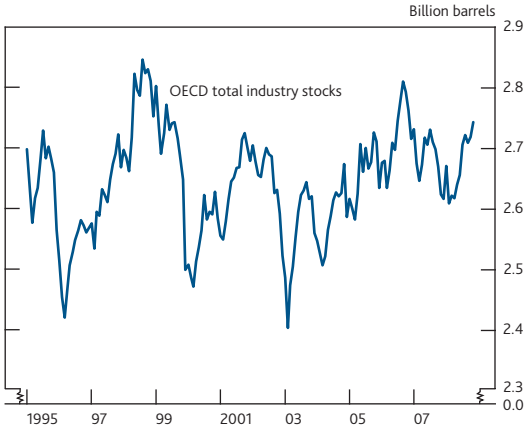
Cabinet Office (2008), while acknowledging that the impact of financial investors on futures commodity prices has been difficult to establish empirically, suggests that 'in the absence of large financial flows into and subsequently out of futures markets, it is possible that futures prices may not have risen and fallen as much as they did during 2008'. As supporting evidence, the authors appeal to the marginal costs of non-conventional sources of oil supply falling short of futures prices during the first half of 2008 and the difficulties of explaining the rise and fall in prices during 2008 by probable future demand and supply scenarios.

Speculative flows, asset price bubbles and inventories

A number of commentators have pointed out that any evidence of speculative flows driving oil prices should be reflected in inventory data (Krugman (2008) and Hamilton (2009)). The argument is based on Working's theory of storage summarised earlier in the article. In particular, if commercial traders interpreted large financial flows into the futures market as an indicator of future tightness, they would have an incentive to bring forward spot purchases — inventories would therefore need to build up. Equally, an inventory build-up is necessary for the argument in Caballero *et al* (2008) to hold, as speculators shift their demand from non-storable financial assets to storable oil.

Although data on inventories are not comprehensive, the available figures do not seem to support the claim that speculative flows have been driving up oil prices. OECD inventories did not increase substantially between late 2006 and 2008 (**Chart 15**). And data provided by the Joint Oil Data Initiative suggest that total inventories in 30 countries for which data are available fell by almost 7% over this period.(2) This, by itself, convinced some commentators that speculation could not have been a major driver behind the rise in oil prices (Krugman (2008)). Another possibility is that oil was kept in the ground by producers deliberately slowing the rate at which oil was extracted. However, OPEC spare capacity reached a trough in the first half of 2008, making it unlikely that they were building up inventories under the ground.

Chart 15 OECD crude oil stocks



Source: International Energy Agency monthly reports.

But as set out in the discussion of Working's model earlier, the level of inventories responds to a number of shocks. Speculative demand for oil as an asset class will tend to lead to an increase in inventories. By contrast, a shock to oil demand that is perceived to be temporary will lead consumers to draw down their inventory. It is at least conceivable, therefore, that observed inventory levels did not rise because the speculative demand for oil was being offset by physical investors adjusting their inventories in response to a positive shock to oil demand that they did not expect to last. That is, it is possible that speculative flows could have played a role in driving up oil prices but it did not show up in the observed inventory data.

Conclusion

This article has examined the potential key factors that have driven the sharp movements seen in oil prices over the past few years. It argues that demand shocks from fast-growing emerging markets coupled with subsidised prices and successive overestimation of non-OPEC supply are together consistent with the continued rise in the oil price between 2003 and 2007. The behaviour of prices in 2008 is more difficult to reconcile with news on the balance of demand and supply. At the same time, theories that suggest that the rapid increase in financial flows from speculators in the oil futures market during recent years led spot prices to diverge from fundamentals do not find empirical support. That said, neither this evidence nor evidence from inventories is sufficient to rule out completely the possibility that asset price bubble dynamics might have played a role.

(1) For example, the publicly available NLNC data would exclude flows from oil producers and consumers that trade in the futures markets for speculative purposes.
(2) The data are from www.jodidata.org. Their sample includes developing economies, but omits much of the Middle East and importantly China. The inventory data that do exist however do not support the argument that speculative behaviour was a major driver of oil prices.

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Bank of England *Systemic Risk Survey*

By Sarah Burls of the Bank's Risk Assessment Division.[1]

Earlier this year, the Bank introduced a formal *Systemic Risk Survey* to supplement its regular dialogue with market participants. The survey is intended to elicit market participants' views about the prospects for financial stability in the United Kingdom. This article introduces the survey and reports the key results, following the summary published in the June 2009 *Financial Stability Report*.

Introduction

A core purpose of the Bank is to contribute to financial stability. This entails identifying, assessing and seeking to mitigate threats to the stability of the UK financial system. Such threats are detected, in part, through the Bank's surveillance and market intelligence functions. As a contribution to this activity, the Bank has developed a formal survey to gauge market participants' views about system-wide risks and prospects for financial stability in the United Kingdom.

A pilot survey was conducted in July 2008 to confirm both the value of the exercise and participants' support for the initiative. A full survey was subsequently conducted by the Bank in May 2009. The June 2009 *Financial Stability Report* summarised these results;[2] this article provides more detail.

Bank of England *Systemic Risk Survey*

The *Systemic Risk Survey*[3] has been designed to gauge market participants' perceptions of:

- key sources of risk to the UK financial system and how these have changed;
- those sources of risk that market participants would find hardest to manage; and
- overall risks to, and confidence about, the financial system's stability over the short and medium term.

The survey complements other sources of information on risks to the system, including regular dialogue with market participants. It is designed to enable the Bank to compare its view of key risks against those suggested by market participants: first, to ensure that the Bank is not missing risks that are of concern to survey respondents; and second, to highlight risks that the Bank considers to be important but are not cited by market participants. The survey may also help the Bank to decide where further analysis and research is needed and could help the Bank to target and prioritise mitigating actions.

The Bank conducted the first full survey over the period 27 April to 15 May 2009. It was sent to a range of market participants, including UK banks, large complex financial institutions (LCFIs), hedge funds, asset managers and insurance companies. The sectoral breakdown of respondents was broadly comparable to the pilot survey, although more hedge funds responded in the May 2009 survey (**Table A**). Overall, 61% of those invited to complete the May 2009 survey responded. The response rate may be expected to increase as the survey becomes more established. The Bank intends to conduct the survey regularly and to report the results in future *Financial Stability Reports*.

Table A Survey respondents, by sector

	May 2009		July 2008	
	Number	Response rate (per cent)	Number	Response rate (per cent)
LCFIs	9	69	9	56
Hedge funds	8	89	4	44
UK banks	7	70	9	69
Asset managers	5	45	4	40
Insurance companies	5	38	7	54
Total	34	61	33	54

Sources: Bank of England *Systemic Risk Survey*, July 2008 and May 2009, and Bank calculations.

Summarising the results

The survey consists of five questions and is divided into two sections. Section 1 aims to identify key sources of risk to the UK financial system. Section 2 solicits market participants'

(1) The author would like to thank Will Kerry and Tomasz Wieladek for their help in producing this article.
(2) Box 5, '*Systemic Risk Survey* results', Bank of England *Financial Stability Report*, June 2009.
(3) The survey was carried out by the British Market Research Bureau (BMRB) on behalf of the Bank.

Table B Key risks to the UK financial system, May 2009 survey[a]

	Key risks[b]		Hardest risk to manage[c]		
	Number[d]	Per cent[a]	Number[e]	Per cent[a]	Per cent of responses in column A
	A	B (column A /34)	C	D (column C /34)	E (column C /A)
Economic downturn	28	82	12	35	43
Borrower defaults	16	47	8	24	50
Pressures in funding markets	11	32	4	12	36
Tight credit conditions	9	26	1	3	11
Regulatory and accounting changes	9	26	9	26	100
Sovereign risk	9	26	2	6	22
Failure of financial institutions	8	24	5	15	63
Financial market dislocation	8	24	4	12	50
Operational risk	8	24	1	3	13
Lack of confidence in pricing, disclosure and ratings	7	21	4	12	57
Loss of confidence in authorities	7	21	3	9	43
Property price falls	6	18	1	3	17
Disruption to derivatives and insurance markets	5	15	1	3	20
Infrastructure disruption	4	12	2	6	50

Sources: Bank of England *Systemic Risk Survey*, May 2009, and Bank calculations.

(a) Thirty four market participants provided the Bank with their views.
(b) Respondents were asked to list the five risks that they believe would have the greatest impact on the UK financial system if they were to materialise in order of potential impact.
(c) Respondents were asked for three of the risks they identified that would be most challenging to manage as a firm.
(d) The total of this column would be 170 if all respondents had listed five risks. Not all respondents listed five risks so the total of this column is less than expected.
(e) The total of this column would be 102 if all respondents had listed three risks. Not all respondents listed three risks so the total of this column is less than expected.

