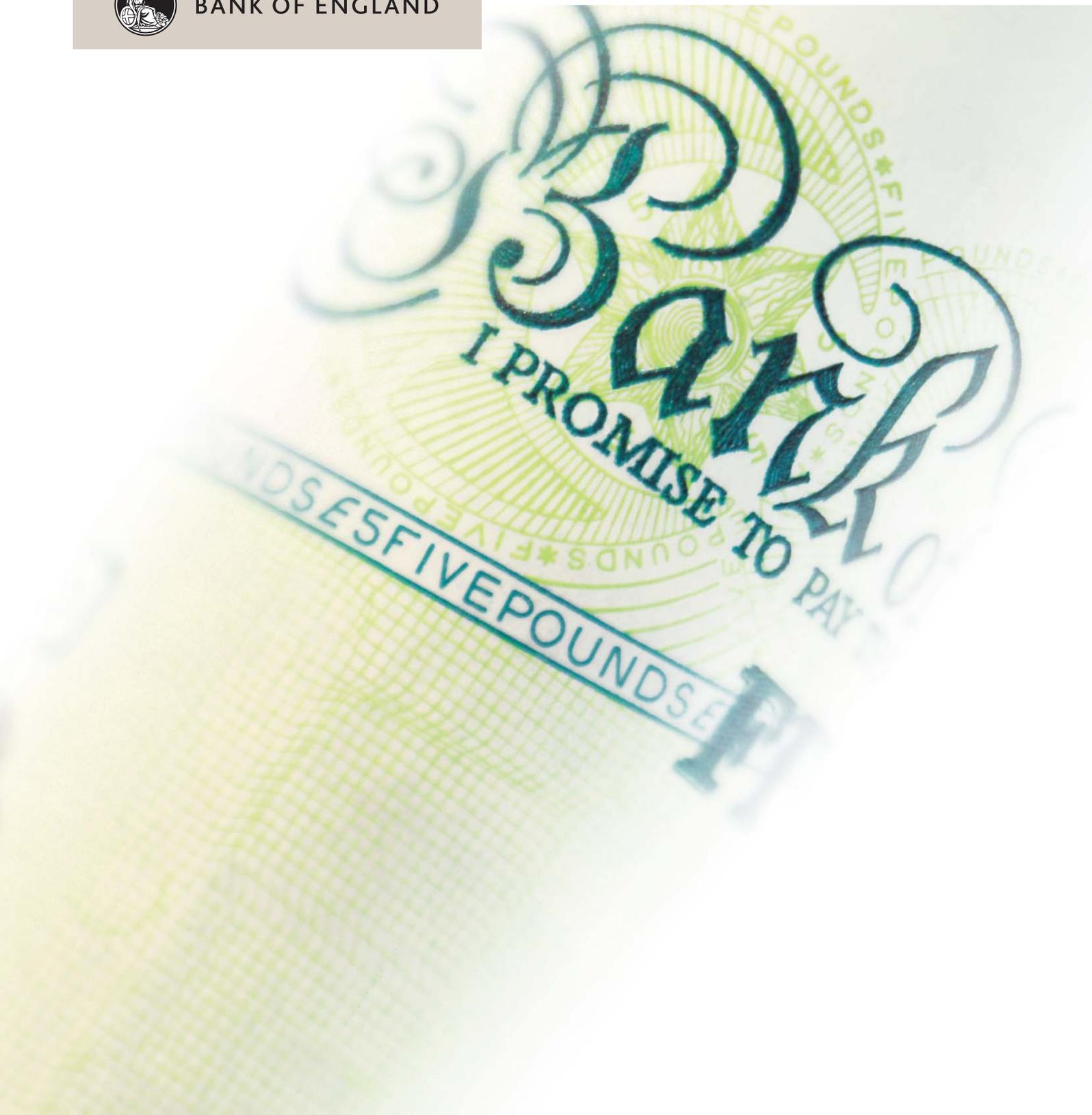


Quarterly Bulletin

2007 Q4 | Volume 47 No. 4



BANK OF ENGLAND





BANK OF ENGLAND

Quarterly Bulletin

2007 Q4 | Volume 47 No. 4

Foreword

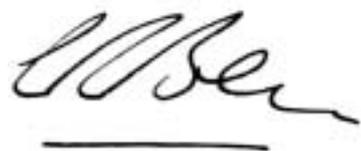
This quarter's edition of the *Quarterly Bulletin* begins with the regular *Markets and operations* report, reviewing developments in global capital markets and the Bank's official operations over the past three months. Following the financial market upheaval during the summer, there were signs of improvement in some markets during October. But conditions in credit and money markets deteriorated again in November, amid increased concerns about the magnitude and distribution of losses on structured credit investments. Coupled with the continuing difficulty of distributing securitised loans and the reintermediation of such loans back onto banks' balance sheets, this led to renewed funding pressures on banks.

A key issue facing the Monetary Policy Committee is how households' accumulation of debt in recent years will affect the way in which they respond to changes in interest rates and credit conditions. That response is likely to vary across households, so it is potentially fruitful to examine disaggregated data to assess the impact. Matt Waldron and Garry Young use the latest survey of households, carried out annually for the Bank by NMG, to examine how they have responded to changes in the burden of mortgage payments over the past year, and whether they are experiencing greater problems in servicing their debts. The survey suggests that around half of mortgagors experiencing an increase in mortgage payments had cut back their spending. But the proportion of mortgagors reporting difficulties in paying for their mortgage remains relatively low and appears to have changed little over the past year.

The November *Inflation Report* highlighted higher energy prices as one factor raising the near-term outlook for inflation. But the impact of such cost shocks on inflation in the medium term depends crucially on the conduct of monetary policy and the evolution of inflation expectations. Richard Barwell, Ryland Thomas and Kenny Turnbull set out the different channels through which higher energy costs affect the economy. So far, the impact of rising energy prices on both activity and inflation appears to have been much less pronounced than in earlier episodes of sharp energy price increases. That is probably related to the greater flexibility of both goods and labour markets, as well as the anchoring of inflation expectations.

Corporate bond spreads — the difference between the yields on corporate and government bonds — narrowed between the end of 2002 and the middle of this year, but have widened during the recent financial market turmoil. These spreads reflect both compensation for bearing the risk of default and the effect of other factors, such as market illiquidity. Lewis Webber and Rohan Churm describe a method to separate the spreads into these different components, using market information on default risks. Their analysis suggests that the recent rise in spreads reflects both an increase in the required compensation for default risk and the impact of heightened liquidity concerns.

The United Kingdom is currently the world centre of foreign exchange activity. Grigoria Christodoulou and Pat O'Connor present the results of a survey, conducted in April 2007, of foreign exchange market turnover. This showed that the United Kingdom accounted for a third of the share of the global foreign exchange market — a rise of 80% over the preceding three years. That is almost double that of the next biggest centre, the United States, which accounted for just 17% of the global market. A number of developments, such as the proliferation of electronic trading and the increasing number of market participants appear to have contributed to the strong growth in foreign exchange market turnover. The article also reviews recent developments in the over-the-counter derivatives markets.

A handwritten signature in black ink, appearing to read 'C Bean', with a horizontal line underneath.

Charles Bean

Chief Economist and Executive Director for Monetary Policy, Bank of England.

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.

Contents

Recent economic and financial developments

Markets and operations	490
Box An indicative decomposition of Libor spreads	498
Box Supply of reserves and the liquidity support facility to Northern Rock	506
Box The work of the Money Market Liaison Group in 2007	508

Research and analysis

Household debt and spending: results from the 2007 NMG Research survey	512
Box Aggregating the change in mortgage repayments in the survey	515
Box Survey method	520
The macroeconomic impact of higher energy prices on the UK economy	522
Decomposing corporate bond spreads	533
Summaries of recent Bank of England working papers	542
– Investment adjustment costs: evidence from UK and US industries	542
– Labour market institutions and aggregate fluctuations in a search and matching model	543
– Using copulas to construct bivariate foreign exchange distributions with an application to the sterling exchange rate index	544
– Business cycle fluctuations and excess sensitivity of private consumption	545
– A state space approach to extracting the signal from uncertain data	546

Report

The foreign exchange and over-the-counter derivatives markets in the United Kingdom	548
Box BIS triennial survey and the Foreign Exchange Joint Standing Committee survey	550
Box Definitional issues	556

Speeches

The Governor's speech in Northern Ireland	566
Given at the Northern Ireland Chamber of Commerce and Industry, Belfast on 9 October 2007	
Current monetary policy issues	570
Speech by Rachel Lomax, Deputy Governor for monetary policy, delivered to Hull & Humber Chamber of Commerce at KC Football Stadium, Hull on 22 November 2007	
The global economy and UK inflation	574
Speech by Andrew Sentance, member of the Monetary Policy Committee, given at the Leeds office of RSM Bentley Jennison, in association with the Leeds Financial Services Initiative on 24 September 2007	

Trends in European labour markets and preferences over unemployment and inflation	582
Speech by Professor David Blanchflower, member of the Monetary Policy Committee, given at the Dresdner Kleinwort Seminar on European Labour Markets and Implications for Inflation and Policy on 27 September 2007	
Fear, unemployment and migration	592
Esmée Fairbairn Memorial Lecture, delivered by Professor David Blanchflower, member of the Monetary Policy Committee, at Lancaster University on 30 October 2007	
Risk, uncertainty and monetary policy	600
Speech by Charlie Bean, Executive Director, Chief Economist and member of the Monetary Policy Committee, at an event hosted by Dow Jones at the City Club, London on 31 October 2007	
New markets and new demands: challenges for central banks in the wholesale market infrastructure	607
Speech by Nigel Jenkinson, Executive Director for financial stability, delivered at the Bank of England/European Central Bank Conference on Payments and Monetary and Financial Stability on 12 November 2007	
A tale of two shocks: global challenges for UK monetary policy	613
Speech by Andrew Sentance, member of the Monetary Policy Committee, at the University of Warwick City Alumni Group, London on 27 November 2007	

Appendices

Bank of England speeches	622
Contents of recent Quarterly Bulletins	623
Bank of England publications	625

The contents page, with links to the articles in PDF, is available at www.bankofengland.co.uk/publications/quarterlybulletin/index.htm

Author of articles can be contacted at forename.surname@bankofengland.co.uk

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

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

Recent economic and financial developments



Markets and operations

This article reviews developments in global financial markets since the 2007 Q3 *Quarterly Bulletin* up to the end of November. The article also reviews the Bank's official operations during this period.

Global financial markets⁽¹⁾

Overview

The 'Markets and operations' article in the previous *Quarterly Bulletin* reviewed a time of stress for international financial markets, and this continued into the latest review period. Conditions across credit markets remained difficult and this was accompanied by renewed volatility and impaired liquidity in many global financial markets more generally.

There were tentative signs of recovery in some markets during October, but November saw a retrenchment of investor risk appetite amid renewed concerns about marked-to-market losses on structured credit products, in part prompted by further ratings downgrades. Coupled with continued hoarding of liquidity by some banks in the face of uncertain funding needs, especially around the approaching year end, global money market conditions tightened sharply.

Against this background, as well as some signs of a weakening in the outlook for economic activity, some central banks cut their official policy rates. And market expectations of the future paths of official interest rates were revised downwards.

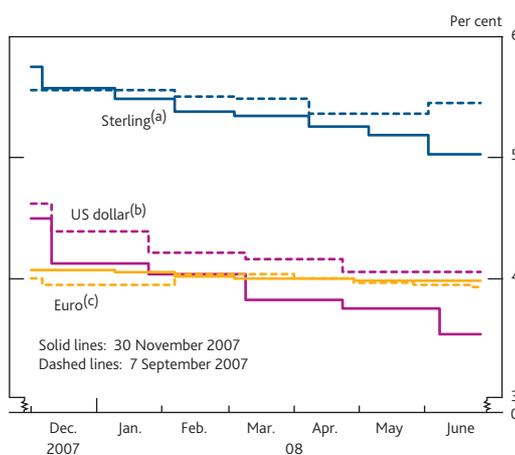
Recent developments in global capital markets

Monetary policy outlook

Faced with a deteriorating outlook for aggregate demand in the United States — principally reflecting the anticipated effects of further weakness in the housing market, higher oil prices and ongoing turbulence in financial markets — the US FOMC reduced its target for the federal funds rate by 75 basis points between September and November. After the data cut-off for this article the UK MPC reduced Bank Rate by 25 basis points to 5.5% and the FOMC reduced its target rate by a further 25 basis points to 4.25%.

Looking ahead, market expectations of the future path of official interest rates were revised downwards for the US dollar and sterling, but were little changed for the euro (**Chart 1**). Over the period, sterling and US dollar implied short-term interest rates initially rose but fell considerably in the second half of October and during November. Contacts suggested these later falls reflected expectations of future cuts in official

Chart 1 International forward implied policy rates



Source: Bank calculations.

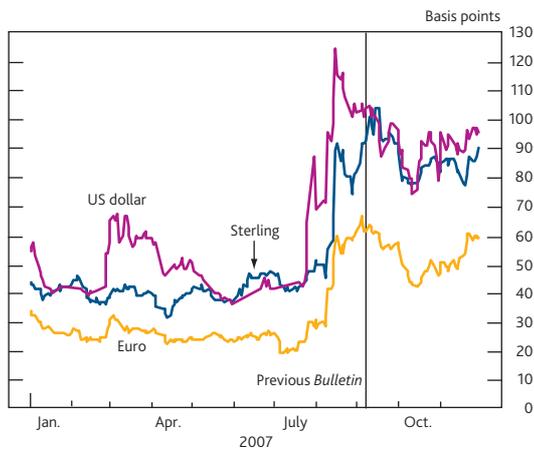
- (a) Derived from sterling overnight index average (SONIA) swaps.
 (b) Derived from overnight swaps that settle on fed funds effective rate.
 (c) Derived from euro overnight index average (EONIA) swaps.

interest rates linked to concerns about the potential impact on economic activity of a tightening in credit conditions.

Uncertainty about the future path of short-term interbank interest rates, as inferred from options prices, remained elevated. Having fallen back a little in September, implied uncertainty picked up again in October and November, especially for short-term US dollar interest rates (**Chart 2**). This coincided with a period of heightened concerns across asset markets, although implied uncertainty remained below levels observed during the summer. Since these options settle on futures contracts for interbank fixings (Libor or Euribor), it is difficult to tell what proportion of the moves in implied volatility reflected uncertainty about expected policy rates and how much reflected uncertainty about the future spread between policy rates and interbank rates. This spread remained elevated and volatile, possible reasons for which are analysed in the box on pages 498–99.

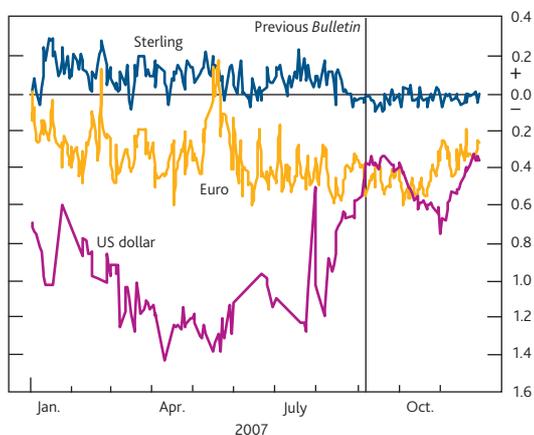
Information from options prices also indicated that the skew of the implied distribution of future short-term interest rates was

(1) This article focuses on global capital market developments. The data cut-off for this section is 30 November.

Chart 2 International six-month implied volatility from interest rate options

Sources: Bank of England and Euronext.Liffe.

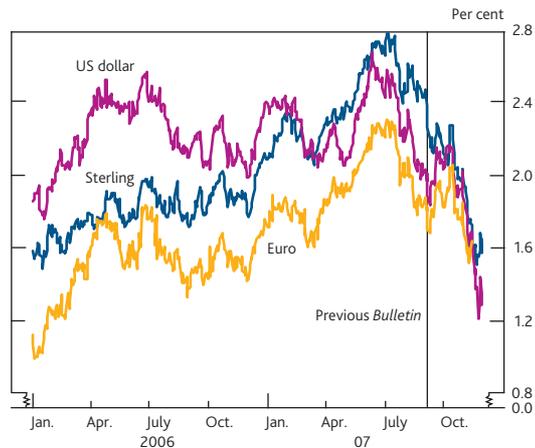
little changed for sterling and slightly less negative for euro. The balance of probabilities surrounding future US dollar interest rates moved further to the downside during October, prior to the FOMC cutting its target for the fed funds rate on 31 October, before returning close to the level at the beginning of the period (Chart 3).

Chart 3 International six-month skews from interest rate options

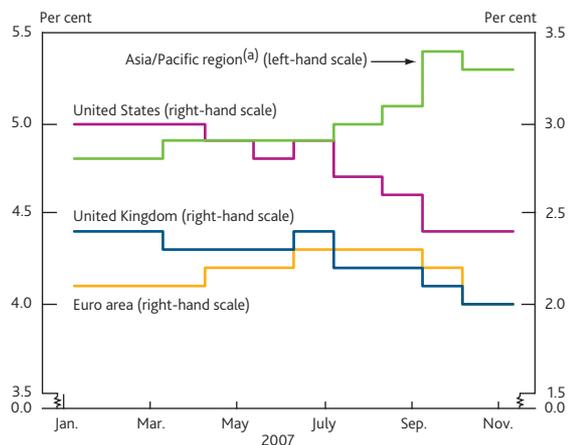
Sources: Bank of England and Euronext.Liffe.

Short to medium-term US dollar, euro and sterling real interest rates fell further over recent months (Chart 4). This was perhaps consistent with downward revisions to market participants' outlook for economic growth in the major economies. Consensus forecasts were for economic activity in the United States, the United Kingdom and the euro area to decelerate in 2008 (Chart 5).

In contrast, forecasts for Asian economies, and other emerging markets, remained strong (Chart 5). This is widely thought by market participants to have been a key factor underpinning the overall strength in commodity prices (Chart 6).

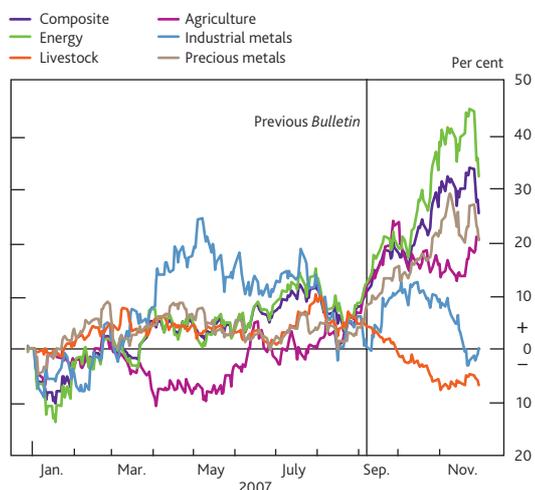
Chart 4 International three-year real instantaneous forward rates^(a)

(a) Real component of euro rates implied by nominal government bond yields less inflation swap rates. Sterling and US dollar real rates derived from the Bank's government liability curves.

Chart 5 Expected real GDP growth for 2008

Source: Consensus Economics.

(a) Comprises 16 countries.

Chart 6 Cumulative changes in selected commodity price indices^(a) since January 2007

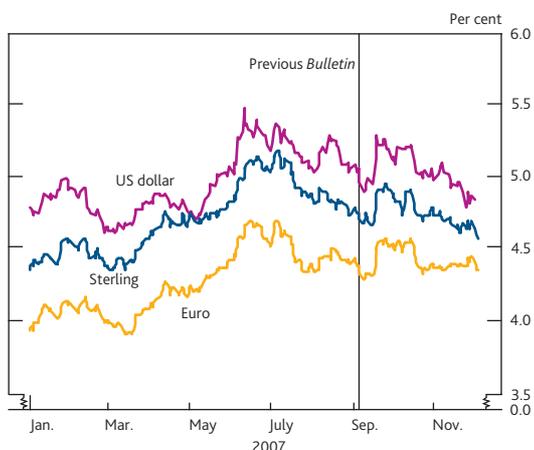
Source: Goldman Sachs.

(a) Indices refer to S&P GSCI total return index.

Long-term interest rates

At longer horizons, US dollar and sterling nominal forward interest rates fell slightly (Chart 7). The lower levels of these rates may be consistent with market expectations of official rates remaining lower for a prolonged period. But they may also reflect investors being willing to pay an increased premium for government bonds. In particular, given heightened uncertainty about the global economic environment, investors may have become more willing to pay a premium for long-dated government bonds to be certain of fixed default-free cash flows, as well as to use as collateral for secured borrowing.

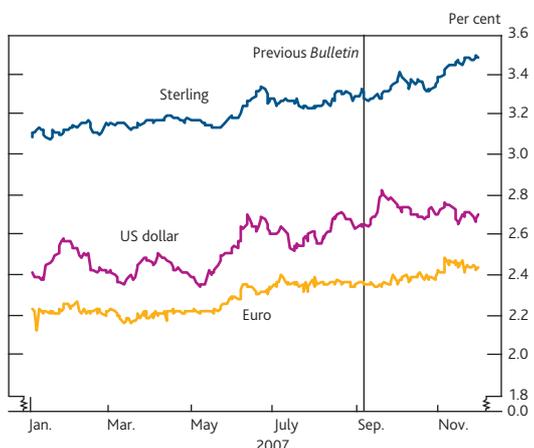
Chart 7 International five-year forward interest rates^(a)



(a) Five-year rates starting five years forward, derived from the Bank's government liability curves.

Long-term inflation forward rates drifted slightly higher internationally (Chart 8). However, it is not clear how far this reflected a pickup in inflation expectations, increased uncertainty about future inflation or the effects of particular market factors. For example, market contacts reported continued strong demand for sterling index-linked bonds, which could have affected sterling inflation forward rates that

Chart 8 International implied inflation forward rates^(a)



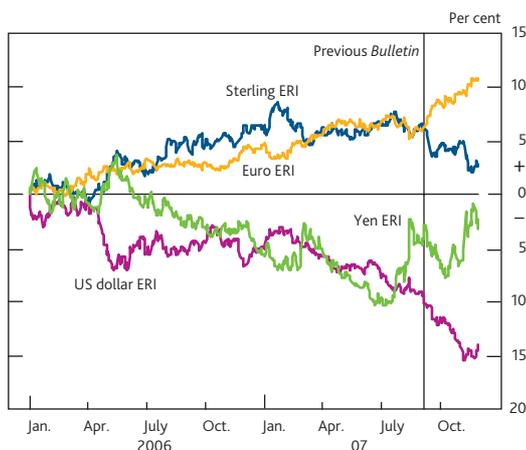
(a) Implied inflation over five years starting five years ahead. US dollar and sterling rates derived from the Bank's government liability curve. Euro rates derived from inflation swap rates. Sterling rates referenced to RPI, dollar rates referenced to CPI and euro rates referenced to HICP.

are derived from the difference between yields on nominal and index-linked bonds.

Foreign exchange

Since the beginning of 2007, the US dollar effective exchange rate index (ERI) fell by around 10% with around half of this fall since early September (Chart 9). In general, the main counterpart to the dollar depreciation had been an appreciation of the euro and sterling. But in October and November the yen appreciated sharply while the sterling ERI depreciated by around 1.5%.

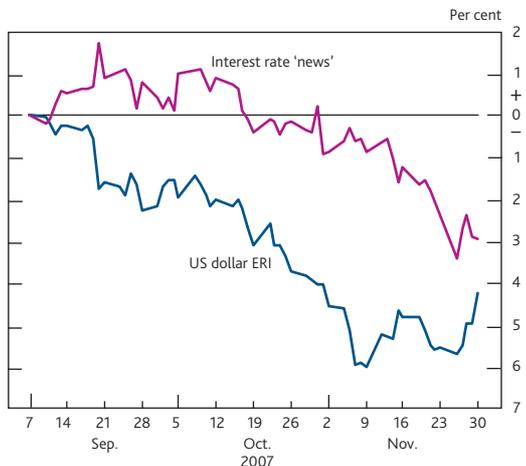
Chart 9 Cumulative changes in exchange rate indices since January 2006



Sources: Bank of England and Bloomberg.

A proportion of the recent changes in exchange rates was consistent with developments in relative interest rates. Based on uncovered interest rate parity, Chart 10 suggests that changes in relative interest rates were broadly consistent with a fall in the dollar ERI, if not the magnitude observed.

Chart 10 Implied contribution of interest rate 'news' to cumulative change in the US dollar ERI since previous Bulletin^(a)

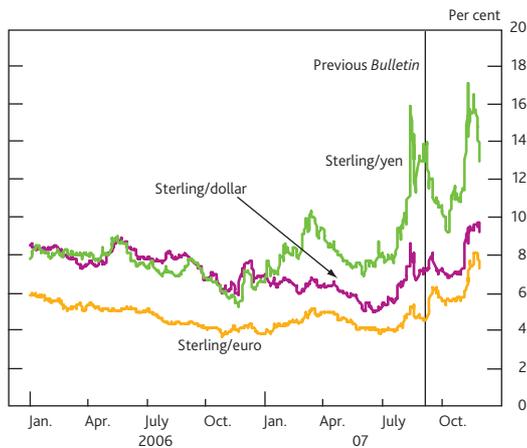


Source: Bank calculations.

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

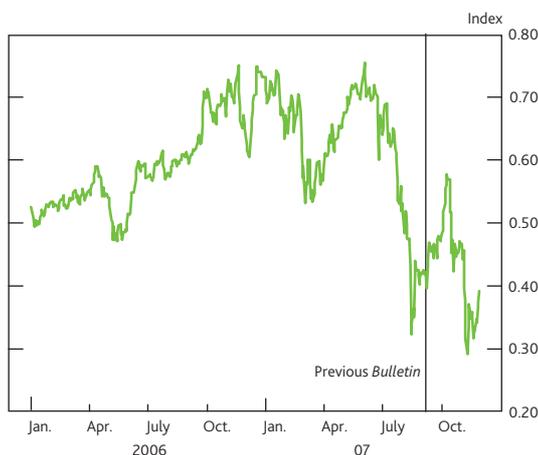
Market contacts have also suggested that some of the recent decline in the US dollar could be attributed to investors seeking to unwind their foreign exchange carry-trade positions. This may partly reflect an increase in the perceived riskiness of these trades, consistent with sharp increases in foreign exchange implied volatilities (Chart 11). An indicator, which compares the difference between US and Japanese short-term interest rates and the implied volatility of the yen-dollar exchange rate, suggested that the attractiveness of yen-funded carry trades fell sharply (Chart 12).

Chart 11 Three-month implied sterling exchange rate volatility



Sources: Bank of England and Bloomberg.

Chart 12 A yen-funded carry-trade indicator^(a)



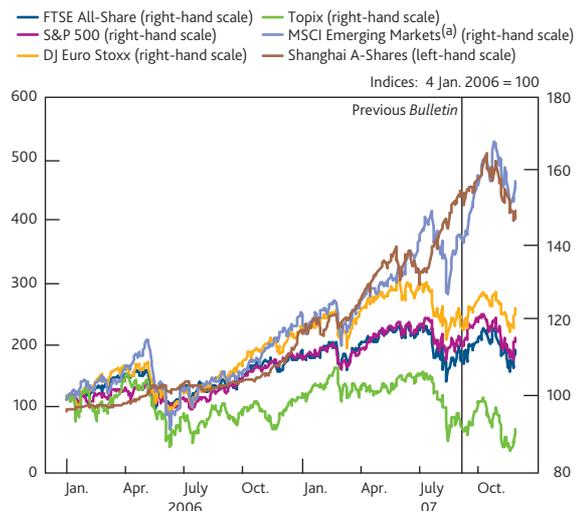
Sources: Bloomberg and Bank calculations.

(a) Spread between US and Japanese three-month interest rates per unit of three-month implied volatility of the US\$/¥ exchange rate.

Equity markets

The depreciation of the dollar meant that, in US dollar terms, the main US equity indices tended to fall relative to the main European indices over recent months. However, in domestic currency terms, at the end of November the major equity indices were much the same as at the time of the previous Bulletin (Chart 13).

Chart 13 International equity indices (domestic currencies)



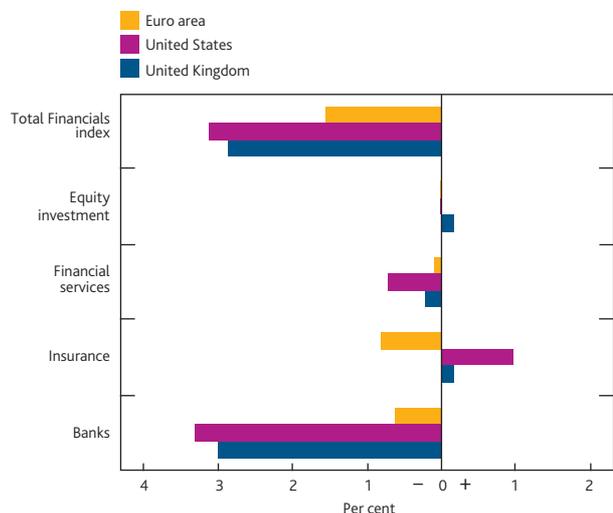
Sources: Bank of England and Bloomberg.

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

Nonetheless there was considerable volatility in equity markets over the period. During September and October, international equity price indices generally rose despite the ongoing turmoil in credit and interbank lending markets. This was especially true of emerging market stock prices — for example the MSCI Emerging Markets index rose by around 10%. However, in November equity prices fell globally as worries intensified about the wider implications of the problems in structured credit markets.

At the sectoral level, equity prices of financial companies and banks in particular, fell quite sharply over the period (Chart 14). This seemed to reflect downward revisions to the earnings prospects for these firms. A number of large global banks and broker-dealers reported significant write-downs on

Chart 14 Sectoral decomposition of changes in financial equity indices since previous Bulletin^(a)



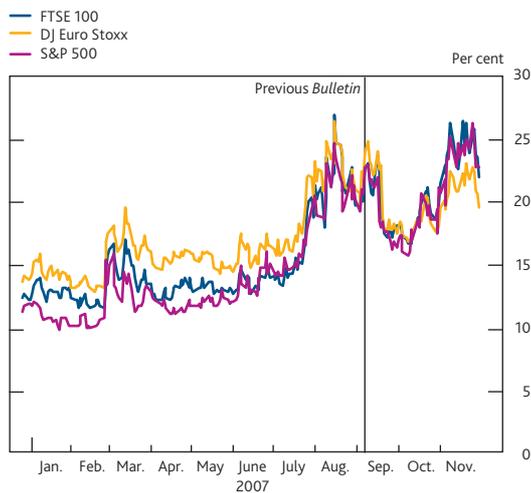
Sources: Bank of England and Thomson Datastream.

(a) Changes in price indices weighted by market value as at 7 September.

their structured credit exposures in 2007 Q3 and anticipated further write-downs in Q4. Perhaps reflecting this, IBES earnings forecasts for 2007 for US and UK financial companies were revised down. In contrast, earnings forecasts for non-financial companies generally remained robust.

Towards the end of November, the major equity indices recovered somewhat. This may partly have reflected the falls in risk-free interest rates. Other things being equal, lower risk-free interest rates would have boosted share valuations since they lower the rate at which future cash flows are discounted. However, potentially offsetting that, volatility in equity prices could have affected the required risk premium on shares. Indeed, information from option prices indicated that implied volatilities on the major equity indices remained elevated (Chart 15). Similarly, a simple dividend discount

Chart 15 Three-month implied volatility from equity options^(a)



Sources: Bank of England, Chicago Mercantile Exchange, Eurex and Euronext.liffe.

(a) Three-month (constant maturity) implied volatilities.

Chart 16 Implied equity risk premium^(a)



Sources: Bank of England and Thomson Datastream.

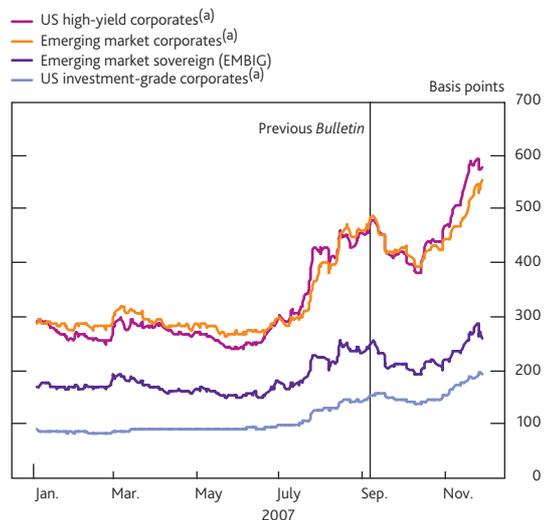
(a) Estimated using a one-stage dividend discount model with an exogenous long-term dividend growth rate equal to 3%. For more details of the dividend discount model see Vila Wetherill, A and Weeken, O (2002), 'Equity valuation measures: what can they tell us?', *Bank of England Quarterly Bulletin*, Winter, pages 391–403.

model indicates that the implied equity risk premium for the major equity indices picked up recently (Chart 16).

Corporate and EME debt markets

Investors in corporate bond markets may also have sought greater compensation for absorbing risk given the uncertain macroeconomic environment. After narrowing a little in October, spreads on corporate credit default swaps and bonds widened sharply (Chart 17). This was particularly true for securities issued by non-investment grade companies and emerging market economy (EME) corporates, the spreads on which widened by around 100 basis points and 70 basis points respectively since September. Spreads on sovereign EME bonds also widened over recent months but by less than for EME corporates.

Chart 17 Emerging market, US high-yield and investment-grade corporate bond spreads



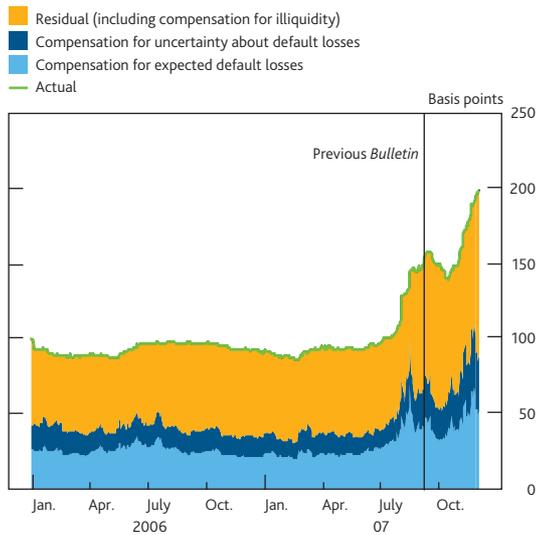
Sources: JPMorgan Chase & Co. and Merrill Lynch.

(a) Option-adjusted spreads.

A model-based decomposition of corporate bond spreads suggests that most of the recent widening reflected increased compensation for uncertainty about future defaults and other factors such as illiquidity (Chart 18).⁽¹⁾ Market contacts reported that liquidity in corporate bond markets was poor. Perhaps consistent with that, the difference between spreads on corporate bonds and the spreads on credit default swaps (the so-called 'CDS-bond basis') widened (Chart 19).

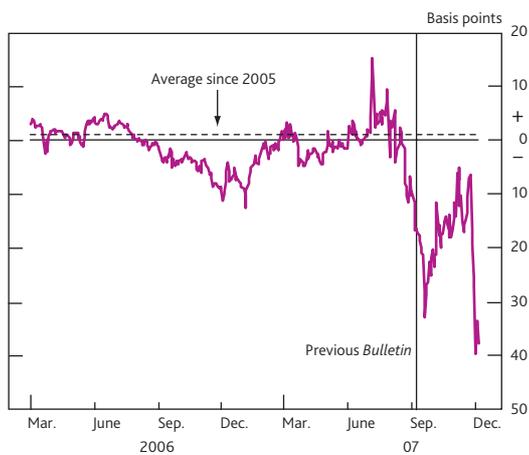
The impact of wider credit spreads on firms' cost of debt capital has to some extent been offset by the falls in default-free government bond rates. Indeed, US investment-grade and EME corporate bond yields were broadly unchanged (Chart 20). However, yields on US non-investment grade corporate bonds increased by around 40 basis points. The increased cost may have contributed to weaker bond

(1) This model-based decomposition is the subject of an article on pages 533–41 of this *Bulletin*.

Chart 18 Decomposition of US dollar-denominated investment-grade credit spreads^(a)

Sources: Bloomberg, Merrill Lynch, Thomson Datastream and Bank calculations.

(a) For details of the method underlying the decompositions see 'Decomposing corporate bond spreads' by Lewis Webber and Rohan Churm on pages 533–41 in this *Bulletin*.

Chart 19 Indicative 'basis' between bond spreads and corresponding credit default swap spreads for US investment-grade corporates^(a)

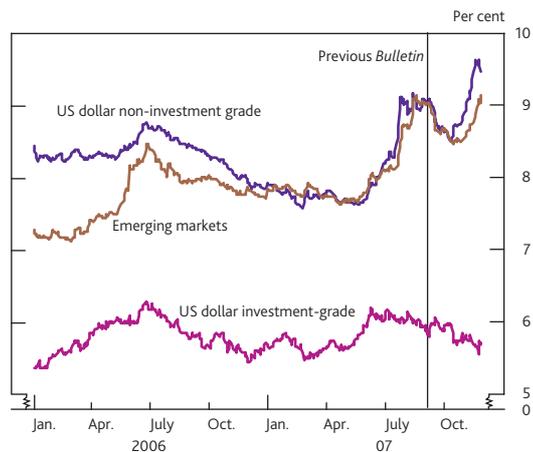
Source: JPMorgan Chase & Co.

(a) Calculated as an equally weighted average of the basis between 550 investment-grade bond spreads and spreads on the corresponding credit default swaps.

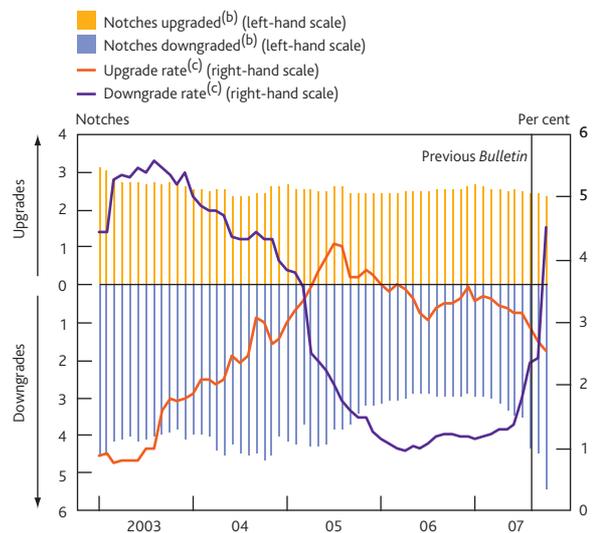
issuance. The latest BIS *Quarterly Review* noted that borrowing in international debt markets retreated sharply during 2007 Q3 — net issuance of \$396 billion in bonds and notes was less than half that of the previous quarter.

Asset-backed and structured credit markets

Against the backdrop of rising delinquencies and higher-than-expected correlation of defaults in the United States, the major rating agencies reviewed the ratings applied to global structured credit instruments. This generally resulted in significantly more downgrades than upgrades. And according to Moody's, the average size of downgrades increased sharply over recent months (Chart 21).

Chart 20 Corporate bond yields

Source: Merrill Lynch.

Chart 21 Rating changes on global structured finance^(a)

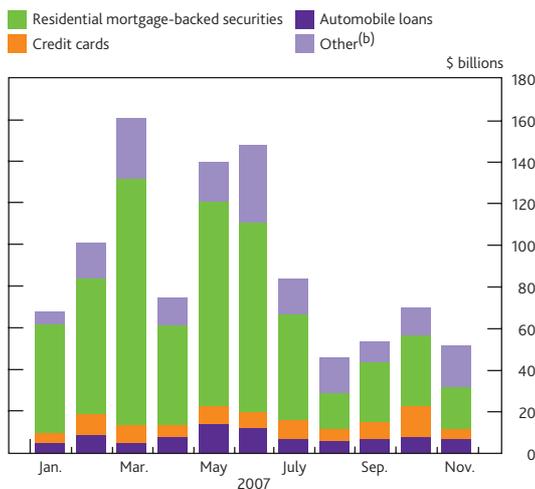
Source: Moody's Investors Service.

(a) This encompasses ABS, CMBS, RMBS and CDOs across the United States, EMEA, Asia Pacific and Latin America. It also includes some transactions outside of these sectors such as ABCP, SIVs, catastrophe bonds and derivative product companies.
 (b) Average number of total notches upgraded/downgraded over a rolling twelve-month period.
 (c) Upgrade (downgrade) rate is the number of securities upgraded (downgraded) over a rolling twelve-month period divided by the total number of outstanding securities at the beginning of the twelve-month period.

Primary issuance of asset-backed securities (ABS) slowed sharply over the past few months as the turmoil in securitisation markets persisted (Chart 22). Indeed, some mortgage-backed securities markets were largely closed to new issuance. There was some issuance of collateralised loan obligations (CLOs) related to high-yield loans. This probably reflected some repackaging of those loans that were unexpectedly caught on banks' balance sheets, particularly in the United States.

In secondary markets, spreads on mortgage-backed securities remained wide and indeed in Europe continued to widen over the past few months (Chart 23). However, these markets remained extremely illiquid with, according to contacts, few transactions actually taking place.

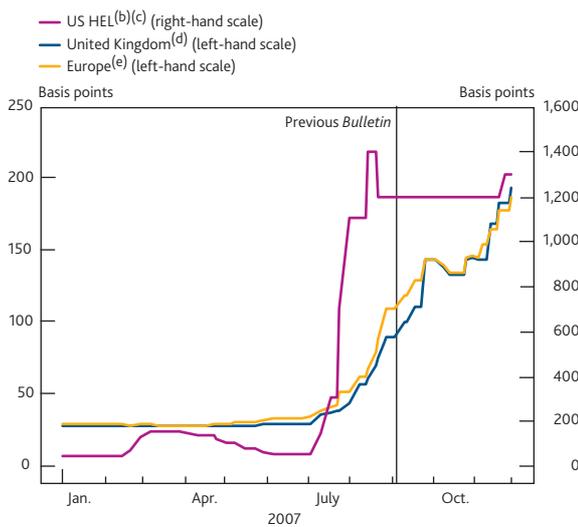
Chart 22 Global issuance of asset-backed securities (ABS)^(a)



Source: JPMorgan Chase & Co.

(a) Refers to funded or so-called cash asset-backed securities (ABS) and excludes synthetic ABS.
 (b) Includes securities linked to equipment, student loans, commercial mortgage-backed securities, sovereign and agency debt, and other receivables.

Chart 23 Spreads on residential mortgage-backed securities^(a)



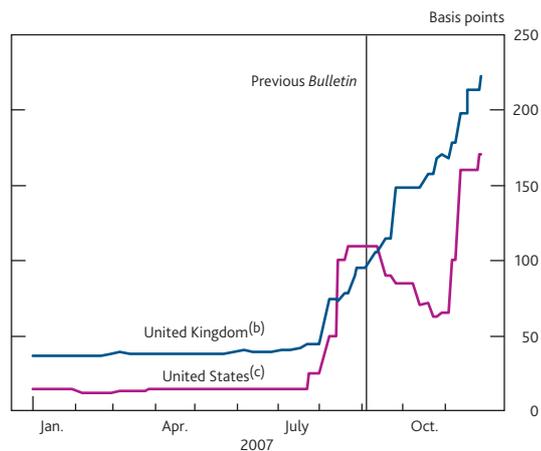
Source: Lehman Brothers.

(a) A-rated.
 (b) Home equity loans.
 (c) Five-year dollar floating rates over Libor.
 (d) Five-year sterling floating rates over Libor.
 (e) Five-year euro floating rates over Libor. Spreads on Dutch, Italian, Portuguese and Spanish (ten-year) securities weighted by total issuance as of 23 November.

Similarly, spreads on securities backed by US and UK credit card receivables widened further (Chart 24). In the United States, this has been accompanied by wider spreads on auto loan ABS, in part reflecting worries that a weaker outlook for the US economy could lead to more widespread borrower distress.

One source of pressure on ABS spreads was the prospect of forced selling from structured investment vehicles (SIVs).⁽¹⁾ Around half of their assets (around \$400 billion at the end of August 2007) were held in ABS. As market prices of their assets fell, the mark-to-market net asset value of SIVs declined.

Chart 24 Spreads on credit card-backed securities^(a)

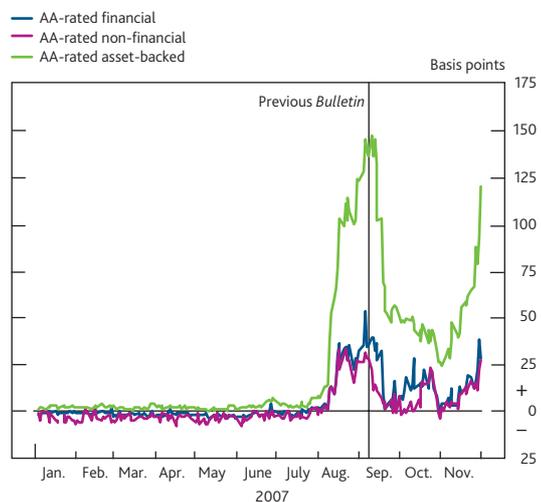


Source: Lehman Brothers.

(a) A-rated.
 (b) Five-year sterling floating rates over Libor.
 (c) Five-year dollar floating rates over Libor.

Most SIVs continued to find it difficult to obtain funding by issuing asset-backed commercial paper (ABCP). And the spreads on ABCP issued by ABCP-funded vehicles widened sharply in November (Chart 25), reversing the narrowing in October. This added further pressure for banks that sponsor ABCP-funded vehicles to take assets back onto their balance sheets.

Chart 25 Spreads on US commercial paper^(a)



Sources: Bloomberg and Board of Governors of the Federal Reserve System.

(a) Yields on 30-day US commercial paper less rates inferred from overnight index swaps.

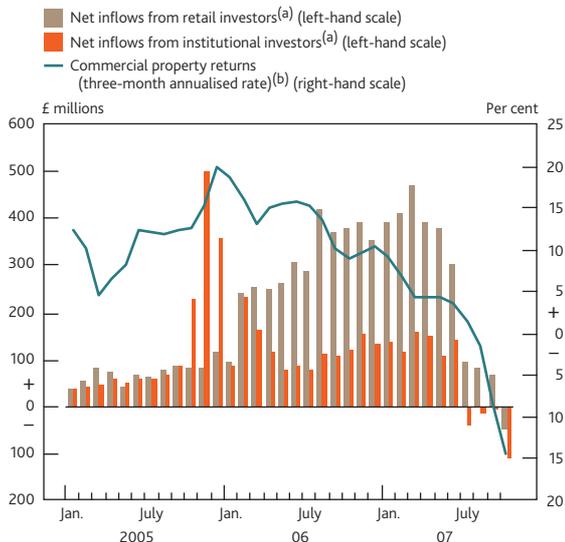
A large proportion of the investor base for ABCP comprises money market funds. According to contacts, some of these funds reduced the quantity and term of their ABCP investments, focusing their portfolios on very low risk and highly liquid assets in case they faced significant redemptions. Some funds that invested in ABCP have encountered

(1) For more details of SIVs and ABCP conduits see the box 'ABCP-funded vehicles' on page 348 of the 2007 Q3 Quarterly Bulletin and also the box 'Types of ABCP programmes' in 'Risk transfer between banks, insurance companies and capital markets', by David Rule published in the *Financial Stability Review*, December 2001, pages 137–59.

difficulties over the past few months, but the traditional, low-risk money market funds continued to receive inflows suggesting confidence in this industry generally remained robust.

However, a particular concern among contacts related to the position of funds which invested exclusively in commercial property. UK property funds recorded net redemptions in October from both retail and institutional investors (Chart 26). In the same month, commercial property prices fell sharply in the United Kingdom and returns on commercial property slowed significantly. Furthermore, implied rates from commercial property derivatives markets suggested further falls.⁽¹⁾ To the extent that commercial property funds became forced sellers of their assets, this could potentially further undermine returns.

Chart 26 UK commercial property returns and inflows into UK property funds



Sources: Investment Management Association and Thomson Datastream.

(a) Based on data compiled by the Investment Management Association (IMA) on 32 UK on-shore property funds with total funds under management of around £15 billion at the end of October 2007.

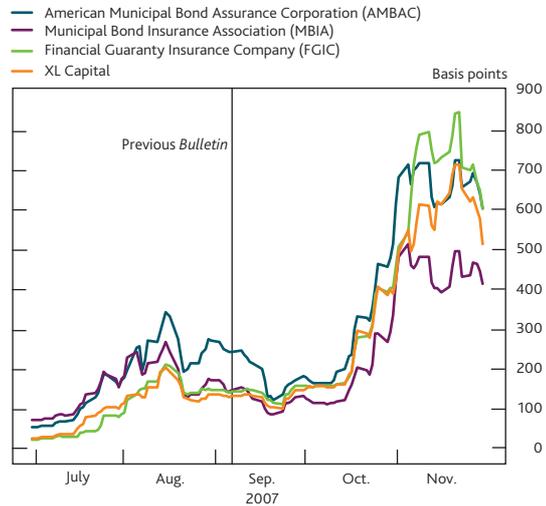
(b) Uses the Investment Property Databank (IPD) UK All property monthly index, which measures monthly returns to direct commercial property investments in a total of 75 portfolios, covering 4,247 properties worth £56 billion.

Contacts have also expressed concerns about the market impact of any rating downgrades to the major financial guarantors; in particular, specialist insurers known as monolines that provide insurance of interest and principal payments on debt securities. Traditionally monolines largely provided insurance for US municipal bonds. But the main monolines also moved into structured finance and credit markets, typically either through selling insurance policies on ABS or writing credit default swap contracts on collateralised debt obligations (CDOs) of ABS.

Spreads on CDS of the main monolines moved sharply higher over recent months (Chart 27). And the major rating agencies announced they would review the capital cushions that they require monolines to hold in order to retain their AAA ratings.

These cushions are intended to ensure that the monolines are adequately capitalised to absorb potentially higher-than-expected claims.

Chart 27 Spreads on five-year credit default swaps of financial guarantors



Source: Markit.

A downgrade to a major monoline could potentially cause further disruption in structured credit markets if it led to downgrades to the securities it insured. Contacts have also suggested that if a downgrade to a monoline prompted downgrades of US municipal bonds, this could amplify financial market volatility more generally. Many investors in municipal bonds, such as certain money market funds, have strict investment mandates that stipulate they invest solely in highly rated securities. As such, if a major monoline lost its triple-A rating and that led to a rating downgrade of the bonds they insured, this might potentially trigger widespread sales of municipal bonds.

These concerns about financial guarantors are symptomatic of the general uncertainty about the scale of potential losses on structured credit assets. Based on published information, there was considerable variation in the valuations across structured products and for different financial institutions. Moreover, the valuations were typically stated net of hedging strategies. To the extent that such hedges may not be perfect, this is a further source of uncertainty about institutions' potential exposures to structured credit vehicles.

These variations in valuations could simply have reflected the different characteristics of individual firms' asset portfolios and hedging strategies. But they were also related to different internal methods to value these complex securities; either a model-based process ('mark-to-model' which requires certain assumptions to be made about the factors that affect

(1) For a further discussion of recent trends in commercial property prices, see pages 27–28 of the October 2007 *Financial Stability Report*.

An indicative decomposition of Libor spreads

Libor is the most widely used benchmark for short-term interbank interest rates in major currencies worldwide.⁽¹⁾ From late July, international Libor rates rose relative to other measures of expected policy rates. These spreads remained wide across currencies, reflecting a reduced appetite for unsecured lending to banks and uncertainty about the location of losses associated with the US sub-prime market.

This box outlines an indicative decomposition of the spread between twelve-month Libor rates and equivalent maturity overnight interest rate swap rates. It suggests that, during August and September, credit factors appeared to account for only a small proportion of the spread. More recently, bank credit concerns appear to account for a more significant portion of the spread, although that could partly reflect the effects of liquidity rationing.

Calculating credit and non-credit premia

In principle, Libor rates reflect current and expected future overnight interest rates (ie the expected path of monetary policy) and premia associated with liquidity and credit risk. The latter arises because Libor rates relate to unsecured interbank lending and are therefore subject to the risk of the borrower defaulting.

The analysis in this box uses prices of credit default swaps (CDS) for banks in the Libor panel to form a rough estimate of the credit premia implicit in Libor rates. It then assumes that any difference between observed Libor rates and the sum of the estimated credit premia and a measure of the risk-free interest rate reflects factors not related to credit or policy expectations, such as frictions in the interbank market or liquidity premia. There are, however, a number of assumptions and caveats attached to this methodology, including that credit and liquidity premia are unlikely to be entirely independent; for example, the inability to raise funds — liquidity risk — may be factored into CDS prices.

In principle, CDS prices reflect the default probability of the reference entity, the loss given default and some compensation for uncertainty about these factors. Assuming that investors recover 40% of their deposit in the event of default,⁽²⁾ and ignoring any liquidity effects in CDS markets, an implied (risk-neutral) probability of default for the underlying security is derived using a simple no-arbitrage relationship.

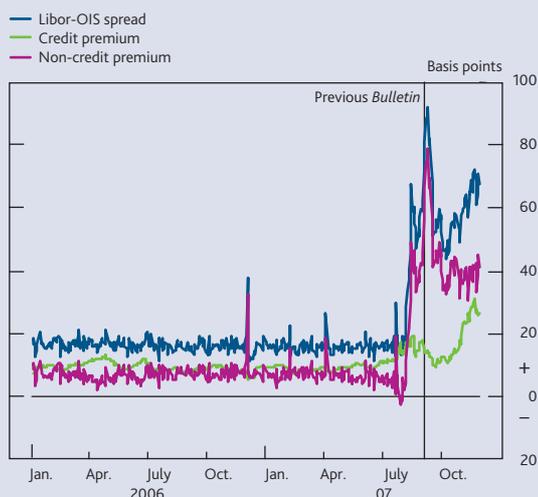
This probability can then be used to infer a credit spread (above the risk-free rate) that must prevail such that a risk-neutral investor is indifferent between investing in a risk-free bond and a risky bank deposit. Overnight index swap (OIS) rates are used to proxy for the risk-free rate.⁽³⁾

Put simply, this method maps (under certain assumptions) a standard CDS price into a 'fair' spread for obtaining twelve-month funds in the interbank market. Having derived a spread for each bank in the Libor panel, a simple average provides a crude estimate of the credit premium in Libor. The residual of the Libor-OIS spread net of the credit premium is referred to as the non-credit premium.

Decomposition and international comparisons

The indicative decompositions for sterling, US dollar and euro are shown in **Charts 1–3**. These suggest that (at the onset of the turbulence) credit markets reacted to international financial market developments before the widening of money market spreads. Specifically, credit premia (implied by CDS prices) rose more rapidly than Libor rates in late July and early August. That Libor did not react to the rise in CDS prices in July suggests that credit risk was initially probably not a key determinant of Libor.

Chart A Decomposition of the sterling twelve-month Libor-OIS spread^(a)



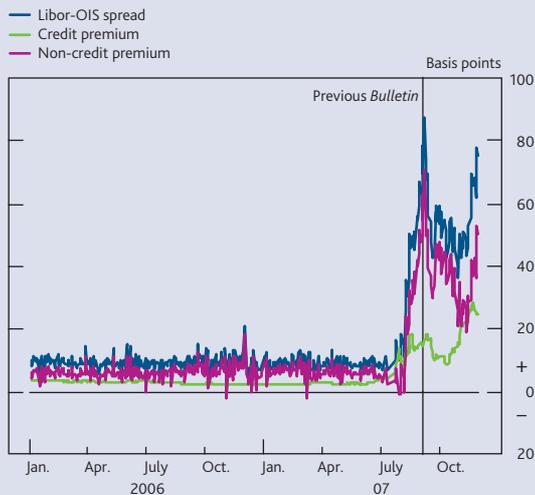
Sources: British Bankers' Association, Markit and Bank calculations.

(a) The decomposition adjusts for the ten-day moving average spread between overnight index swaps and secured rates.

Instead, the substantial increases in Libor and associated widening in Libor-OIS spreads during August and September appears to have been largely associated with non-credit factors across currencies. Market contacts have suggested that this was due to banks hoarding liquidity, as uncertainty about funding commitments to specialist financing vehicles, conduits and corporates increased.⁽⁴⁾

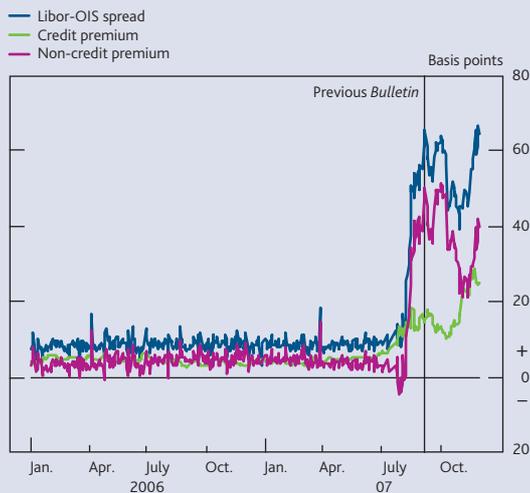
At the beginning of October, Libor spreads narrowed quite sharply before widening again during November. The decomposition suggests that during the latest period of spread widening, a larger part of the move can probably be attributed to an increase in credit premia. This reflected increases in bank CDS prices following the news about significant write-downs

Chart B Decomposition of the dollar twelve-month Libor-OIS spread



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

Chart C Decomposition of the euro twelve-month Libor-OIS spread^(a)



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

(a) The decomposition adjusts for the ten-day moving average spread between overnight index swaps and secured rates.

on exposures to mortgage-backed securities and leveraged loan commitments.

The decomposition is consistent with a shift to greater credit concerns over recent months. However, it is subject to some caveats. Specifically, the recovery rate for a Libor deposit in the event of a bank defaulting may be higher than the assumed 40%. Another assumption is that CDS prices efficiently reflect default risk. In practice, CDS prices may also be affected by specific factors in CDS markets. The analysis also assumes investor risk-neutrality. In reality, CDS prices and the credit premia implicit in Libor rates may partly reflect additional compensation for market participants' aversion to risk.

In summary, the indicative decompositions shown in this box appear broadly consistent with market contacts' views about the evolution of observed Libor-OIS spreads. At the beginning of the market turbulence, non-credit premia accounted for the majority of the spread widening, which may have been due to banks hoarding liquidity. More recently, however, credit premia increased. This coincided with markets reportedly becoming more concerned about the capital adequacy of banks and, in particular, whether they would need to replenish common equity following significant write-downs related to structured credit exposures and mark downs to leveraged loan commitments. However, it is important to stress that this crude decomposition is only indicative. It relies on, and is sensitive to, a number of assumptions. And, in practice, credit and non-credit (liquidity) premia are unlikely to be entirely independent.

- (1) Libor is an average of indicative funding rates submitted each day by a panel of banks. See box, 'Recent rise in Libor rates', 2007 Q3 *Quarterly Bulletin*, pages 350–51 for a detailed discussion of how Libor is calculated.
- (2) As assumed by protection sellers in their CDS price calculations.
- (3) See box, 'Interest rate expectations from overnight swap rates', Winter 2005 *Quarterly Bulletin*, pages 410–11 for further details on OIS. Sterling and euro OIS rates are adjusted for a ten-day moving average of observed spreads to secured rates. US dollar OIS rates settle on rates targeted by the Federal Reserve, so are not adjusted.
- (4) See October 2007 *Financial Stability Report*, pages 8–9 for a fuller discussion of uncertainties related to balance sheet commitments.

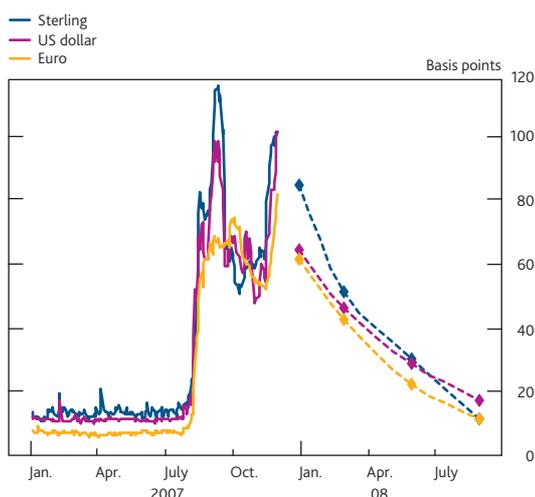
asset valuations), or one based on a quoted market price ('mark-to-market').

However, it should be noted that in most cases the write-downs did not reflect realised losses (ie actual defaults). Consequently, it is possible that banks will make write-backs in future months if conditions in ABS markets were to improve.

Bank funding markets

In the face of losses on structured credit exposures, combined with the prospect of the reintermediation of assets onto banks' balance sheets, bank funding markets remained under pressure. In particular, many money market participants reported difficulties in obtaining funding at maturities longer than one week. Consequently, term Libor spreads remained elevated and forward rates suggested that they would remain so for a while (Chart 28).

Chart 28 Three-month Libor rates relative to expected policy rates^(a)



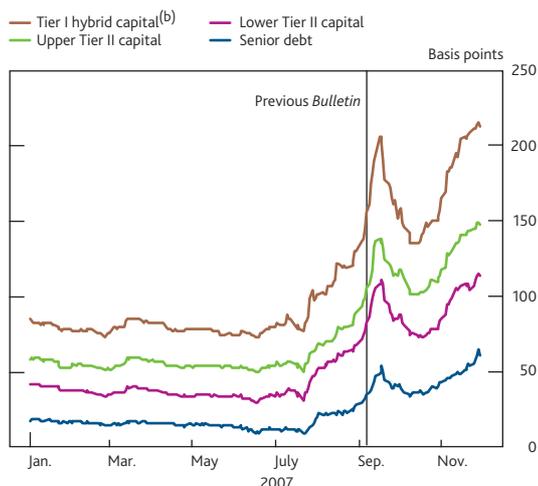
Sources: Bloomberg, British Bankers' Association and Bank calculations.

(a) Three-month spread of Libor to overnight interest swap rates. Dashed lines show implied forward spreads derived from forward rate agreements as at 30 November.

The initial widening in Libor spreads during August had, according to contacts, mainly reflected banks hoarding liquidity. During October and November, further uncertainty about losses on structured credit led to heightened concerns about the potential impact on banks' capital positions. In turn, this may have increased investor perceptions of counterparty risks associated with banks — as evidenced by higher premia on credit default swaps. This is discussed in more detail in the box on pages 498–99.

The cost of longer-term bank funding and capital also increased over the past few months (Chart 29). Spreads on covered bonds — securities issued by banks backed by assets on their balance sheets — also widened sharply over the past few months. After some improvement during October, raising capital through the issuance of so-called hybrid Tier 1

Chart 29 Spreads on sterling bank debt and capital^(a)



Source: JPMorgan Chase & Co.

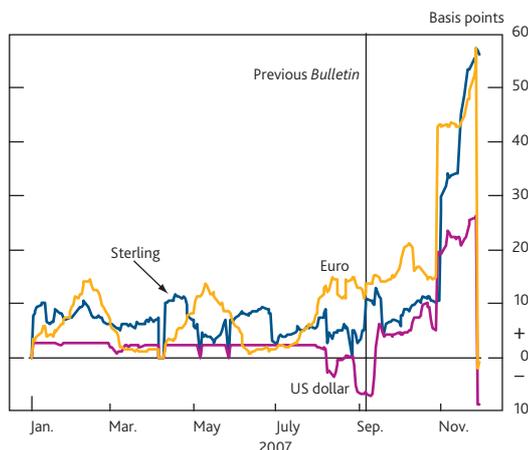
(a) Spreads over interest rate swaps.
(b) Fixed-rate debt instruments with equity-like features.

securities again became more difficult. However, some banks were able to raise Tier 1 capital through private placements of mandatory convertible securities, essentially a forward sale of common equity.

According to market contacts, the continued illiquidity in money markets also related to an increased concern surrounding funding conditions over the year end. As discussed in more detail on page 505, this reflected banks wishing to 'window dress' their balance sheets over the year end. That pushed up further the premium for borrowing for periods spanning 31 December. Reflecting this, the spread of two-month Libor to one-month Libor increased sharply at the start of November when the two-month rates extended beyond the year end (Chart 30). This spread narrowed sharply on 30 November for US dollar and euro once the one-month Libor rates also spanned the year end.

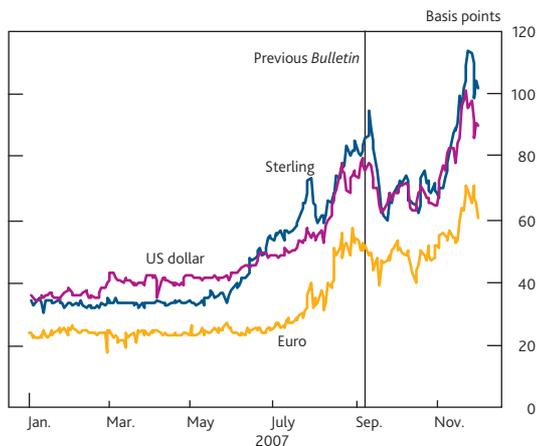
Persistently wider spreads on interbank lending also contributed to a sharp widening in the spreads between

Chart 30 Spread between international one-month and two-month Libor rates



Source: British Bankers' Association.

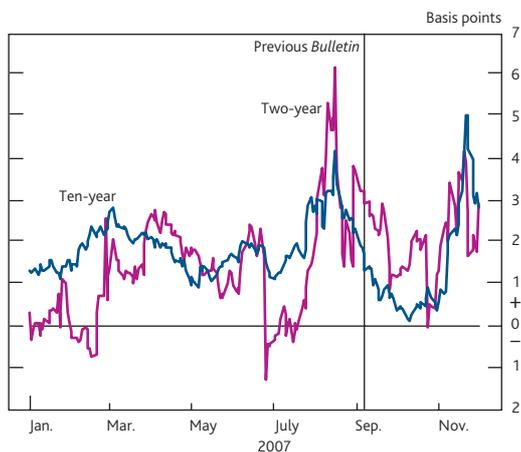
Chart 31 Two-year spreads between interest rate swap rates and government bond yields



Source: Bloomberg.

interest rate swaps and government bond yields (**Chart 31**). According to contacts, part of this widening in spreads also reflected increased demand for government bonds as part of a general 'flight to quality'. Perhaps indicative of that, the spread between yields on the most recently issued, and most liquid, US Treasuries (so-called 'on-the-run' bonds) and those issued earlier (so-called 'off-the-run' bonds) widened sharply in early November before narrowing a little towards the end of the month (**Chart 32**).

Chart 32 Swap spreads between 'on-the-run' and 'off-the-run' US government bonds^(a)



Source: JPMorgan Chase & Co.

(a) Difference between the swap spread of the most recently issued and the next most recently issued US government bond at that maturity.

Overall, financial markets remained fragile. In particular, continued uncertainty about the scale and location of possible losses on structured credit investments, coupled with increased concerns about downside risks to the US economy, further suppressed investors' risk appetite. Market contacts thought that it would take time for the full implications of the recent financial market turmoil to become clear, and while that is the case financial market volatility would be likely to remain elevated.

Bank of England official operations

The Bank's balance sheet is managed in accordance with its policy purposes. These relate to the implementation of monetary policy; management of the Bank's foreign exchange reserves; provision of banking services to other central banks; provision of payment services for the UK financial system and the wider economy; and management of the Bank's free capital and cash ratio deposits from financial institutions.

Sterling monetary framework

This section reviews two full maintenance periods between 6 September and 7 November and summarises key developments in the Bank's official operations during the November–January maintenance periods.

The Bank's operations in the sterling money markets aim to keep secured market overnight interest rates in line with Bank Rate by supplying sufficient reserves for the banking system, in aggregate, to meet chosen targets for average balances held at the Bank of England over a maintenance period running from one MPC decision date until the next.

Each month, ahead of the start of a reserves maintenance period, reserves banks in the United Kingdom have the opportunity to set new reserves targets, and the Bank undertakes to supply the reserves that banks in aggregate need to meet those targets. Thus the monthly resetting of reserves targets provides an opportunity for banks individually, and the banking system as a whole, to obtain extra liquidity from the Bank.

Given the strains in money markets observed since August, reserves banks have in aggregate increased their targets ahead of each of the subsequent maintenance periods. In total, the aggregate target increased by 37% from £16.6 billion in August to £22.7 billion for the maintenance period starting on 6 December.

September–November maintenance periods

As reported in the previous *Bulletin*,⁽¹⁾ ahead of the start of the September–October maintenance period, there was reason to believe that banks' chosen targets did not fully reflect their demand for reserves. Reserves targets should be set on the basis of expected costs and benefits. For an individual bank, the benefit is a buffer against unexpected payment shocks and, in turn, a reduced probability of needing to use the Bank's standing facilities.

But for the September–October maintenance period a co-ordination problem seemed possible. If banks collectively had set higher reserves targets and the Bank supplied the extra liquidity, pressures in the money market might have been

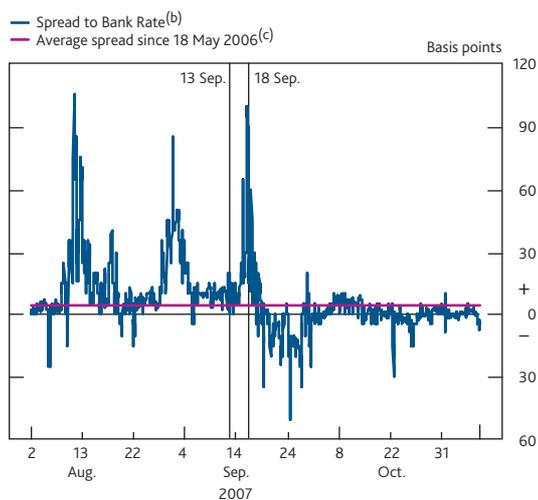
(1) For a fuller description, see pages 358–60 of the previous *Bulletin*.

expected to ease. In turn, market rates, and the cost of holding reserves, might have been expected to fall. But individual banks setting reserves targets did not know what targets other banks would set. And the incentive for any individual bank to set a higher target was diluted to the extent that the benefit of its action would have gone partly to other banks in the form of lower funding costs.

The Bank could not know whether or to what extent such a co-ordination problem had affected targets set for the September–October maintenance period, but it took the possibility seriously. When it announced the new aggregate target on 5 September it stated that in its open market operation (OMO) on the following day it would offer to supply reserves to meet the new target, following standard practice. But if over the subsequent week the secured overnight rate continued to exceed Bank Rate by an unusual amount it would, in the following OMO on 13 September, offer to supply, at Bank Rate, additional reserves of up to 25% of the aggregate reserves target.

In the event, the secured overnight rate did fall back in the subsequent week, but it was still unusually high relative to Bank Rate. The Bank accordingly offered in the OMO of 13 September extra reserves equivalent to 25% of the aggregate target and announced that it would re-offer these extra reserves at each scheduled OMO for the remainder of the maintenance period. The OMO was oversubscribed and the additional reserves were fully allotted. Later that day the secured and unsecured overnight interest rates fell further and traded close to Bank Rate (Chart 33).

Chart 33 Spread to Bank Rate of intraday secured sterling overnight interest rate^(a)



Sources: BrokerTec and Bank calculations.

- (a) Vertical lines show announcement of additional reserves provision.
 (b) Excludes data from 17 August 2007.
 (c) Excludes data from 31 July 2006, 28 June to 4 July 2007 and 17 August 2007.

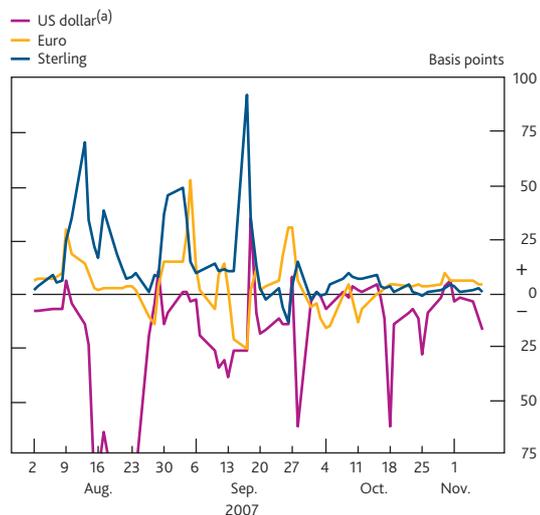
The announcement of a liquidity support facility to Northern Rock on 14 September provided a further disturbance to conditions in sterling money markets, with the

effect that sterling overnight interest rates rose sharply. This, together with intelligence from counterparties, suggested that there might have been a further (possibly temporary) rise in the demand for reserves. The Bank therefore offered, on 18 September, additional reserves in an exceptional fine-tuning OMO. More specifically the Bank offered, in a two-day repo, additional reserves equivalent to a further 25% of the aggregate reserves target. The fine-tuning OMO was oversubscribed and the additional reserves offered were all supplied.

The additional reserves supplied in the exceptional fine-tuning OMO and the additional reserves supplied in the scheduled OMO on 13 September were both re-offered in the scheduled OMO on 20 September. This helped to reassure money market participants that the Bank was committed to stabilising the overnight interest rate. The supply of additional central bank money via regular or exceptional OMOs is one of a number of provisions within the Bank's framework for its operations in the sterling money markets that can be used in stressed or otherwise extraordinary conditions.⁽¹⁾

Following the extraordinary fine-tuning OMO, secured sterling overnight rates fell back and traded close to Bank Rate with limited day-to-day volatility for the remainder of the review period (Chart 34).

Chart 34 Spread to policy rates of secured international overnight interest rates



Sources: Bloomberg and Bank calculations.

- (a) US dollar series fell to -287.5 on 21 and 22 August 2007.

Reflecting this, the Bank did not re-offer the additional 25% supplied in the extraordinary fine-tune in the final scheduled OMO on 27 September. But it did, as it said it would, re-offer the additional reserves supplied on 13 September. And in view

(1) See box on page 359 of the previous *Bulletin* and *The Framework for the Bank of England's Operations in the Sterling Money Markets* (the 'Red Book'); www.bankofengland.co.uk/markets/money/publications/redbookfeb07.pdf.