Table C Key risks to the UK financial system, July 2008 survey[a][b]

	Key risks[c]		Hardest risk to manage[d]		
	Number[e]	Per cent[b]	Number[f]	Per cent[b]	Per cent of responses in column A
	A	B (column A /33)	C	D (column C /33)	E (column C /A)
Economic downturn	20	61	14	42	70
Borrower defaults	4	12	2	6	50
Pressures in funding markets	11	33	7	21	64
Tight credit conditions	5	15	2	6	40
Regulatory and accounting changes	9	27	4	12	44
Sovereign risk	0	0	0	0	0
Failure of financial institutions	29	88	14	42	48
Financial market dislocation	10	30	3	9	30
Operational risk	10	30	5	15	50
Lack of confidence in pricing, disclosure and ratings	6	18	3	9	50
Loss of confidence in authorities	5	15	1	3	20
Property price falls	15	45	7	21	47
Disruption to derivatives and insurance markets	6	18	6	18	100
Infrastructure disruption	4	12	3	9	75

Sources: Bank of England *Systemic Risk Survey*, July 2008, and Bank calculations.

(a) Risks in the same order as **Table B**.
(b) Thirty three market participants provided the Bank with their views.
(c) Respondents were asked to list the five risks that they believe would have the greatest impact on the UK financial system if they were to materialise in order of potential impact.
(d) Respondents were asked for three of the risks they identified that would be most challenging to manage as a firm.
(e) The total of this column would be 165 if all respondents had listed five risks. Not all respondents listed five risks so the total of this column is less than expected.
(f) The total of this column would be 99 if all respondents had listed three risks. Not all respondents listed three risks so the total of this column is less than expected.

views on the stability of the UK financial system. A full list of the questions is reproduced in Annex 1.

Section 1: Key sources of risk to the UK financial system

The first question in Section 1 asks respondents to list the five risks that they believe would have the greatest impact on the UK financial system, if they materialised in a plausible worst-case scenario. The second question aims to identify those risks that institutions would find most challenging to control.

These two questions require free-format answers. To summarise the results, responses are grouped into broader generic categories. For example, responses citing economic risks, such as high unemployment, are grouped together in a generic economic downturn category. These broader categories are not intended to be comprehensive; new groups will be created over time if the risks identified do not fit into the categories used in previous surveys.

Key risks

Tables B and **C** report all of the risks identified in the May 2009 survey and in the pilot survey conducted in July 2008. In each case the number (column A) and percentage (column B) of respondents citing each risk is also provided.[1]

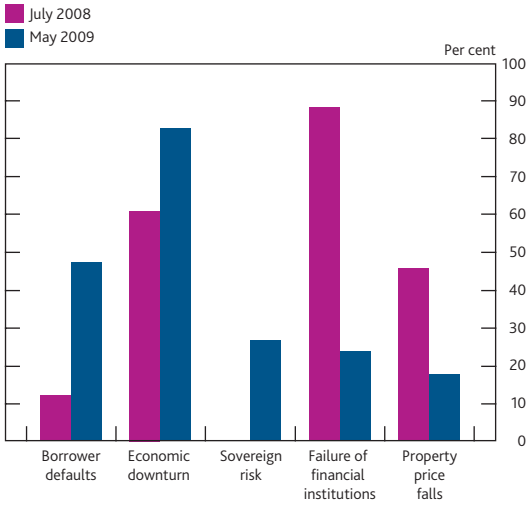
The top risks identified in the 2009 survey were:

- economic downturn (82% of respondents);
- borrower defaults (47%);
- pressures in funding markets (32%);
- tight credit conditions (26%);
- regulatory and accounting changes (26%); and
- sovereign risk (26%).

Most of these top risks were cited by a greater proportion of respondents than in the pilot survey (**Chart 1** and **Tables B** and **C**). In the case of the first two risks, this is consistent with financial institutions' exposure to the sharp deterioration in macroeconomic conditions in the intervening period.[2] Sovereign risk was cited for the first time. This category includes risks relating to increased government debt, potential sovereign downgrades by credit rating agencies, and loss of

(1) Annex 2 compares these figures with an alternative measure, which assigns a weight to risks according to how highly they were rated. The top risks identified are broadly the same under this measure.
(2) As discussed in the *Financial Stability Report*, which can be found at www.bankofengland.co.uk/publications/fsr/2009/fsrfull0906.pdf.

Chart 1 Selected key risks to the UK financial system[a][b]



Sources: Bank of England *Systemic Risk Survey*, July 2008 and May 2009, and Bank calculations.

(a) Respondents were asked to list the five risks that they believe would have the greatest impact on the UK financial system if they were to materialise in order of potential impact.
(b) Per cent of respondents citing risk.

confidence in the ability of sovereigns to fund their guarantees of bank assets and liabilities.

Respondents appeared to be less concerned, however, about several other risks that had been highlighted in the pilot survey. In particular, far fewer respondents highlighted property price falls and the potential failure of a financial institution, both of which had been in the top three risks in the pilot survey in July 2008 (**Chart 1**).

The apparent decline in concerns about these risks could be a reflection of events occurring between the two surveys. Concerns about the stability of the financial system during the crisis led to two waves of public sector support measures for the banking system, one in October 2008 and another in early 2009.(1) That may have reduced the perceived likelihood of financial institution failure. Similarly, falls in commercial and residential property prices may have led respondents to believe further substantial falls were less likely.

Hardest risks to manage

From the risks identified in the first question, participants were asked to identify the three that they would find most difficult to manage. Participants are likely to interpret this question in one of two ways. First, it could be interpreted in terms of costs to an organisation (for example, the costs associated with increased regulation). Second, it could be interpreted in terms of losses to an organisation (for example the losses associated with borrower defaults or the failure of a financial institution). It is important to note that respondents may see changes that impose costs on their organisation, for example alterations to regulation, as a risk to their business, but these changes may be designed to reduce risks to the system as a whole.

The risks most commonly identified as difficult to manage were (**Table B**):

- economic downturn (35% of respondents);
- regulatory and accounting changes (26%);
- borrower defaults (24%); and
- failure of financial institutions (15%).

Even where risks are cited by relatively few respondents, they may still be of concern if they would be challenging to manage. So it may be informative to consider a complementary measure that calculates the proportion of those respondents identifying a risk who also said it would be difficult to manage. For example, regulatory and accounting changes was cited as a key risk by only nine respondents, but all nine thought it would be difficult to manage (**Table B**, column E). In contrast, economic downturn was the most commonly cited risk, but only 43% of respondents identifying this as a top financial stability risk thought it would be difficult to manage.

Under this approach, the risks that were identified as most difficult to manage were:

- regulatory and accounting changes (100%);
- failure of financial institutions (63%); and
- lack of confidence in pricing, disclosure and ratings (57%).

Most of these risks were thought to be hard to manage by a higher proportion of respondents than in the pilot survey conducted in July 2008. By contrast, far fewer respondents were concerned with disruption to derivatives and insurance markets in May 2009, the risk identified as most difficult to manage in the pilot survey. Concerns about the manageability of operational risk, as well as risks relating to property price falls and tight credit conditions, were also significantly lower than the previous year.

Section 2: Aggregate risks to the UK financial system

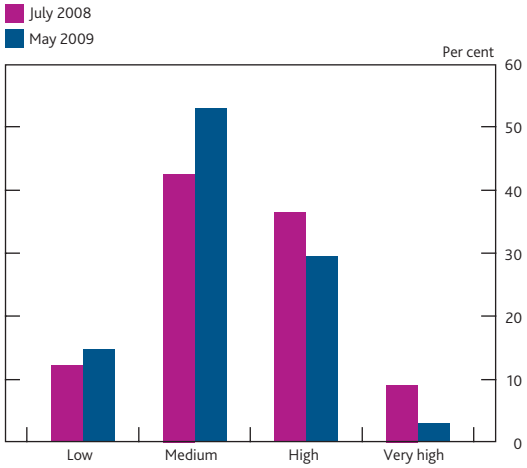
Section 2 of the survey consists of three questions on the likelihood of a high-impact event and confidence in the UK financial system.

Probability of a high-impact event

The first question in Section 2 asks participants to report their view of the likelihood of a high-impact event affecting the UK financial system over the short term and medium term. Although the survey does not define a high-impact event, this could be interpreted by respondents as, for example, the failure of a large financial institution or the closure of a key financial market. As in the July 2008 pilot survey, around one half of respondents judged a high-impact event to be

(1) As discussed in the June 2009 *Financial Stability Report*, which can be found at www.bankofengland.co.uk/publications/fsr/2009/fsrfull0906.pdf.