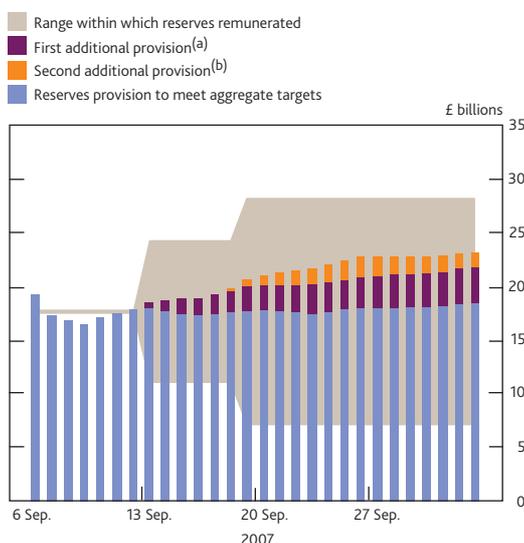
of the provision of extra reserves earlier in the maintenance period, the Bank did not hold a fine-tuning OMO on the final day of the maintenance period.

Because banks' reserves targets had not changed, the range around those targets within which banks are remunerated on their reserves needed to be widened in order to accommodate the increased supply of reserves. The range around each bank's point reserves target is designed to reduce the probability of banks needing to use standing facilities by mitigating the effect of central bank forecast errors. This in turn helps to stabilise market interest rates. Typically, the range has been set at $\pm 1\%$.

The supply of additional reserves on 13 September, re-offered in subsequent OMOs, was equivalent to 25% of aggregate targets offered for 21 days in a 28-day maintenance period, ie on average over the maintenance period as a whole, $18\frac{3}{4}\%$ of target. Reserves ranges were widened to plus or minus twice that amount ($\pm 37\frac{1}{2}\%$) to allow flexibility in the distribution of the additional reserves between banks. Some banks might have wished to hold reserves up to the top of the new range. Other banks might have wished to hold reserves at their target. A range of $\pm 37\frac{1}{2}\%$ provided room for banks to make these different choices.

Reserves offered in the exceptional fine-tuning operation on 18 September, re-offered in the subsequent scheduled OMO, were equivalent to a further 25% of aggregate targets offered with 16 days remaining in the maintenance period of 28 days. Reflecting this, reserves ranges were widened further to $\pm 60\%$. The impact on the cumulative average provision of reserves is shown in **Chart 35**.

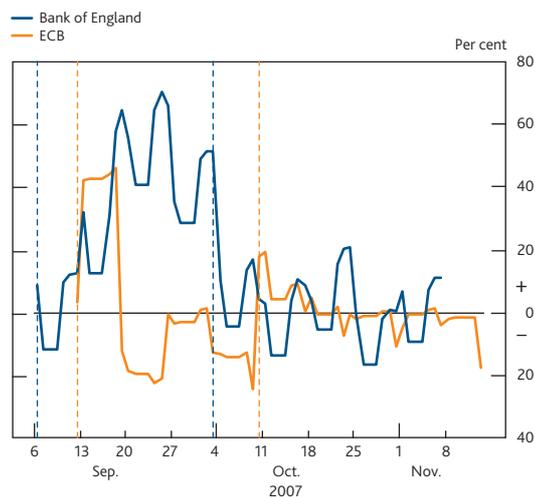
Chart 35 Cumulative average reserves provision in September–October maintenance period



- (a) Additional 25% of aggregate reserves targets provided on 13 September and resupplied for the remainder of the maintenance period.
 (b) Additional 25% of aggregate reserves targets provided on 18 September for two days and resupplied on 20 September for one week.

The net addition of reserves over the maintenance period differed somewhat from the approach taken by other central banks, reflecting the different frameworks. The ECB, in September, provided additional reserves earlier in their maintenance period, but subsequently drained these reserves later in the maintenance period, meaning that there was no additional supply of reserves (**Chart 36**). The ECB had taken a similar approach during the August maintenance period. In the United States, data are not available on the distribution of reserves provision within each two-week maintenance period. But data are published on the level of reserves provided in excess of requirement. More reserves were provided during the first maintenance period in early August than were required to meet banks' reserves requirements. But the level of excess reserves subsequently returned to more normal levels (**Chart 37**).

Chart 36 Daily aggregate reserves balances relative to target^(a)



Sources: Bank of England and European Central Bank.

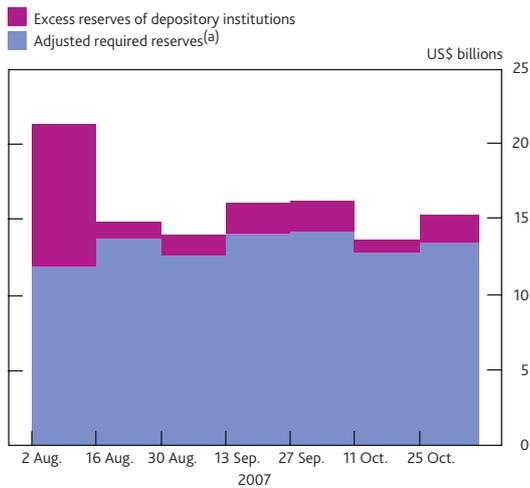
- (a) Vertical lines indicate the start of reserves maintenance periods. Bank of England maintenance periods ran from 6 September to 3 October and 4 October to 7 November. European Central Bank maintenance periods ran from 12 September to 9 October and 10 October to 13 November.

In the United Kingdom, reserves banks in aggregate increased their targets again ahead of the October–November maintenance period. The aggregate target rose by 13% from £17,630 million to £19,970 million, reflecting further demand from reserves banks for central bank money (**Chart 38**).

During this maintenance period the Bank provided reserves through regular, scheduled OMOs sufficient to allow reserves banks to meet their targets in aggregate. But in response to feedback from its counterparties, the Bank maintained wider ranges around reserves targets within which it would remunerate reserves balances, at $\pm 30\%$.

Ranges around point reserves targets provide banks with flexibility on the final day of each maintenance period in managing liquidity and meeting their targets. Before

Chart 37 Supply of reserves relative to required reserves in the United States



Source: Board of Governors of the Federal Reserve System.

(a) Required reserves less vault cash used to satisfy reserves plus required clearing balances.

Chart 38 Aggregate reserves targets and additional supply

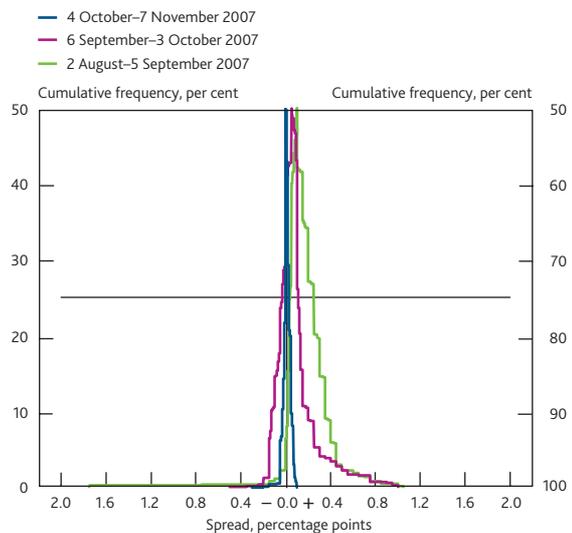


(a) Average additional reserves.

September, the Bank considered a range of $\pm 1\%$ as sufficient to absorb aggregate liquidity shocks. But with greater volatility and uncertainty in money markets, the probability of a bank receiving a late payment shock toward the end of the maintenance period may have been higher and the process of banks redistributing reserves between themselves may have been impeded. Wider ranges were therefore maintained to provide additional flexibility around the distribution of reserves across banks, even though the amount of reserves supplied was sufficient for banks in aggregate to meet targets at the centre of their ranges.

The combination of wider ranges and higher reserves targets, plus an apparent absence of large shocks to the demand for reserves meant that overnight market rates were generally close to Bank Rate and stable throughout the October–November maintenance period (Chart 39).

Chart 39 Folded cumulative distribution^(a) of spread of sterling secured overnight interest rate (trade weighted) to Bank Rate

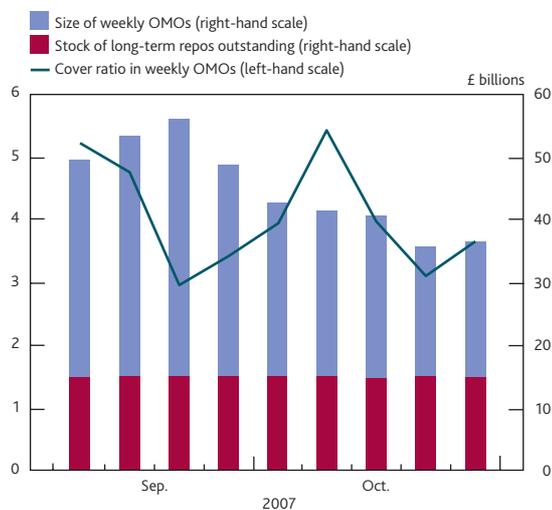


Sources: BrokerTec and Bank calculations.

(a) Distribution of the spread between overnight interest rate at end-of-day and the official interest rate. The distributions are folded at the median so that cumulative probabilities for values above (below) the median are indicated by the right-hand (left-hand) scale.

Despite reserves banks increasing their aggregate reserves targets by 13% between the October and November maintenance periods, the amounts supplied in the Bank's regular weekly OMOs declined during the review period (Chart 40). As explained in the box on page 506, this does not mean that the total amount of liquidity provided to the banking sector fell — this rose in line with the aggregate reserves target. Rather, it reflected reserves being supplied via drawings by Northern Rock on the liquidity facility announced on 14 September.

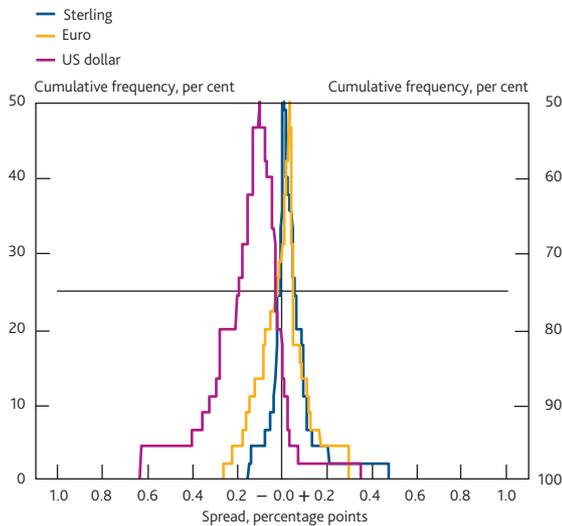
Chart 40 Liquidity provided in OMOs and weekly OMO cover ratio



For the September–November maintenance periods combined, sterling secured and unsecured overnight market interest rates

tended to be at least as close to policy rates as comparable euro and dollar overnight rates (Chart 41 and Chart 42).

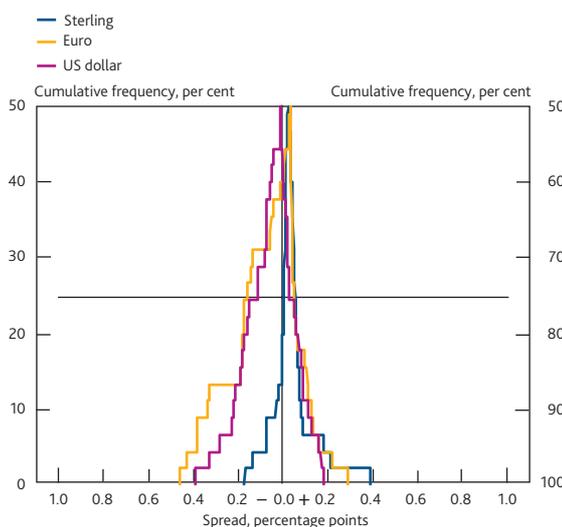
Chart 41 Folded cumulative distribution^(a) of spread of international secured overnight interest rates to official interest rates^(b)



Sources: ICAP and Bank calculations.

- (a) Distribution of the spread between overnight interest rate at end-of-day and the official interest rate. The distributions are folded at the median so that cumulative probabilities for values above (below) the median are indicated by the right-hand (left-hand) scale.
- (b) Chart shows the distribution for period 6 September–7 November 2007. Differences in the median level of the spread of secured rates to official rates are due to differences in the way official operations are conducted.

Chart 42 Folded cumulative distribution^(a) of spread of international unsecured overnight interest rates to official interest rates^(b)



Sources: Wholesale Market Brokers' Association and Bank calculations.

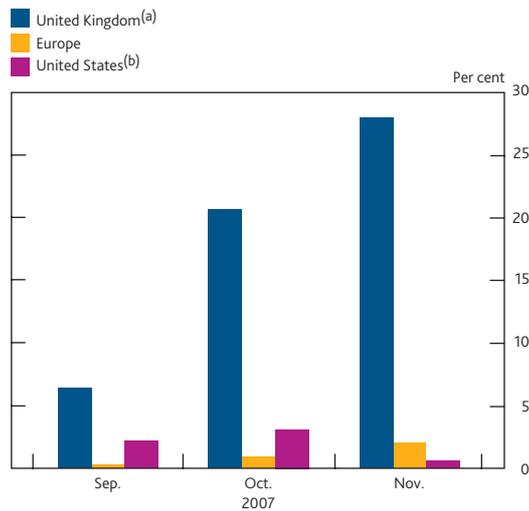
- (a) Distribution of the spread between overnight interest rate at end-of-day and the official interest rate. The distributions are folded at the median so that cumulative probabilities for values above (below) the median are indicated by the right-hand (left-hand) scale.
- (b) Chart shows the distribution for period 6 September–7 November 2007.

November–January maintenance periods

Ahead of the November–December maintenance period, members of the Bank's reserves scheme increased their aggregate targets by a further 6%, to £21,200 million, bringing

the cumulative increase in aggregate reserves targets since 1 August to 28% (Chart 43). The Bank maintained wider ranges ($\pm 30\%$) around reserves targets within which it would remunerate reserves balances. This maintenance period ended on 5 December and will be reviewed in full in the 2008 Q1 *Bulletin*.

Chart 43 Cumulative increase in aggregate reserves targets since August 2007



Sources: Bank of England, Board of Governors of the Federal Reserve System and European Central Bank.

- (a) UK aggregate reserves targets for August 2007 announced on 1 August 2007.
- (b) Required reserves less vault cash used to satisfy reserves plus required clearing balances.

On 5 December, the Bank announced the size of aggregate reserves targets set by reserves banks for the December–January maintenance period. This showed an increase of £1.5 billion, bringing the cumulative increase in reserves since the August maintenance period to £6.1 billion, or 37%.

A key influence on market interest rates over these maintenance periods was expected to be market participants' behaviour in the run-up to the year end. Since early November, market contacts have expressed concerns about potential illiquidity in money markets in all currencies over this period. This introduced a high premium in unsecured interest rates that spanned the year end. Money market rates often rise over the year end because banks try to 'window dress' their balance sheets over what is an important reporting date.⁽¹⁾ In particular, banks tend to reduce interbank lending and hoard liquidity, which both put upward pressure on money market interest rates. This year, against a backdrop of a protracted period of stressed money market conditions, uncertainty about the year end was unusually high. To alleviate these concerns, the Bank and other central banks took steps to ensure increased availability of term funding over the year end.

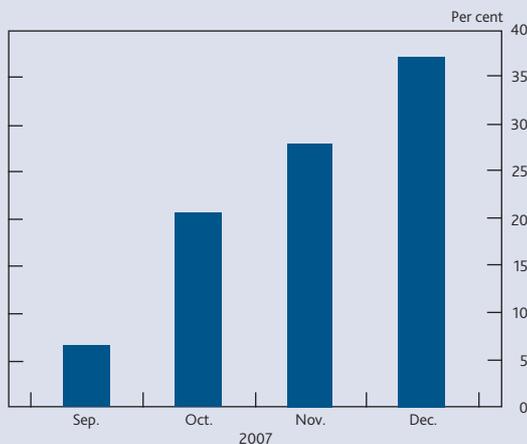
On 29 November, the Bank announced its intention to offer £10 billion, a significant proportion of its scheduled supply of

(1) See page 16 of the 2007 Q1 *Quarterly Bulletin*.

Supply of reserves and the liquidity support facility to Northern Rock

A unique feature of the Bank's operational framework is the freedom reserves scheme banks have to choose their own reserves target balances and to adjust those targets from one maintenance period to the next. In early August they chose targets which in aggregate amounted to £16.6 billion. By the start of the December–January maintenance period the aggregate target had risen to £22.7 billion. That means that over this period the amount of reserves to be injected into the system by the Bank had risen by 37% (Chart A).

Chart A Cumulative increase in aggregate reserves targets since August 2007



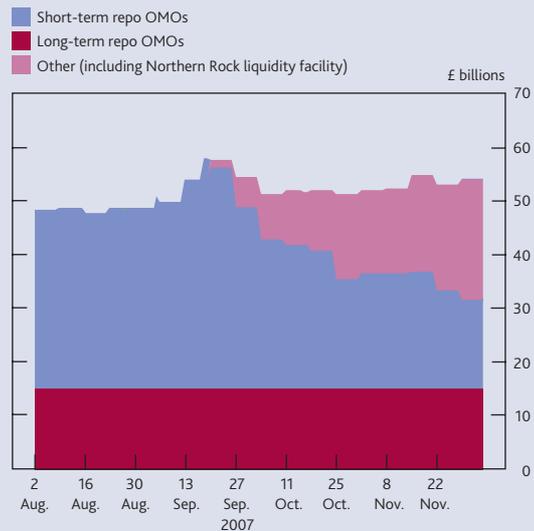
The Bank undertakes to supply reserves banks, in aggregate, with the reserves they need to meet their targets. If reserves targets rise, the Bank needs to supply more reserves and normally does so by lending more via one-week repos in its open market operations (OMOs).

However, it is important to note that OMOs also provide, in part, funds that banks use to purchase banknotes. So the size of OMOs will depend, among other things, on the demand for banknotes, which is, for example, higher in the period ahead of Christmas. Changes in banks' reserves targets will therefore not necessarily be reflected one-for-one in changes to the size of the Bank's OMOs.

It is also important to note that OMOs are not the only route through which money passes from the Bank to the banking system. Since late September, lending to Northern Rock under the liquidity support facility has been another important channel. As Northern Rock pays away the money to meet liabilities to other creditors, it simply adds to the reserves of other banks. Had the size of the Bank's OMOs remained unchanged, the total amount of funds provided to the banking system would have exceeded the amount needed for banks, in

aggregate, to meet their reserves targets. To avoid this, the size of the Bank's OMOs fell, contrary to the usual seasonal pattern, by about £14 billion from £48 billion on 2 August to £34 billion on 6 December. But consistent with the increase in banks' reserve targets over that period, the total amount of funds provided to the banking system through OMOs and other transactions including the Northern Rock facility had risen by some £6 billion (Chart B).

Chart B Breakdown of sterling market transactions



reserves during the maintenance period beginning on 6 December, in the form of a five-week repo open market operation (OMO). This was done in order to help to alleviate concerns that money market conditions would be particularly tight over the year end, and to provide greater assurance to banks in managing their liquidity positions over that period. The decision to conduct a five-week repo OMO followed discussions with reserves scheme banks and at the Money Market Liaison Group (the work of the Money Market Liaison Group during 2007 is described in the box on pages 508–09). In the event, the operation was oversubscribed, with a cover ratio of 6.2.

Along with other central banks, the Bank announced on 12 December further measures designed to address pressures in short-term funding markets, which had increased in the weeks before the announcement.⁽¹⁾ Specifically, the Bank announced changes to its scheduled long-term repo OMOs on 18 December and 15 January.⁽²⁾ In those operations, it announced that reserves would, as usual, be offered at three, six, nine and twelve-month maturities against the Bank's published list of eligible collateral. But the total amount of reserves offered at the three-month maturity would be expanded and the range of high-quality collateral accepted for funds advanced at this maturity would be widened.

The total size of reserves offered in the operations would be raised from £2.85 billion to £11.35 billion, of which £10 billion would be offered at the three-month maturity. The range of securities eligible as collateral in the three-month operations would be wider than in the Bank's normal OMOs, but narrower than those eligible for the recent term auctions described on pages 509–10. The Bank also announced that, consistent with its objective of keeping overnight market interest rates in line with Bank Rate, that it would offset in its other market operations additional reserves taken up in the long-term repo operations.

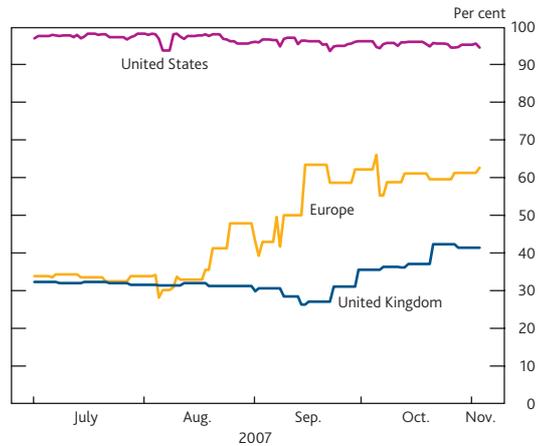
Longer-term repo OMOs

During the September–November maintenance periods, longer-term repos accounted for an average of 34% of liquidity supplied through OMOs (Chart 44). Each of the operations were fully covered (Table A). Cover in the three-month maturity repo offered in September was a little higher than in previous months, though reverted to more normal levels in October. The twelve-month maturity also achieved slightly higher cover in this review period than in the previous two months. Yield tails were low in most of these operations.

Electronic tendering system for OMOs

The Bank has introduced a new electronic tendering system, Btender, through which it will conduct its regular short-term and long-term repo OMOs. On 22 November, it conducted the first weekly OMO using this system. The Bank intends

Chart 44 Proportion of total stock of open market operations provided by longer-term financing^{(a)(b)}



Sources: Bank of England, Bloomberg, European Central Bank and Federal Reserve Bank of New York.

(a) Defined as instruments longer than two weeks to maturity at inception.
(b) This chart differs from the printed version which, owing to a technical error, showed the United States line at the wrong level.

Table A Long-term repo operations

	Three-month	Six-month	Nine-month	Twelve-month
18 September 2007				
On offer (£ millions)	1,500	750	400	200
Cover	3.53	1.82	2.00	3.00
Weighted average rate ^(a)	5.819	5.736	5.680	5.700
Highest accepted rate ^(a)	5.900	5.750	5.700	5.700
Lowest accepted rate ^(a)	5.805	5.685	5.660	5.700
Tail ^(b)	1.40	5.10	2.00	0.00
16 October 2007				
On offer (£ millions)	1,500	750	400	200
Cover	2.25	1.40	2.25	3.00
Weighted average rate ^(a)	5.757	5.739	5.730	5.740
Highest accepted rate ^(a)	5.761	5.750	5.730	5.740
Lowest accepted rate ^(a)	5.740	5.730	5.730	5.740
Tail ^(b)	1.70	0.90	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.

that, subject to market conditions and continuing liaison with counterparties, it will conduct the first long-term repo OMO using Btender on 18 December.

In addition to short and long-term repo operations, the Bank intends to provide longer-term financing to the banking system through purchases, on an outright basis, of gilts and foreign currency bonds, swapped into sterling. During the review period the Bank announced plans to hold the first gilt-purchase OMO early in the new year; the date to be announced before the end of this year.

(1) www.bankofengland.co.uk/publications/news/2007/158.htm.

(2) The Bank has supplied liquidity via monthly longer-term repo operations at four different maturities since January 2006.

The work of the Money Market Liaison Group in 2007

The Money Market Liaison Group (MMLG), chaired by the Bank of England, was established in March 1999. It provides a high-level forum for discussion of market or structural developments affecting sterling money markets and related infrastructure and, where appropriate, responds to them. Typically, it meets quarterly and comprises representatives from institutions involved in the Bank's sterling monetary framework, trade associations and the authorities.

Discussions of developments in the Bank of England's official operations

Sterling monetary framework contingency measures

The MMLG has been a high-level discussion forum for issues arising from the period of money market stress that began in the summer. In particular, the Bank sought feedback from the group on contingency measures taken within its framework for operations in the sterling money markets (the 'Red Book'). The Bank also sought the MMLG's views on expected money market pressures over the year end.

OMOs for outright bond purchases and electronic bidding

Throughout the year, the MMLG has been consulted on the Bank's proposals to provide long-term funding to the banking system through outright bond purchases. MMLG members were invited to comment on revisions to the Bank's operational procedures covering electronic bidding and outright purchases.

Market-wide contingency planning

The MMLG is sponsoring a series of 'live' sterling market tests to test banks' ability to trade and settle from disaster recovery sites (DRSs), with each test getting progressively more challenging. The first test was conducted on 24 May and included large clearing banks and some investment banks who participated in and, in some cases, settled the Bank's weekly OMO from their DRSs. Infrastructure providers and some broking firms also took part in the test.

The exercise was a success in that all trades were executed and settled. Nevertheless, there had been some learning points. In general, the tests had been useful in identifying small issues that had not previously been thought of ahead of an emergency move to a DRS. For example, some counterparties had difficulty locating important information (eg key contact details and passwords). This suggested that key staff at the Bank and its counterparties should have 'grab bags' of key information to take to DRSs.

A second, more challenging, test had been scheduled for 2007 Q4, but this had been rescheduled owing to the stressed conditions in global money markets. The series of 'live' tests is expected to resume in 2008.

A desktop scenario exercise is also scheduled for the new year. The objective is to provide MMLG with a more informed understanding of how a major operational disruption, which could not be tested live, might affect the sterling markets. It will also give participants an opportunity to test their own planning assumptions and may identify practical issues that may not be identified by a live test.

Operational developments

The MMLG and its operations subgroup also provides a forum for the discussion of important structural developments affecting trading, clearing, payments and settlement infrastructure in sterling markets. As well as commenting on the design of live and desk-based tests, this involves identifying potential operational disruption. For example, through 2007 the MMLG discussed the implications of major disruption to CREST late in the trading day, and potential contingency measures to ensure outstanding trades can be unwound in an orderly manner.

Discussions/initiatives relating to the wider sterling money market

Volatility in overnight interest rates

The group discussed volatility in overnight interest rates during the final days of 2006. Group members noted that it was not unusual for rates to rise over the year end, and similar effects were apparent in euro and dollar rates. The Group suggested that shortages of gilt collateral could also cause volatility. In response to these discussions, the Bank had extended the deadline for its counterparties to substitute gilt for euro-denominated collateral in its operations.

Another period of volatility had occurred around the end of June, following an uncovered repo OMO. MMLG members thought that the reaction to the episode may have reflected some money market participants not fully appreciating how the Bank's sterling monetary framework was supposed to work. But it provided a useful case study and a repeat was thought unlikely.

Euroclear proposals for a single platform

During 2007, the MMLG has continued to monitor and offer feedback on Euroclear's migration of its national central depositories to a single platform. The problems experienced during 2006 were resolved but the Group did raise a number of other concerns with Euroclear, which were subsequently addressed.

LCH clearing of DBV repos

The Group has also continued to monitor the progress and contribute views on LCH.Clearnet's initiative to extend its central counterparty clearing service for gilt repo transactions to deliveries of gilts through CREST's delivery-by-value (DBV) service, which launched on 14 March 2007. The launch occurred with no technical or procedural problems and trading volumes had grown steadily.

Foreign currency reserves

There have been no significant developments in the Bank's holdings of foreign exchange reserves over the review period. The assets held in the reserves are currently funded by two liabilities: a euro-denominated note which matures on 28 January 2008 and the new programme of annual bond issuance which commenced in March 2007. Upon maturity of the 2008 Note, the level of reserves will fall from the current level of just over £2 billion to around £1 billion until the subsequent bond issue, due in March 2008, and which is planned to take the level back up to £2 billion. At present, the steady state of the Bank's foreign exchange reserves is planned to be around £3 billion.

Capital portfolio

The Bank holds an investment portfolio that is approximately the same size as the Bank's capital and reserves (net of equity holdings, eg in the BIS and ECB, and the Bank's physical assets) together with aggregate cash ratio deposits. The Bank's 'free' capital and cash ratio deposits are invested in a portfolio 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 bond portfolio currently includes around £2 billion of gilts and £1 billion of other debt securities. Purchases are generally made each month with purchase details announced in advance on the Bank's wire services pages. Over the current review period, gilt purchases were made in accordance with the announcement on 24 September: £20 million each in September and October.

The remainder of the Bank's capital and reserves are invested in short-term repos, which are conducted as part of the Bank's OMOs.

Customer deposits

Over the review period, the Bank's consolidated balance sheet increased (**Table B**). As well as higher reserves targets, this reflected higher balances held by central bank customers. In common with many central banks, the Bank provides banking services to other central banks.

Special term auctions against wide collateral

On 19 September, the Bank announced plans to conduct a series of special auctions to provide funds at three-month maturity against a much wider range of collateral than is eligible in the Bank's OMOs and standing facilities. A Market Notice⁽¹⁾ issued on 21 September provided detailed operational

Table B Simplified version of Bank of England consolidated balance sheet^{(a)(b)}

£ billions					
Liabilities	7 Nov.	5 Sep.	Assets	7 Nov.	5 Sep.
Banknote issue	41	41	Short-term sterling reverse repo	21	36
Reserves account balances	22	21	Long-term sterling reverse repo	15	15
Standing facility deposits	0	0	Ways and Means advance	13	13
Other sterling deposits, cash ratio deposits and the Bank of England's capital and reserves	14	10	Standing facility assets	0	0
Foreign currency denominated liabilities	17	12	Other sterling-denominated assets	24	4
			Foreign currency denominated assets	21	16
Total^(c)	94	84	Total^(c)	94	84

(a) The Bank Charter Act 1844 requires the Bank of England to separate the note issue function from its other activities. Accordingly, the Bank has two balance sheets: for Issue Department and Banking Department.

See 'Components of the Bank of England's balance sheet' (2003), *Bank of England Quarterly Bulletin*, Spring, page 18.

(b) Based on published weekly Bank Returns. The Bank also uses currency, foreign exchange and interest rate swaps to hedge and manage currency and non-sterling interest rate exposures — see the Bank's 2006 *Annual Report*, pages 36–37.

(c) Figures may not sum to totals due to rounding.

(1) www.bankofengland.co.uk/markets/money/documentation/statement070921.pdf.

information on the term auctions. These auctions were offered in order to alleviate the strains in longer-maturity money markets, and wider financial markets.

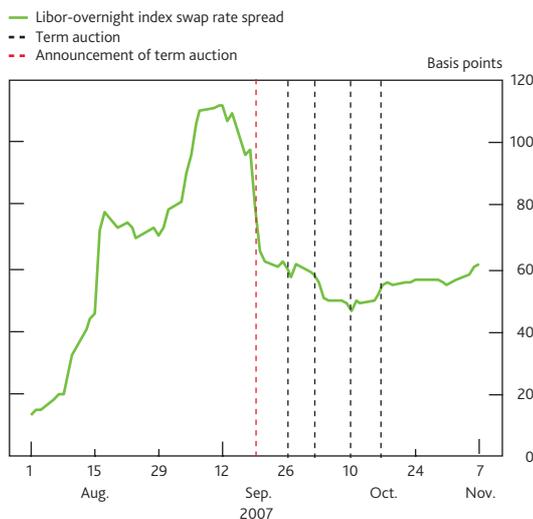
Banks eligible to participate in the auction were reserves account holders and banks and building societies with access to the Bank's standing facilities. Bids in the auctions were to be submitted as a spread to Bank Rate prevailing over the term of the auction, with a minimum spread equal to the spread between the Bank's standing lending facility rate and Bank Rate (100 basis points). The auctions were held at a variable rate on a discriminatory rate basis.

These operations were held against a much wider range of collateral than is eligible in the Bank's open market operations. In addition to the collateral eligible in regular OMOs, the Bank accepted a range of other securities. The Bank also offered to make loans secured against raw mortgages. Details of eligible securities for repo transactions, together with margin ratios, were provided in the Market Notice.

The margin ratios determined the value of collateral delivered to the Bank against lending in the auctions. The value of collateral taken by the Bank would have been higher than the loan amount. This was in order to protect the Bank from changes in market value of the securities in the case that a counterparty defaulted on a transaction and the Bank had to bring the collateral onto its balance sheet.

The Bank offered £10 billion in each of four operations held on 26 September and 2, 10 and 17 October. The term of each borrowing was approximately three months.

Chart 45 Three-month sterling Libor spread to three-month OIS



In the period between the announcement of the term auctions and the date of the first auction, there was a significant narrowing in the spread between three-month market interbank interest rates and measures of the expected path of Bank Rate (**Chart 45**). Partly as a result of this, no bids were received in any of the term auctions because obtaining funds in the auction became expensive relative to prevailing market rates. And without the prospect of large-scale participation, some banks may have been deterred from bidding owing to the reputational risk if their usage of the facility became widely known.

No further term auctions have been held since 17 October. The Bank announced that it would consider re-introducing term auctions at any time if market conditions warranted.

Household debt and spending: results from the 2007 NMG Research survey

By Matt Waldron of the Bank's Structural Economic Analysis Division and Garry Young of the Bank's Monetary Assessment and Strategy Division.

This article summarises the main results from the latest survey carried out for the Bank by NMG Research in late September about the state of household finances. There was a slight increase in financial pressure among renters, continuing a recent trend. Mortgagors appeared not to have experienced any increased difficulty despite the increase in policy rates over the year. Partly, this reflects the widespread use of fixed-rate mortgage products. Credit conditions appeared to have tightened a little for renters, but loosened for mortgagors over the year to September.

Introduction

A key question for monetary policy makers in many countries is whether the build-up of household debt in recent years has affected the way in which households respond to changes in interest rates and economic conditions more generally.⁽¹⁾ That question is particularly pertinent for UK monetary policy at the moment in view of the five increases in Bank Rate in the year to July 2007 and the possibility that changes in credit market conditions since August might affect household borrowing and consumption.⁽²⁾ Because the response to these events is likely to vary substantially across households, it is important to examine disaggregated data to assess their effects.

In late September 2007, NMG Research surveyed a representative sample of around 2,000 people on behalf of the Bank and asked them a range of questions about their finances.⁽³⁾ These included questions about how much debt households owed, whether their borrowing was secured or unsecured, whether they found it to be a burden and whether they had experienced difficulty accessing further credit. The survey is the fifth that the Bank has conducted on household finances.⁽⁴⁾ This year, the survey included additional questions on how much mortgage payments had increased and how the households affected by this had financed their extra outgoings. A box in the November 2007 *Inflation Report* (page 21) summarised some key results from the survey. This article describes these results in more detail.⁽⁵⁾

Taken together with information from successive waves of the British Household Panel Survey (BHPS), the survey sheds light on trends in the financial position of British households since 1991, the first wave of the BHPS. This article includes data from the 2005 wave of the BHPS (published in April 2007). In both the BHPS and NMG surveys, care must be taken in

interpreting small changes in results from year to year because they may not be a reliable guide to changes in the population as a whole.⁽⁶⁾ This issue is particularly important when subsets of the survey population are analysed. In such cases, the number of households under consideration might not be large enough to reduce the influence of outlying observations. The possibility that some of the changes in the survey might reflect sampling variation should be borne in mind throughout this article.

In addition, although the survey post-dated some of the recent financial market turbulence, it was conducted too soon afterward to pick up any changes in household credit conditions that might occur as a result. As such, the survey is unlikely to provide any information about the effect of the financial market disruption on household finances or spending.

Participation in the debt markets

It is useful to distinguish between households who own their homes outright, mortgagors and renters. Past surveys have shown that outright owners tend to have very little debt and experience few problems in servicing it. Most debt is owed by mortgagors, where for most that debt is backed by substantial amounts of housing collateral. Partly as a result, mortgagors tend to report fewer problems servicing their debts than

(1) For recent Bank research on this issue see Benito, Waldron, Young and Zampolli (2007). For recent analyses of other countries see, for example, Dynan and Kohn (2007) and Girouard, Kennedy and Andre (2007).

(2) See for example, the latest *Inflation Report* published in November 2007.

(3) Some more detailed information about the survey is included in the box on page 520.

(4) See Waldron and Young (2006) for details of the previous survey.

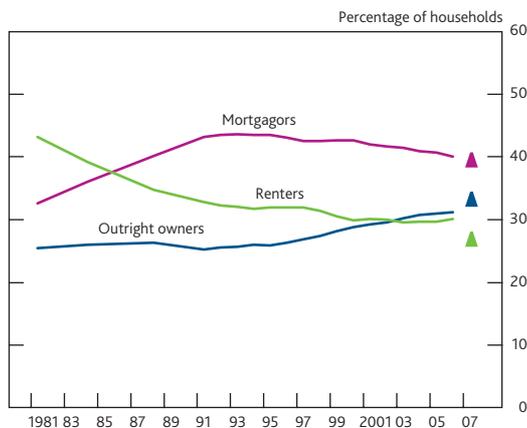
(5) The raw survey data are provided at www.bankofengland.co.uk/publications/quarterlybulletin/nmgsurvey2007.xls.

(6) In principle, the BHPS should be more reliable and subject to lower sampling variation than the NMG survey. That is because it surveys around twice as many households, most of whom are surveyed over a number of consecutive years.

renters, who tend to be less well off and do not have housing equity to draw on when their financial circumstances worsen.

In the 2007 NMG survey, 40% of households were mortgagors, 33% owned their homes outright and the remaining 27% were renters. The proportion of mortgagors was similar to the proportion in the 2006 Survey of English Housing (SEH).⁽¹⁾ The SEH suggests that the proportion of mortgagors and renters in the population has gradually declined since the early 1990s, while the proportion of households who own their homes outright has risen (Chart 1).

Chart 1 Trends in housing tenure

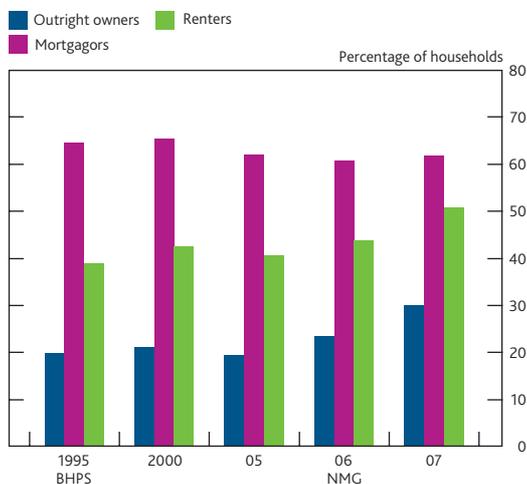


Notes: Triangles are from the 2007 NMG survey. All other data are from the Survey of English Housing (SEH). The data in the chart have been interpolated prior to 1991 because the SEH was not conducted annually until that year.

Sources: NMG Research survey, SEH and Bank calculations.

A higher proportion of mortgagors have unsecured debt than either renters or outright owners (Chart 2). In fact, mortgagors owed around 97% of the total amount of debt identified in the survey: 100% of the secured debt and 65% of

Chart 2 Proportion of households with unsecured debt by housing tenure^(a)



Sources: British Household Panel Survey, NMG Research survey and Bank calculations.

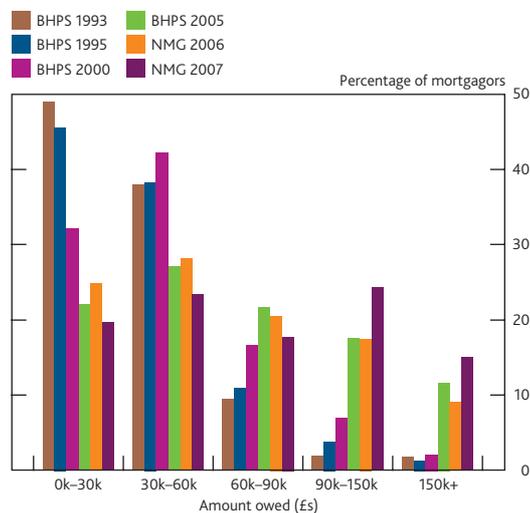
(a) The most widely used forms of household unsecured debt are credit cards, personal loans, overdrafts and hire purchase arrangements.

the unsecured debt. This means that understanding how debt is distributed among mortgagors and how they react to changes in interest rates is vital in assessing the implications of debt for monetary policy.

Distribution of debt among mortgagors

Chart 3 shows a rightward shift over time in the distribution of secured debt among mortgagors: the number of mortgagors with small mortgages has fallen and the number with large mortgages has risen. Higher house prices have meant that new entrants to the housing market have had to borrow larger amounts to finance house purchase than did their predecessors (Hamilton (2003)).

Chart 3 Distribution of secured debt among mortgagors



Notes: Mortgage debt from the BHPs captures mortgage debt owed by households on all properties they own. Mortgage debt from the NMG Research surveys only captures mortgage debt owed on households' primary residences. The 1993 wave of the BHPs was the first to ask households how much secured debt they owed.

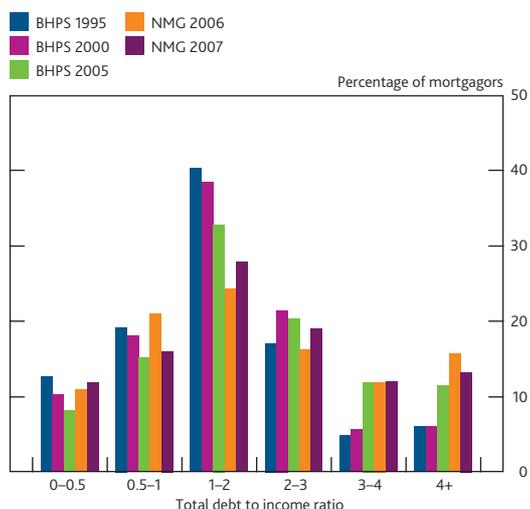
Sources: British Household Panel Survey, NMG Research survey and Bank calculations.

That a higher proportion of households owed large amounts of secured debt than in previous surveys does not necessarily imply that mortgagors' debts had become less affordable. The affordability of debt also depends on the incomes of individual households. Chart 4 shows that the ratio of total debt (secured and unsecured debt) to income of mortgagors had become more widely dispersed.⁽²⁾ Around a quarter of mortgagors owed more than three times their pre-tax annual household income. That was broadly the same as in 2005 and 2006, but much higher than in the 1995 and 2000 waves of the BHPs, in which only around 10% of mortgagors were in that position.

(1) The SEH is an annual household survey in England conducted by the National Centre for Social Research. Its core purpose is to provide descriptive information about housing in England. See Benito and Power (2004) for more details.

(2) Almost 30% of mortgagors owed more than £5,000 in addition to their mortgage debt. That percentage was higher than in the 2006 NMG survey, but lower than in the 2005 wave of the BHPs.

Chart 4 Distribution of debt to income ratios among mortgagors



Notes: Mortgage debt from the BHPS captures mortgage debt owed by households on all properties they own. Mortgage debt from the NMG Research surveys only captures mortgage debt owed on households' primary residences. Mortgagors with reported debt to income ratios exceeding ten have been excluded from the sample on the grounds that their responses may have been spurious. Questions about unsecured debt are only included in the BHPS every five years; 1995, 2000 and 2005.

Sources: British Household Panel Survey, NMG Research survey and Bank calculations.

The impact of higher mortgage interest rates on household finances

Mortgage interest rates had risen over the year to September, driven largely by increases in Bank Rate. Bank Rate was 5.75% at the time the 2007 survey was conducted, 100 basis points higher than in September 2006. In order to assess the impact of higher mortgage rates on the financial position of different households, this year's survey included some new questions. Mortgagors were asked about the type of mortgage they had, by how much their mortgage repayments had increased over the twelve months preceding the survey (or how much they were expected to increase) and how they had responded to those increases (or how they planned to respond).

The effect of changes in mortgage rates on the repayments of an individual household depends on a number of factors. Of key importance is whether the household has a variable-rate or fixed-rate mortgage. For those with variable-rate mortgages, mortgage rates typically tend to rise in line with Bank Rate with a one-month lag. But for those with fixed-rate deals, the mortgage rate only changes when the term of the fix expires. This means that some mortgagors would have experienced no change in their mortgage repayments over the year because they had been on continuing fixed-rate deals. In addition, for those whose fixed-rate deals had expired, the change in their mortgage repayments would have depended largely on the rate at which their previous mortgage deal was agreed. Rates would have increased the most for those whose fixed rate had been agreed in the middle of 2003 when the policy rate was at 3.5% and longer-term household borrowing

rates were historically low.⁽¹⁾ But for others, rates may not have increased at all.

The effect of changes in mortgage rates on the repayments of an individual household also depends on the size of their mortgage and, if they have a standard repayment mortgage, the remaining term of the mortgage. For example, monthly repayments on a standard repayment mortgage of £75,000 to be repaid over ten years amount to £795.49 when mortgage rates are 5% and £832.65 when rates are 6%, a difference of £37.16. But the difference is £42.35 for a mortgage being repaid over 20 years and £62.50 for an interest-only mortgage.⁽²⁾

Table A outlines some key facts about three different types of mortgagor identified in the survey: those who had continuing variable-rate mortgages (column 1), those who had fixed-rate mortgage deals that expired in the twelve months preceding the survey (column 2) and those who had continuing fixed-rate mortgage deals which had not expired in the twelve months preceding the survey (column 3). **Table A** shows the

Table A Characteristics of mortgagors and changes in repayments by types of mortgage

	Mortgagors on continuing variable-rate deals	Mortgagors who had a fixed-rate deal that expired during the preceding twelve months	Mortgagors on continuing fixed-rate deals
Percentage of mortgagors	46	16	38
Mean pre-tax income (£s)	49,409	48,795	47,029
Mean outstanding mortgage balance (£s)	78,570	95,008	98,679
Mean mortgage loan to house value (per cent)	32	51	45
Mean age of respondent (years)	44	38	42
Distribution of actual or expected changes in monthly repayments (per cent)			
Haven't increased or not expected to increase	6	21	24
£1-£39	56	26	18
£40-£79	18	22	19
£80-£119	13	17	26
£120-£159	3	8	4
£160-£199	4	0	4
More than £200	0	5	5
Mean change in monthly repayment (£s) ^(a)	45	59	66
Mean percentage change ^(b)	8	12	14

Sources: NMG Research survey and Bank calculations.

(a) Households were not given the opportunity to say that their mortgage repayments had gone down (or were expected to go down). Few households would be in that position, but any that were would be counted here as having no change in their repayments, rather than a decrease. As such, the calculated mean change in repayment may marginally overstate the true mean change among mortgagors in each group.

(b) Mean change as a percentage of those mortgagors' average monthly mortgage repayments prior to the change in their repayments.

(1) In June 2003, average quoted rates for borrowers with loan to value ratios of 75% or less were 3.85% for two-year fixes, 4.2% for three-year fixes and 4.36% for five-year fixes. The corresponding rates in September 2007 were 6.04%, 6.42% and 6.15% respectively.

(2) See the FSA mortgage calculator available at www.moneymadeclear.fsa.gov.uk/tools/mortgage_calculator.html.

distribution of reported changes in monthly mortgage repayments for those who had continuing variable-rate deals and for those who had fixed-rate deals which had expired over the year. It also outlines the distribution of changes that those on continuing fixed-rate deals were expecting to experience when their current fixed-rate deals eventually expire.

Just under 50% of mortgagors said that they had had a variable-rate mortgage of some description over the year to September 2007. The survey suggests that variable-rate mortgagors tend to have different characteristics to fixed-rate mortgagors: on average they owe less (around £79,000 compared with £95,000 for those on fixed-rate deals) and have a lower loan to value ratio (around 30% compared with 50% for those on fixed-rate deals), consistent with them having shorter remaining terms on their mortgages. Over the year until September 2007, their mortgage repayments went up by an average of £45 per month, equivalent to 8% of their average monthly mortgage repayments.⁽¹⁾ There is some variation around the reported changes in repayments reflecting different outstanding amounts of debt, different terms to maturity, different types of repayment vehicle, as well as inaccurate responses.

The change in repayments of those whose fixed-rate deal had expired in the twelve months prior to the survey would have depended on when their previous deal had been taken out. Altogether 16% of mortgagors in the survey said that they had been on a fixed-rate deal that had expired over the year. Of these, 21% said that their repayments had not increased. But mortgage repayments had gone up for most: on average repayments had increased by £59 per month or about 12% of those mortgagors' average monthly repayments. The repayments of about a quarter of the households whose fixed-rate deals had expired had risen by more than 20%, equivalent to 3% of their monthly pre-tax incomes.

When aggregated across the UK population, these figures imply that mortgage repayments for those whose fixed-rate deals had expired in the twelve months preceding the survey had gone up by around £300 million per quarter, equivalent to 0.1% of aggregate disposable income.⁽²⁾ When the increases in mortgage payments experienced by those with variable-rate mortgages are included, mortgage repayments for existing borrowers were around £900 million per quarter higher than they would have been if there had been no change in mortgage rates over the past year (see the box opposite). This is equivalent to just over 4% of aggregate interest payments made by the household sector⁽³⁾ and around 0.4% of aggregate disposable income.

The remaining 38% of mortgagors were on fixed-rate deals that had not yet expired and so had not yet experienced an increase in repayments. On average, they were expecting their payments to go up by £66 per month when their

current fixed-rate deals expired, equivalent to 14% of their current monthly mortgage repayments. Of those, 23% said that their current deal was due to expire within the next twelve months, a further 20% within the next 24 months, while 50% thought that their deal would not expire within the next 24 months.⁽⁴⁾

Aggregating the change in mortgage repayments in the survey

The payments were aggregated as follows.

(1) The mean change in repayments was calculated for each group: £45 for variable-rate mortgagors and £59 for mortgagors who had fixed-rate deals which expired during the twelve months preceding the survey (Table A).

(2) These mean changes were weighted by the proportion of each group in the mortgagor population: 46% and 16% respectively (Table A), giving $0.46 \times £45 + 0.16 \times £59 \approx £21 + £10$.

(3) This was weighted by the proportion of mortgagors in the survey population as a whole: 40% (Chart 1), $0.4 \times (£21 + £10) \approx £8 + £4$.

(4) This was multiplied by an estimate of the number of households in the UK population in 2006 (just under 26 million)⁽¹⁾ to give the aggregate monthly change in mortgage repayments implied by the survey: $26 \text{ million} \times (£8 + £4) \approx £200 \text{ million} + £100 \text{ million}$.

(5) Finally, this was multiplied by three to give the quarterly change: $3 \times (£200 \text{ million} + £100 \text{ million}) \approx £600 \text{ million} + £300 \text{ million} \approx £900 \text{ million}$.

(1) The UK household population estimate is the sum of estimates for Great Britain from the Department for Communities and Local Government, and for Northern Ireland from the Northern Ireland Statistics and Research Agency.

(1) Given the increase in Bank Rate over the past year, that is broadly in line with the increase that would have been expected for a variable-rate mortgagor on a standard repayment mortgage with around ten years until maturity and an outstanding mortgage balance of around £79,000 (the mean for that group).

(2) This figure is consistent with a similar calculation published in the August 2007 *Inflation Report* (page 12).

(3) This is less than the increase in total interest payments of the household sector over the same period as that would also include unsecured interest payments and, importantly, the interest payments of new borrowers. Over the year to 2007 Q2, seasonally adjusted interest payments of the household sector increased from £17.8 billion to £21.0 billion, a change of £3.2 billion per quarter.

(4) The remaining 7% said they did not know when their fixed-rate deal was due to expire.

The increase in mortgage repayments represents a loss in disposable income that requires some adjustment to household budgets. Households who said that their mortgage repayments had already increased were asked how they had responded to those increases. **Table B** jointly details the responses of those who had been on continuing variable-rate mortgages and of those whose fixed-rate deals had expired. Around half of households had cut back on spending to meet their increased interest payments. Around 10% had increased the amount they worked and a similar proportion had made some financial adjustment, such as running down their savings or borrowing more.

Table B Responses to higher mortgage repayments^{(a)(b)}

	What were the main ways by which you met the increased payments?
Percentage that mentioned:	
Cut back on spending	50
Took a second job or increased overtime	10
Sold financial assets	8
Borrowed more	7
Reduced regular monthly saving	7
Extended term of mortgage	2
Other/none of these	23
Don't know	3

Sources: NMG Research survey and Bank calculations.

(a) Among variable-rate mortgagors and those whose fixed-rate deals had expired.
 (b) Households were permitted to make multiple responses, so figures do not add up to 100.

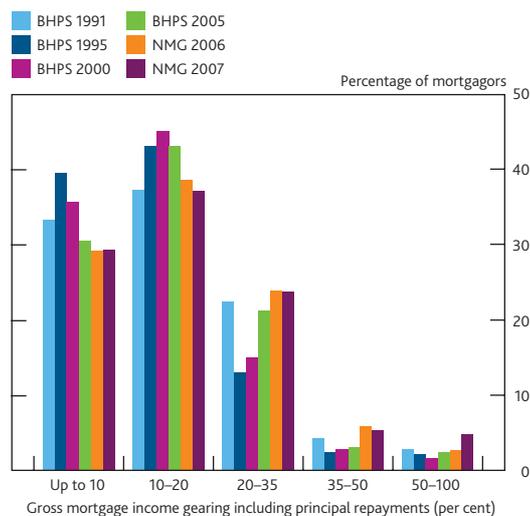
A similar question was put to those who expected their mortgage interest payments to increase when the terms of their fixed-rate deals eventually expired. When asked how they would respond to this increase, 39% said they would cut back on spending when the time came, 9% said they would take a second job or increase their overtime, and 8% said they had already started to cut back on spending.

Repayment difficulties among mortgagors

One measure of how increased interest rates and indebtedness over the past year have affected the affordability of debt is the share of household income that is devoted to servicing that debt. This varies significantly across households. **Chart 5** shows how the proportion of households' gross incomes that is spent on mortgage repayments is distributed. A slightly higher proportion of mortgagors in the 2007 NMG survey devoted a relatively large share (more than 20%) of their pre-tax incomes to debt service than was the case in the 1991 wave of the BHPS, when nominal interest rates were over 10%.⁽¹⁾

As in past surveys, evidence on the amount owed and its affordability was complemented by asking households directly whether they had experienced problems meeting their debt obligations. The proportion of mortgagors reporting problems

Chart 5 Distribution of mortgage income gearing

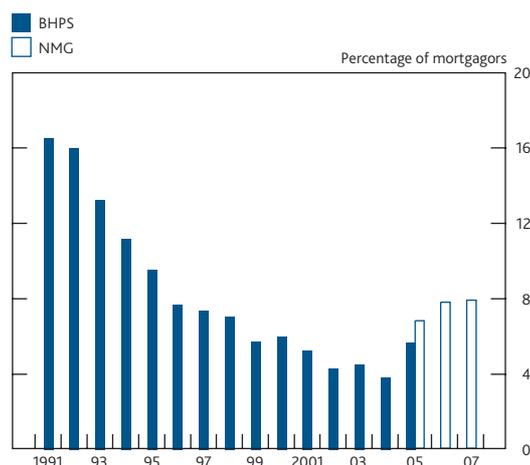


Notes: The 1991 wave of the BHPS was the first year the survey was conducted. Mortgagors who said that their repayments exceeded their pre-tax incomes were excluded from the sample on the grounds that their responses may have been spurious.

Sources: British Household Panel Survey, NMG Research survey and Bank calculations.

paying for their accommodation remained at 8% in 2007 (**Chart 6**). That is around half the level reported in the BHPS in 1991. Households who reported problems paying for their mortgages tended to have more debt and lower income than those who did not have problems.⁽²⁾ They accounted for less than 5% of the total income of all households and about 9% of the debt. Consistent with variable-rate mortgagors tending to have less debt relative to their incomes than fixed-rate mortgagors (**Table A**), only 6% of those with

Chart 6 Mortgage payment problems^(a)



Sources: British Household Panel Survey, NMG Research survey and Bank calculations.

(a) Question: 'Many people these days are finding it difficult to keep up with their housing payments. In the past twelve months would you say you have had any difficulties paying for your accommodation?'

(1) Econometric evidence suggests that mortgage payment problems become more likely when mortgage income gearing exceeds 20% (May and Tudela (2005)).

(2) The mean debt of mortgagors reporting mortgage payment problems was £102,453 against £90,539 who reported no problems. The mean income of mortgagors reporting mortgage payment problems was £36,056 against £48,912 who reported no problems.

variable-rate mortgages reported problems paying for their accommodation, compared to 22% of those whose fixed-rate deals had expired in the year preceding the survey. This was appreciably higher than the 5% of mortgagors on continuing fixed-rate deals who reported problems.

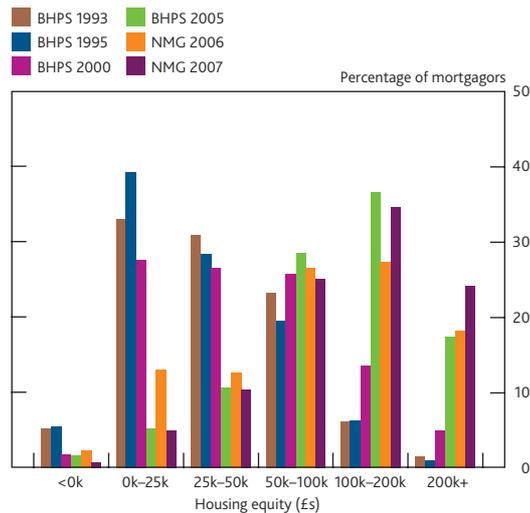
If mortgagors are currently devoting a similar proportion of their incomes to debt repayments as in 1991, why is a similar proportion not reporting difficulties paying for their mortgage? There are several candidate explanations. First, interest rates increased sharply from 7.5% at the end of May 1988 to 15% by the end of September 1990, and remained at over 10% throughout 1991. Given the size and speed of that increase, it is quite likely that it was unanticipated by many households. Whereas increases over the past year are less likely to have been as surprising. In that sense, the distributions of debt and income gearing observed today are more likely to reflect household choices, so it is perhaps less surprising that households are currently more comfortable with their debts than they were in the early 1990s.

Second, as highlighted by Benito *et al* (2007), it is likely that the more favourable economic environment at the time of the most recent survey has meant that households have been able to adjust to changes in their circumstances and repayments in ways that were not available to them in the early 1990s. For example, some households may have responded by increasing their labour income, either by additional members of the household going out to work (Bottazzi, Low and Wakefield (2007)), by taking a second job (Boheim and Taylor (2004)) or by increasing the number of overtime hours worked. As an example of that, **Table B** showed that a significant minority of mortgagors said that they had reacted to increased mortgage payments by working longer hours. One implication of this is that the ability of households to adjust to changes in their circumstances is likely to vary as the macroeconomic environment varies.

Third, relative to the early 1990s, mortgagors have deep wells of housing equity to draw on should they experience temporary problems servicing their debts. As well as raising the amount that new entrants to the housing market have had to borrow, higher house prices have also raised significantly the housing equity of existing homeowners. In recent years the proportion of mortgagors with small amounts of equity in their homes was substantially lower than it had been in the mid-1990s (Chart 7). At the other end of the distribution, around 60% of mortgagors had more than £100,000 of equity in their homes, compared to less than 10% in 1993 (the first year in which the BHPs included information on households' outstanding balances of secured debt). Mortgagors with substantial amounts of equity in their homes can borrow against it to tide them over should they experience temporary difficulties. 4% of mortgagors in the 2007 NMG survey said they had withdrawn some of the equity in their

homes over the preceding twelve months to consolidate debts, an increase on previous years.⁽¹⁾ This illustrates that, because most mortgagors have built a significant cushion of housing equity that could be used as collateral for additional borrowing, aggregate consumer spending may not be particularly sensitive to modest falls in house prices, see Benito *et al* (2006).

Chart 7 Distribution of housing equity



Notes: Mortgage debt from the BHPs captures mortgage debt owed by households on all properties they own. Mortgage debt from the NMG Research surveys only captures mortgage debt owed on households' primary residences. Mortgagors with loan to value ratios exceeding 200% have been excluded from the sample on the grounds that their responses may have been spurious. The 1993 wave of the BHPs was the first to ask households how much secured debt they owed.

Sources: British Household Panel Survey, NMG Research survey and Bank calculations.

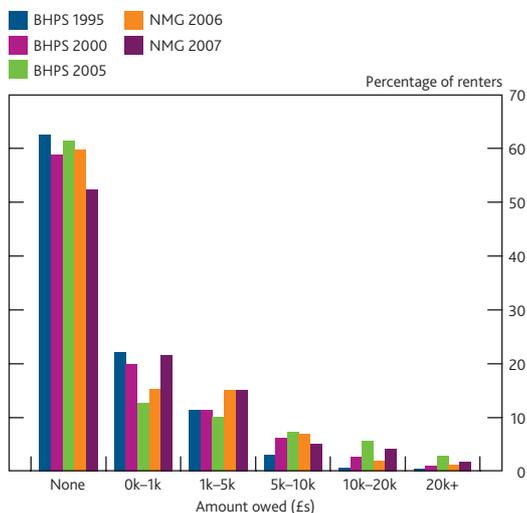
Given that mortgagors' unsecured borrowing accounts for around 65% of the total outstanding stock of unsecured debt, the extent to which mortgagors found their unsecured debts to be a burden to them is also of relevance. In the 2007 survey, 6% of mortgagors reported that their unsecured debts were a heavy burden to them, a small increase on previous years. There was a large overlap between mortgagors reporting problems paying their mortgage and mortgagors reporting that their unsecured debt was a burden to them. Of those reporting problems paying for their mortgage, 84% had some form of unsecured debt and 92% of those said that their unsecured debt was either somewhat of a burden or a heavy burden.

(1) In the 2007 survey, the proportion of mortgagors withdrawing equity in the twelve months preceding the survey was 10%, lower than in 2005 and 2006, in which 13% and 14% of mortgagors said they had withdrawn equity. Of the 10% in the 2007 survey who said they had withdrawn equity, 52% said they had done so to make home improvements, 36% to consolidate debts and 14% to buy goods for the home. Respondents were allowed to cite more than one reason for withdrawing equity so the percentages do not sum to 100.

Distribution of debt and repayment difficulties among renters

Chart 8 shows how unsecured debt was distributed across the renters responding to the survey. Around half had some unsecured debt, higher than in previous years: the proportion of renters with unsecured debt had risen from 37% in the 1995 wave of the BHPS to 51% in the 2007 NMG survey. The amount owed by most renters tended to be relatively small: only around 10% of renters owed more than £5,000, while only 1% of renters had unsecured debts in excess of their annual pre-tax income. That had fallen from 4% in the 2006 survey and 2% in the 2005 survey.

Chart 8 Distribution of unsecured debt among renters

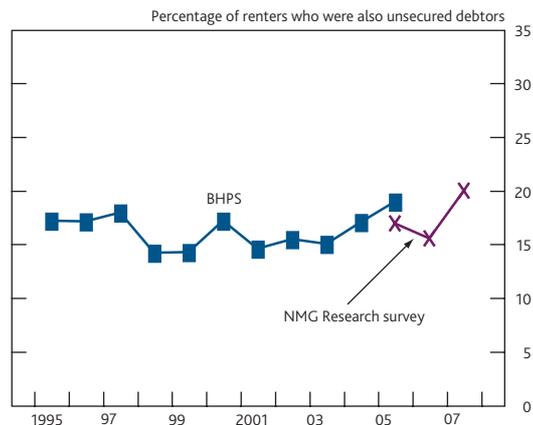


Note: Questions about how much unsecured debt households owe are only included in the BHPS every five years; 1995, 2000 and 2005.

Sources: British Household Panel Survey, NMG Research survey and Bank calculations.

A minority of renters, who do not have housing equity to fall back on, were experiencing difficulties in servicing their debts. About 20% of renters with unsecured debts said that their debts were a heavy burden. As with mortgagors, the proportion of renters who said that their unsecured debt was a heavy burden was a little higher than last year (**Chart 9**). However, although an increased proportion of renters said that they were having difficulties with their debts, the fraction of aggregate income and debt they accounted for remained small. Overall, renters for whom unsecured debt was a heavy burden accounted for just over 1% of the total income of all households in the survey and about 5% of the unsecured debt (0.4% of the total debt in the survey), a similar proportion to previous years. So, despite the increased incidence of debt repayment problems among renters over the past few years, the implications for monetary policy remain small.

Chart 9 Burden of unsecured debt among renters^(a)



Sources: British Household Panel Survey, NMG Research survey and Bank calculations.

(a) Question: 'To what extent is the repayment of these loans and the interest a financial burden on your household?' The chart shows the percentage of renters with unsecured debt who said that their debt is a heavy burden.

What are the causes of debt repayment difficulties and how do households respond to them?

In addition to specific questions about the burden of unsecured debt and mortgage payment problems, households were also asked 'do you ever have problems paying your debts?'. As was the case in last year's survey, the majority of households said that they never had any problems paying their debts.⁽¹⁾ Renters were far more likely to report problems paying for their debts than homeowners. 28% of renters reported problems paying for their debts at least occasionally, compared to 15% of mortgagors and 6% of outright owners. For renters that was an increase of 4 percentage points from last year's survey.

Those respondents who said that they had problems paying for their debts were asked what had caused them. As last year, the two most frequently cited reasons by both renters and mortgagors were 'lack of cash flow that has been or will be resolved in the future' and 'overspending', though the proportion who cited a lack of cash flow had increased this year to around half the respondents who said they had problems paying for their debts (**Table C**). Renters were more likely than mortgagors to cite factors representing shocks to household circumstances like unemployment, higher-than-expected household bills and higher-than-expected interest rates. But overall, as in last year's survey, it would appear that most households saw their debt problems as either temporary or arising from circumstances within their control.

(1) There is a high, but not complete, overlap between households who said they at least occasionally had debt problems and those who said that their unsecured debt is a burden and those that said they were having problems paying for their accommodation. The proportion of households who reported having no problems of any kind is 57% for renters, 69% for mortgagors and 88% for outright owners.

Table C Reasons for debt problems^{(a)(b)}

	Renters		Mortgagors	
	2006	2007	2006	2007
Percentage that mentioned:				
Lack of cash that has been or will be resolved in future	36	48	34	54
Overspending	29	25	27	28
Unemployment	16	17	5	3
Higher-than-expected household bills	15	17	10	11
Loss of income through reduction or cessation of overtime	12	5	9	1
Children's school or university fees	7	3	2	4
Illness	6	8	6	3
Divorce or separation	5	4	4	4
Debt legacy from being a student	4	2	1	2
Redundancy	3	4	2	0
Credit card and other loan offers were too tempting	2	2	4	3
You or your partner leaving work to have a child	2	8	6	2
Higher-than-expected interest rates	–	13	–	12
Other	4	2	9	7
Don't know	4	1	11	1

Sources: NMG Research survey and Bank calculations.

(a) Question: 'What are the main reasons for the problems you have in repaying your debts?'
 (b) Households were permitted to make multiple responses, so figures do not add up to 100.

Households who said that they had problems repaying their debts were also asked what action they would consider taking to resolve them. The responses are shown in **Table D**. As in 2006, the most frequently cited response by both renters and mortgages was to cut back on spending, although the proportion saying they would do this fell relative to 2006. This dominated all other suggested responses with only a small proportion saying they would borrow more, remortgage their house or declare themselves insolvent (either by bankruptcy or an Individual Voluntary Arrangement (IVA)).⁽¹⁾

Table D Action to resolve debt problem^(a)

	Renters		Mortgagors	
	2006	2007	2006	2007
Percentage that mentioned:				
Cut back on spending	64	43	55	46
Take out another mortgage on your house	–	–	7	2
Take out another loan	4	7	8	8
Declare your self insolvent (ie bankruptcy or IVA)	5	6	2	0
Sell your house	–	–	6	2
Other/none of these	26	40	22	40
Don't know	–	4	–	2

Sources: NMG Research survey and Bank calculations.

(a) Question: 'What action would you consider taking to resolve your debt problems?'

Credit conditions

To assess how credit conditions for households may have changed over the year to late September, the survey included questions on whether households felt themselves to be

constrained in the amount they could borrow. The questions covered both perceived constraints that discouraged households from applying for credit, and actual constraints where the household was prevented from borrowing either by the unavailability of credit or its high price. 14% of respondents claimed to be facing a perceived or actual credit constraint, marginally lower than in the 2006 survey. **Table E** shows that around a quarter of renters identified themselves as credit constrained, much higher than the proportions of mortgagors and outright owners. Compared to the 2006 survey, this proportion had gone up slightly, whereas that for mortgagors and outright owners had gone down slightly. **Table E** also shows that households who considered themselves to be constrained tended to be younger, have more unsecured debt and were more likely to be experiencing problems with their debts. Constrained mortgagors had higher existing repayment commitments (income gearing ratios) and larger outstanding mortgage balances as a percentage of the value of their homes (loan to value ratios).

Table E Characteristics of credit-constrained households^(a)

	Unconstrained	Constrained
Renters		
Percentage of households	73	27
Mean age (years)	41	38
Mean pre-tax income (£s)	20,721	21,096
Mean unsecured debt (£s)	1,522	2,796
Proportion experiencing debt problems (per cent)	26	68
Mortgagors		
Percentage of households	86	14
Mean age (years)	41	40
Mean pre-tax income (£s)	49,306	38,070
Mean unsecured debt (£s)	3,445	8,751
Mean mortgage debt (£s)	90,188	80,166
Mean loan to value ratio (per cent)	38	46
Mean mortgage income gearing (per cent)	18	22
Proportion experiencing debt problems (per cent)	23	72

	Unconstrained	Constrained
Outright owners		
Percentage of households	95	5
Mean age (years)	62	57
Mean pre-tax income (£s)	27,537	19,039
Mean unsecured debt (£s)	997	5,436
Proportion experiencing debt problems (per cent)	9	64

Note: Households were treated as having experienced debt problems if they said that they were having trouble paying for their accommodation or if they said that their unsecured debt was a burden or if they said that they ever had problems paying for their debts.

Sources: NMG Research survey and Bank calculations.

(a) Questions: 'Have you been put off spending because you are concerned that you will not be able to get further credit when you need it, say because you are close to your credit limit or think your loan application would be turned down?' 'Would you like to borrow any more at the moment but find it too difficult or expensive to do so?' 'Have you found it easier or harder to borrow to finance spending than a year ago?'

(1) An IVA is an agreement, whereby the borrower agrees a repayment plan with the lender as an alternative to bankruptcy.

Respondents were asked whether they found it easier or harder to borrow to finance spending than a year earlier; 22% said it was easier, while 16% said it was harder and the rest thought lending conditions had not changed. Within that, the proportion of renters who reported that they had found it harder to get credit over the year preceding the survey had gone up, while the proportion of homeowners who reported that had gone down.

Summary and conclusions

The latest survey updates analysis from previous years of how debt is distributed among households. As in previous years almost all of the reported debt was owed by mortgagors, the vast majority of whom report few problems in servicing it.

The increases in mortgage rates over the year preceding the survey had not been associated with an increase in the proportion of mortgagors reporting problems paying for their accommodation, which remained at about 8%. That was substantially lower than in the early 1990s despite the fact that mortgagors were devoting a similar proportion of their pre-tax incomes to servicing their debts. Moreover, households reporting problems paying for their accommodation accounted for only about 3% of the total income reported in the survey. As such, these problems are currently unlikely to have large implications for monetary policy because any effect that they might have had on aggregate consumer spending is likely to have been small.

One reason why fewer mortgagors have been reporting problems paying for their accommodation than in the

Survey method

The survey was undertaken by adding 25 questions to the monthly omnibus survey, MarketMinder, carried out by NMG Research. Interviews were conducted in the respondents' homes using Computer Assisted Personal Interviewing (CAPI). Altogether 1,857 people were interviewed between 21 and 27 September 2007. Survey results were weighted to correct for any bias in the sample using nationally defined profiles for age, social grade, region and working status.

A limitation of all surveys about sensitive issues such as household finances is that some people are reluctant to discuss them in face-to-face interviews. Because of embarrassment, those who face the most financial stress might be more likely than others to refuse to answer certain questions or to understate their difficulties.⁽¹⁾ As in previous years, the survey was designed to reduce these possibilities. In order to encourage respondents to divulge sensitive information, they were told that the survey was being carried out on behalf of the Bank of England and would be useful in assessing how spending might be affected by its interest rate decisions and in judging the risks to financial stability. They were assured that their replies would be treated in the strictest confidence, would not be passed to any third party at any stage in the future and would not under any circumstances be used for sales or marketing purposes. Also, to avoid embarrassment in revealing sensitive information to the interviewer, replies to questions were coded on show cards and recorded on a computer in such a way that the interviewer would not know the content of respondents' answers.

Response rates were similar to those obtained in previous years. Only those respondents who were the chief income earner or main shopper were asked for their income. This

meant that 12% of respondents were not asked about their income. A further 31% of households either refused to provide (22%) or did not know (9%) their household income. About 16% of respondents refused to say whether their households had any unsecured debt and a further 6% did not know. There was a large overlap between those households who refused to provide information about their income and those who would not discuss their unsecured debt. There was greater openness and awareness about secured debt. Only 2% of those asked did not know how much they owed and 5% refused to say how much.

Several possible approaches can be used to adjust for missing values arising from non-response to particular survey questions. Effectively, these all involve imputing a value for missing observations.⁽²⁾ All calculations reported in this article have been carried out using all available responses, implicitly assuming that non-response is distributed in the same way as recorded responses, regardless of the characteristics of non-respondents. In reality, non-response for individual survey questions is not distributed uniformly across groups in the survey population. For example, older people are a little more likely to refuse to say whether they have any unsecured debt.⁽³⁾ Ignoring this causes a potential upward bias to estimates of the proportion of the population with unsecured debt and the overall amount owed. Nevertheless, internal analysis shows that the overall conclusions from the survey are not sensitive to which of the available imputation methods is used.

(1) There is a large literature on the psychology of survey responses. See for example Tourangeau *et al* (2000).

(2) The most common imputation methods are mean imputation, hot decking, multiple imputation and regression-based approaches. See Little and Rubin (2002) for further details.