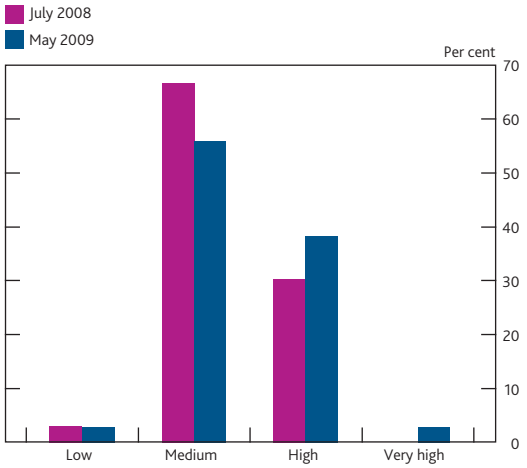
Chart 2 Probability of a high-impact event in the UK financial system in the short term(a)



Sources: Bank of England *Systemic Risk Survey*, July 2008 and May 2009, and Bank calculations.

(a) Respondents were asked for the probability of a high-impact event in the UK financial system in the short term. Five possible answers: very high; high; medium; low; very low. There were no responses for very low.

Chart 3 Probability of a high-impact event in the UK financial system in the medium term(a)



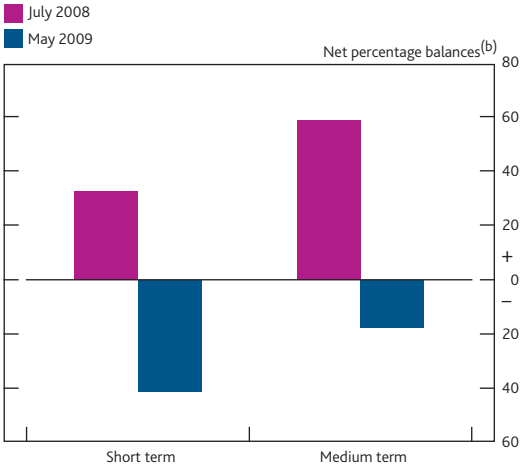
Sources: Bank of England *Systemic Risk Survey*, July 2008 and May 2009, and Bank calculations.

(a) Respondents were asked for the probability of a high-impact event in the UK financial system in the medium term. Five possible answers: very high; high; medium; low; very low. There were no responses for very low.

reasonably likely and a third or more thought the likelihood was high or very high in both the short and medium term (**Charts 2** and **3**).

Participants were also asked to report their view on whether the probability of a high-impact event affecting the UK financial system in both the short and medium term had changed over the past six months. **Chart 4** shows the percentage of respondents who perceived an increase in the probability of a high-impact event, less the percentage perceiving a decrease, for both the pilot and the May 2009 full survey. It shows that the balance of respondents in May 2009 perceived a high-impact event to be less likely than six months earlier.

Chart 4 Change in probability of a high-impact event in the UK financial system over the past six months(a)



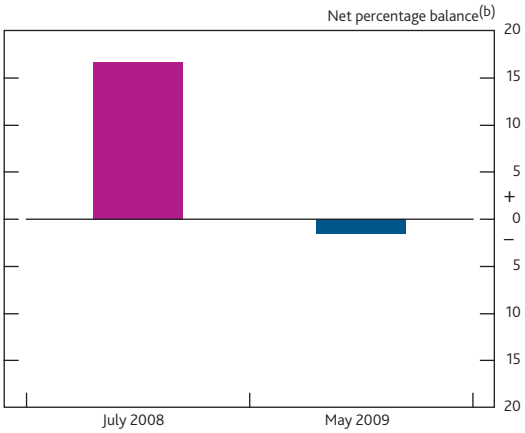
Sources: Bank of England *Systemic Risk Survey*, July 2008 and May 2009, and Bank calculations.

(a) Respondents were asked how the probability of a high-impact event in the UK financial system has changed over the last six months in the short term and in the medium term. Three possible answers: increased; unchanged; decreased.
(b) The net percentage balance is calculated as the percentage of respondents who perceived an increase in the probability of a high-impact event, less the percentage perceiving a decrease.

Confidence in the financial system

Finally, survey participants were asked to report their overall confidence in the stability of the UK financial system over the next three years. **Chart 5** shows the percentage of respondents who were confident, less those who were not very confident. The net percentage balance was weighted according to the strength of the sentiment (see footnote (b) of **Chart 5**). Confidence was significantly lower than reported in July 2008, with a sharp decrease in those stating that they were very confident (from 36% to 15% of respondents), and an increase in those who were not very confident (from 3% to 18%).

Chart 5 Confidence in the stability of the UK financial system as a whole over the next three years(a)



Sources: Bank of England *Systemic Risk Survey*, July 2008 and May 2009, and Bank calculations.

(a) Respondents were asked how much confidence they have in the stability of the UK financial system as a whole over the next three years. Five possible answers: complete confidence; very confident; fairly confident; not very confident; no confidence. No responses for complete confidence or no confidence.
(b) Net percentage balances are calculated by weighting together the responses as follows: complete confidence (1); very confident (0.5); fairly confident (0); not very confident (-0.5); no confidence (-1).

Looking at the responses to these last two questions together, although participants judged that the probability of a high-impact event in the UK financial system had decreased over the past six months, they had less confidence in the stability of the financial system than they had in July 2008. One interpretation is that this result reflects the timing of events in the financial crisis. Survey respondents were perhaps less confident in the stability of the system in May 2009 than in July 2008, as a result of the crisis worsening in the second half of 2008. But participants may have also thought that a high-impact event was less likely in May 2009 than during the period of instability six months earlier. This is consistent with the improvement in market sentiment in the second quarter of 2009, discussed in the June 2009 *Financial Stability Report*.

Conclusion

The Bank recently launched a biannual *Systemic Risk Survey* to improve its understanding of market participants' views on system-wide risks and on prospects for financial stability. The May 2009 survey highlighted a number of the risks that the Bank had also identified in its surveillance work. Several of these risks were discussed in the June 2009 *Financial Stability Report*. In addition, the survey helped to reveal those risks that market participants believed they would find difficult to manage. As future results are collected, it is hoped that the *Systemic Risk Survey* will become an increasingly important input into the Bank's assessment of systemic risk.

Annex 1
Survey questions

Section 1: Key sources of risk to the UK financial system

1.1 Looking ahead, which risks do you believe would have the greatest impact on the UK financial system if they were to materialise? Please list risks in order of potential impact (ie greatest impact first).
Respondents are asked to list five risks.

1.2 Which of these risks would you find most challenging to manage as a firm?
Respondents are asked to list three risks.

Section 2: Aggregate risks to the UK financial system

2.1 In your view, what is the probability of a further high-impact event in the UK financial system in the period ahead?
In the short term? Very high High Medium Low Very low
In the medium term? Very high High Medium Low Very low

2.2 How has this probability changed over the last six months?
In the short term? Increased Unchanged Decreased
In the medium term? Increased Unchanged Decreased

2.3 How much confidence do you have in the stability of the UK financial system as a whole over the next three years?
Complete confidence Very confident Fairly confident Not very confident No confidence

Annex 2
Additional results

The results described in the main article are based on the percentage of respondents citing certain risks. But the survey participants were asked to list their top five risks in order of potential impact. To take account of the relative importance that individual respondents attached to each risk, it is possible to construct a weighted average percentage for each risk. This measure places greater weight on those risks that tended to be ranked more highly in each respondent's top five. But as **Table A1** shows, for the May 2009 survey, the top risks are broadly the same, whichever method is used to calculate the results.

Table A1 Key risks to the UK financial system[a][b]

	May 2009[c]		July 2008[d]	
	Number of times cited	Weighted average percentage	Number of times cited	Weighted average percentage
Economic downturn	28	23	20	15
Borrower defaults	16	14	4	3
Pressures in funding markets	11	9	11	9
Sovereign risk	9	9	0	0
Failure of financial institutions	8	7	29	28
Regulatory and accounting changes	9	6	9	4
Financial market dislocation	8	5	10	7
Loss of confidence in authorities	7	5	5	2
Tight credit conditions	9	4	5	4
Disruption to derivatives and insurance markets	5	4	6	5
Lack of confidence in pricing, disclosure and ratings	7	4	6	4
Operational risk	8	4	10	6
Property price falls	6	4	15	11
Infrastructure disruption	4	2	4	2

Sources: Bank of England *Systemic Risk Survey*, July 2008 and May 2009, and Bank calculations.

(a) Respondents were asked to list the five risks that they believe would have the greatest impact on the UK financial system in order of potential impact.
(b) Table shows a weighted average percentage. Each risk's rank is assigned a weight as follows: risk 1 (5); risk 2 (4); risk 3 (3); risk 4 (2); and risk 5 (1). The number in the table is the weighted number of responses for each risk as a percentage of the total.
(c) Thirty four market participants provided the Bank with their views.
(d) Thirty three market participants provided the Bank with their views.

Funding liquidity risk in a quantitative model of systemic stability

Summary of Working Paper no. 372 David Aikman, Piergiorgio Alessandri, Bruno Eklund, Prasanna Gai, Sujit Kapadia, Elizabeth Martin, Nada Mora, Gabriel Sterne and Matthew Willison

The global financial crisis of 2007–09 has illustrated the importance of modelling the closure of funding markets to financial institutions and accounting for liquidity feedbacks within any model of systemic risk. This paper illustrates how such channels are incorporated into a Risk Assessment Model for Systemic Institutions (RAMSI), and outlines how RAMSI can aid assessment of institution-specific and system-wide vulnerabilities.