(3) 19% of the respondents aged 65 or over refused to say if they had unsecured debt, compared to 15% for other age groups.

early 1990s could be that most mortgagors have a substantial housing equity buffer that can be used as collateral for borrowing, either to support consumption or consolidate debts. Of course, the sustainability of the buffer that mortgagors have depends heavily on the future outlook for house prices. But the current distribution of housing equity indicates that aggregate consumer spending may not be particularly sensitive to modest falls in house prices.

While only a small proportion of household debt was owed by renters, these households appear to have had the greatest problems both in getting access to debt and in servicing it. This reflects their lower income and the fact that they did not own a home that could act as collateral for loans. There had

been some slight increase over the past year in the proportion of renters who found their unsecured debt to be a heavy burden, continuing a recent trend. But they accounted for only about 1% of aggregate income. The macroeconomic impact of changes in their spending is therefore likely to have been very small.

Compared to last year, there was little change in the proportion of households who reported that they had found it harder to access credit over the twelve months preceding the survey. Credit conditions appeared to have tightened a little for renters, but loosened for mortgagors over the year to September.

References

Benito, A and Power, J (2004), 'Housing equity and consumption: insights from the Survey of English Housing', *Bank of England Quarterly Bulletin*, Autumn, pages 302–09.

Benito, A, Thompson, J, Waldron, M and Wood, R (2006), 'House prices and consumer spending', *Bank of England Quarterly Bulletin*, Summer, pages 142–54.

Benito, A, Waldron, M, Young, G and Zampolli, F (2007), 'The role of household debt and balance sheets in the monetary transmission mechanism', *Bank of England Quarterly Bulletin*, Vol. 47, No. 1, pages 70–78.

Boheim, R and Taylor, M (2004), 'And in the evening she's a singer with the band: second jobs — plight or pleasure?', *University of Essex Working Paper no. 2004-03*.

Bottazzi, R, Low, H and Wakefield, M (2007), 'Why do homeowners work longer hours?', *Institute for Fiscal Studies Working Paper no. 09/07*.

Dynan, K and Kohn, D (2007), 'The rise in US household indebtedness: causes and consequences', *Federal Reserve Board Finance and Economics Discussion Series*, No. 2007-37.

Girouard, N, Kennedy, M and Andre, C (2007), 'Has the rise in debt made households more vulnerable?', *OECD Economics Working Paper no. 535*.

Hamilton, R (2003), 'Trends in households' aggregate secured debt', *Bank of England Quarterly Bulletin*, Autumn, pages 271–80.

Little, R and Rubin, D (2002), *Statistical analysis with missing data*, John Wiley and Sons, New York.

May, O and Tudela, M (2005), 'When is mortgage indebtedness a financial burden to British households? A dynamic probit approach', *Bank of England Working Paper no. 277*.

Tourangeau, R, Rips, L and Rasinski, K (2000), *The psychology of survey response*, Cambridge University Press, New York.

Waldron, M and Young, G (2006), 'The state of British household finances: results from the 2006 NMG Research survey', *Bank of England Quarterly Bulletin*, Vol. 46, No. 4, pages 397–403.

The macroeconomic impact of higher energy prices on the UK economy

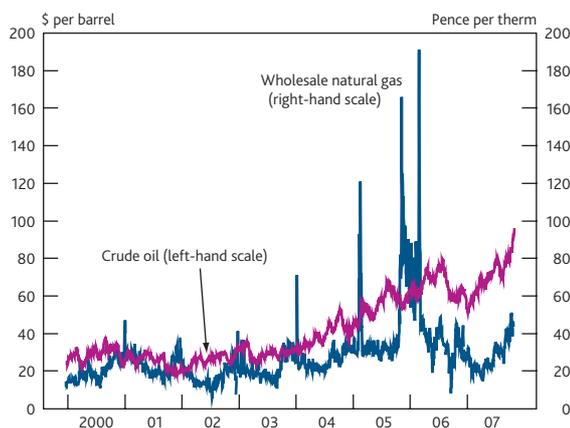
By Richard Barwell of the Bank's Conjunctural Analysis and Projections Division and Ryland Thomas and Kenny Turnbull of the Bank's Structural Economic Analysis Division.

This article explores the macroeconomic impact of the rise in energy prices since 2004. The article discusses the various channels through which rising energy prices are likely to influence the degree of inflationary pressure in the UK economy. Rising energy costs put upward pressure on the prices of energy-intensive goods and services, and can affect both aggregate demand and potential supply. The adjustment of prices and quantities in the labour market are particularly important in this regard. Ultimately though the impact on inflation will depend on monetary policy and the behaviour of inflation expectations. Some past episodes in which energy prices increased sharply preceded a marked deterioration in the macroeconomic environment. The evidence so far suggests a more muted impact on the economy than in these previous cases.

Introduction

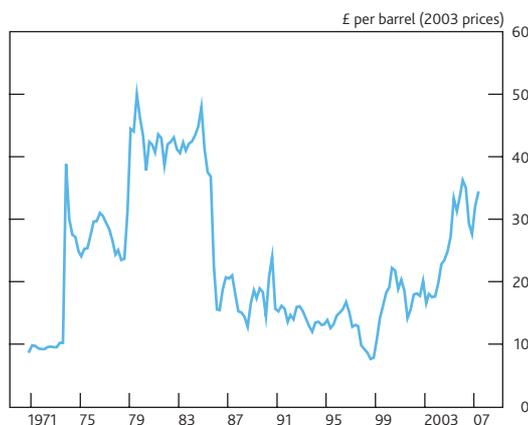
There have been large shifts in the price of crude oil and natural gas since the beginning of 2004. Crude oil prices rose from around \$30 (£17) per barrel to just under \$100 (£45) (Chart 1), at the time of the November 2007 *Inflation Report*. And the sterling price of oil relative to other UK goods and services — the 'real' price — doubled between 2004 Q1 and 2007 Q3 (Chart 2). The futures price of oil suggests that most of the increase since 2004 is expected to persist although there are good reasons for believing they may not be a good guide to expected spot prices in the future.⁽¹⁾ Gas prices have behaved somewhat differently to crude oil prices. UK wholesale gas prices rose sharply in late 2005, and remained

Chart 1 Daily spot crude oil and wholesale natural gas price



Sources: Bloomberg, Intercontinental Exchange and Reuters.

Chart 2 Quarterly real price of crude oil^(a)



Sources: ONS and Thomson Datastream.

(a) Oil price divided by household consumption deflator. Quarterly averages.

elevated throughout the winter of 2005/06, averaging around 75 pence per therm (Chart 1), but have since fallen back from those peaks. Nevertheless gas prices have risen more recently and remain significantly above their pre-2005 levels and gas futures prices remain elevated.

Some past episodes in which energy prices increased sharply preceded a marked deterioration in the macroeconomic environment. For example, real sterling oil prices almost trebled between 1973 Q4 and 1974 Q4 and more than doubled between 1978 Q4 and 1979 Q4. In both cases annual

(1) For more information on the economics of the oil futures market see the box on pages 28–29 of the November 2004 *Inflation Report*.

consumer price inflation in the United Kingdom subsequently doubled to over 20%, and the economy went into recession. Such a deterioration in the UK macroeconomic outlook has not so far been the case for the recent episode; nor was it the case following the doubling in oil prices between early 1999 and 2000. Understanding the factors underlying these different responses to energy price increases is an important issue for monetary policy makers.

This article explores the channels through which variations in the price of energy affect the UK economy, focusing in particular on the consequences for CPI inflation.⁽¹⁾ It sets out a macroeconomic framework for analysing the various channels of transmission, and identifies some of the key pieces of data that will be affected by higher energy prices.

Do higher energy prices lead to higher inflation?

In 1974, Milton Friedman⁽²⁾ argued that a change in the relative price of a good such as energy might not necessarily have any effect on the general price level and its rate of inflation:

'It is essential to distinguish changes in relative prices from changes in absolute prices. The special conditions that drove up the price of oil and food required purchasers to spend more on them, leaving them less to spend on other items. Did that not force other prices to go down or rise less rapidly than otherwise? Why should the average level of prices be affected significantly by changes in the price of some things relative to others?'

This section considers the channels through which a change in the relative price of energy can affect inflation in an open economy like the United Kingdom. A simple aggregate demand-supply framework is used to illustrate the main points and show the conditions under which Friedman's 'relative price hypothesis' holds. For the most part, the analysis abstracts from the underlying factors that have caused the rise in energy prices, but in practice this will be an important consideration for policymakers. The rise in energy prices since the beginning of 2004 is likely to be the result of rapid growth in global demand as well as constraints on global supply.⁽³⁾ And these underlying shocks may have an effect on the UK economy over and above the impact of energy prices — for example, higher global demand is likely to raise UK exports. In the analysis below these additional effects are identified when relevant.

The impact is analysed in several stages. First, the impact on companies' costs is considered along with a discussion of how higher energy costs are passed through into final goods and services prices. At this stage it is assumed that wages and other input prices are unaffected and that the level of nominal spending in the economy is unchanged. This provides a

benchmark case of what might be called the 'first-round' effects. The more general impact of higher energy prices is then considered by looking at the adjustment of wages and other input prices, and the impact on potential supply and aggregate demand. Finally the response of monetary policy and inflation expectations is considered.

The impact of energy prices on an individual firm's costs

Most finished goods and services are likely to require inputs of oil and/or gas at some stage in their production process. For example, almost all companies use electricity, and the production of electricity relies heavily on the use of gas-fired power stations. A key factor that determines the impact of higher energy costs on the price of a finished good or service is the energy intensity of production — the share of production costs accounted for by the use of oil and gas.

Companies will tend to set the price of a finished good or service as a mark-up on the marginal cost of producing an extra unit of output. If, at all stages in the production process, energy is used in fixed proportions to other inputs of production (so that no substitution between energy and other inputs is possible), then, other things being equal, the marginal cost of producing a final good or service will respond to a rise in energy prices according to the relationship:

$$\% \text{ change in marginal cost} = \text{initial share of energy in costs} \times \% \text{ change in energy prices.}$$

So, for example, if the initial share of oil in the cost of producing a good is 2% and oil prices double, the marginal cost of production will increase by around 2%. If energy can be substituted for other factors of production, then the rise in the cost of production will be less extreme than this.⁽⁴⁾ The extent to which different factors of production are free to vary over time is also a factor. It may only be feasible to change factors like capital and energy in the long run. So expenditure on energy by companies may largely reflect 'overheads' or fixed costs of production in the short run. In this case, short-run marginal costs will be less affected by a rise in energy prices, although average costs will be higher.

(1) For a detailed analysis of this question from the perspective of a monetary policy maker see the speech given by David Walton on 23 February 2006, at www.bankofengland.co.uk/publications/speeches/2006/speech268.pdf.

(2) Friedman, M (1974), 'Perspectives on inflation', *Newsweek*, 24 June. Reprinted in Friedman, M (1975), *There's no such thing as a free lunch*, Open Court, pages 113–15.

(3) This is less true for gas where certain structural features of the UK domestic gas market are likely to have been behind some of the recent movements in prices.

(4) For example, a standard assumption is the 'Cobb-Douglas' case where the elasticity of substitution between different factors of production is equal to 1. This means that relative factor inputs respond (negatively) in proportion to changes in their relative prices. In this case the relationship becomes:

$$\text{change in the log of marginal cost} = \text{initial share of energy in costs} \times \text{change in log of energy prices.}$$

In this case a 100% energy price increase leads to around a 1.4% increase in marginal cost if the initial share is around 2%.

The impact on aggregate costs and the price level

In practice, energy intensity varies considerably across goods and services and across industries. For example, crude oil represents a large chunk of petrol refiners' costs, as does natural gas in the costs of gas and electricity providers. By contrast, the energy intensity of other finished goods and services may be relatively small. This suggests that some prices are more likely to rise than others, leading to significant movements in the relative prices of finished goods and services. And just as companies have an incentive to substitute away from energy in production, households have an incentive to substitute away from energy-intensive goods and services.

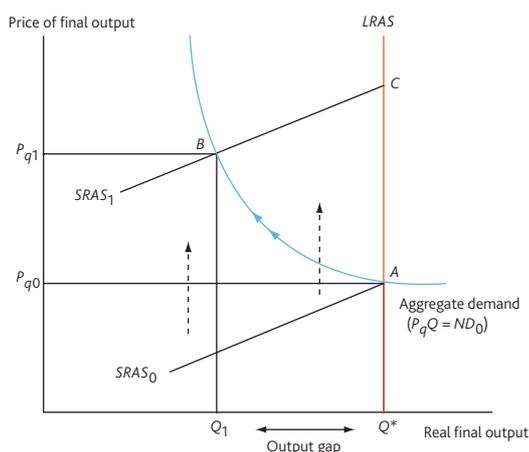
To analyse the impact on the aggregate price level and the macroeconomy it is useful, as a first step, to abstract from these relative price movements and imagine there is a single finished good produced. By netting out all the intermediate use of domestic output by each industry, it is possible to summarise aggregate marginal costs in the finished goods sector of the economy in terms of the costs of four primary inputs — capital, labour, overseas inputs of goods and services and inputs of oil and gas. This can be written as:⁽¹⁾

$$MC = c(W, P_k, P_e, P_m)$$

where W = wages; P_k = price of renting/using capital; P_e = price of energy; P_m = price of non-energy imports and c reflects how different factor prices affect marginal cost, which depends on the aggregate degree of substitutability in the economy. In this highly stylised set-up it is possible to think of the aggregate price level for finished goods and services as a mark-up on this marginal cost measure as if it were a single good or service.

As higher energy prices push up marginal cost, companies will want to raise the price they charge for their goods and services. **Figure 1** illustrates the issue in terms of a standard aggregate demand and supply framework.

Figure 1 Initial effects of rise in the price of energy



The economy is initially at point A. The non-oil and gas producing sector⁽²⁾ of the economy produces output of finished goods,⁽³⁾ Q^* , at a final price P_{q0} . Point A represents the equilibrium between the aggregate demand for final goods and services and long-run or 'potential' supply of these goods. It is assumed initially that the level of nominal expenditure on finished goods and services in the economy is fixed. As a result the aggregate demand curve is a downward-sloping curve that traces out the combinations of real output and final output prices consistent with a given level of nominal demand: $P_q Q = ND_0$. Ultimately the level of nominal demand is pinned down by monetary policy as is discussed later.

The long-run aggregate supply (LRAS) curve shows the combinations of nominal prices and finished output that can be achieved in the long run if nominal prices and wages are perfectly flexible. It is a vertical line because long-run final output (Q^*) is determined independently of the nominal price level and depends on underlying demand and supply conditions for the different factors of production, as discussed below. Point A also lies on a short-run aggregate supply curve ($SRAS_0$). This describes the level of output supplied at each and every aggregate price level, but with factor input prices and the capital stock assumed to be fixed in the short run.

Assume that there is an unexpected and permanent increase in the relative price of energy. Because nominal wages and other factor prices are assumed to be fixed, it is now more costly to produce any given level of output. So marginal cost and the price companies wish to charge increases at each and every level of output.⁽⁴⁾ This leads to a shift in the short-run aggregate supply curve to $SRAS_1$. As firms increase their prices they find that the demand for their output falls, given that nominal expenditure is unchanged at ND_0 . As a result the economy moves to point B with the aggregate price level higher and output lower than at point A. So in this stylised example firms have been unable to pass on the full increase in their energy costs to prices (which would occur at point C). As a result output falls, marginal costs fall back somewhat as variable factors of production get used less intensively and a negative output gap ($Q_1 - Q^*$) has been created.

(1) Assuming constant returns to scale.

(2) Any production of oil and gas by the economy is assumed to be a fixed amount that requires no labour or other goods and services to produce. Energy inputs used by the non-oil and gas extraction sector are assumed to be met at the margin from overseas at a globally determined price, so production is equal to, or lower than, consumption.

(3) Note that the finished goods sector's output is a gross or final measure of output that reflects the contributions of all the inputs used in production, including imports and energy. So it is not the same concept as GDP or the value added of the non-oil and gas extraction sector, which are measures that only reflect the contributions of capital and labour to output.

(4) The upward shift in aggregate costs and prices in response to an increase in real energy prices can be expressed in a similar way to the response of an individual firm's costs to a nominal energy price increase. In the case where energy is used in fixed proportions to other factors of production and there is a fixed proportional mark-up on costs, the relationship is given by:

$$\frac{\text{initial share of energy}}{1 - \text{initial share of energy}} \times \% \text{ change in real energy prices.}$$

The above analysis assumes that the shift in the supply curve occurs immediately. This may not be the case if energy-using industries face large financial or contractual costs of changing prices. So there may be a delay between the timing of the 'cost shock' and the change in final output prices. In reality, higher energy costs will be passed through the succession of firms that make up the UK supply chain and at each stage there may be some sluggishness in price adjustment. So initially companies at various stages of the chain may absorb the impact of higher energy costs in lower profit margins.

It is also useful to note what happens at a more disaggregated level as the economy moves from A to B. The major impact of higher energy prices on firms that use little or no energy will be a fall in demand for their products, rather than a rise in their costs. This will arise if the higher prices of energy-intensive goods result in increased nominal spending on these items, leaving less of a given amount of aggregate nominal expenditure for the less energy-intensive goods and services in the economy. This would happen if energy-intensive goods and services have a low degree of substitutability with other goods and services. This fall in demand lowers the output of the less energy-intensive sectors given no reduction in their other input costs.

The effect on wages and other costs

So far it has been assumed that the cost of other inputs of production have been unaffected by energy price changes. But the costs of capital and imported materials are both likely to increase if energy is required to produce these goods as well. In that case, the initial shift in marginal cost will be even larger⁽¹⁾ if these factors are variable inputs.

The negative output gap that emerges under the assumptions underlying Figure 1 is likely to lead to downward pressure on nominal earnings. This is because the fall in output is likely to reduce the demand for labour, and unemployment may rise relative to its long-run equilibrium or 'natural' rate. Figure 2 shows how long-run equilibrium is restored if nominal wages fall in response to the increase in unemployment. Starting

from point B, the short-run aggregate supply curve shifts to $SRAS_2$ and the economy 'slides down' the aggregate demand curve to point D, which coincides with the initial equilibrium (point A in Figure 1). So at the aggregate level, the fall in nominal wages reduces the cost of producing a given level of output and offsets the rise in energy costs. The fall in labour costs allows the aggregate price level to return to its initial level. The required fall in nominal wages will be larger if, as discussed above, capital and import prices have also increased as a result of higher energy prices. At a disaggregated level, prices that are less energy-intensive (and more labour-intensive) will fall to offset the rise in the prices of energy-intensive goods and services. Since nominal spending is fixed in this example, the falls in wages and output prices are accompanied by a recovery in real output back to its initial level.

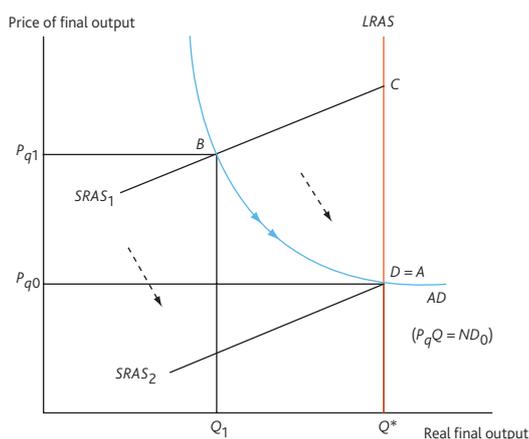
This is effectively the process described by Friedman. The rise in energy costs and energy-intensive goods and services prices is offset by falls in nominal wages and the prices of goods and services in less energy-intensive sectors. Just as prices may be slow to change following the initial impact of the rise in energy prices (the move from A to B), there may also be nominal rigidities in a downward direction, that slow the adjustment from B to D. In this case the degree of sluggishness of wages as well as prices will also be a factor. If these nominal rigidities are significant the price level and unemployment rate could remain high relative to their initial levels for some time.

The effect on potential supply

A key assumption in Figure 2 is that long-run potential supply remains unaffected. But permanent changes in energy and other input prices are likely to lead to changes in the demand for labour, capital, energy and imports in the long run. The supply of each factor is also likely to be affected. Potential supply will remain unchanged only if the factors of production have to be used in fixed proportions and the supply of at least one of the factors is fixed. But what about the more general case?

In theory, companies will demand a factor of production up to the point at which the extra real output or 'marginal product' that it produces is equal to its real cost — the nominal price of the factor divided by the price of final output. At this point, it is not profitable for the firm to employ more or less of the factor. A rise in the real price of energy is likely to lead to a decrease in the demand for energy inputs, provided companies can substitute other factors for energy. Energy inputs will be cut back relative to other inputs, until the marginal product of energy rises in line with the higher real

Figure 2 Restoration of long-run equilibrium



(1) If the production of imports and capital goods has the same energy intensity as the production of domestic goods, then in the case where all inputs are variable and used in fixed proportions and nominal wages are fixed, the impact on marginal cost and prices will be given by: $\frac{\text{initial share of energy}}{\text{initial share of labour}} \times \% \text{ change in real energy prices}$.

cost. As companies cut back on their use of energy it is likely that the marginal product of non-energy inputs will fall. This will occur when energy and the other factors are 'co-operant' or 'aggregate complements' in production,⁽¹⁾ and will lead to a fall in the demand for capital, labour and imported intermediates at each level of their factor price.⁽²⁾ The greater the degree of substitutability between energy and a given non-energy input, the smaller will be the fall in the demand for that input.

In practice, the degree of substitutability will depend on the time horizon. For example, certain types of capital equipment may 'embody' a particular energy intensity that is difficult to alter once it is installed. So firms may only be able to change the energy intensity of their production in the long run, once they have had a chance to withdraw the least energy-efficient equipment from production — sometimes known as capital 'scrapping' — and replace it with alternatives with a lower built-in intensity.

Even though the *demand* for factor inputs is likely to fall as a result of higher energy prices, there will only be an impact on potential output if the long-run *supply* of each factor contracts in response to the downward pressure on relative factor prices. So what might we expect to happen to the relative price and supply of non-energy inputs?

The real cost of capital and imported materials are similar to energy prices in that they are largely determined by global conditions.⁽³⁾ So, as far as the United Kingdom is concerned, the long-run supply of these factors will be close to perfectly elastic at a globally determined relative price. And, as discussed earlier, the costs of producing capital and imported goods at a global level are likely to respond to energy prices in a similar way to those of other finished goods and services. So the *relative* price of imports and capital are unlikely to fall substantially following a rise in energy prices. And any fall in demand for these factors will typically lead to a lower amount employed in the long run and a contraction in potential supply.

The impact of higher energy prices on the supply of labour is less clear and depends on the extent to which workers' wage aspirations adjust to a higher energy price. **Figure 2** showed that in order to restore employment and the price level to their initial levels the nominal wage had to fall sufficiently to offset the impact of higher energy costs. In other words there has to be sufficient downward adjustment in the 'real consumption wage' of workers — the quantity of final or 'consumer' goods that the nominal wage can buy — to ensure employment does not contract in the long run. This will only occur in practice if labour supply is 'perfectly inelastic' or insensitive to the level of real consumption wages — where workers (or their representatives) are prepared to lower their real wage aspirations by whatever amount it takes to keep aggregate

employment unchanged. If real wage aspirations do not adjust sufficiently, then labour supply is likely to be 'upward sloping' and workers will reduce the amount of labour they are willing to supply as real consumption wages decline. This is sometimes termed 'real wage resistance' and results in lower potential output.

Whether that reduction in potential output is temporary or permanent will depend on the extent to which wage aspirations adjust over time. If the adjustment of wage aspirations occurs gradually, then real wage resistance may well be only a temporary phenomenon. In this case, the negative impact on potential supply will diminish over time. If wage aspirations fail to adjust downwards, however, then a higher natural rate of unemployment would be required in the long run to make workers accept a fall in the real consumption wage with different implications for the observed path of unemployment and inflation.⁽⁴⁾ So distinguishing between temporary and permanent real wage resistance is important for monetary policy makers.

The required adjustment of real consumption wages can also be viewed from the perspective of restoring companies' profitability. A rise in the price of energy initially raises costs and reduces companies' profits if nominal wages do not adjust. Other things being equal this gives companies the incentive to reduce output and employment. To restore employment and profitability to their initial levels requires some combination of lower nominal wages and higher final goods prices. Either way the purchasing power of workers' take-home pay must decline if companies' profitability is to be restored.

A useful indicator that is often used to monitor the adjustment of the labour market to a change in energy prices is the real 'product' wage — the nominal wage divided by the price of companies' value added. In aggregate, the price of companies' value added is the price of their final output *net* of their energy and import costs. As energy costs rise this price initially declines, if final goods prices do not adjust immediately, and there is a fall in companies' profitability. As a result real product wages increase, companies have an incentive to reduce employment, and a 'wedge' opens up with the real

(1) See Hogan (1979) and Solow (1979) for a discussion.

(2) This change in the demand for factor inputs can be thought of as the result of two effects: a 'substitution' effect that reduces the demand for energy and increases the demand for other factors at a given level of output; and a 'scale effect' that reduces the demand for all factors because the profit-maximising level of output falls as a result of the energy price increases, assuming the price of the other factors remains unchanged. In the case of energy, the two effects reinforce each other. For other factors the effects are offsetting. Typically the scale effect will dominate the substitution effect given the usual assumptions that are made about production technology (although in principle the effect could go either way). This is effectively what happens in **Figure 1** where the fall in output leads to a fall in the demand for labour and other variable factors given unchanged factor prices.

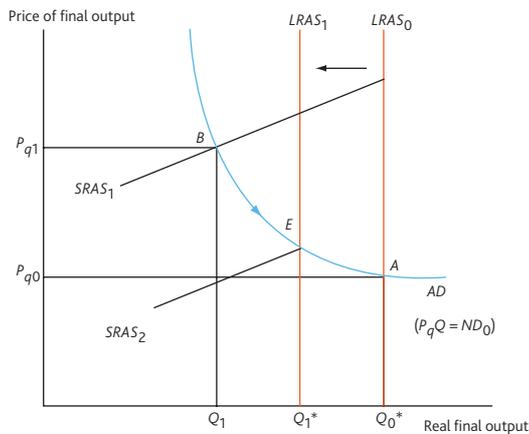
(3) The exception would be domestically produced capital goods.

(4) See Layard, Nickell and Jackman (1991) for a discussion in a wage-bargaining framework. Similar issues arise in an efficiency wages model of the labour market, see Carruth *et al* (1998).

consumption wage. Only if the real product wage returns to its initial level, so that the 'wedge' is entirely reflected in a lower real consumption wage, will companies want to retain the initial workforce.⁽¹⁾ This can only happen if nominal wages fall back or final goods prices rise. So, as is shown later, movements in the real product wage (relative to what otherwise would have been expected from productivity growth and other factors) are likely to be a useful summary statistic of the degree of real wage resistance and the pressure on firms to cut employment.

The effects of a shift in long-run potential supply are shown in **Figure 3**. As in **Figure 1** the rise in the energy price initially shifts the short-run aggregate supply curve to $SRAS_1$. But the energy price increase also reduces the level of long-run aggregate supply and the long-run aggregate supply curve moves inwards to $LRAS_1$. Now as wages fall over time, the economy slides down the aggregate demand curve to a new equilibrium point E rather than the initial point A . The aggregate price level in the new equilibrium is higher than the original equilibrium because the nominal wage does not fall sufficiently to offset the energy price rise.

Figure 3 Long-run supply effects of relative price rise



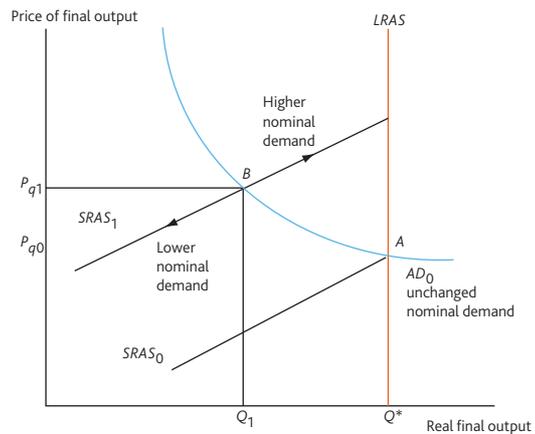
The impact of energy prices on aggregate demand

In the analysis so far nominal spending in the economy has been held fixed. But in practice nominal spending is also likely to adjust in response to a change in energy prices, increasing or decreasing the price level response to the initial rise in costs and affecting the size of the output gap that emerges (**Figure 4**). That adjustment may take place through variations in household, corporate and government spending plans as well as the reaction of monetary policy.

Impact on household, corporate and government spending plans

Nominal spending might respond differently if higher energy prices lead to a change in planned real spending by companies and households but with interest rates set at the same level as point B .

Figure 4 The impact of an adjustment in nominal demand



A rise in energy prices might influence the level of demand by affecting consumer spending. As discussed above, the rise in energy prices will tend to squeeze the purchasing power of labour income through a fall in the real consumption wage. If the increase in energy prices is believed to be permanent, then households should expect that the reduction in their purchasing power will also be permanent. That reduction in permanent labour income should lead to a fall in consumer spending.

But labour income is not the only source of funds which households use to finance consumption, and it is likely that non-labour income will increase. Oil and gas extraction companies, operating both domestically and overseas, should benefit from the increase in the price of their output. Part of the higher profit income is likely to benefit both domestic households and the government. Domestic households' non-labour income and financial wealth will be boosted to the extent that: (a) domestic residents have shareholdings in energy companies and (b) post-tax incomes are boosted by the current and future reductions in household taxes that are made possible by the extra corporation and energy taxes earned by the government from the domestic-based energy extraction sector.

Even if households' total permanent income is broadly unaffected there may be distributional effects. If wealthy households tend to consume a smaller fraction of any additional income than the typical household, then the drag on consumption from the squeeze in labour income (which affects a broad spectrum of households) will tend to dominate the boost to consumption from the higher dividends and share prices (which may affect wealthy households the most).

(1) See Rotemberg and Woodford (1996) for a discussion of the exact conditions under which this holds. If the capital stock falls in response to energy prices and if firms charge a significant proportional mark-up on all their costs, then it is likely that the real product wage needs to fall below its initial level to restore employment.

Another channel through which the rise in energy prices may affect the level of demand is through its impact on investment spending, which may fall as a result of higher energy prices. But, as noted previously, firms might respond by scrapping energy-intensive capital and replacing it with more energy-efficient alternatives. In this scenario, the rise in energy prices would lead to a simultaneous decrease in potential supply and an increase in investment demand — both of which would tend to raise inflationary pressure in the economy for a period.

The government may benefit from the higher corporation and other energy taxes that result from higher energy prices. The key issue for both the composition and total level of aggregate demand is whether the government spends this money or whether it is ultimately expected to return it to households in the form of lower taxes, allowing household consumption to increase. If the government decides not to spend the revenue then the impact will depend on whether households expect this to lead to future tax cuts and adjust their consumption accordingly.

Higher energy prices could have influenced the spending behaviour of overseas households and companies through the same channels discussed above. The rise in energy prices will lead to a transfer of resources from countries/regions which are net importers of energy, to those countries/regions which are net exporters of energy. If national savings rates in these energy-importing countries differ from those in the energy-exporting countries then this transfer of income could lead to an overall shift in the level of global demand in general, and the global demand for UK output in particular. Savings rates have tended to be relatively high in the energy-exporting nations, so it is possible that this transfer of income may have depressed demand for UK exports.

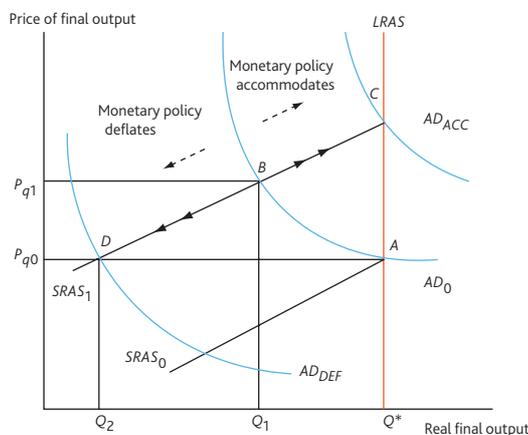
As discussed earlier, the latest rise in oil prices should not be treated as an exogenous macroeconomic shock in its own right. Rather it may reflect more underlying forces such as strong global demand and/or constraints on the global supply of energy. This could have different implications for UK aggregate demand depending on which of the underlying forces is the most important in driving up energy prices. For example, strong global growth should be reflected in an increased demand for UK exports. And that boost to UK exports should be counted against any impact eg from the transfer of national income from low-saving energy-importers to high-saving energy-exporters.

The monetary policy response

Even though higher energy prices may lead to changes in planned expenditure by households and companies, ultimately the level of nominal expenditure in the economy is pinned down by monetary policy, through setting an appropriate level of interest rates. **Figure 5** considers two stylised examples of

how nominal demand might be allowed to adjust following an increase in energy prices.

Figure 5 Alternative monetary policy responses to an energy price rise



One response is to allow the amount of nominal spending in the economy to increase — that is, to 'accommodate' the initial first-round effects of the energy price shock. This rise in nominal spending is represented by the rightward shift in the nominal demand schedule in **Figure 5**. The economy (assuming prices are fully flexible) moves immediately from point A to point C, which represents a new long-run equilibrium position with a permanently higher price level and unchanged output. In this case, the required fall in real consumption wages is achieved through an increase in the general price level rather than a fall in nominal wages. And, provided there are no further increases in prices and wages, the implied increase in inflation is only temporary and there is only a one-off shift in the price level.

But a key risk here is that accommodating the first-round increase in the price level leads to an increase in inflation expectations (assumed fixed in **Figure 5** above), putting additional upward pressure on wages and prices. It is possible that agents might not revise their expectations of inflation at all if they understand what policymakers are trying to achieve. But the fact that policymakers do not respond to the rise in inflation could lead agents to believe that there has been a *de facto* change in the policy target. An intermediate case might be one in which agents continue to believe that policymakers are only prepared to accommodate a temporary increase in inflation but expect them to allow inflation to remain higher for a period of time. In all but the first scenario, the initial rise in inflation increases inflation expectations to some extent, providing an additional stimulus to the medium-term outlook for inflation.

An alternative response would be to reduce nominal demand, preventing even a one-off increase in the price level. In this case nominal aggregate demand needs to be reduced,

represented by the leftward shift in the aggregate demand curve in **Figure 5**. This approach might help anchor inflation expectations by encouraging wages and less energy-intensive goods prices to fall more quickly than in the fixed nominal demand case. The cost is that the economy moves from point *A* to point *D* with a larger short-term fall in output and employment than for the case in which policy maintains nominal spending. Over time, as wages fall and the short-run aggregate supply curve moves back to its original position ($SRAS_0$) the policymaker can allow aggregate nominal spending to recover to offset the effect of falling nominal wages on the general price level. And the economy gradually moves from point *D* to point *A* with the price level unchanged.

In the United Kingdom, monetary policy is set by the Bank of England’s Monetary Policy Committee to achieve the Government’s 2% CPI inflation target, and subject to that, to support the economic policy of the Government including its objectives for growth and employment.⁽¹⁾ The two stylised responses shown in **Figure 5** highlight the fundamental trade-off facing a central bank. The central bank can act by setting a level of interest rates that attempt to prevent any rise in energy costs from filtering through to prices and inflation expectations, but at the cost of a larger fall in output and employment in the short run. Full accommodation avoids a negative output gap emerging but at the cost of inflation picking up relative to target, with the risk that inflation expectations become dislodged. Of course the stylised examples presented here only consider how policy might respond to a single shock — a rise in energy prices. In practice, it is likely that a number of shocks will be affecting the economy at any given time, and policymakers need to respond to the combined effect of those shocks.

How has the rise in energy prices affected the economy?

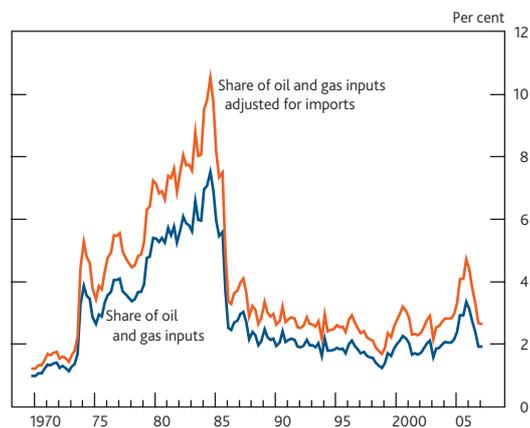
This section of the article briefly discusses the various pieces of evidence that are available on each of the channels discussed above. More analysis can be found in recent *Inflation Reports*.

Chart 3 shows an estimate of the value or ‘nominal’ share of crude oil and natural gas inputs in the final expenditure on non-oil and gas products in the United Kingdom derived from the National Accounts.⁽²⁾ It also shows an implicit share of expenditure if it is assumed that the energy intensity of imported non-energy goods and services is the same as that of the United Kingdom.⁽³⁾ This suggests the share of energy inputs in final expenditure was around 2% in 2004 prior to the energy price shock. Calculations based on the Input-Output Supply and Use Tables suggest a similar share for final consumption expenditure.

Following the initial rise in energy prices the share rose significantly. This was similar to the response in the early

1970s. A rise in the share suggests there is little ability to substitute away from energy in the short term because the increase in oil and gas prices is not offset by a proportionate fall in energy inputs used. Since 2006 the share has fallen back and in 2007 Q2 stood at around pre-shock levels. This partly reflects the fact that wholesale gas and oil prices fell back in the first half of 2007. But oil prices were still almost double their 2004 level in 2007 Q2. The lack of a significant change in the share of energy suggests that there has been some substitution away from energy although the most recent data are subject to revision. A greater degree of substitutability may be one reason why the recent impact of higher energy prices may have been less than in previous episodes. The energy share increases observed in the 1970s were not reversed until oil prices fell sharply in the mid-1980s. Of course, the rise in energy prices since 2007 Q2 may push up on the share.

Chart 3 Nominal share of energy inputs in total final expenditure



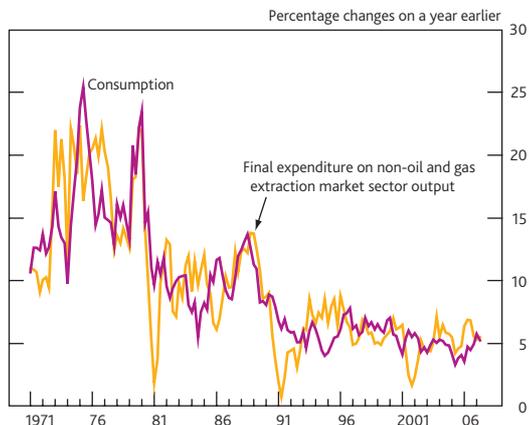
Sources: ONS and Bank calculations.

Chart 4 shows nominal demand growth over this period. As discussed, developments in nominal demand are important in determining how much of the rise in costs will ultimately feed into higher aggregate prices. Nominal expenditure slowed significantly in 2005 before recovering somewhat in 2006 and 2007 (**Chart 4**). This is different to the experience in the 1970s and early 1980s, when nominal spending growth picked up significantly following the energy price increases. It is difficult to judge how much of the slowdown in nominal demand growth in 2005 is attributable to energy prices. As discussed

(1) See www.hm-treasury.gov.uk/documents/uk_economy/monetary_policy/ukecon_mon_index.cfm.
 (2) Energy inputs are defined as the UK output of oil and gas products less own use by the oil and gas extraction sector plus imports of crude oil and natural gas, less exports of crude oil and natural gas. Final expenditure (at basic prices) on non-oil and gas products is estimated as total final expenditure (adjusted for MTIC fraud) less general government value added, imputed rents, indirect taxes net of subsidies and exports of crude oil and natural gas. The share in **Chart 3** can be thought of as an approximation to the share of oil and gas inputs in domestic market sector final output if all imports are assumed to be intermediate inputs, and as the share of oil and gas inputs in companies’ costs if additionally companies operate under conditions close to perfect competition.
 (3) This is estimated as the share of oil and gas inputs divided by one minus the share of non-oil and gas imports.

earlier, the behaviour of nominal demand is a complex interaction between the real spending plans of households and companies and monetary policy decisions. And shocks other than energy prices will have affected nominal demand over this period.

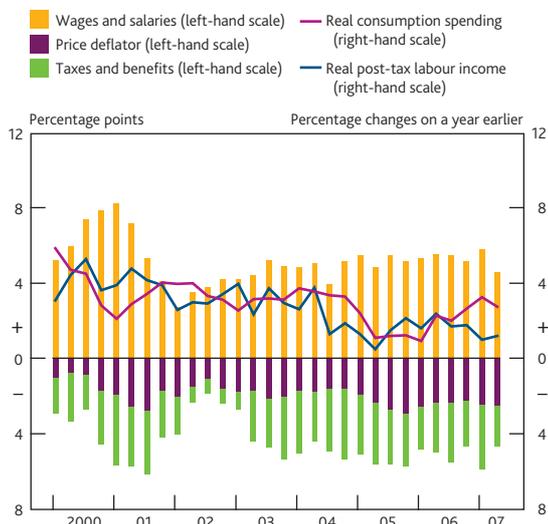
Chart 4 Nominal demand growth



Sources: ONS and Bank calculations.

Chart 5 shows evidence on the real spending behaviour of households. Real household labour income slowed in the period following the energy price increase. At least part of that is accounted for by a fall in the rate of growth of real consumption wages. Consumption appeared to respond to this slowdown in labour income growth relatively quickly. This could reflect the cash-flow constraints on households or it may be that the propensity to consume out of labour income is higher than other forms of income. But it could also reflect households revising down their permanent income, perhaps because they did not expect the squeeze on labour incomes from higher energy prices to be offset by lower future taxes or higher dividends from the ownership of oil companies. Since

Chart 5 Real consumption and contributions to real labour income growth

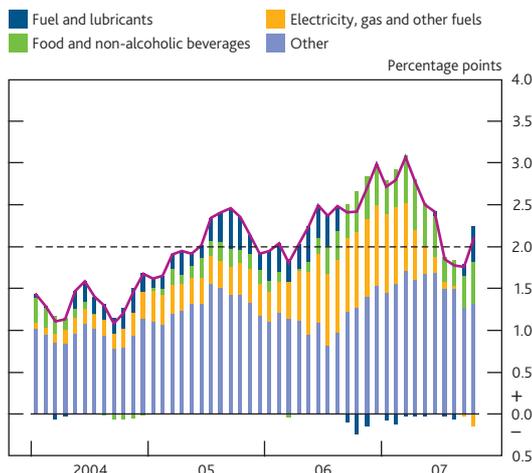


2006 consumption has picked up although labour income growth has remained subdued.

There is little hard evidence on the extent to which UK households' non-labour income may have benefited from higher energy prices. For example, it is difficult to know how different taxes and government spending would have been in the absence of the energy price rises. And there is no comprehensive evidence on UK residents' total earnings from the energy price increases. It is known that UK residents hold substantial shareholdings in some of the major energy companies. That may imply significant earnings from higher energy prices given the extent of these companies' overseas operations. But many of the gains would have accrued to institutional shareholders such as pension funds. It is not clear whether households recognised these gains and adjusted their consumption.

Chart 6 shows the behaviour of the CPI inflation rate over this period together with some of the key components. In general the rise in CPI inflation over this period was modest compared to what might have been expected from previous episodes when energy prices increased. But the upward influence of the energy-intensive components on CPI inflation was not offset by a significant decline in the inflation rate of the less energy-intensive sectors over this period. And partly as a result CPI inflation increased over this period, reaching a peak of 3.1% in March 2007. That might reflect stickiness in both nominal wages and prices in the less energy-intensive sectors, at least in the period when nominal demand was slowing. Later on, the pickup in nominal demand over the 2006/07 period may have helped to accommodate the rise in energy prices, requiring less downward adjustment of nominal wages and prices in the less energy-intensive sectors. But it is impossible to know the counterfactual. Other shocks may have pushed up inflation over this period, so that in the absence of the energy shock, CPI inflation excluding fuels and energy utilities would have picked up by even more.

Chart 6 Contributions to annual CPI inflation



One reason why inflation excluding the energy-intensive components did not fall back might be due to the impact of energy prices on the supply side. There is limited evidence that companies have utilised their capital less intensively, or scrapped some capital altogether. But there is information on the impact of rising energy prices on the level of employment. **Chart 7** shows estimates of real wages. In the absence of shocks, both real product and real consumption wages would be expected to grow in line with labour productivity growth. This ensures that the share of profits in the value of output will be stable over time. So both real wage measures have been adjusted for productivity in **Chart 7**. The real consumption wage fell significantly relative to labour productivity between 2004 and 2007. Initially this fall may not have been sufficient to maintain employment. The real product wage initially increased relative to productivity, reflecting the fact that firms did not immediately pass on the increase in costs, but also the fact that nominal wages did not adjust sufficiently to offset the rise in energy costs. The implied squeeze in average profit margins may have given firms an incentive to lower their demand for labour. And indeed unemployment rose over this period (**Chart 8**).

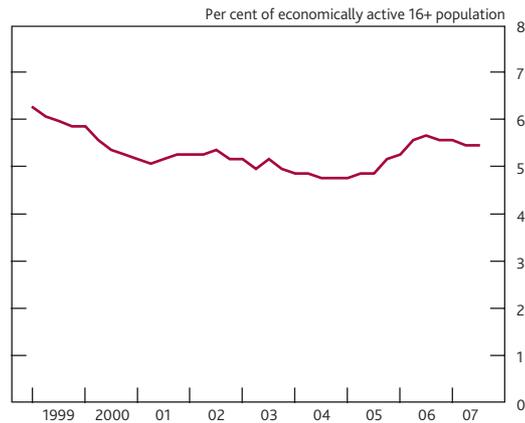
Chart 7 Real product and consumption wages adjusted for productivity



(a) Household post-tax wages and salaries per head divided by the consumption deflator. Includes non-profit institutions serving households. Productivity is calculated from ONS data on non-oil and gas market sector output divided by private sector employees.
 (b) Total compensation of employees per head divided by the gross value added (GVA) deflator of the non-oil and gas market sector. Productivity is calculated from ONS data on non-oil and gas market sector output divided by private sector employees.

Since 2006 the productivity-adjusted real product wage has fallen back to its 2004 level implying that companies have been able to restore their profitability. This suggests that most of the required adjustment of the real consumption wage may now have taken place. So any real wage resistance in response to the rise in energy prices over the 2004–06 period looks to have been temporary. Nevertheless unemployment remains higher than its level in 2004. And workers may not have fully adjusted their wage aspirations so they might attempt to recover some of the squeeze in their real take-home pay in the future.

Chart 8 Unemployment



Looking ahead, the increase in energy prices in 2007 is likely to increase the wedge between final output and value-added prices further. And in the long run that should imply a further adjustment in real consumption wages, and perhaps the level of unemployment too if workers resist a further erosion in their real take-home pay. The effect on unemployment so far appears modest relative to the movements in previous episodes of large changes in energy prices.

Conclusions

This article has explored the macroeconomic impact of the latest rise in energy prices. It has set out a framework involving a number of distinct channels through which rising energy prices can influence the degree of inflationary pressure in the economy. It has also set out the various pieces of evidence and data that need to be considered in assessing the impact of higher energy prices on the UK economy. These are being continually monitored given ongoing developments in the price of energy. The evidence so far suggests that the impact of energy prices on both the demand and supply side of the economy have been small relative to some previous episodes of similar energy price increases. In particular there may be more flexibility in both the goods and labour markets that have allowed a more muted impact of higher energy prices on the economy than previously. And nominal demand growth over this period has been more stable than that observed in the 1970s, part of which may be related to the current monetary policy framework. But we have little evidence on how the quantity and utilisation of capital services has been affected by energy prices. And the latest energy price increases will require further adjustment in real consumption wages which may have implications for wage pressures going forward if employees resist further erosions in their real take-home pay.

References

Bank of England (2004), *Inflation Report*, November.

Carruth, A, Hooker, M and Oswald, A (1998), 'Unemployment equilibria and input prices: theory and evidence from the United States', *The Review of Economics and Statistics*, Vol. 80, No. 4, pages 621–28.

Friedman, M (1974), 'Perspectives on inflation', *Newsweek*, 24 June.

Friedman, M (1975), *There's no such thing as a free lunch*, Open Court, pages 113–15.

Hogan, W (1979), 'Capital-energy complementarity in aggregate energy-economic analysis', *Resources and Energy*, Vol. 2, pages 201–20.

Layard, R, Nickell, S and Jackman, R (1991), *Unemployment: macroeconomic performance and the labour market*, Oxford University Press.

Rotemberg, J and Woodford, M (1996), 'Imperfect competition and the effects of energy price increases on economic activity', *Journal of Money, Credit and Banking*, Vol. 28, No. 4, Part 1, pages 549–77.

Solow, J (1979), 'A general equilibrium approach to aggregate capital-energy complementarity', *Economics Letters*, Vol. 2, Issue 1, pages 91–94.

Decomposing corporate bond spreads

By Lewis Webber of the Bank's Systemic Risk Assessment Division and Rohan Churm of the Bank's Conjunctural Assessment and Projections Division.

Sterling, dollar and euro-denominated corporate bond spreads narrowed substantially between late 2002 and mid-2007, but widened abruptly during the recent financial market turmoil. This article uses a structural credit risk model to examine the extent to which movements in spreads over the past decade have been driven by credit and non-credit related factors. Compensation for bearing non-credit related illiquidity risk appears to have been a particularly important driver of high-yield spreads, including during the recent financial market turmoil, but the compensation required for credit risk has also increased recently.

Introduction

Corporate borrowers pay higher yields on the bonds they issue than governments pay on bonds of the same maturity. The difference between these yields is called the *corporate bond spread*.

Part of this spread compensates investors for the *expected default loss* associated with holding corporate debt — arising from the possibility that corporate bonds may not be repaid in full. Another component of the spread compensates risk-averse corporate bond investors for their exposure to *unexpected default losses* — arising from their aversion to uncertainty about whether that default risk will actually crystallise over the life of the bond. Together, these two components comprise the total part of corporate bond spreads that can be attributed to default-related *credit risks*.

In addition, corporate bond spreads may also contain compensation for a number of non-credit factors. In particular, the market for government bonds is usually more liquid than that for corporate bonds. Corporate bond spreads are therefore likely to contain a relative *illiquidity premium*. This reflects the additional compensation, compared to government debt, that investors in corporate bonds require for bearing the risk that they might not always be able to sell their claim immediately without incurring a substantial price discount.

There are a number of other non-credit related factors that might also influence corporate bond spreads. For example, corporate and government debt are often treated differently for tax and regulatory purposes; options for borrowers to redeem bonds early are more common for corporate debt than

government debt; some corporate bonds are convertible into equity; and corporate bonds are less widely accepted as collateral than government debt, or only accepted on more stringent terms.

Understanding corporate bond spreads is important for the Bank's financial stability remit because these spreads reflect market participants' aggregate perceptions about the relative financial health of corporate issuers. Decomposing spreads into credit and non-credit related components can provide useful additional information. For example, an increase in corporate bond spreads that reflected a widespread pickup in expected default losses could be associated with a worsening macroeconomic outlook. This might have different implications for UK systemic stability than an increase in spreads that reflected an increase in compensation for uncertainty about future default losses, caused by a change in corporate bond investors' attitude towards risk. And changes in spreads that reflected compensation for bearing non-credit related illiquidity risk could help to infer information about prevailing financial market conditions.

Monitoring corporate bond spreads is also useful from a monetary policy perspective because these spreads are part of the cost of external debt financing for the corporate sector. Other things being equal, wider corporate spreads increase the cost of capital, which may lead firms to postpone or scale back investment projects, thereby reducing aggregate demand and muting inflationary pressure in the short run.

This article uses a so-called 'structural model' of credit risk to value the different claims on the assets of a corporate bond issuer. It describes a framework that can be used to model explicitly the compensation that corporate bond investors

demand for bearing default-related credit risks, based on observed financial market data. Making different assumptions about investors' aggregate risk preferences allows this total credit-related compensation to be split into the two subcomponents described above: compensation for expected future default losses and compensation for uncertainty about future default losses. The non-credit related component of corporate bond spreads can then be inferred as a residual.

The model is used to investigate the extent to which movements in sterling, dollar and euro-denominated corporate bond spreads over the past decade can be attributed to credit and non-credit related factors. The model is also used to examine how credit and non-credit related risks were repriced in international corporate bond markets following the spillover of problems originating in the US securitised mortgage market to financial markets more broadly. This is described, for example, in the October 2007 *Financial Stability Report*.

A structural model of credit risk

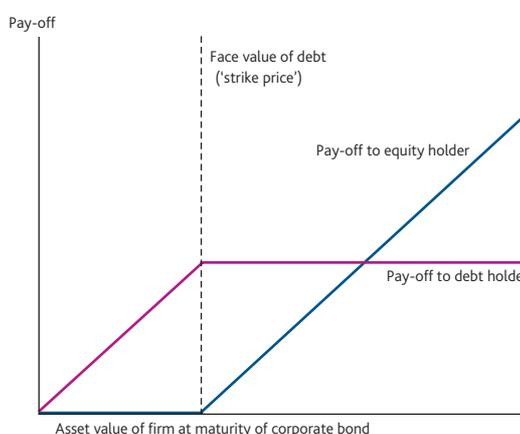
In the so-called 'structural approach' to credit risk modelling, the market value of a firm's equity can be used to infer the probability of corporate default by considering the positions of different claimants on the firm's (unobserved) asset value. In turn, this default probability determines the amount of compensation that investors require for bearing the credit risk associated with holding corporate bonds.

The simplest such approach, introduced by Merton (1974), is to consider a firm with a capital structure comprised of two basic elements: a fixed amount of non coupon-paying or 'zero-coupon' debt (the 'senior claim') and equity (the 'junior claim'). If the firm's asset value were insufficient to pay the face value of its debt when it fell due, the company would be in default. In this case, equity holders would receive nothing and bond holders, as senior creditors, would recover whatever the firm's assets were worth after paying any bankruptcy costs. If, on the other hand, the firm's assets were worth enough to repay the debt in full when it matured, the remainder would go to the equity holders.

Because equity investors are the residual claimants on the firm's asset value, they receive the same pay-off as a hypothetical investor who holds an option to buy the firm's assets at a 'strike price' equal to the face value of the firm's debts.⁽¹⁾ The equity value of a corporate borrower can therefore be described using option-pricing methods. If the underlying asset value of the firm were less than the strike price when the option was due to be exercised, the option would not be used and would expire worthless. But if the value of the firm were greater than the strike price, the pay-off to the option holder would be the difference between the two. So the pay-off to the equity holder would be zero if the value of the firm were less than the face value of the debt

when it fell due, but would otherwise increase one-for-one with the firm's asset value. This is shown by the blue line in **Figure 1**.

Figure 1 Option-like pay-off to corporate bond and equity investors in the Merton model



Moreover, because the market value of debt is equal to the difference between the firm's asset value and its equity value, debt can also be valued using option-pricing methodology. This is shown by the magenta line in **Figure 1**.

This article uses a structural credit risk model that extends the simple Merton model in two key ways.⁽²⁾ First, it is assumed that firms issue coupon-paying bonds rather than zero-coupon bonds, to match more closely the debt-financing behaviour that companies adopt in practice. Second, at every instant before the corporate bond matures, equity holders, as firm owners, choose whether to meet their debt obligations or to default.

In the model, equity holders will only service the company's debt if it is in their interests to do so. More precisely, they act to maximise the value of their residual claim on the firm's asset value, and will only continue to service the debt if the value of their claim will remain positive after the debt is paid. Equity holders are therefore assumed to set a critical threshold or *default boundary* for the value of the firm's assets at which the expected returns on equity from continued operation of the firm equal the cash flows required to keep the firm solvent. When the firm's asset value is above this default boundary, the firm is a going concern and equity holders choose to repay the debt. But when the firm's asset value falls to the default boundary, equity holders choose not to honour their debt obligations and the firm defaults.

Despite these extensions to the basic Merton framework, the fundamental insight that claims on the firm's assets can be

(1) An option gives the holder the right but not the obligation to buy (in the case of a 'call' option) or sell (in the case of a 'put' option) an asset at a pre-agreed 'strike' price at some point in the future. See also Black and Scholes (1973).

(2) Details of the model can be found in *Bank of England Working Paper no. 253* by Churm and Panigirtzoglou (2005).

valued using option-pricing methods still applies. Moreover, the broad intuition of the set-up remains the same: the closer the asset value of the firm is to the default boundary, the greater the probability that the firm will default on its debt in the future. This increases the corporate bond spread over the default-free government bond yield, other things being equal.

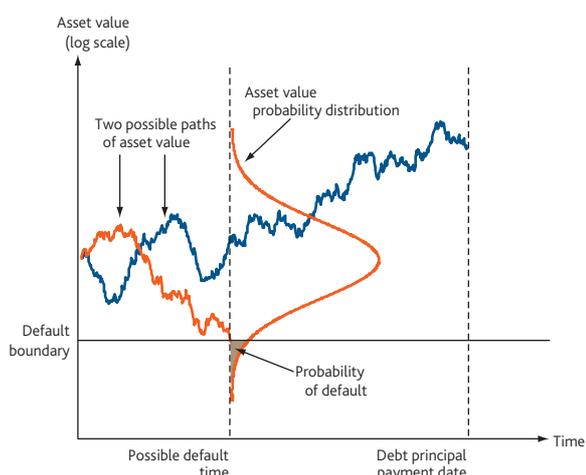
The model used in this article assumes that the return on the firm's assets is equal to its cost of finance, minus the cash flows that are paid out as dividends to equity holders and coupons to bond holders. This is an equilibrium condition. If, on average, the firm's asset value grew any more quickly, the firm would demand unlimited additional finance because the cost of doing so would be below the return on its assets. If, on average, the firm's asset value grew more slowly, the firm would be unviable in equilibrium.

A higher asset return raises the firm's asset value more quickly, reducing the probability of default, other things being equal. In contrast, higher payments to claimants on the firm will lead to slower asset value growth and a greater probability of default, other things being equal.

But there is also uncertainty about the asset value growth rate. The greater is this uncertainty, the higher the probability that the asset value of the firm will hit the default boundary over any given period. Uncertainty about the asset value growth rate means that the range of possible values for the firm's assets widens out over time. **Figure 2** illustrates two possible paths for the firm's asset value. It also shows the asset value probability distribution at some time prior to debt maturity, which reflects the range of possible asset values at that instant, with the most likely outcome at the peak of the 'hill'. If, at any point, the firm's asset value falls to the horizontal line, default occurs. This can happen before the debt principal is due to be paid.

The cumulative corporate default probability implicit in this set-up, up to the date on which the debt principal is due,

Figure 2 Evolution of a firm's asset value



determines the amount of compensation that corporate bond investors require for bearing the credit risk associated with holding the company's debt. As noted in the introduction, the total compensation for default-related risks that investors require in practice is likely to reflect their expected future default losses *and* their uncertainty about the size and timing of any such losses. As described in the Annex on pages 540–41, it is possible to separate out these two subcomponents. Intuitively, the model is used to calculate how much compensation investors would require for expected default losses if they were indifferent to uncertainty about their occurrence, by discounting the future cash flows they expect from the bond in practice at the default-free rate. Compensation for uncertainty about default losses is then obtained as the difference between total credit-related compensation and that required in this hypothetical case. In addition, there may be a residual part of observed corporate bond spreads that the model cannot explain. This contains compensation for all non-credit factors, including a premium for the relative illiquidity of the corporate bond market compared to the government bond market. This gives three contributions to observed corporate spreads: the compensation investors demand for expected default losses; compensation for uncertainty about default losses; and a non-credit related residual. The following sections go on to use the model to calculate these three components.

Implementing the structural model

For financial stability purposes, the Bank is often interested in understanding the behaviour of aggregate indices of corporate bond spreads as broad indicators of the financial health of similarly rated companies. Using the model described in the previous section, it is possible to decompose the Merrill Lynch investment-grade and high-yield indices of corporate bond spreads, for bonds denominated in sterling, dollars and euros.⁽¹⁾ These spreads are already adjusted for any option features in the corporate bonds. This helps to identify the unexplained non-credit related residual component of corporate bond spreads, since it excludes the possibility that the residual can be accounted for by, say, conversion or call options that are sometimes present in corporate debt.

Uncertainty about the representative corporate issuer's asset value cannot be observed directly. It is therefore estimated by looking at the representative issuer's equity return volatility and relating the value of the firm's equity to its asset value. Ideally, purely forward-looking measures of equity volatility implied from option prices⁽²⁾ for each of the firms in the Merrill Lynch bond spread indices would be used, with the

(1) The Merrill Lynch Global Index System contains a number of indices of weighted-average corporate bond spreads, calculated over large samples of corporate debt issues. The indices are available by currency of issuance and credit rating, and are filtered to exclude small bond issues and issues with irregular coupon schedules.

(2) See also Clews *et al* (2000) for details about extracting forward-looking information from options prices.

same maturity as each firm's debt. But sufficiently long-dated equity options are not typically traded. Instead, an average of one-year option-implied equity volatility and ten-year historical equity volatility for a large proportion of firms in the indices is used. This helps to suppress the relatively large day-to-day movements in one-year implied equity volatility.⁽¹⁾

The average growth rate of the firm's assets is calculated as a weighted average of the costs of debt and equity, using fixed long-run average leverage weights of 41.6% and 68.4% for investment-grade and high-yield corporate issuers respectively.⁽²⁾ In turn, the cost of debt is proxied by the default-free government interest rate plus the observed corporate bond spread. The cost of equity is estimated as the default-free government interest rate plus an equity risk premium calculated using a one-stage dividend discount model (DDM) applied to UK, US and euro-area equity prices.⁽³⁾

In principle, the appropriate leverage ratio to use in the model is that expected over the maturity of the representative firm's debt, which can vary over time. However, since firms can adjust their payout ratios of dividends from earnings to ensure that leverage reverts towards a preferred level over the life of the debt, a fixed average of past leverage may be a reasonable proxy for expected leverage looking forward. Moreover, substantial changes in leverage that are not coupled with a change in credit rating might reasonably be assumed to be temporary.⁽⁴⁾

Accounting for recent bond spreads

Credit-related components of spreads

Charts 1–6 show decompositions of sterling, dollar and euro-denominated corporate bond spreads, for both investment-grade (left-hand column) and high-yield companies (right-hand column).⁽⁵⁾ They suggest that compensation for bearing credit-related risks fell across the credit spectrum between the end of 2002 and mid-2007, but that credit risk compensation picked up during the recent financial market turmoil. The combined level of compensation for credit risk factors is greater for high-yield corporate debt (Charts 2, 4 and 6) than for investment-grade corporate debt (Charts 1, 3 and 5), since bonds at the lower end of the credit spectrum have a greater probability of defaulting over any given period, other things being equal. Furthermore, the *proportion* of the spread that can be accounted for by compensation for expected default losses and uncertainty about default losses is higher for high-yield corporate bonds than investment-grade bonds.

The component of sterling-denominated high-yield corporate bond spreads that can be attributed to expected future default losses has moved closely with the actual default experience of sub-investment grade companies globally since the start

of our sample in 1998 (Chart 7). The recent increase in compensation for expected default losses, to above its average since 1998, suggests that market participants may already be projecting higher default rates going forward, consistent with Moody's October 2007 forecast.⁽⁶⁾

Between early 2003 and mid-2007, the compensation that investors required for exposure to uncertainty about future default losses associated with holding sterling-denominated investment-grade corporate bonds fell. The fall was proportionally greater than the decline in comparable compensation investors required for the uncertainty about future earnings streams associated with equities in the FTSE 100 index (Chart 8). Since the end of July 2007, however, the premium attached by investors to uncertainty about future default losses has increased sharply. This is consistent with the rapid transmission of the fundamental uncertainty surrounding the value of US sub-prime mortgage-backed securities to other structured products and to global interbank funding and bond markets, as described in the October 2007 *Financial Stability Report*. The model suggests that compensation for unexpected default losses is currently around twice its average level since 1997.

The estimates of credit-related risk premia shown in Charts 1–8 are calculated using the market value of equity for the representative firm issuing in sterling, dollars and euros. They therefore rely on equity prices accurately reflecting aggregate expectations of corporate earnings prospects and uncertainty looking forward. If equity market investors were more optimistic about the outlook for corporate earnings than bond investors, for example, this could cause the model to underestimate compensation for credit-related default losses.

Non-credit related components of spreads

The non-credit related residual components of corporate bond spreads backed out from the model move reasonably closely with direct, market-based measures of corporate bond liquidity conditions. A number of studies have found that interest rate swap spreads are driven primarily by market liquidity conditions.⁽⁷⁾ And Chart 9 shows that the residual from the model-based decomposition of dollar-denominated investment-grade corporate spreads moves broadly with dollar interest rate swap spreads over default-free government bond

(1) It is possible that this may lead to an underestimation of long-dated equity volatility in times of extreme market stress.

(2) Leverage is defined as the ratio of debt principal to asset value.

(3) The DDM is described in Panigirtzoglou and Scammell (2002).

(4) A more complete description of the data, the calibration and the procedure can be found in Churm and Panigirtzoglou (2005). For example, the equity volatility index is rescaled for the high-yield spread decompositions. And there are other parameters that are not described here, including bankruptcy costs and the effective tax advantage of debt.

(5) The starting point for the decompositions is different but they all end in November 2007.

(6) Moody's Global Trailing 12-Month Issuer-Weighted Speculative-Grade Default Rates Forecast, October 2007.

(7) For example, see Liu *et al* (2002) and Huang and Neftci (2003).

Chart 1 Decomposition of sterling-denominated investment-grade corporate bond spreads

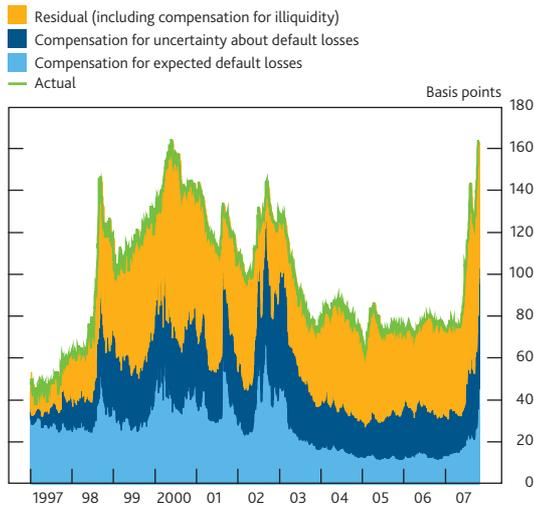


Chart 2 Decomposition of sterling-denominated high-yield corporate bond spreads

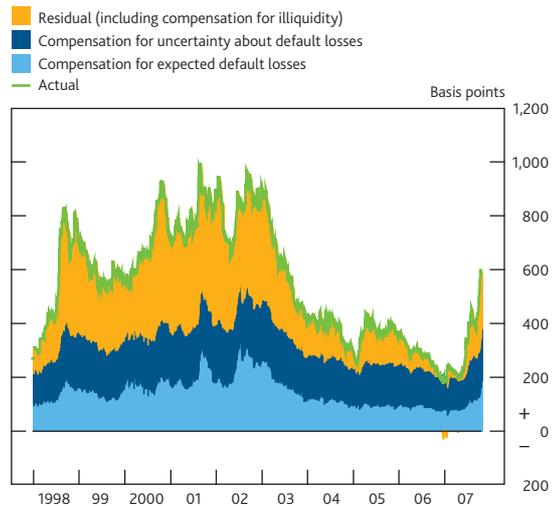


Chart 3 Decomposition of dollar-denominated investment-grade corporate bond spreads

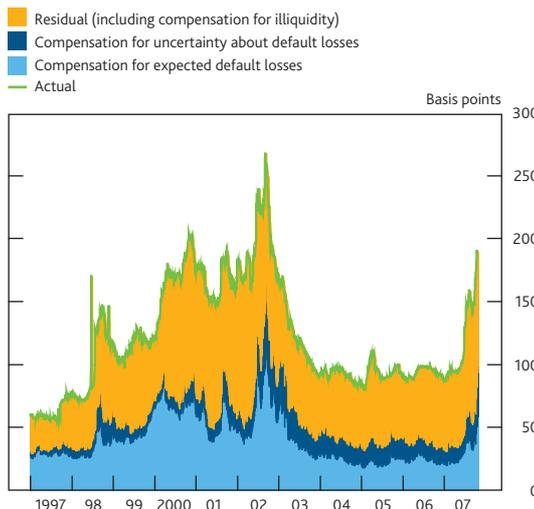


Chart 4 Decomposition of dollar-denominated high-yield corporate bond spreads

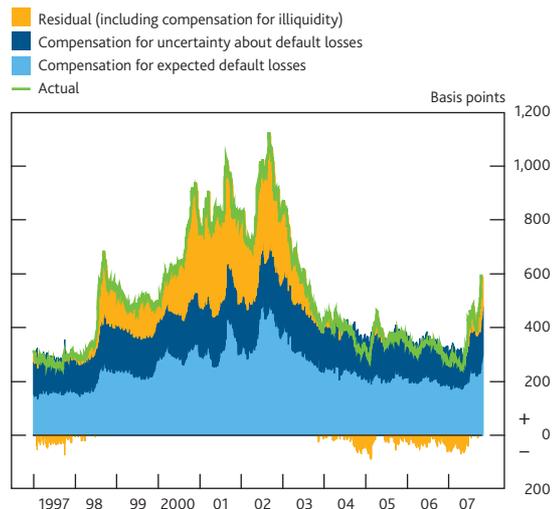


Chart 5 Decomposition of euro-denominated investment-grade corporate bond spreads

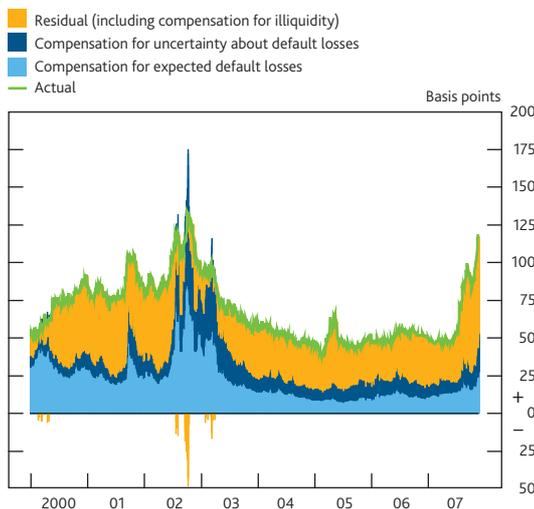


Chart 6 Decomposition of euro-denominated high-yield corporate bond spreads

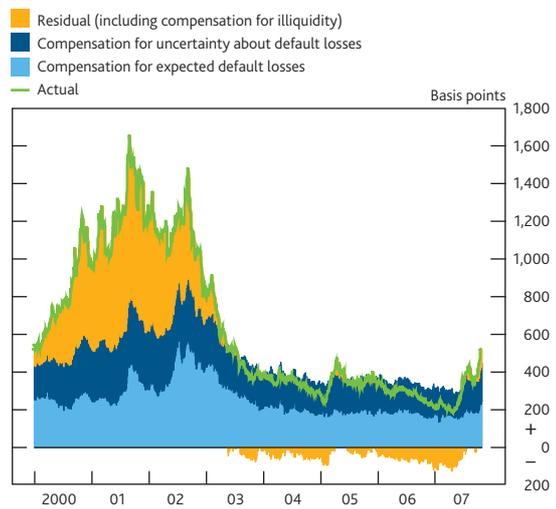
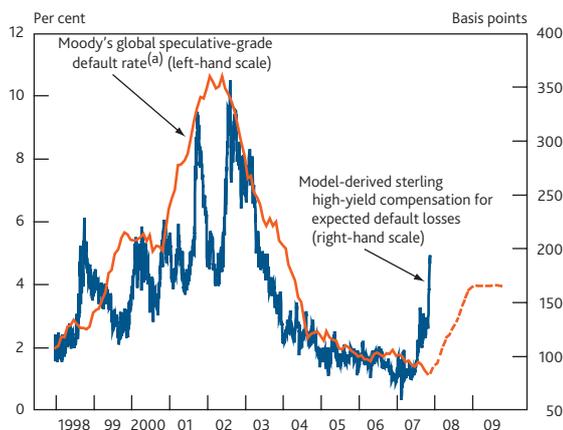
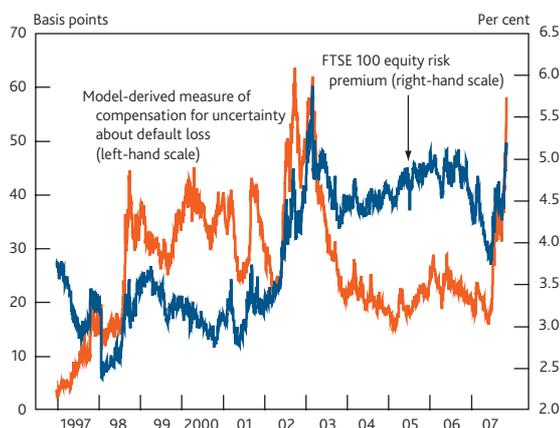


Chart 7 High-yield corporate default rate forecasts and compensation for expected default losses



(a) Solid line shows realised global speculative-grade default rate, dashed line shows Moody's October 2007 forecast.