RAMSI aims to deliver a suite of models that should provide a rigorous and consistent quantitative framework for risk assessment, and help to sharpen the analysis of key vulnerabilities. It will provide a tool for examining the impact of key risks on a bank-by-bank and system-wide basis, and aid in the assessment of the impact of potential policy measures. The results from the suite of models will assist in the communication of risk assessment messages to risk managers in the financial sector, thereby helping shape their attitudes to risk.

The model focuses on the health of core banks in the UK financial system. For these banks, it provides a quantitative framework for assessing how balance sheets dynamically adjust to macroeconomic and financial shocks. The framework allows for macro-credit risk, interest and non-interest income risk, network interactions, and feedback effects arising on both the asset and liability side of the balance sheet. Systemic risks stem from the connectivity of bank balance sheets via interbank exposures (counterparty risk); the interaction between balance sheets and asset prices (fire sale effects); and confidence effects that may affect funding conditions.

The crisis afflicting banks in the United Kingdom and internationally has illustrated the importance of funding liquidity risk, which is captured through two complementary channels. First, an empirical model is used to project individual bank credit ratings, and assess how funding costs may change with the fundamentals of a bank. Second, a 'danger zone' model is used, in which a range of indicators determine whether a bank suffers stress so severe that it is shut out of unsecured funding markets.

The model is applied to the UK banking system based on the balance sheet vulnerabilities that existed at the end of 2007, and the results show how rising funding costs and liquidity concerns can amplify other sources of risk. The outputs are generated by running 500 simulations capturing different outturns for the macroeconomy on a three-year forecast horizon. It should be emphasised that the results are illustrative, reflecting model properties in this preliminary version rather than being the authors' view of the likely impact on the banks in question. In terms of aggregate results for variables such as system-wide profits and total assets, there is some evidence of bimodality, insofar as there are a number of observations in the extreme tail of the distributions, which are typically associated with one or more banks failing.

The unified modelling approach demonstrates how a failing bank may trigger contagion by defaulting on interbank liabilities, selling assets in a fire sale, and undermining confidence in other similar banks. A single, extreme draw is dissected to illustrate these channels. In it, one bank defaults for fundamental reasons but causes two other banks to fail. The second bank fails because its existing vulnerabilities are exacerbated by a drain in confidence in its funding position as it is perceived to be similar to the first failed bank. And the third bank fails because it suffers counterparty losses on the interbank market and endures mark-to-market losses on its assets as a result of the depressing effect on market prices caused by the fire sales of the other two failing banks. The simulations do not incorporate any regulatory or other financial stability policy intervention. The model therefore provides an assessment of how the financial system might fare without any specific policy response.

Further development is planned to extend the model in a number of areas. A substantial area for further work is to analyse banks' cash-flow constraints and consider how defensive actions in the face of funding stress may affect the rest of the financial system and the wider macroeconomy. Another key challenge is to incorporate feedbacks from the banking sector to the real economy.

Ultimately, the future development of the RAMSI framework will be determined to a large degree by the aspects of the model that are found to be most useful in enhancing understanding and communication of financial vulnerabilities. It is envisaged that RAMSI's analytical framework will become useful in the analysis of systemic risk in the United Kingdom, and perhaps in some other countries as well.

International financial transmission: emerging and mature markets

Summary of Working Paper no. 373 Guillermo Felices, Christian Grisse and Jing Yang

With an increasingly integrated global financial system, we frequently observe that shocks to individual asset markets affect not only other asset markets in the same country but also the ones in other countries. Such spillover effects were noticeable during several past financial crises episodes in emerging market economies (EMEs) and have been also prevalent during the current global financial crisis which started in developed countries. From a central banking perspective, understanding the mechanisms through which shocks are transmitted across financial markets is important for gauging the impact that financial crises and volatilities in EMEs can have on the financial systems in developed countries, and *vice versa*.

Using daily data from prior to the East Asian crisis through to the early stages of the current global financial crisis, this study analyses the relationships between bond markets in the United States and EMEs. How do shocks — such as financial disruptions — in EME bond markets affect interest rates in the United States? And how do changes in US interest rates in turn affect EME bond markets? A key challenge in answering these questions is to identify a shock to a specific asset. For example, interest rates paid on risky US corporate debt and the rates paid on EME debt exhibit a high positive correlation: they tend to move in the same direction. However, we do not know whether this positive correlation is caused by EME shocks being transmitted to the United States, by US shocks affecting EMEs, or merely the result of a common shock.

Many studies deal with this problem by imposing some *ad hoc* restrictions; for example, assuming that the causality runs in only one direction. In this paper, we use a method developed by Rigobon and his co-authors, which allows us to capture all feedback effects. This method identifies a shock to a specific asset market as a period when volatility in this asset market is uniquely high; ie volatilities in other asset classes are low. Then the period can be used to identify the feedback effects from this market to other asset markets. The period of shocks identified in this way for EME bond markets capture all the known EME sovereign crises over the past decade (such as in Argentina, Brazil, Russia and Turkey).

We find that adverse shocks to EME sovereign bond spreads lead to a short-run fall in US interest. This finding supports a stylised fact that, at the time of stress, investors shift their investment away from risky assets into risk-free assets which causes prices of the risk-free assets to rise, and thus their rates to fall. This is often described as a 'flight to quality'. An adverse shock to EME bond spreads also leads to a widening in US high-yield spreads, and *vice versa*. This constitutes an important contagion channel through which crises in emerging markets can affect mature economies. What is the overall contemporaneous effect of a shock to EMEs on mature economies? On the one hand, mature economies might benefit from strong 'flight to quality', driving down the financing costs for risk-free bonds. On the other hand, an EME shock is not necessarily good news for mature economies as it will widen the spreads on other risky bonds, leading to a higher financing cost for risky corporates. In the other direction, we also find that an increase in financing costs of US riskier corporates — as happened in the early stages of the current financial crisis — can lead to a sizable increase in financing cost of EME sovereigns (although by much less than if shocks originate in EMEs themselves).

We also examine the speed and duration of shock transmission. For example, shocks that raise US interest rates initially *decrease* US high-yield and EME bond spreads for a very short period, but eventually widen the spreads of risky debt with a lag of about two days. Since both EME sovereign bonds and US high-yield bonds are priced as spreads over risk-free US Treasury yields with similar maturities, a rise in the US interest rates will automatically increase the interest rates paid on these risky bonds, ie higher financing cost for emerging market (EM) sovereigns and US corporates. The reverse is also true: a fall in US interest rates is likely to lead to a fall in EM and US high-yield bond spreads. This is consistent with the stylised fact that, when the safe rates are low, investors search for higher return by purchasing riskier bonds, which push up the prices and bring down the spreads on these assets. Therefore, our results support the existence of the 'financing cost' and 'search for yield' channels, but they work with a lag.

We then ask how much of the forecast error variance of each variable can be explained by shocks from other variables. We find that both US short and long-term government bond yields are explained largely by their own structural shocks, across all forecast horizons. However, a very different picture emerges for US high-yield and EM bond spreads: at longer forecast horizons the variances of the errors in forecasting US high-yield and emerging market sovereign debt spreads are both largely explained by structural shocks to US short and long-term rates. In particular, shocks to US long-term government bond yields explain 60% and 75% of the forecast error variance in EM bond spreads for 5 day and 20 day ahead forecasts. This suggests that US interest rates are of primary importance for explaining the developments in markets for more risky debt, at least in the medium run.

How do different models of foreign exchange settlement influence the risks and benefits of global liquidity management?

Summary of Working Paper no. 374 Jochen Schanz

In response to greater internationalisation, financial groups have adopted a wide range of approaches to liquidity risk management, a defining characteristic of which is the degree of centralisation. Under local liquidity management, each subsidiary of a financial group maintains a separate pool of liquidity in its local currency and funds its obligations domestically in each market. Under global liquidity management, financial groups also fund liquidity shortfalls (or recycle liquidity surpluses) via intragroup, cross-currency and/or cross-border transfers of liquidity or collateral: there is a global flow of liquidity within the group.

In practice, there are many barriers to managing liquidity globally. When banks are concerned about their counterparties' credit risk, one of these barriers can be the design of the settlement infrastructure for the cross-currency transfer of liquidity. A key design feature is whether the settlements of the two currencies involved in the foreign exchange (FX) transaction occur simultaneously, or at least closely co-ordinated in time. At the moment, facilities are available for simultaneous next-day settlement, but not for simultaneous same-day settlement. This paper shows that while there are benefits to increased co-ordination for same-day settlement of foreign exchange transactions, there may also be costs for financial stability.