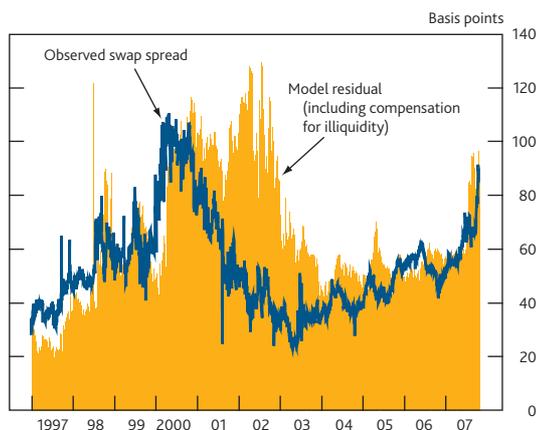
Chart 8 Compensation for pay-off uncertainty surrounding UK equities and corporate bonds



yields.⁽¹⁾ This suggests that they could be interpreted as compensation for bearing illiquidity risk.⁽²⁾

Chart 9 shows that the non-credit related residual component of dollar-denominated investment-grade spreads was generally high between mid-2000 and mid-2002, and widened by around 30 basis points between the end of 2001 and mid-2002. This broadly coincides with the episode of corporate accounting scandals in the United States, beginning when Enron filed for Chapter 11 bankruptcy protection in December 2001. The timing of the subsequent fall in the non-credit related residual broadly coincides with the introduction of the Sarbanes-Oxley Act, which became effective in August 2002 and set out stricter financial reporting standards for US-listed corporates. These observations are consistent with the interpretation of the model residual as a relative corporate bond illiquidity premium. Following the failure of a number of previously investment-grade corporates because of accounting fraud, investors may have become more uncertain about the reliability of corporate balance sheet information in general. This, in turn, may have led investors to feel less confident about their ability to trade rapidly out of

Chart 9 Dollar swap spread and implied dollar investment-grade illiquidity premium



their corporate bond positions, leading to a fall in demand for risky corporate assets and a widening of the illiquidity premium in corporate bond markets. But these fears subsequently subsided following the introduction of stricter rules on corporate disclosure in 2002. This legislation may have also helped to reduce credit risk premia.

Given the interpretation of the non-credit related residual as an illiquidity premium, it is notable from **Charts 2, 4 and 6** that there appears to have been a substantial compression in compensation for bearing illiquidity risk in high-yield corporate bond spreads between the end of 2002 and the start of the recent financial market turmoil. This would be consistent with investors having used increasingly risky strategies to maintain nominal returns over the period. Such return-seeking behaviour — or the so-called 'search for yield' — may have focused on high-yield corporate debt because those bonds offered higher spreads than their investment-grade counterparts. This could have helped promote activity in high-yield corporate bond markets, pushing spreads on high-yield bonds towards or even slightly below levels that offered sufficient compensation for default-related factors alone.⁽³⁾

In addition, illiquidity premia may have become compressed because of a shift in global investor demand from equities to fixed-income assets over the period — in particular, on the part of managers of official foreign exchange rate reserves in Asia and pension funds duration-matching their liabilities with holdings of bonds.⁽⁴⁾ The behaviour of such investors may be

(1) Interest rate swaps were developed to allow the transfer of interest rate risk between two counterparties. Specifically, **Chart 9** shows 'plain vanilla fixed-for-floating' interest rate swap spreads, in which one investor receives floating interest rate payments (referenced to Libor) while making payments to another investor a pre-agreed fixed rate. See also Cortes (2003).

(2) The residuals from the model are one component of the financial market liquidity index described in Box 2 of the April 2007 *Financial Stability Report*.

(3) As discussed by Sir John Gieve in his 'Pricing for perfection' speech, given at the Bank of England on 14 December 2006. See also *Bank of England Quarterly Bulletin*, 2007 Q1, pages 112–17.

(4) As discussed by Paul Tucker in his Roy Bridge Memorial Lecture, 'Macro, asset price, and financial system uncertainties', on 11 December 2006. See also *Bank of England Quarterly Bulletin*, 2007 Q1, pages 122–30.

insensitive to the global business cycle and short-run financial market conditions. This could have increased the depth and hence liquidity of corporate bond markets, other things being equal.

For example, in the United Kingdom, the non-credit related residual component of sterling-denominated corporate bond spreads may have been influenced by regulation designed to alter the portfolio holdings of institutional investors directly. In particular, the Minimum Funding Requirement increased pension fund demand for UK government bonds in the late 1990s, putting downward pressure on UK government yields. Other things being equal, this would have widened corporate bond spreads for reasons unrelated to the possibility of corporate default. But it seems unlikely that this explanation could explain the high-frequency changes in the residual component of sterling-denominated corporate spreads over the period as a whole.

Recently, the compression in corporate bond illiquidity premia has unwound rapidly, particularly for high-yield debt. Between early August and the end of November 2007, the components of sterling, dollar and euro-denominated high-yield corporate spreads that can be attributed to compensation for bearing illiquidity risk increased by 121 basis points, 69 basis points and 57 basis points respectively. These increases coincided with the abrupt fall in demand for assets at risk of default that accompanied the drying up of liquidity in interbank money markets beginning in mid-2007.

Conclusion

The implications of the recent widening in corporate bond spreads depend on the driving factors. The model described in

this article is one tool that can be used to separate out the compensation investors demand for bearing the risk of corporate default from compensation for non-credit related illiquidity risk.

The model used in this article suggests that compensation for bearing credit-related risks fell internationally and across the credit spectrum between the end of 2002 and mid-2007, corresponding to a period of generally falling realised corporate default rates. Illiquidity premia also fell over the period and appeared to become particularly compressed in high-yield corporate bond markets. This would be consistent with return-seeking behaviour among market participants that had focused on the highest-yielding assets, and a probable shift in global demand from equities to fixed-income assets.

However, credit and illiquidity risk premia both appeared to increase abruptly during the recent financial market turmoil. The model suggests that the compensation corporate bond investors require for bearing expected default losses has increased substantially since mid-2007 — consistent with expectations among market participants of higher corporate default rates looking forward. And the recent rise in fundamental uncertainty surrounding the value of some credit derivative instruments appears to have been reflected in corporate bond spreads as higher compensation for unexpected default losses. Alongside these increases, corporate bond illiquidity premia also appear to have risen — consistent with the recent drying up of liquidity in money markets.

Annex

Full technical details of the model used to decompose corporate bond spreads are described in Churm and Panigirtzoglou (2005). This annex provides an outline of the main calculations. The method is based on the Merton (1974) and Leland and Toft (1996) structural credit risk models.

Asset return volatility

Volatility in the return on a firm's underlying assets cannot be observed directly and so it is calculated as a transformation of observed equity return volatility using the Merton (1974) model. This is convenient because it is possible to derive a simple formula from which asset return volatility can be obtained directly, using observed market data.

In the Merton (1974) model, the underlying asset value of a firm evolves according to a so-called diffusion process:

$$\frac{dV_t}{V_t} = \mu dt + \sigma_V dW_t \quad (1)$$

where V_t denotes the firm's asset value at time t .
 μ denotes the asset value drift rate.
 σ_V denotes the volatility of asset returns.
 $dW_t \sim N(0, dt)$ denotes a normally distributed random fluctuation.

In turn, the equity value of the firm is a function of the underlying asset value, $E(V)$. Using Itô's lemma, the incremental change in equity value with asset value is:

$$dE_t = \frac{\partial E}{\partial V} dV_t + \frac{1}{2} \frac{\partial^2 E}{\partial V^2} (dV_t)^2 \quad (2)$$

By substituting equation (1) into equation (2) and assuming that the value of equity follows a similar process to equation (1), it is possible to relate σ_V (which is unobserved) to σ_E (which is observed):

$$\sigma_V = \left(\frac{V}{E} \frac{\partial E}{\partial V} \right)^{-1} \sigma_E \quad (3)$$

Equity holders' optimal default barrier

The critical asset value, or default barrier, at which equity holders choose not to honour their debt obligations, V_B , is obtained using the Leland and Toft (1996) model. This assumes that equity holders, as owners of the firm, act to maximise the value of their claim on the firm's assets. At each instant, equity holders choose the default barrier such that there is no incremental change with asset value in the value of their claim from continued operation of the firm. Consequently, equity holders trigger default the first time that

the asset value of the firm falls to the default barrier. This might occur before the corporate bond matures. The equity holders' choice of default barrier depends on, among other things, the value of the firm's asset return volatility. Equity holders therefore solve the equation:

$$\frac{\partial E(V_B(\sigma_V))}{\partial V} = 0 \quad (4)$$

Corporate bond pricing equation

The value of the debt issued by the firm is given by the present value of its expected coupon payments plus the present value of the principal due to be paid when the bond matures, adjusted for the present value of the expected loss given default. With semi-annual coupons, this can be written:

$$P_t = \sum_{t=1}^{2T-1} \frac{K}{2} e^{-r \frac{t}{2}} (1 - (1-R)EDF_t) + \left(1 + \frac{K}{2}\right) e^{-rT} (1 - (1-R)EDF_t) \quad (5)$$

where P_t denotes the price of the corporate bond.
 K denotes the total coupon per annum.
 r denotes the default-free rate of return.
 R denotes the recovery rate.
 T denotes the time until the bond matures.

EDF_t denotes the expected default frequency of the corporate issuer. This depends on, among other things, the level of the default barrier chosen by the firm's equity holders. Because equity holders choose to default the first time that the asset value of the firm falls to the default barrier, calculating the expected default frequency is analogous to pricing a so-called down-and-out barrier option (where the option holder loses the right to exercise the option if the price of the underlying asset falls below the strike price).

The two credit-related components of corporate bond spreads are calculated by solving equation (5) for the coupon payments that provide investors with sufficient compensation to ensure that the present value of the bond is equal to the principal payment expected when it matures, under different assumptions about their aggregate risk preferences.

Calculating compensation for bearing expected and unexpected default losses

It is assumed that, in practice, corporate bond investors demand compensation for bearing both expected and unexpected default losses. The sum of these two components is calculated using the model by assuming that investors recognise the uncertainty surrounding the firm's asset value growth rate. They therefore discount the future cash flows they expect in practice at a risky rate of return to reflect the

possibility of default occurring looking forward. To isolate the compensation demanded for expected default losses, it is assumed that investors continue to expect risky rates of return, but instead discount expected cash flows at the default risk-free rate. Compensation for bearing the risk of unexpected default losses can then be obtained as the difference between these two values.⁽¹⁾

(1) Equivalently, the total compensation investors demand for bearing expected and unexpected default losses is calculated in the model using *risk-neutral* valuation methods. This involves calculating the expected default frequency used in equation (5) under the risk-neutral probability measure. Compensation for expected default losses is isolated by calculating the expected default frequency used in equation (5) under the real-world probability measure.

References

- Black, F and Scholes, M (1973)**, 'The pricing of options and corporate liabilities', *Journal of Political Economy*, Vol. 81, pages 637–59.
- Churm, R and Panigirtzoglou, N (2005)**, 'Decomposing credit spreads', *Bank of England Working Paper no. 253*.
- Clews, R, Panigirtzoglou, N and Proudman, J (2000)**, 'Recent developments in extracting information from options markets', *Bank of England Quarterly Bulletin*, Spring, pages 50–60.
- Cortes, F (2003)**, 'Understanding and modelling swap spreads', *Bank of England Quarterly Bulletin*, Winter, pages 407–16.
- Gieve, J (2007)**, 'Pricing for perfection', *Bank of England Quarterly Bulletin*, Vol. 47, No. 1, pages 112–17.
- Huang, Y and Neftci, S (2003)**, 'What drives swap spreads, credit or liquidity?', *ISMA Centre Working Papers in Finance no. 2003–05*.
- Leland, H and Toft, K (1996)**, 'Optimal capital structure, endogenous bankruptcy, and the term structure of credit spreads', *Journal of Finance*, Vol. 51, pages 987–1,019.
- Liu, J, Longstaff, F and Mandell, R (2002)**, 'The market price of credit risk: an empirical analysis of interest rate swap spreads', *NBER Working Paper no. 8990*.
- Merton, R (1974)**, 'On the pricing of corporate debt: the risk structure of interest rates', *Journal of Finance*, Vol. 29, pages 449–70.
- Panigirtzoglou, N and Scammell, R (2002)**, 'Analysts' earnings forecasts and equity valuations', *Bank of England Quarterly Bulletin*, Spring, pages 59–66.
- Tucker, P (2007)**, 'Macro, asset price, and financial system uncertainties', *Bank of England Quarterly Bulletin*, Vol. 47, No. 1, pages 122–30.

Investment adjustment costs: evidence from UK and US industries

Summary of Working Paper no. 332 Charlotta Groth and Hashmat Khan

If wages and prices were perfectly flexible, and if labour and capital could move costlessly between firms and sectors, the economy would always operate at potential. In this case, large fluctuations in output, consumption and investment would not be observed. But from the past we know that some of these variables exhibit large fluctuations over the business cycle. To understand these movements, it is important to acknowledge the presence of frictions in the economy, that prevent prices and the factors of productions — labour and capital — from adjusting in response to shocks.

The literature has recognised the importance of both nominal and real frictions. Nominal frictions arise when wages and prices are sticky and therefore do not respond to changes in the economic environment. These types of frictions have been stressed in the New Keynesian literature, and give rise to the well-known Phillips trade-off between inflation and some measure of real activity. Real frictions prevent labour and capital from costlessly adjusting in response to changes in the economy. As an example, consider a firm that wants to increase its stock of capital, to be able to meet an increase in demand. In addition to the cost for buying new equipment, it may also need to spend resources on physically installing the capital, training labour and reorganising the production process, to make full use of the capital. These types of costs prevent firms from costlessly adjusting the level of capital. In turn, this means that firms will only slowly respond to shocks that alter the optimal level of capital, since it may prove costly to adjust capital in response to short-lived changes in economic conditions.

Frictions to adjusting the level of capital are common in models of the business cycle, to better replicate and explain economic fluctuations. But there are some shortcomings with these models. For example, they fail in generating the hump-shaped response of output, investment and consumption that is typically observed after a monetary policy shock — an unexpected change in the stance of monetary policy. They are not able to account for the volatility of asset returns over the business cycle. And they are not able to match the response of wages and hours worked in response to fiscal shocks. For this reason, recent studies instead introduce a friction to changing investment, instead of capital, into models of the business cycle — a so-called investment adjustment cost. This friction prevents investment quickly responding to changes in economic conditions. By introducing this friction, the performance of business cycle models are

improved along a number of dimensions, such as those discussed above.

Investment adjustment costs therefore appear to have important implications for understanding the aggregate dynamics of the economy. It is, however, unclear whether there is empirical support for these types of costs at the firm or industry level, or whether they are largely an *ad hoc* friction, introduced to better match aggregate data. Some motivations have been made for these types of costs — they may proxy delays in investment planning, or inflexibility in changing the planned pattern of investment. While this interpretation is appealing, so far no attempt has been made to estimate investment adjustment costs directly at a disaggregated level. In comparison, a large body of literature has estimated capital adjustment costs using disaggregated data. The disaggregated approach is also extensively used to assess evidence on other important frictions in the economy.

In this paper we conduct an empirical assessment of investment adjustment costs and investigate whether industry-level data provide support for this cost structure. We use industry data for both the United States and the United Kingdom, and estimate a theoretical model for capital and investment under different assumptions of the adjustment cost structure. In particular, we consider a model which is a weighted average of the investment and the capital adjustment cost model, and obtain industry-specific estimates of the relevant parameters in the adjustment cost function. The main result is that the relative weight on the investment adjustment cost model turns out to be close to zero, for all industries, in both countries. In other words, industry data do not support the investment adjustment cost structure and instead favour the traditional capital adjustment costs.

We also estimate a constrained model which imposes the investment adjustment costs on the data. Based on the estimated parameters from this model, we are able to quantify the importance of the investment adjustment cost friction. We compare this estimate to those typically obtained in aggregate models of the economy. Our results suggest that at the industry level, the friction arising from investment adjustment costs is significantly smaller than that assumed at the aggregate level. From this, we conclude that from a disaggregated empirical perspective it remains difficult to motivate and interpret the investment friction considered in recent macroeconomic models.

Labour market institutions and aggregate fluctuations in a search and matching model

Summary of Working Paper no. 333 Francesco Zanetti

It is recognised that the labour market plays an important role in the assessment of the economy. The value of labour accounts for two thirds of the total value of goods and services produced in the economy. That makes labour costs a crucial influence on most firm's production and pricing decisions, and, therefore, on the dynamics of inflation and other important macroeconomic variables. This paper explores the influence of some key institutional features of the labour market on aggregate fluctuations in real quantities like output and unemployment, and inflation. It assesses their quantitative implications by studying the effects of unemployment benefits and firing costs. Unemployment benefits are modelled as payments that accrue to workers after separations from jobs, while firing costs are modelled as firing taxes that firms pay when a worker is dismissed. It is widely thought that the best approach to macroeconomics is to use a general equilibrium approach, where the evolution of the economy over time is fully integrated into the model, and the uncertain ('stochastic') nature of the world is explicitly recognised. These are known as dynamic stochastic general equilibrium (DSGE) models. This paper uses a DSGE model characterised by search and matching frictions in the labour market and nominal rigidities in the goods market, a relatively new approach.

Results suggest that an increase in firing costs decreases the volatility of output, unemployment, employment and flows

both into and out of employment, while the volatility of inflation, real wages and labour market tightness all increase. The presence of firing costs affects the intertemporal employment decision of firms, since an increase in current employment exposes firms to future firing costs. This induces firms to decrease lay-offs and hiring, leading to higher unemployment duration and lower unemployment incidence. Since quantities are more costly to change and disturbances affect a lower number of jobs, firms adjust to shocks through prices, changing them aggressively. Hence, inflation becomes more volatile.

An increase in unemployment benefits has the reverse effect. The volatility of output, unemployment, employment, and flows in and out of the labour market increases, while the volatility of inflation, real wages and labour market tightness decreases. Higher unemployment benefits make unemployment less painful for workers, causing the duration and flows into unemployment to increase. Since workers have an incentive to stay out of employment as long as they are eligible for unemployment benefits, and shocks displace a larger number of jobs, the volatility of labour market quantities increases. Firms find it more convenient to adjust the employment level in response to shocks, so that they are less likely to adjust their prices in response to disturbances. As a result, inflation volatility decreases.

Using copulas to construct bivariate foreign exchange distributions with an application to the sterling exchange rate index

Summary of Working Paper no. 334 Matthew Hurd, Mark Salmon and Christoph Schleicher

Option contracts give the right, but not the obligation, to buy or sell a financial asset at a predetermined price, known as the 'strike price'. As such, the value of an option depends on the likelihood that its holder will exercise this right. Therefore, option prices contain information about the probability that market participants attach to different outcomes of future asset prices. A common way to summarise this information is by estimating probability distributions of future asset prices implied by option prices.

Option contracts are traded for a wide range of currencies. Nevertheless, for the purpose of monetary policy, the effective exchange rate index (ERI) is more relevant than individual bilateral exchange rates. The main purpose of this paper is to develop a method that estimates option-implied distributions for effective exchange rates.

The sterling effective exchange rate is a weighted average of a large number of sterling bilateral exchange rates. However, it can be reasonably approximated by a function of only two exchange rates — the sterling-euro and the sterling-dollar bilaterals. The distribution of the sterling ERI can then be modelled as a function of the joint distribution of the sterling-euro and sterling-dollar exchange rates. The joint distribution describes the probability of all possible joint outcomes of the two exchange rates.

We observe option prices on the sterling-euro and the sterling-dollar exchange rates and use them to compute individual probability distributions for the two exchange rates. In order to link these two individual distributions to a joint distribution we make use of a so-called copula. Copulas are functions that link probabilities of individual events ('it will be cloudy tomorrow', 'it will rain tomorrow') to those of outcomes of joint events ('it will be cloudy and it will rain tomorrow'). In the context of this paper, they join two

one-dimensional distributions to create one two-dimensional distribution. Copulas are useful, because they provide a very general description of dependence patterns.

A potential problem is the fact that there are a very large (in fact infinite) number of copulas to choose from. We overcome this problem by imposing a no-arbitrage condition between the joint distribution of the sterling-euro and sterling-dollar exchange rates on the one hand, and the univariate distribution of the euro-dollar cross-rate on the other hand. Observed option prices need to satisfy this condition, because otherwise they would present an opportunity to make a profit in excess of the risk-free rate without taking on any risk. Our no-arbitrage condition is a generalisation of the standard triangular no-arbitrage condition between any two spot exchange rates and their cross-rate. This narrows the choice of the copula function to those that are consistent with no-arbitrage.

In an empirical application we derive option-implied distributions of the sterling ERI on a daily basis between 2000 and 2005. We show that the distribution has seen considerable variation during this time. We also show how we can compute distributions of the sterling ERI that are conditional on movements in the euro-dollar exchange rate. This allows us to gauge the sensitivity of the sterling ERI to changes in the cross-rate of the United Kingdom's main trading partners.

In a second application we show that our method can be simply modified to calculate prices for options on exchange rate indices. We show that, contrary to standard models, the copula-based model generates a smile effect: options with strike prices that are further away from the current level of the effective exchange rate are relatively more expensive.

Business cycle fluctuations and excess sensitivity of private consumption

Summary of Working Paper no. 335 Gert Peersman and Lorenzo Pozzi

When consumers can freely lend and borrow on capital markets, aggregate private consumption should only react to changes in permanent income. Previous scientific work, however, finds that total consumption growth in the economy is determined by the growth rate in total disposable income. An important interpretation of this observation is that a fraction of the consumers in the economy is having a hard time obtaining credit. We say that these consumers are liquidity constrained. Therefore, when confronted with a higher income, these consumers tend to spend the additional amount instead of saving it. Another part of the consumer population does not face difficulties obtaining a loan and is therefore able to consume as much as it can. When confronted with a higher income these consumers do not necessarily consume the additional amount: they save it.

In this paper we investigate whether the impact of disposable income growth on consumption growth is higher during recessions than during expansions, ie whether during recessions there is a higher number of consumers who spend their disposable income. We find that this is the case. Our finding is based on a data set for the US economy that covers the period 1965–2000.

From a policy point of view, our findings suggest that the impact of policy changes that affect disposable income is very likely to have greater effects during recessions than during

expansions. Our study is motivated by theoretical results found in previous work where it is argued that during recessions liquidity constraints faced by consumers are more severe than in expansions. The reason is that the worsening of households' balance sheets in a recession decreases the possibility of consumers financing their expenditures through accumulated wealth. This raises the demand for credit. At the same time however the higher monitoring and contract enforcement costs faced by banks during recessions increases the cost of banks to give loans and therefore diminishes the credit supply. Our observation that consumption growth depends more heavily on disposable income growth during recessions thus supports previous theoretical results.

In our study we revisit an issue that was investigated in previous studies, namely the possibility that, over time, the fraction of liquidity-constrained consumers has decreased. In previous work it has been suggested that financial liberalisation and the development of credit markets that has occurred in the United States (especially during the 1980s) may have reduced the numbers of consumers that are liquidity constrained. We test this hypothesis by looking at whether the impact of disposable income growth on private consumption growth has fallen over the period 1965–2000. We find that it has not, suggesting that the average number of consumers that are liquidity constrained has not decreased.

A state space approach to extracting the signal from uncertain data

Summary of Working Paper no. 336 Alastair Cunningham, Jana Eklund, Christopher Jeffery, George Kapetanios and Vincent Labhard

Most macroeconomic data are uncertain — they are estimates rather than perfect measures. Measurement errors arise because data are typically based on incomplete samples. And they arise because many variables — for example, in-house software investment — are not easily observable; necessitating the use of proxies. Such uncertainty poses challenges for both forecasting and economic analysis. Where it is material, economists must decide how much weight to place on apparent 'news' in the published data. But how can the extent of the problem be judged and what can be done about it?

One symptom of data uncertainty is the propensity of statistical agencies to revise their estimates in light of new information (bigger samples) or methodological advances (better proxies). In the United Kingdom, the National Accounts are subject to a rich revisions process and as a result, the scale of the ensuing revisions may give a clear indication of the extent of data uncertainty in the past. And to the extent that past revisions give a good guide to the likely scale of revisions in the future, they can also be used to gauge the uncertainty associated with the latest data.

Recognition of this uncertainty leads naturally to a probabilistic view of the past. Estimation of a confidence interval around the official published data is a first step; giving an indication of the potential scale of revisions. Going further, economists can gather additional evidence about the current economic conjuncture; using that evidence to assess the likely impact of future revisions on the profile of growth.

Treating uncertain data in this way is neither new nor unique to the Bank. A 2004 study by the Statistics Commission concluded that 'the main users of the [official] statistics knew that revisions should be expected, understood the reasons for them, and were able to make some allowance for them when

taking important decisions'. However, most attempts to allow for potential revisions are informal. Approaching the issue more formally can add rigour to the exercise of combining such diverse source of information — this sort of exercise is known as a 'signal extraction problem'.

This paper describes a formal model of uncertain (revisable) data that can be used to extract the signal from uncertain data. The model draws on the experience of past revisions to proxy the uncertainty surrounding the latest vintage of the official data published by the Office for National Statistics. It estimates how far and in which direction to update preliminary estimates using past patterns of revisions, alternative indicators (such as business surveys) and time-series properties of the data. The model's output is an estimate of the 'true' value of the variable of interest that can be used as a cross-check of the latest published data, or even to substitute for those data in any economic applications.

In using the model to predict the cumulative impact of revisions, economists should, however, be alert to a number of caveats. In particular, the model relies on past revisions being a good indicator of current uncertainty. It is, however, possible that revisions may become less predictable in the future. For example, successful delivery of the Office for National Statistics' Statistical Modernisation Programme will enable faster balancing of National Accounts data from differing sources and facilitate internal reviews of collation procedures. And some significant methodological revisions in the past — such as the introduction of the ESA 95 accounting framework — may not be representative of current uncertainty. It is also quite possible that alternative indicators that have provided a good mapping to mature ONS data in the past will offer a worse indication in future — for example if the sample of respondents to a particular business survey becomes unrepresentative.

Report



The foreign exchange and over-the-counter derivatives markets in the United Kingdom

By Grigoria Christodoulou of the Bank's Foreign Exchange Division and Pat O'Connor of the Bank's Monetary and Financial Statistics Division.

In April this year, the Bank of England conducted its usual three-yearly survey of turnover in the UK foreign exchange and over-the-counter currency and interest rate derivatives markets, which forms part of the latest worldwide survey co-ordinated by the Bank for International Settlements. The results show that the volume of foreign exchange activity in the United Kingdom rose by 80% between April 2004 and April 2007, increasing the UK share of the global market to 34%. Turnover in OTC currency and interest rate derivatives also rose considerably in the same period. This report sets out the results of the UK survey and then goes on to consider developments in these markets over the past three years.

Introduction

In April this year, central banks and monetary authorities in 54 countries, including the United Kingdom, conducted national surveys of turnover in the traditional foreign exchange (FX) markets⁽¹⁾ — consisting of spot, outright forwards and foreign exchange swaps — and in over-the-counter (OTC) currency and interest rate derivatives markets (see the box on pages 556–57 for more details on the types of trades captured in the survey). These surveys have taken place every three years since 1986⁽²⁾ and measure turnover for the whole of April. They are co-ordinated on a global basis by the Bank for International Settlements (BIS), with the aim of obtaining comprehensive and internationally consistent information on the size and structure of the corresponding global markets.

In pursuing its goals of maintaining monetary and financial stability, the Bank monitors developments in all major UK financial markets. With an average daily turnover of around \$1.4 trillion, foreign exchange is currently one of the largest financial markets in London. An in-depth understanding of the factors affecting the foreign exchange market is an important part of the Bank's market monitoring.

This report begins by concentrating on the results of the UK part of the survey, which fed into the BIS global results,⁽³⁾ and highlights the significant increase in UK foreign exchange turnover since the last survey. The UK survey was conducted by the Bank of England and covers the business of 62

institutions (both UK-owned and foreign-owned) within the United Kingdom. The second part of this report considers the main developments in the UK foreign exchange markets in recent years that may have contributed to the marked increase in turnover, as well as the challenges that have arisen.

All data used in this report are for April 2007 or before, and therefore pre-date the recent period of financial market turbulence. The second section of this report does contain some references to recent events where they provide some insight into the robustness of the foreign exchange markets and the behaviour of their participants.

I The results of the UK survey

Foreign exchange turnover in the United Kingdom

Average daily turnover in the UK foreign exchange market during April 2007 was \$1,359 billion, 80% higher than in April 2004 measured at current exchange rates and 73% higher at constant April 2007 exchange rates,⁽⁴⁾ as shown in **Chart 1**.

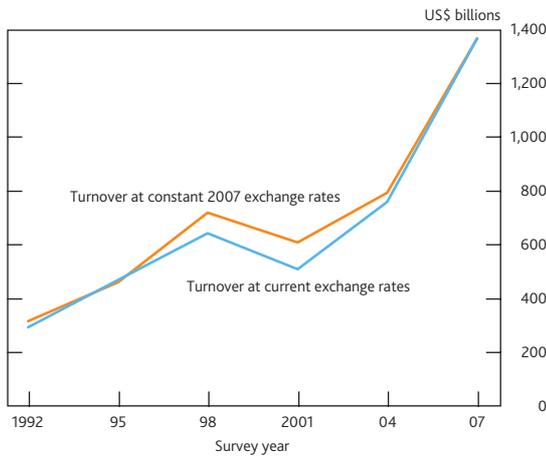
(1) Unless otherwise stated, turnover figures published here are adjusted to remove double counting of trades between UK principals that will have been reported by both parties (so-called 'local double counting').

(2) OTC derivatives were included for the first time in 1995.

(3) The BIS global results can be found on the BIS website: www.bis.org.

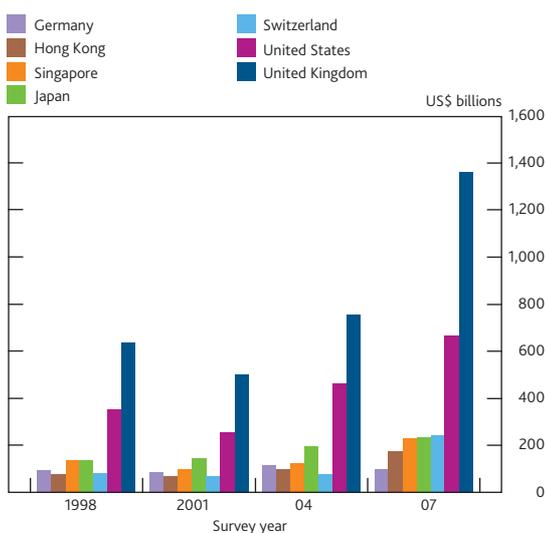
(4) For these purposes each leg of a foreign currency transaction, other than the US dollar leg, has been converted into original currency amounts at average exchange rates for April of the relevant year, and then converted back into US dollar amounts at average April 2007 exchange rates.

Chart 1 Average daily foreign exchange turnover in the United Kingdom at constant and current exchange rates



Most global financial centres saw increased activity in the three years to April 2007 (**Chart 2**). The United Kingdom reported the biggest increase in turnover and consolidated its position as the largest centre of foreign exchange activity, accounting for 34.1% of the global market in 2007, up from 31.3% in 2004. The next largest centre was the United States with 16.6% of the global market in 2007, down from 19.2% in 2004. Switzerland was the third largest, with its market share having almost doubled to 6.1% in 2007, in part due to the relocation of some trading desks to Zurich. The majority of turnover in the UK foreign exchange markets was cross-border business⁽¹⁾ — some 68% of total turnover in April 2007 — reflecting London’s role as an international financial centre.

Chart 2 Average daily foreign exchange turnover — United Kingdom and other centres

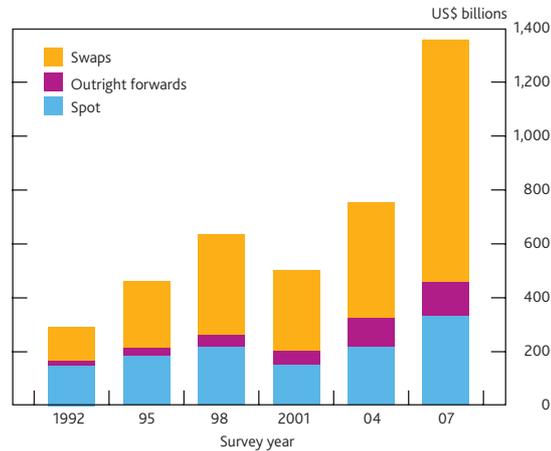


Source: BIS.

Turnover increased across all foreign exchange instruments, as illustrated in **Chart 3**. Foreign exchange swaps showed the largest increase,⁽²⁾ with turnover at \$899 billion per day, more than double the level in April 2004. Swaps accounted for 66% of total foreign exchange turnover in April 2007, up from 57%

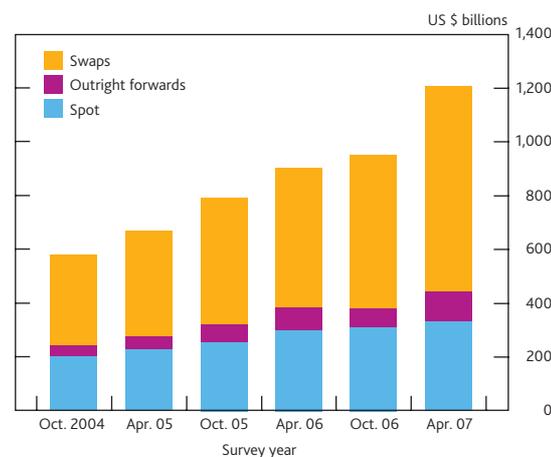
in April 2004. The maturity profile of forwards and swaps continued to move towards shorter-term trades. The percentage of forward and swap deals maturing in less than seven days increased to 78% in 2007, compared with 72% in 2004 and 69% in 2001.

Chart 3 Average daily foreign exchange turnover in the United Kingdom — by instrument type



Data from the Foreign Exchange Joint Standing Committee (FXJSC) survey (**Chart 4**), which collects similar information to the BIS survey but on a more frequent basis — twice yearly as opposed to the BIS survey which is every three years — shows foreign exchange turnover increased fairly steadily between the 2004 and 2007 surveys. While the increase in turnover slowed between April and October 2006, it picked up again in April 2007. The box on page 550 provides more information on the FXJSC survey and how it compares with the BIS survey.

Chart 4 Average daily foreign exchange turnover in the United Kingdom by instrument type — FXJSC survey results^(a)



(a) FXJSC survey reporters account for approximately 95% of the BIS survey data.

(1) ‘Cross-border business’ covers transactions with entities located outside of the United Kingdom.
 (2) A foreign exchange swap is a transaction which involves the actual exchange of two currencies on a specific date and a reverse exchange of the same two currencies at a date further in the future, with rates agreed for both legs when the deal is undertaken.

BIS triennial survey and the Foreign Exchange Joint Standing Committee survey

The Foreign Exchange Joint Standing Committee (FXJSC) is a UK market liaison group established by the banks and brokers of the London foreign exchange market and chaired by the Bank of England. Since 2004, it has been publishing foreign exchange turnover data for the United Kingdom every six months. Data are collected for turnover in April and October each year. Further details on the FXJSC can be found at www.bankofengland.co.uk/markets/forex/fxjsc.

The FXJSC survey collects similar information to the foreign exchange section of the BIS triennial survey. There are two important differences in institutional coverage and definition. First, the FXJSC survey has around 30 reporting institutions, a subset of the BIS triennial survey reporters which numbered 62 in 2007 and 93 in 2004. The second difference is the reporting basis: the FXJSC survey is based on the location of the price-setting dealer or trading desk (where transactions are executed), while the BIS triennial survey is based on the location of the sales desk (where transactions are arranged).

Despite these differences the two surveys are still reasonably comparable. **Table 1** shows the data reported on the FXJSC survey and the equivalent BIS triennial data for the same reporting institutions. The numbers are very similar, suggesting the difference in reporting basis did not have a significant effect overall in 2007. **Table 2** shows the FXJSC reporting institutions' percentage share of the BIS triennial survey, which is very high for all instruments. Together, these tables suggest that the FXJSC survey provides a reliable, and more frequent, indication of activity within the foreign exchange market in the United Kingdom.

There was marked growth in turnover with non-reporting customers ('non-financial customers' and 'other financial institutions'), with turnover in April 2007 more than triple that in April 2004.⁽¹⁾ This business accounted for over half of total turnover in 2007, but only one third in April 2004, as shown in **Chart 5**. Business with 'other financial institutions', such as hedge funds and mutual funds, averaged \$571 billion per day in April 2007. Business with 'non-financial customers', such as corporates and governments, averaged \$174 billion per day. US dollar-denominated customer business showed the largest growth, particularly against the euro and sterling. Turnover between reporting dealers increased by 21% compared with April 2004, reaching \$614 billion per day in April 2007.

The US dollar continued to be the dominant currency in the UK foreign exchange market, with 89% of all trades having one side denominated in US dollars in 2007 (**Table A**). The euro remained unchanged at 42%, while the proportion of turnover involving sterling fell from 28% to 22%. The market share of

Similar semi-annual surveys are also conducted for the New York market by the New York Foreign Exchange Committee; for the Singapore market by the Singapore Foreign Exchange Market Committee; and for the Canadian market by the Canadian Foreign Exchange Committee. The Tokyo Foreign Exchange Market Committee also began an annual survey of foreign exchange turnover in April 2006.

Table 1 Comparison of BIS triennial and FXJSC data for FXJSC reporting institutions (April 2007)

	Daily average turnover in \$ billions ^(a)		
	BIS triennial	FXJSC	Difference
Spot	353	400	-48
Outright forwards	124	119	5
FX swaps	962	926	36
Currency swaps	18	15	2
FX options	117	142	-25
Total	1,573	1,602	-30

(a) To allow this comparison these data are *not* adjusted to remove double counting of trades between UK principals that will have been reported by both parties.