In order to understand the argument, consider the case of a global bank, A, with two legally independent subsidiaries in the United Kingdom and the United States, referred to as A(UK) and A(US). A(UK), which may be subject to severe credit risk, is faced with requests to make an unusually large number of payments. Incoming payments are only expected for the following day. In response to these payment requests, A(UK) could either delay the payments, or attempt to raise sufficient funds on the interbank market (for example, via an overnight loan, or via an FX swap) to be able to execute them. Suppose A(UK) decided to take out an FX swap. Each foreign exchange transaction requires two settlements, one in the payment system of each currency. When A(UK) buys sterling against dollars for same-day settlement, it effectively borrows sterling from a UK counterparty, B, and promises that its US subsidiary, A(US), will pay dollars to B's US correspondent on the same day. If the settlement of the dollar payment occurs later than the settlement of the sterling payment, then B is exposed to the risk that A(UK) might default in-between the two settlements. Once the dollar transfer has taken place, A(US) is exposed to the risk that A(UK) might default. As a result, A(UK) may be left short of liquidity for two reasons: if B is concerned about A(UK)'s credit risk, it may refuse to enter into the foreign exchange transaction with A(UK). Or, A(UK) may also be unable to raise funds because A(US) refuses to execute the dollar transfer on A(UK)'s behalf.

The likelihood that the foreign exchange transaction will take place in the presence of counterparty credit risk depends, therefore, on the information that A(US) and A(UK)'s UK counterparty have about A(UK)'s insolvency risk. The main assumption of this paper is that information flows freely between the two subsidiaries but not between different banks. Thus, A(UK)'s domestic counterparty charges an interest rate appropriate to the *expected* risk of A(UK), whereas A(US) charges an interest rate appropriate to A(UK)'s *actual* risk. In both cases, the interest rate is proportional to the time the lender carries this exposure. The better co-ordinated the settlement, the less time can expire between the settlement of the sterling and dollar payments, the longer A(US)'s exposure, and the shorter the exposure of A(UK)'s UK counterparty. If A(UK)'s actual risk is higher than its UK counterparty expects, A(UK)'s cost of an FX swap increases. Conversely, the cost of an FX swap falls when A(UK)'s risk is below average. As a result, with better co-ordination, only the less risky banks find funding, while riskier banks delay payments.

Delaying payments thereby becomes a signal for high solvency risk, and this signal becomes more precise when the co-ordination in FX settlement increases. In practice, a bank's failure to execute payment requests that are contractually due might therefore trigger further liquidity outflows. Other creditors of A(UK) might refuse to roll over funds and eventually drive A(UK) into insolvency. To keep the model tractable, I do not model these further consequences of A(UK)'s inability to make payments in detail but simply assume that A(UK) incurs a fixed cost if it delays payments beyond their due date.

The main result of the paper is that better co-ordination of FX settlements has two, potentially offsetting, effects on risk. On the one hand, it reduces the likelihood that solvency shocks are transmitted from one institution to another. If a bank was close to insolvency, it would not be able to refinance itself at all in response to liquidity outflows, neither domestically nor via FX transactions. Should such a bank eventually default, this default shock remains more contained because it had not entered (additional) loan agreements as part of an FX swap, or an overnight loan. But on the other hand, that bank would have to delay the payment of its obligations beyond their due date.

Inflation dynamics with labour market matching: assessing alternative specifications

Summary of Working Paper no. 375 Kai Christoffel, James Costain, Gregory de Walque, Keith Kuester, Tobias Linzert, Stephen Millard and Olivier Pierrard

The main task of central banks is to maintain price stability by controlling inflation and, for this reason, it is important to understand what drives the dynamics of inflation. A long tradition in monetary economics has assigned the labour market a central role in inflation dynamics. Not least given the wide diversity in labour market structures, institutions and policies across Europe, and the world more generally, it is of interest to know whether or not heterogeneity in certain aspects of the labour market matters for inflation dynamics and, hence, monetary policy.

This paper analyses and compares existing approaches to modelling the labour market, explaining their implications for the behaviour of inflation. The paper highlights which of the particular features of each modelling approach are most important for driving inflation dynamics and provides a structure to the rich variety of modelling approaches in previous work. In so doing, we follow an active strand of research that has set out explicitly to model individual workers and firms, who take time to form job matches. The rationale for so doing comes from the belief that the slow responses of employment and unemployment to changes in demand are a natural place to look for the origins of the slow response of inflation to changes in demand.

We start by examining what euro-area data suggests happens to labour market variables after an unexpected fall in interest rates (ie a monetary policy shock). We find that output rises significantly above its steady state, that inflation rises, that wages per employee also rise but by less than output (in percentage terms), that employment rises significantly, and unemployment falls and, finally, that most of the adjustment in labour is borne by the number of employees rather than by hours worked per employee.

We then consider a standard macroeconomic model with unemployed workers looking for jobs, firms posting vacancies, and a clear distinction between employment and hours worked. Building on this, we replace certain assumptions about the labour market structure by others, one at a time. First, we consider alternative ways that firms and workers can decide on how many hours each worker works. Then, we consider the effect of wage negotiations being staggered, with wages fixed for some time and what happens when we, additionally, tie the wages of newly hired workers to those of existing workers in a firm. Next, we consider interactions at the firm level between price and wage-setting. We then consider various types of hiring costs before moving on to consider search on-the-job, and finish by considering what happens when job destruction varies over the cycle. In each of the cases we provide intuition for the effect that a specific modification of the baseline model has on inflation dynamics.

We find that the baseline model predicts a response of inflation to changes in interest rates that is too large relative to the data. Allowing search on-the-job and considering different types of hiring cost does not seem to affect this result. However, when our baseline model is combined with the assumption that once employers and employees have agreed on an hourly wage, the employer chooses how many hours his employees will work, staggered wages help to smooth the reaction of wages resulting in a smaller response of inflation to an interest rate change. Inflation responds even less when we account for the firm-specific nature of labour. But, in this case, the model also has implications for the responses of unemployment and vacancies that do not match the data.

More generally, by analysing a wide range of institutional features of the labour market, we show that only those institutional features that affect or generate a direct channel from wages to inflation matter for how inflation responds to interest rate changes. By contrast, institutional features that leave this channel unaffected matter much less for inflation dynamics.

Report

Monetary Policy Roundtable

Introduction

On 8 June, the Bank of England and the Centre for Economic Policy Research jointly hosted a Monetary Policy Roundtable. This was the second in a regular series intended to provide a forum for economists to discuss key issues affecting the design and operation of monetary policy in the United Kingdom.(1) Participants included a range of economists from private sector financial institutions, academia and public sector bodies. There were four discussion topics:

- monetary policy and the current conjuncture;
- quantitative easing;
- sterling and capital flows; and
- lessons from monetary history for the current policy challenges.

This note summarises the main points made by participants at the Roundtable. The event was conducted under the 'Chatham House Rule' and, as such, 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.

Monetary policy and the current conjuncture

Short-term prospects for the UK economy were generally perceived to have picked up in recent months. Surveys indicated that output had stabilised towards the end of the second quarter. Conditions in financial markets had improved, with lower spreads and increased activity in markets for risky assets. There was also growing evidence that housing market activity had been rising, albeit from low levels.

The severity of the recession had been partly attributable to a pronounced stock cycle. Companies had cut their holdings of stocks, in part due to pessimism about future sales, and in part due to a need to conserve cash. The pace of de-stocking was likely to decline through 2009, which could potentially support a sharp pickup in GDP growth. But stockbuilding was notoriously difficult to forecast, so the precise profile was uncertain.

Looking further forward, there was a range of views on the prospects for growth. Some speakers argued that household consumption spending had been excessive for a number of years and the saving rate would need to rise significantly to correct that. Others pointed out that household consumption had not grown at extreme rates in recent years. And in aggregate the private sector had been running a financial surplus. So there may not be large imbalances to unwind. There was a general consensus that the prospect of a sharp fiscal tightening would potentially dampen growth. But it was also noted that tighter fiscal policy could be consistent with a continued weak sterling exchange rate, which would stimulate some growth through net exports.

There was little consensus on the likely path for inflation. Some participants argued that there was a large margin of spare capacity in the UK economy, which was likely to persist for several years. Given past experience in recessions, that presented a significant risk that inflation would fall below the MPC's target and could potentially result in a period of mild deflation. Others thought that the chance of deflation was low. They emphasised the aggressive fiscal and monetary policy responses and credibility of the inflation target, the weak sterling exchange rate, recent increases in commodity prices, and the relatively low levels of spare capacity implied by service sector business surveys. It was noted that inflation expectations implicit in the price of index-linked bonds were consistent with inflation remaining close to target, although others took little comfort from that.

The MPC's action to introduce a programme of large-scale asset purchases was viewed to have reduced the threat of deflation. Some speakers, however, felt that any MPC statements on how this programme might be wound up could reduce the stimulus to growth and inflation. Others perceived a risk that the programme strayed too close to fiscal policy issues and so might lead to concerns that the MPC was not independent of the government.

Returning to growth prospects, overall it was judged that the rapid policy responses across the globe had almost certainly averted the risk of a global depression as severe as in the 1930s. Some participants thought that there could be a period of protracted weakness for the UK economy, given the combination of high debt levels and the potential for deflation. Others were sceptical, reiterating that the chance of deflation in the United Kingdom was small.

(1) Roundtables are held twice a year: a full-day event in the first half of the year and a half-day event in the second half of the year. The next Roundtable is scheduled for December 2009.

Quantitative easing

This session covered three subjects: how the MPC's programme of asset purchases (sometimes known as quantitative easing) could stimulate the economy; issues in implementing quantitative easing; and challenges for monetary policy strategy.

Four theoretical explanations of how quantitative easing could stimulate the economy were highlighted. First, it could raise expectations of future inflation. There is some statistical evidence that this channel was the most effective part of the Japanese approach to combating deflation. It was argued that the credibility of the Bank's inflation target meant that there was perhaps less to be gained from this mechanism. Second, central banks purchasing assets that are imperfect substitutes for money can change the composition of balance sheets, thereby pushing up asset prices and reducing borrowing costs. Views differed on the theoretical and empirical evidence on the effectiveness of this channel. Third, increasing banks' liquidity may encourage them to lend more. Fourth, direct operations in corporate credit markets could reduce the cost of borrowing in those markets. But some argued that thinking in terms of these channels overcomplicated the issue, as increasing the growth rate of household and corporate deposits was a necessary and sufficient condition for economic recovery; measures such as M4 had been correlated with nominal GDP growth over many decades.

There were three issues about the implementation of quantitative easing. First, how should the MPC decide on the amount of assets to purchase? The Committee's approach of estimating the shortfall in nominal income, and then using a range of models to map that into asset purchases, was discussed. Second, which assets should the MPC purchase? Participants who felt that the composition of the Bank's balance sheet was the most important channel advocated purchasing assets that were poor substitutes for cash such as corporate bonds. Other speakers thought that purchasing gilts from the non-bank private sector would be sufficient to increase broad money growth, without incurring credit risk. Third, how could the success of the policy be measured? Opinion was divided here, with different weights attached to well-functioning markets, financial market prices, intermediate indicators such as money growth, and inflation projections relative to target.

On monetary policy strategy issues, there was a discussion of the Bank's exit strategy from quantitative easing. Views differed on whether it mattered if asset purchases were reversed before any increase in Bank Rate. There was a general consensus that the macroeconomic impact and correct timing of tighter policy was crucial, but hard to judge. It was also argued that the MPC could raise inflation expectations by committing to maintain low interest rates for a period of time. But there were a number of drawbacks with such commitments.

Sterling and capital flows

This session discussed the significant depreciation of the sterling exchange rate during the financial crisis. Speakers focused on the role of short-term factors, changes to the equilibrium exchange rate and the credibility of the inflation target.

One view was that periods of sterling's depreciation could be linked to expectations of future UK interest rates falling by more than their foreign equivalents, but this link could be obscured by periodic re-ratings of sterling. Some speakers thought that this factor was unable to account for the scale of sterling's depreciation and noted that the information content of interest rate differentials was affected by the foreign exchange 'carry trade'. Links between sterling and equity markets were also discussed.

Several reasons were advanced for why the financial crisis could have caused sterling's equilibrium value to fall, including: by causing UK consumers and firms to become less optimistic about the United Kingdom's future relative economic performance, which would reduce UK demand for non-traded goods relative to traded goods; by reducing the previously strong contribution of financial services to the current account; and by adversely affecting the United Kingdom's net foreign asset position, given losses on 'sub-prime' assets. One approach to examining such issues, given the time lags in the official data, was to examine proxies for capital account flows such as international merger and acquisition transactions. But there were complications in interpreting these data.

Another approach was to use models to examine the impact of alternative assumptions about macroeconomic variables such as the sustainable current account position. Conclusions differed here. One view was that a substantial sterling depreciation could be accounted for using reasonable assumptions, although the fall would be smaller once supply-side adjustments were taken into account. Another view was that, once wealth effects from asset stocks were considered, a large proportion of sterling's depreciation remained unexplained. It was also argued that the crisis might have no effect on sterling's equilibrium exchange rate if it represented a permanent decline in wealth. A final view was that the crisis should cause sterling to appreciate since, relative to other countries, it had a larger effect on UK national income but a smaller effect on UK output.

There was also a discussion of whether sterling's depreciation reflected a decline in the credibility of the inflation target, perhaps linked to the deterioration of the UK fiscal position. One view was that this was not an important story, given the

structure of UK public sector debt. Other speakers referenced the rise in financial market measures of UK sovereign debt default, although it was noted that they had declined from their peaks.

It was stressed that conclusions about exchange rates needed to be consistent at an international level. The role of emerging market economies, as well as the industrialised countries, was discussed.

Lessons from monetary history for the current policy challenges

Discussion in this session centred on the lessons that could be learnt from the Great Depression and the more recent experience in Japan.

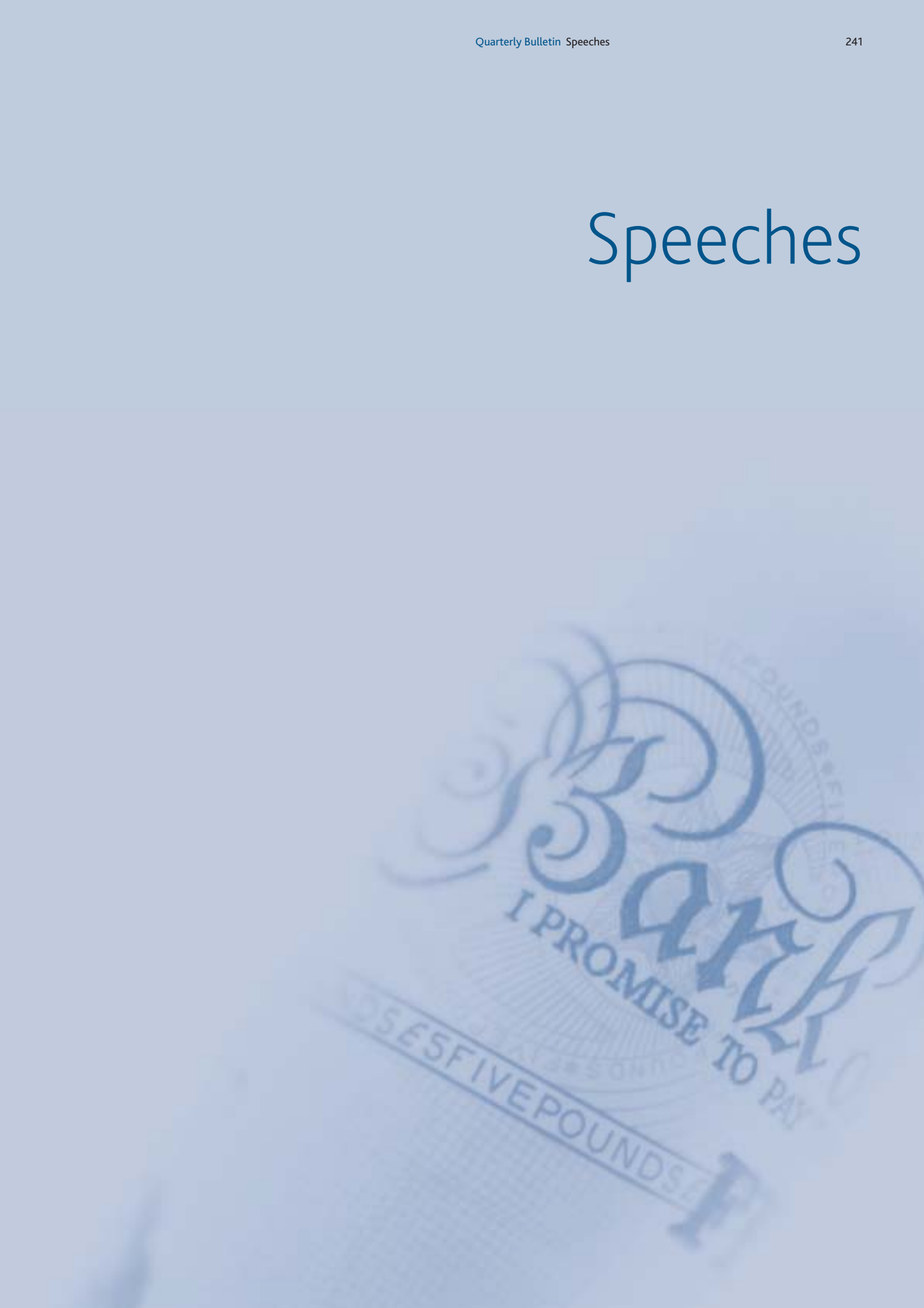
The Great Depression of 1929–33 was the most catastrophic event in American economic history and has been the most-intensively researched topic in economic history. But there was still disagreement over its causes and the reasons for the eventual recovery. One view was that the Great Depression reflected the failure of the US Federal Reserve to take appropriate actions, thereby not preventing a sharp contraction in the money supply. And it was argued that, rather than a fiscal stimulus, the main reason for the eventual recovery in the US economy was the monetary expansion which occurred alongside the United States leaving the gold standard. The dollar's depreciation raised inflation expectations and reduced real interest rates. Improved confidence in the banking system, reflecting insolvent banks being closed, also contributed. Lessons from this experience were that the banking system needed to be provided with adequate liquidity and that such liquidity should be removed when the crisis ends.

The discussion of the Japanese experience since 1990 focused on the role of balance sheet problems. These were a result of high corporate debt accumulation, followed by asset price falls. And they forced Japanese businesses to pay down debt even when interest rates were around zero. It was suggested that these debt repayments remained in the banking system due to weak household borrowing, putting downward pressure on the economy. In such a recession, the economy does not enter self-sustaining growth until private sector balance sheets are repaired. One lesson was that government borrowing can be helpful in such situations: between 1998 and 2007 the Japanese Government borrowed more and spent the excess savings of the private sector to sustain economic activity. And there were argued to be similarities with the US Great Depression experience: US money supply growth after 1933 was also made possible by increased government borrowing.

Another view was that one of the lessons from history is that the big crises cannot be avoided by monetary policy intervention. Rather, severe balance sheet recessions following the collapse of asset price bubbles are best avoided by regulation.

Several arguments were advanced for why central banks should worry about asset price bubbles: misallocation of capital during the bubble period; overheating in the economy due to wealth effects, which could raise inflationary pressures; and a sudden collapse of asset prices may amplify a recession. This might suggest that monetary policy should try to lean against asset price bubbles, as some participants argued. But there were also reasons why a central bank should not intervene, including the difficulty involved in knowing the extent of the asset price overvaluation and the negative impact on the economy more generally from raising interest rates to tackle the asset price bubble.

Speeches



Bank of England speeches

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

The Great Moderation, the Great Panic and the Great Contraction

Charles Bean, Deputy Governor, August 2009.

www.bankofengland.co.uk/publications/speeches/2009/speech399.pdf

Charles Bean delivered the Schumpeter lecture at the Annual Congress of the European Economic Association. In the lecture he looked back at the causes of the financial crisis and subsequent recession. He discussed macroeconomic factors. The decade of unusually stable activity in advanced economies leading up to the crisis had created a false sense of security. Real short and long-term interest rates were also low due to loose monetary policy and strong global savings. He also discussed microeconomic distortions in financial markets which created strong incentives for financial institutions to become highly geared. He also described the severe information problems created by highly complex financial instruments. When losses grew, the financial sector was impaired because the complexity of the interbank network created enormous uncertainty about the extent of counterparty risk.

Uncertainties in the financial system were transmitted to the real economy after the collapse of Lehman Brothers which made the task of deleveraging in the financial system more difficult and the tightening of credit more severe. Mr Bean discussed whether central banks should use monetary policy to counteract credit cycles but concluded they should develop macroprudential instruments instead.

He argued that there are lessons for the economics profession to learn but it does not need radical change because much of what went wrong can be analysed using standard economic tools. Economists should take more notice of history and not treat crises as pathologies but as a central feature of free-market economies that models should aspire to explain. Finally, macroeconomists have to put credit markets into their models which enable us to examine shocks originating in the financial sector rather than just as an amplification mechanism.

Opening remarks for panel on the macroeconomy and quantitative easing

Tim Besley, Monetary Policy Committee member, July 2009.

www.bankofengland.co.uk/publications/speeches/2009/speech398.pdf

In this speech, Professor Tim Besley described three issues relating to the transmission mechanism for monetary policy. The first issue was the motivation for quantitative easing (QE), which Professor Besley described as '...the natural way to conduct monetary policy when nominal interest rates hit their effective lower bound'. The second was recognising the importance of financial frictions in affecting the transmission mechanism of monetary policy — inhibiting the transmission of Bank Rate onto the real economy and also affecting the transmission of QE. Third, the implications for future policymaking from the use of QE and existence of such frictions — and the problems of interpreting current policy using a simple policy rule. Professor Besley concluded that there will be a need to pay greater attention to the role of financial frictions in the monetary policy transmission mechanism, but that the ability to move into QE indicated that the inflation-targeting framework with monetary policy independence remains strong.

Small lessons from a big crisis

Andrew Haldane, Executive Director for Financial Stability, July 2009.

www.bankofengland.co.uk/publications/speeches/2009/speech397.pdf

In this speech, Andrew Haldane discussed seven issues arising from the crisis and assessed their implications for policymakers and practitioners. These included a role for a systemic overseer in detecting exuberance in financial markets and institutions; the need for banking returns to more accurately reflect risk, especially when higher returns are generated from higher leverage and hence risk; the need to reassess the Modigliani-Miller hypothesis in a banking context to understand why raising equity is perceived as costly; the importance of other markets learning lessons from the robustness of payment and settlement infrastructures exhibited during this crisis; and the need for fundamental reform of post-trade infrastructure in over-the-counter financial markets.

Regimes for handling bank failures: redrawing the banking Social Contract

Paul Tucker, Deputy Governor, June 2009.

www.bankofengland.co.uk/publications/speeches/2009/speech396.pdf

In this speech, the third of a series on redrawing the 'Social Contract' for banking in the light of the financial crisis, Paul Tucker discussed the need for banks to organise and manage themselves in a way that facilitates the orderly management of crises, including through deposit insurance and the resolution of distressed firms. He explained how the banking system should bear the cost of insuring retail depositors against loss, through a risk-based, pre-funded system of deposit insurance. Pre-funding ensures that you are not trying to collect levies from risky banks after they have failed. Risk-based premia are necessary to head off risk-taking by banks on the back of *de facto* 100% deposit insurance for retail depositors. Further to their role in funding the deposit insurance scheme, banks also need to structure themselves to permit their orderly resolution should that be required. As part of that, banks needed to maintain and provide better information to facilitate rapid payout to retail depositors by the Financial Sector Compensation Scheme; to aid the Bank of England's choice and execution of resolution tools under the United Kingdom's Special Resolution Regime; and for potential bidders for part of or all a failed bank. This will require a major change in the information banks have about themselves.

Tucker argued that banks should maintain a realistic resolution plan for how they could be derisked and, if necessary, wound down in an orderly way. That now had to be part of the banking Social Contract. It would probably entail a radical simplification of some group structures. That would not be easy. But it was important to bring about the kind of regime shift necessary to restore confidence and trust in the industry without a government prop.

In relation to the cross-border aspects of bank resolutions, he noted the potential tension between the regulatory division of labour in normal times and insolvency or resolution regimes, which in distressed times can effectively split banks into a series of *de facto* ring-fenced entities. The Financial Stability Board's 'Principles for Cross-Border Co-operation on Crisis Management', which were endorsed by the G20 Heads of Government, have the potential to bring about material changes in the way banks structure their businesses, in how they interact with the authorities, and in the wider environment in which they operate.

Inflation targeting: learning the lessons from the financial crisis

Spencer Dale, Executive Director and Chief Economist, June 2009.

www.bankofengland.co.uk/publications/speeches/2009/speech395.pdf

In this speech, Spencer Dale talked about inflation targeting and the lessons that should be learnt from the financial crisis. He then addressed some concerns that had been raised about the asset purchase programme. The dramatic easing in monetary policy over the previous year demonstrated the strength of the inflation-targeting framework in action. But recent events needed to serve as a wake-up call. The need to make difficult judgements meant that a policy of 'leaning against the wind' would be difficult to implement, but these judgements could not be ducked. However, short-term interest rates were not well suited to the task of managing asset price bubbles and economic imbalances, so an expansion of the range of instruments available to policymakers was needed. The ideal would be policy instruments that were effective in preventing the build-up of asset price bubbles and economic imbalances and efficient in minimising the associated costs to the real economy.

The Governor's speech at the Mansion House

Mervyn King, Governor, June 2009.

www.bankofengland.co.uk/publications/speeches/2009/speech394.pdf

In this speech, the Governor noted that the macroeconomic outlook is particularly uncertain. There were reasons to be optimistic about the outlook but the continued weakness of bank lending suggested a need for caution. He also noted that although it is too soon to reverse the extraordinary policy stimulus that has taken place over recent months, it is not too early to prepare for such exit strategies and explain how they would work.

He argued that we must learn lessons from the events of the past two years. One key lesson is that price stability does not guarantee stability of the economy as a whole. But this does not mean that monetary policy should be diverted from its goal of price stability. That would risk making the economy less stable and the financial system no more so.

Instead new instruments to pursue financial stability are required: a 'macroprudential' toolkit to reduce risk across the financial system. But the 'macroprudential' toolkit should not be put together in a hurry. And, more generally, we will need to reflect more deeply on the lessons from the crisis before designing a regulatory response.

Finally, the Governor noted that the Bank needs suitable powers if it is to be able to meet its new statutory responsibility for financial stability.

The road to recovery and the inflation target

Paul Fisher, Monetary Policy Committee member, June 2009.

www.bankofengland.co.uk/publications/speeches/2009/speech393.pdf

In this speech, Paul Fisher looked at the events of the worldwide slowdown, and the role and reaction of monetary policy, outlining in particular how the MPC first reduced Bank Rate and then adopted unconventional asset purchases in pursuit of the inflation target. He set out the various channels through which asset purchases should work.

He challenged the notion that the UK inflation-targeting regime had in some sense 'failed' given that the economy was in recession. Most developed countries had seen a recession, irrespective of their monetary policy regime or stance. It was unlikely that an alternative framework could have prevented some degree of recession given the shock to the global financial system. Moreover, there were reasons to believe that the framework had proven to be more flexible and effective than previous regimes. Because strong inflationary pressures had been kept in check, the MPC had been able to provide substantive monetary policy support to the economy at the onset of the recession, which contrasted with previous recessionary episodes. And this approach had accommodated 'quantitative easing'.

The outlook, as portrayed in the May *Inflation Report*, was for the economy to move back to positive growth over the forthcoming year or so. But the downside risks to output were significant, particularly those associated with the state of the impaired banking system and its impact on the economy's potential growth rate.

Meeting the challenges of economic recovery

Andrew Sentance, Monetary Policy Committee member, June 2009.

www.bankofengland.co.uk/publications/speeches/2009/speech392.pdf

In this speech, Andrew Sentance outlined how difficulties in the banking system, a required rebalancing of the economy and higher global volatility were likely to act as challenges to the recovery of the UK economy. He described how there were likely to be constraints on lending as banks sought to rebuild their financial reserves. The economy would need to rebalance away from the primary sources of growth over the past decade — consumer spending and financial and business services — meaning recovery would depend more on overseas demand and the growth of investment. And such a recovery was likely to take place against a background of continued global volatility. But he explained how fundamental changes in the UK economy over recent decades should underpin longer-term confidence for the future. The environment of low and stable inflation, a more flexible labour market and a productive and competitive base of manufacturing and international trading businesses should serve the economy in good stead over the course of the recovery.

The state of the markets: four issues

Paul Tucker, Deputy Governor, June 2009.

www.bankofengland.co.uk/publications/speeches/2009/speech391.pdf

In this speech, Paul Tucker remarked on four broadly linked issues.

On the macroeconomic outlook and bank lending he said the medium-term outlook remains 'highly uncertain'. He noted that for the moment it is unclear as to whether the financial system can generate the expansion of credit that will most likely be necessary to support recovery. He warned against the risks of banks simultaneously deleveraging by cutting back on the availability of credit, pointing out that this would be a 'counter productive business and financial strategy'.

On the Bank's policy response to the crisis, he discussed quantitative easing and its interaction with the insurance industry and other long-term investment institutions. On trade and working capital finance, he welcomed the recent initiative by the insurance industry to release a code of conduct for trade-credit insurance.

On developing more resilient capital markets he noted that entrepreneurial innovation in capital markets may have outstripped the supporting market infrastructure. In particular he said that the Bank of England agreed that more of the vanilla OTC markets should be cleared via central counterparty clearing houses. He went on to say that the financial community must also be open to more trading in core vanilla markets going via exchanges or other well-designed and open trading platforms, to help preserve liquidity when times are tough. Indeed serious consideration is needed of whether the corporate bond markets could benefit from exchange trading.

Finally, on bank capital instruments, he argued that only equity should count as regulatory capital for banks in the medium term; and called for investors to consider exchanging subordinated debt for equity or senior unsecured debt, as has already occurred in some cases.

Appendices

Contents of recent Quarterly Bulletins

The articles and speeches that have been published recently in the *Quarterly Bulletin* are listed below. Articles from November 1998 onwards are available on the Bank's website at:

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

Articles and speeches

Speeches are indicated by (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

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. 362 Output costs of sovereign crises: some empirical estimates (February 2009)
Bianca De Paoli, Glenn Hoggarth and Victoria Saporta

No. 363 Dynamics of the term structure of UK interest rates (March 2009)
Francesco Bianchi, Haroon Mumtaz and Paolo Surico

No. 364 What lies beneath: what can disaggregated data tell us about the behaviour of prices? (March 2009)
Haroon Mumtaz, Pawel Zabczyk and Colin Ellis

No. 365 Foreign exchange rate risk in a small open economy (March 2009)
Bianca De Paoli and Jens Søndergaard

No. 366 Common determinants of currency crises: role of external balance sheet variables (April 2009)
Mirko Licchetta

No. 367 Labour market flows: facts from the United Kingdom (April 2009)
Pedro Gomes

No. 368 The real exchange rate in sticky-price models: does investment matter? (April 2009)
Enrique Martínez-García and Jens Søndergaard

No. 369 Multivariate methods for monitoring structural change (June 2009)
Jan J J Groen, George Kapetanios and Simon Price

No. 370 Banks' intraday liquidity management during operational outages: theory and evidence from the UK payment system (June 2009)
Ouarda Merrouche and Jochen Schanz

No. 371 Payment systems, inside money and financial intermediation (June 2009)
Ouarda Merrouche and Erlend Nier

No. 372 Funding liquidity risk in a quantitative model of systemic stability (June 2009)
David Aikman, Piergiorgio Alessandri, Bruno Eklund, Prasanna Gai, Sujit Kapadia, Elizabeth Martin, Nada Mora, Gabriel Sterne and Matthew Willison

No. 373 International financial transmission: emerging and mature markets (August 2009)
Guillermo Felices, Christian Grisse and Jing Yang

No. 374 How do different models of foreign exchange settlement influence the risks and benefits of global liquidity management? (August 2009)
Jochen Schanz

No. 375 Inflation dynamics with labour market matching: assessing alternative specifications (August 2009)
Kai Christoffel, James Costain, Gregory de Walque, Keith Kuester, Tobias Linzert, Stephen Millard and Olivier Pierrard

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. 26 Monetary policies and low-frequency manifestations of the quantity theory (December 2008)
Thomas J Sargent and Paolo Surico

No. 27 The global credit boom: challenges for macroeconomics and policy (June 2009)
Michael Hume and Andrew Sentance

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

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

Handbooks in central banking

The series of *Handbooks in central banking* provide concise, balanced and accessible overviews of key central banking topics. The *Handbooks* have been developed from study materials, research and training carried out by the Bank's Centre for Central Banking Studies (CCBS). The *Handbooks* are therefore targeted primarily at central bankers, but are likely to be of interest to all those interested in the various technical and analytical aspects of central banking. The series also includes lecture and research publications, which are aimed at the more specialist reader. 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.

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. But these data are supplemented by the results of a new collection, established by the Bank of England in late 2008, to provide more timely data covering aspects of lending to the UK corporate and household sectors. The Bank collects these data on behalf of the Lending Panel, which was established by the Chancellor in November 2008 to monitor lending to the UK economy, and to promote best practice across the industry in dealing with borrowers facing financial difficulties.

The Lending Panel comprises Government, lenders, consumer, debt advice and trade bodies, regulators and the Bank of England. See www.hm-treasury.gov.uk/press_126_08.htm.

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 over the following two years. 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 2009 are as follows:

Quarterly Bulletin

Q1	16 March
Q2	12 June
Q3	21 September
Q4	14 December

Inflation Report

February	11 February
May	13 May
August	12 August
November	11 November

Financial Stability Report

June
December

Quarterly Bulletin, Inflation Report and Financial Stability Report subscription details

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

Destination	2009					
	QB, IR and *FSR* package	*QB* and *IR* package	*IR* and *FSR* package	*QB* only	*IR* only	*FSR* only
United Kingdom						
First class/collection[1]	£31.50	£27.00	£13.50	£21.00	£10.50	£5.25
Students/schools (concessionary rate UK only)	*£10.50*	*£9.00*	*£4.50*	*£7.00*	*£3.50*	*£1.75*
Academics (concessionary rate UK only)	*£21.00*	*£18.00*	*£9.00*	*£14.00*	*£7.00*	*£3.50*
Rest of Europe						
Letter service	£38.50	£33.00	£17.00	£25.00	£13.00	£6.50
Outside Europe						
Surface mail	£38.50	£33.00	£17.00	£25.00	£13.00	£6.50
Air mail	£50.00	£43.00	£21.50	£34.00	£17.00	£8.50

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

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

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

These publications are available from Publications Group, Bank of England, Threadneedle Street, London, EC2R 8AH; telephone +44 (0)20 7601 4030; fax +44 (0)20 7601 3298; email mapublications@bankofengland.co.uk or fsr_enquiries@bankofengland.co.uk.

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The Bank of England's website is at www.bankofengland.co.uk.

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