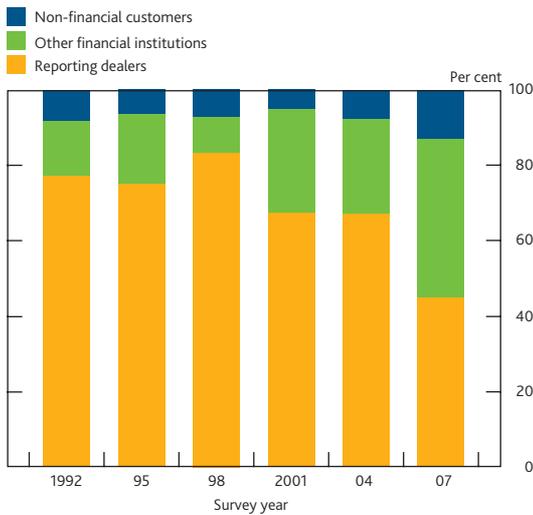
Table 2 FXJSC reporters' contribution to the BIS triennial data (April 2007)^(a)

	Total BIS triennial ^(b)	Of which, FXJSC reporting institutions ^(b)	Per cent
Spot	377	353	94
Outright forwards	132	124	94
FX swaps	1,017	962	95
Currency swaps	20	18	90
FX options	118	117	99
Total	1,664	1,573	95

(a) See footnote (a) in **Table 1**, above.
(b) Daily average turnover in \$ billions.

'other currencies' increased to 19%, which may partly be due to growth in 'carry trades'.⁽²⁾ The survey does not distinguish these trades, but there was an increase in trading in Australian and New Zealand dollars, two currencies commonly used as the investment currency in a carry trade. There was also increased trading in other 'smaller' currencies. The Polish zloty was separately identified in the UK survey for the first time in 2007, recording daily turnover of \$15 billion during April. This equalled the turnover of the Hong Kong dollar and South African rand and was almost three times the turnover in the Singapore dollar. These currencies are included within 'other currencies' in **Table A**.

- (1) Turnover between survey participants, both in the United Kingdom and overseas, is classified as turnover with reporting dealers. Turnover with all other market participants, who do not complete the survey, is classified as turnover with non-reporting customers.
(2) A foreign exchange carry trade occurs when an investor borrows in the currency of a country with low interest rates (for example, the yen or Swiss franc) and invests in the currency of a country with higher interest rates (for example, sterling or the Australian dollar). For more details see the box 'Carry trades in the foreign exchange market', *Bank of England Quarterly Bulletin*, Winter 2003, page 401.

Chart 5 Average daily foreign exchange turnover in the United Kingdom — by counterparty**Table A** Foreign exchange turnover — currency breakdown

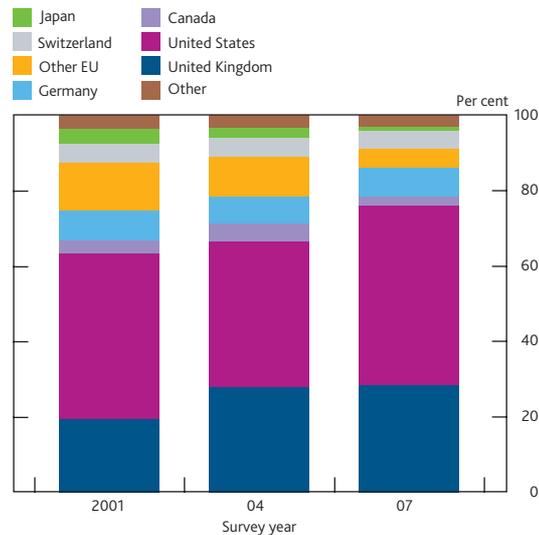
Per cent ^(a)	2001	2004	2007
US dollar	92	90	89
Euro	41	42	42
Pound sterling	24	28	22
Japanese yen	17	15	14
Swiss franc	6	6	6
Canadian dollar	4	3	3
Australian dollar	3	4	5
Other currencies	13	12	19

(a) Because two currencies are involved in each transaction, the sum of the percentage shares of individual currencies totals 200% instead of 100%.

Euro/US dollar remained the most traded currency pair, accounting for 33% of total foreign exchange turnover, unchanged from April 2004. The level of trading in sterling/US dollar decreased as a proportion of total turnover, accounting for 18% of the total, in contrast to the increase seen in previous surveys.

The UK foreign exchange market remained dominated by US-owned institutions, with a 48% share of turnover, up from 39% in April 2004 (**Chart 6**). Turnover attributable to UK-owned institutions accounted for 28% in 2007, unchanged from 2004. Non-UK EU institutions' share fell by 5 percentage points to 13%, largely driven by a fall in the share of French-owned institutions.

The UK foreign exchange market is an open and contestable market. Concentration among financial firms increased in 2007 compared with 2004. The combined market share of the ten institutions with the highest level of total turnover (ie across all three instruments) increased from 61% to 70%, and the share of the top 20 from 80% to 90%. **Table B** shows how concentration varied by instrument. Only two institutions

Chart 6 Average daily foreign exchange turnover in the United Kingdom — by nationality of reporting institution

appear in the top five for all three instruments, but seven institutions are in the top ten for all three instruments. The forwards market was the most concentrated, possibly reflecting its smaller size. However, the UK foreign exchange market remained less concentrated than the OTC derivatives market, which is discussed below.

Table B Foreign exchange turnover — market concentration (April 2007)

Per cent	Spot	Forwards	FX swaps
Top five institutions	45	50	45
Top ten institutions	69	75	72
Top twenty institutions	90	94	92

OTC derivatives turnover in the United Kingdom

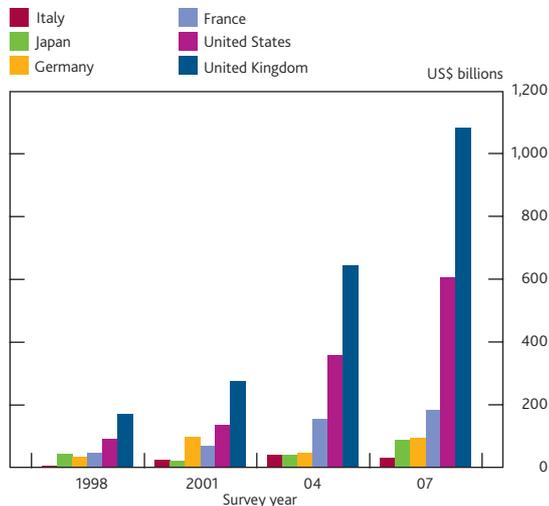
Average daily turnover for OTC currency — consisting of currency swaps and currency options — and interest rate derivatives — consisting of interest rate forward rate agreements (FRAs), swaps and options — in the United Kingdom was \$1,081 billion in April 2007, a 68% increase on 2004.⁽¹⁾ Within this, turnover in OTC interest rate derivatives increased from \$563 billion to \$957 billion per day, while turnover in the OTC currency derivatives rose from \$80 billion to \$124 billion per day.

Most financial centres reported increased turnover in OTC currency and interest rate derivatives in 2007, as shown in **Chart 7**. The United Kingdom remained the main centre for this business, maintaining its 42.5% share of the global market. Once again, the next largest centre was the United States with 23.8%, followed by France with 7.2%. Cross-border trades comprised around three quarters of the

(1) For a more detailed definition of these instruments see the box on pages 556–57.

United Kingdom's OTC currency and interest rate derivatives turnover, up from two thirds in 2004.

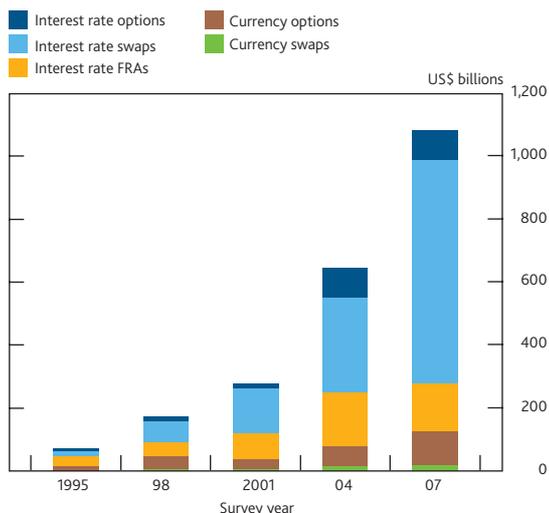
Chart 7 Average daily OTC derivatives turnover — United Kingdom and other centres



Source: BIS.

Chart 8 shows OTC derivatives turnover by instrument type and shows that turnover in interest rate swaps had by far the largest increase between 2004 and 2007, up 137%. Interest rate swaps accounted for 66% of the turnover in the OTC derivatives market in April 2007, compared with 47% in 2004. Turnover in currency options also increased significantly, up 66% from \$64 billion to \$106 billion.

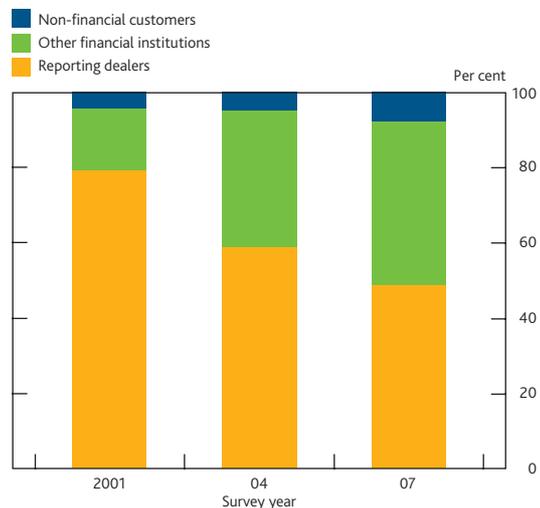
Chart 8 Average daily OTC derivatives turnover in the United Kingdom — by instrument type



As in the foreign exchange market, the proportion of customer business (ie with 'other financial institutions' and 'non-financial customers') increased in 2007, up 10% on 2004, to a 51% share of the market (**Chart 9**). This was driven by a 7% increase in the proportion of business with 'other financial institutions', which accounted for 43% of total turnover. The

increase in customer business is likely to be partly due to the continued growth of hedge funds and their involvement in the OTC derivatives markets.

Chart 9 Average daily OTC derivatives turnover in the United Kingdom — by counterparty



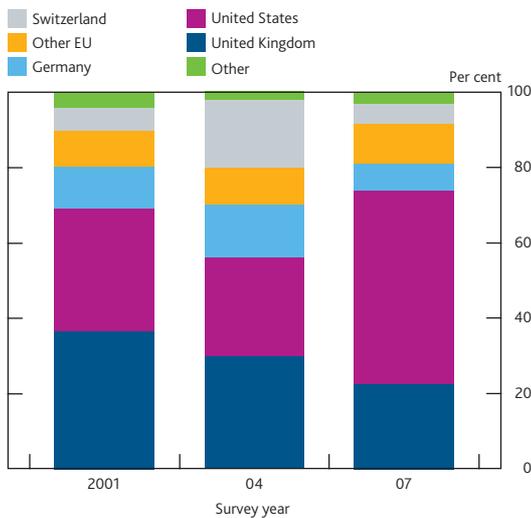
The US dollar remained the most traded currency in the OTC currency derivatives market, with 75% of turnover in 2007, compared to 78% in 2004. The proportion of turnover involving the euro fell to 41%, from 49% in April 2004.

The euro nevertheless remained the dominant currency in the OTC interest rate derivatives market, accounting for 51% of total turnover, down from 58% in 2004. The currency concentration was far higher in the OTC interest rate derivatives market than in currency derivatives. However, turnover in currencies other than the top four — US dollar, euro, sterling and yen — increased from 5% of total turnover in 2004 to 10% in April 2007.

As with the foreign exchange markets, US-owned institutions had a dominant share of the OTC derivatives market in the United Kingdom, accounting for just over half of the total turnover (**Chart 10**). UK-owned institutions' share fell again in 2007, down to 23% of turnover compared with a 30% share in 2004. The share of Swiss-owned institutions fell to 5% in April 2007 from 18% in 2004, while that of German-owned institutions fell from 14% to 7%. This reflects, in part, some non-UK EU institutions having transferred their operations out of London since 2004.

Concentration in the UK OTC derivatives market in April 2007 was similar to that in April 2004 and remained above that in the foreign exchange market. The top ten institutions with the highest total derivatives trading volumes (ie across all five instruments) accounted for 81% of total turnover, compared to 80% in 2004. The top 20 institutions accounted for 96% of total turnover, compared to 94% in 2004. **Table C** shows how

Chart 10 Average daily OTC derivatives turnover in the United Kingdom — by nationality of reporting institution



this concentration varied by instruments. While one institution was ranked within the top five for all the OTC interest rate derivative instruments, no institution was within the top five of all OTC currency and interest rate derivatives.

Table C OTC currency and interest rate derivative turnover — market concentration (April 2007)

Per cent	Currency swaps	Currency options	Interest rate FRAs	Interest rate swaps	Interest rate options
Top five institutions	60	51	54	64	78
Top ten institutions	84	82	78	85	95
Top twenty institutions	98	99	97	97	100

Summary

There was strong growth in turnover in the UK foreign exchange market, increasing by 80% between April 2004 and April 2007. This led to an increase in the United Kingdom's share of the global market to 34%: double the next closest, the United States, with 17%. The increase was predominately driven by business with customers and was focused in foreign exchange swaps. There was also strong growth in OTC derivatives turnover, increasing by 68% between April 2004 and April 2007. The United Kingdom's global market share remained unchanged at 43%. Again, the increase in turnover was driven by customer business, predominately in interest rate swaps.

II Main developments in the foreign exchange market

As the UK survey shows, the average daily turnover in the UK foreign exchange market has increased markedly. Foreign exchange is one of the largest financial markets in London by turnover and in turn, London is currently the largest centre of

foreign exchange activity worldwide. The Bank's many contacts with foreign exchange market participants afford it an insight into the underlying factors affecting the foreign exchange market.

Market contacts have noted three key drivers behind the strong turnover growth: the proliferation of electronic trading, the increasing number of new market participants, and the greater use of foreign exchange as a distinct asset class. This section discusses these three factors in more detail.

Electronic trading

The foreign exchange market landscape has changed notably over the past three years, largely due to the introduction and development of new trading technologies. Market contacts suggest that a growing share of total foreign exchange trading is now being executed electronically. To better document this trend, the BIS began to collect data in 2007 on the execution methods of foreign exchange transactions, as part of the triennial survey. In April 2007, around 30% of total UK foreign exchange turnover was executed through electronic broking and electronic trading systems.⁽¹⁾

However, the overall figure for electronic trading may be higher as some of the interbank and customer direct trading⁽²⁾ reported by the UK survey respondents is also likely to be executed electronically.

Electronic trading has allowed 'traditional' foreign exchange market participants to adopt new trading strategies, streamlining their existing processes, lowering their costs and increasing their efficiency. Moreover, by allowing a growing number of new market participants to access the market directly, these developments have led to increased market liquidity, price transparency and narrower bid-offer spreads (**Chart 11**).

The reduction in trade execution times, together with increased market liquidity and more powerful computational engines, compared with previous survey periods, have also made possible the use of automated high-volume strategies (often referred to generically as algorithmic trading) by some of the larger market participants and hedge funds.

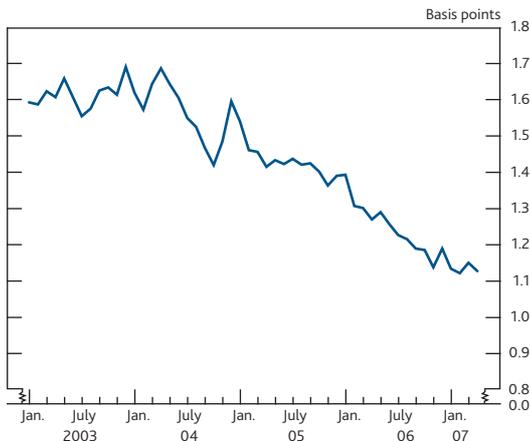
Moreover, the introduction of Continuous Linked Settlement (CLS) in 2002, has significantly reduced foreign exchange settlement risk⁽³⁾ and hence, according to market contacts, supported the increase in total foreign exchange turnover.

(1) Electronic broking systems are defined as automated order matching systems for foreign exchange dealers. Electronic trading systems include single-bank proprietary platforms and multi-bank dealing systems.

(2) These are trades executed either between two BIS survey reporting dealers ('interbank') or between a reporting dealer and a customer or non-reporting dealer ('customer') using direct telephone communication or direct electronic dealing systems such as Reuters Conversational Dealing.

(3) The risk that one party to a transaction will pay the currency it sold but not receive the currency it bought. CLS eliminates foreign exchange settlement risk using a 'payment versus payment' (PvP) system, whereby both sides' payments for a foreign exchange transaction are settled simultaneously.

Chart 11 Bid-offer spread proxy for major foreign exchange currency pairs^(a)



Source: Lehman Brothers.

(a) Spreads are weighted averages across several active foreign exchange currency pairs during core London trading hours in the interdealer market. The weights used are in approximate proportion to the volume traded — they are intended only to be reasonable proxies for typical market spreads.

A brief history of electronic trading

Electronic trading platforms began to emerge in the late 1980s and by the early 1990s dealing systems developed by EBS and Reuters had become established for the interbank market. EBS and Reuters both offered 'matching' systems in which participants were able to put in bids and offers that others could choose to trade at. The market for end-users remained mainly telephone based.

However, advances in technology, and especially the increasing capabilities of the internet, led to the appearance of web-based electronic platforms that were easily accessible by a broader range of market participants.

First, large banks, which already had access to the electronic interbank foreign exchange markets, began to build proprietary trading platforms which allowed their customers to trade electronically with them. Prices were usually based on those on interbank systems. These platforms made transaction processing more efficient and cost effective, and reduced the risk of human error. Straight-through processing (STP) from trading through to settlement was facilitated by going electronic, as was the ability to interface easily with other systems, such as those for real-time risk management. Some banks also sold the technology underlying their proprietary platforms to other market participants that were unable or unwilling to make the necessary technical investment (a process known as 'white labelling').⁽¹⁾ Typically, the supplier bank would also offer pricing in at least some of the currency pairs through these platforms.

In addition to these proprietary platforms, bank consortia and other independent technology suppliers developed multi-bank platforms, where prices are offered by a number of different providers. These platforms were further diversified depending on their features; tailored to specific client groups (such as

corporates), providing anonymous trading, or end-to-end user matching for example.

More recently, price aggregator platforms have also emerged; these systems aggregate multiple sources of liquidity into a single access point allowing traders to see prices simultaneously from a number of different trading platforms. Price aggregators tend to be used by market professionals, including some banks. There has been much debate that the foreign exchange market will one day migrate to a true exchange model (with a central counterparty) and some of the most recently established platforms are pursuing such a strategy.

Main challenges for the foreign exchange market arising from electronic trading

One of the main operational issues preoccupying foreign exchange market participants in recent years has been the 'latency' of the trade cycle: the time it takes to deliver an executable price to a client plus the time it takes for the trade record to return to the price maker. Latency increases in importance when the time horizon for trading shortens, because of its impact on the certainty of filling a trade and the possibility of so-called price slippage. For price-takers, any time delay will expose them to market risk until confirmation that the order has been completed. For price-makers, delays can leave their offered prices in the market at a time when the market is moving. The length of latency periods typically depends on the physical architecture of the trading venue and the links market participants have to it. For a time, latency arbitrageurs (usually small funds) used high-frequency models to exploit time inefficiencies between prices offered by as many providers as they could access. It was reported that some would even locate servers in close physical proximity to a foreign exchange trading platform's data centre to minimise latency.

Another issue with electronic trading has been the 'liquidity mirage': the distribution of an interbank offer price for a specific size trade to multiple trading platforms, making it appear that liquidity is greater than it really is and possibly resulting in mispricing. Once a single price offer is taken (or 'hit') it may disappear simultaneously from many systems. If not, then the bank making the price could be 'hit' on several platforms and find itself committed to a larger-than-expected market risk. One solution trading platforms have adopted to combat this problem is no longer to rely exclusively on external price feeds, but to factor in the bank's current position and market view to create a more robust 'house price'.

Perhaps the most live area of development currently in foreign exchange markets is how market participants manage their trading positions arising from electronic trading. In managing

(1) See *Bank of England Quarterly Bulletin*, Summer 2003, page 237, for a more detailed discussion.

very high frequency risk effectively, some banks now employ sophisticated hedging tools to offset risk automatically and to adjust prices with almost no manual intervention. This ability to manage incoming trade flow ensures that the price-maker can continue to offer robust pricing consistently, including through volatile periods.

The direct impact of the recent financial market turbulence provided an opportunity for market participants to examine the resilience of their systems. Overall the market sentiment has been that the foreign exchange market infrastructure, from trading to settlement, met the test satisfactorily, especially during certain high-volume days in August. The biggest impact was on the foreign exchange swap market, where market-making was restricted because of liquidity and pricing problems in the underlying money markets.⁽¹⁾ Looking forward, the knowledge gained regarding the infrastructure's performance under stress and capacity constraints will inform future system enhancements and stress-testing scenarios.

New market participants

Looking more closely at the trading counterparties involved in foreign exchange transactions, there has been a marked growth in the involvement of 'other financial institutions', a category that includes institutions such as hedge funds and pension funds, and 'non-financial customers', such as corporates and governments (Chart 5).

Electronic trading has improved access to the foreign exchange market for new participants, who were either unwilling or unable to do so before. Lower costs, increased speed and price transparency have all been significant factors in attracting a wide range of new participants, from hedge funds to retail investors, to the foreign exchange market.

Market contacts suggest that both hedge funds and commodity trading advisors (CTAs)⁽²⁾ have significantly increased their foreign exchange trading flows in recent years, benefiting from electronic trading and prime brokerage services⁽³⁾ offered by a number of banks. Indeed, over the past few years an increased number of large hedge fund management and private equity firms have been established in the United Kingdom, with twelve of the world's largest 50 hedge funds currently located in London, as against only three in 2002.⁽⁴⁾ Hedge funds typically employ large-volume foreign exchange trading strategies, and may therefore account for a sizable share of the growth in UK foreign exchange turnover.

In a global context, retail currency trading⁽⁵⁾ has also risen significantly; a report by Greenwich Associates found that total global retail currency trading rose by 54% in 2006 (and by 80% in Europe specifically).⁽⁶⁾ Indeed, according to some market estimates, the average daily retail foreign exchange volume globally is around \$50 billion. Again, electronic trading technology, with low barriers to entry and narrow bid/ask spreads, has been a key catalyst to broadening the appeal of

foreign exchange to end-users. A range of electronic platforms now allow retail investors to invest in foreign exchange in a variety of ways; from margin trading⁽⁷⁾ to more exotic structured products that recreate any desired pay-off profile.

Perhaps the most notable expansion in retail trading has been in Japan. Japanese retail investors engaging in foreign exchange-related trading have been cited by a number of market commentators as a key influence on yen spot prices over the past two years. According to one estimate, online retail traders in Japan account for around \$15 billion of deals⁽⁸⁾ each day.

Possible challenges from new participants

The foreign exchange market landscape has changed significantly over the past few years. Electronic trading has reduced barriers to entry, narrowed spreads and eroded margins. Today a wide range of different market participants can access the foreign exchange market at prices close to traditional foreign exchange traders and on multiple trading platforms. As a consequence, traditional buy and sell-side participant definitions have been blurred and trading volumes have increased rapidly. Infrastructure capacity and banks' ability to monitor and analyse their clients' positions have had to be expanded, and this trend looks set to continue.

Another area of interest among market commentators has been how the new entrants would react in the event of turbulence in the foreign exchange market. A possible concern may be that, having joined the market during a period of exceptionally low levels of volatility, non-financial investors might not have fully taken into account potential market risks. If, in a time of stress, they seek or are forced through margin requirements to unwind their positions quickly, this might have a disruptive effect on markets. Market contacts have suggested that this may have contributed to the sharp movement in the dollar/yen bilateral rate on 16 August, for example, which moved by around 2% in just a few minutes.

Foreign exchange as an asset class

During the past few years market contacts have reported a shift in the way many market participants perceive foreign exchange. Traditionally, foreign exchange tended to be seen

(1) See *Bank of England Quarterly Bulletin*, 2007 Q3, page 349, for a more detailed discussion.

(2) A CTA is an individual or firm which advises others about buying and selling futures and/or options on futures, and manages associated trades for its clients or on its own behalf.

(3) Foreign exchange prime brokerage allows a client to source liquidity from a variety of dealers by utilising a credit relationship, placing collateral, and settling with a single entity — the prime broker.

(4) See Gieve (2007).

(5) Retail foreign exchange in general refers to currency trading not done by large corporations, investment banks/asset managers/fund companies, or large retail banks.

(6) 'Electronic trading systems capture one half of global FX volume', Greenwich Associates (2007).

(7) Margin trading allows an investor to take a position (long/short) on a currency by depositing a portion of the purchase price.

(8) See *The Times* (2007).

Definitional issues

Participants

In April 2007, 62 institutions, mainly commercial and investment banks, participated in the UK part of the global survey. This was fewer than in previous surveys (for example, there were 93 participants in 2004), as only firms that participate in the interdealer market and/or have an active business with large customers were asked to complete the 2007 survey. The 62 reporting institutions for the 2007 survey accounted for 99% of turnover in the 2004 survey. Others active in the UK market were not directly involved in the survey, but their transactions with participating principals will have been recorded by those institutions.

The questionnaire

Survey participants completed a questionnaire prepared by the Bank of England, based on a standard format agreed with other central banks and produced by the Bank for International Settlements (BIS). Participants were asked to provide details of their gross turnover for the 19 business days in April 2007. Gross turnover (measured in nominal values) was defined as the absolute total value of all deals contracted; there was no netting of purchases against sales. Data were requested in terms of US dollar equivalents, rounded to the nearest million. The basis of reporting was the location of the sales desk of the trade, as in the 2004 survey. The questionnaire asked for turnover to be broken down by currency, instrument and type of counterparty.

The survey distinguished the following types of transaction:

Foreign exchange

- *Spot transaction*: Single outright transaction involving the exchange of two currencies at a rate agreed on the date of the contract for value or delivery (cash settlement) within two business days. The spot legs of swaps and swaps that were for settlement within two days (ie 'tomorrow/next day' swap transactions) were excluded from this category.
- *Outright forward*: Transaction involving the exchange of two currencies at a rate agreed on the date of the contract for value or delivery (cash settlement) at some time in the future (more than two business days later). Also included in this category were forward foreign exchange agreement transactions (FXA), non-deliverable forwards, and other forward contracts for differences.
- *Foreign exchange swap*: Transaction which involves the actual exchange of two currencies (principal amount only) on a specific date at a rate agreed at the time of the conclusion of the contract (the short leg), and a reverse exchange of the same two currencies at a date further in the future at a rate (generally different from the rate applied to

the short leg) agreed at the time the contract is agreed (the long leg). Short-term swaps carried out as 'tomorrow/next day' transactions are included in this category.

OTC currency derivatives

- *Currency swap*: Contract which commits two counterparties to exchange streams of interest payments in different currencies for an agreed period of time and to exchange principal amounts in different currencies at a pre-agreed exchange rate at maturity.
- *Currency option*: Option contract that gives the right to buy or sell a currency with another currency at a specified exchange rate during a specified period. This category also includes currency swaptions, currency warrants and exotic foreign exchange options such as average rate options and barrier options.

Single-currency OTC interest rate derivatives

- *Forward rate agreement (FRA)*: Interest rate forward contract in which the rate to be paid or received on a specific obligation for a set period of time, beginning at some time in the future, is determined at contract initiation.
- *Interest rate swap*: Agreement to exchange periodic payments related to interest rates on a single currency. Can be fixed for floating, or floating for floating based on different indices. This category includes those swaps whose notional principal is amortised according to a fixed schedule independent of interest rates.
- *Interest rate option*: Option contract that gives the right to pay or receive a specific interest rate on a predetermined principal for a set period of time. Included in this category are interest rate caps, floors, collars, corridors, swaptions and warrants.

Reporting institutions were asked to distinguish between transactions with:

- *Reporting dealers*: Financial institutions that are participating in the globally co-ordinated survey. These firms actively participate in local and global foreign exchange and derivatives markets.
- *Other financial institutions*: Financial institutions that are not classified as reporting dealers. Thus, it will mainly cover smaller commercial banks, investment banks and securities houses, and in addition mutual funds, pension funds, hedge funds, currency funds, money market funds, building societies, leasing companies, insurance companies, other financial subsidiaries of corporate firms and central banks.
- *Non-financial customers*: Covers any counterparty other than those described above, ie mainly non-financial end-users, such as corporates and governments.

In each case reporting institutions were asked to separate local and cross-border transactions (determined according to the location, rather than the nationality of the counterparty) to permit adjustment for double counting.

Market conditions

Participants were asked whether they regarded the level of turnover in April 2007 as normal. The responses are summarised in **Table 1**, and suggest that the survey results can be regarded as representative.

The aggregate responses (adjusted for double counting) for the main sections of the questionnaire are shown in **Tables D, E and F** (at the end of this article). The BIS intends to publish an analysis of the global survey results in December 2007. A survey of global outstanding positions in the derivative markets (measured at the end of June 2007) has been

more as a residual consideration for traders managing portfolios of other instruments such as equities or bonds. However, with nominal returns under pressure in these more traditional asset classes, investors have searched for alternatives. Attention turned towards hedge funds, structured credit, commodities, property and foreign exchange among others, as possible vehicles to generate extra returns and diversification. Market contacts suggest that institutional clients, such as pension funds, have begun to invest more in foreign exchange products as part of their portfolios, attracted by the deep market liquidity and increased transparency.

Central banks and other official reserve managers also appear to have become more active in foreign exchange markets recently. A number of factors have probably been influential. First, many developed and developing country reserve managers seem to have adjusted the currency composition of their assets in order to benefit from a more diversified portfolio. Over the past couple of years for example, a number of central banks have publicly announced changes to the currency exposure in their reserves.

Second, reserve managers may have started to manage their assets more actively in search of higher yields. Holdings of sterling assets for example have increased significantly, as a percentage of total reserves, according to the IMF's COFER survey: from 2.38% of total reserves in 2004 Q4 to 2.98% in 2007 Q2.⁽¹⁾ With total world foreign exchange reserves exceeding \$5.7 trillion, the impact that reserves management can have on total foreign exchange turnover can be considerable.

Perhaps the most prominent foreign exchange trading strategy over the past few years has been the 'carry trade' (see footnote 2 on page 550). In theory, market arbitrage should ensure that carry trades are not profitable — high interest rate currencies should be expected to depreciate so that the

undertaken and global results for this survey were released by the BIS on 21 November 2007.

Table 1 Survey participants' estimates of foreign exchange turnover levels

In April 2007	Number of banks	Percentage of turnover
Below normal	16	14
Normal	40	60
Above normal	6	26
In preceding six months	Number of banks	Percentage of turnover
Decreasing	7	1
Steady	31	29
Increasing	24	70

potential gain from interest rate differentials (the basis of the carry trade) is exactly offset by a fall in the relative value of the high interest currency. However, the low levels of implied and realised foreign exchange volatility during 2006 and early 2007 made these type of strategies particularly popular with investors with a sufficiently short-term investment horizon, in search of higher returns.

Since the reason behind particular foreign exchange trades is not recorded, there is no single recognised measure of carry-trade activity. Market estimates for the size of carry-trade activity range from around \$34 billion to \$1 trillion but there is little certainty behind these figures. What is clear, however, is that the impact of these types of trading strategies on total foreign exchange turnover has been significant at particular moments in time.

Conclusion

UK foreign exchange turnover increased markedly over the past three years; the average daily turnover rose by 80% from \$753 billion in April 2004 to \$1,359 billion in April 2007. Compared with other contributors to the global BIS triennial survey, the United Kingdom reported the biggest increase in turnover and consolidated its position as the largest centre of foreign exchange activity, accounting for 34% of the global market in 2007. Indeed the UK foreign exchange landscape has changed significantly over the past three years. The proliferation of electronic trading, the increasing number of new market participants and the greater use of foreign exchange as a separate asset class have all contributed to the strong growth in market turnover. Foreign exchange markets continue to develop and evolve, extending the boundaries and posing new challenges to market participants.

(1) *Currency Composition of Official Foreign Exchange Reserves*, IMF (2007).

Table D Average daily net-gross foreign exchange turnover (April 2007)^(a)

US\$ millions (rounded to the nearest million)

	US dollar against:							Sterling against:							
	Euro	¥	SwFr	Can\$	Aus\$	Skr	Other	US\$	Euro	¥	SwFr	Can\$	Aus\$	Skr	Other
Spot															
Reporting dealers	45,260	20,208	7,253	4,921	5,931	626	11,264	24,878	8,533	2,000	371	105	81	68	268
Local	11,461	5,025	1,633	1,188	1,459	50	2,736	7,634	2,797	475	127	22	27	30	70
Cross-border	33,799	15,183	5,620	3,733	4,472	576	8,528	17,243	5,736	1,525	243	83	54	37	197
Other financial institutions	40,069	16,835	5,383	5,243	4,203	2,933	10,839	18,570	5,761	2,313	571	125	153	99	396
Local	10,305	4,462	1,482	1,972	1,140	82	2,548	5,606	2,050	451	218	49	76	75	247
Cross-border	29,764	12,373	3,901	3,271	3,063	2,851	8,291	12,964	3,711	1,861	353	76	77	25	149
Non-financial institutions	12,642	4,773	1,472	1,352	1,275	250	4,285	7,606	1,788	787	168	56	58	41	121
Local	3,251	1,280	413	367	364	79	1,480	2,719	725	117	74	34	34	27	76
Cross-border	9,391	3,493	1,058	985	911	171	2,805	4,888	1,063	670	94	22	24	14	45
Subtotal	97,971	41,816	14,108	11,516	11,409	3,809	26,388	51,054	16,082	5,099	1,110	286	292	208	785
Outright forward															
Reporting dealers	11,896	3,361	1,509	840	928	522	7,879	4,740	1,303	285	133	15	158	8	48
Local	2,014	689	176	150	210	59	1,861	1,547	346	85	51	8	21	4	23
Cross-border	9,882	2,672	1,333	690	718	463	6,018	3,194	957	200	83	7	137	4	24
Other financial institutions	19,184	5,432	2,225	1,330	1,500	644	10,114	7,400	3,294	924	545	83	291	151	267
Local	7,597	1,148	514	410	498	125	2,419	2,605	1,740	425	259	54	163	118	211
Cross-border	11,587	4,284	1,711	920	1,002	519	7,696	4,795	1,554	499	286	29	127	33	56
Non-financial institutions	8,251	2,277	792	882	534	389	4,072	3,784	1,467	292	98	48	60	58	104
Local	2,228	519	187	170	88	77	1,459	1,582	856	193	67	44	44	40	91
Cross-border	6,022	1,759	605	712	446	312	2,613	2,202	611	99	31	4	16	18	13
Subtotal	39,330	11,070	4,525	3,052	2,962	1,555	22,066	15,924	6,065	1,501	776	146	508	217	418
Foreign exchange swaps															
Reporting dealers	131,201	53,674	18,929	12,460	23,452	12,164	67,442	85,091	4,358	801	248	237	289	95	781
Local	36,550	8,168	3,134	2,266	4,884	2,226	15,078	40,901	1,095	345	83	157	42	14	112
Cross-border	94,651	45,506	15,796	10,195	18,568	9,938	52,364	44,190	3,262	456	165	80	247	81	669
Other financial institutions	134,434	39,975	12,162	7,348	15,995	8,270	58,797	72,151	7,949	675	208	106	175	214	500
Local	57,505	7,781	5,392	1,921	6,557	2,319	26,550	39,358	3,577	431	108	81	97	89	380
Cross-border	76,929	32,193	6,771	5,427	9,438	5,952	32,246	32,793	4,372	244	101	26	77	126	120
Non-financial institutions	40,667	7,037	5,253	1,758	2,065	5,347	15,393	16,080	4,934	704	223	286	114	182	418
Local	8,361	1,993	1,475	578	812	501	3,193	7,718	2,436	265	185	211	83	63	258
Cross-border	32,305	5,044	3,778	1,180	1,253	4,847	12,200	8,362	2,498	438	38	75	31	120	159
Subtotal	306,301	100,686	36,345	21,565	41,512	25,781	141,631	173,323	17,241	2,179	680	629	577	492	1,699
Total foreign exchange turnover	443,602	153,572	54,978	36,134	55,883	31,146	190,086	240,301	39,388	8,780	2,566	1,062	1,378	916	2,902
Maturity of forwards; per cent^(b)															
Seven days or less	79	84	83	82	79	80	81	79	53	61	49	68	49	41	71%
Over seven days	21	15	16	17	20	20	17	20	44	38	51	29	50	58	25%
Over one year	0	1	0	1	0	1	2	1	3	1	0	2	0	1	4%

(a) Adjusted for local double counting.

(b) Gross maturities data cannot be adjusted accurately for local double counting. Figures in this table are unadjusted, given as a percentage of gross outright forward and foreign exchange swap turnover.

Euro against:							
¥	SwFr	Can\$	Aus\$	Skr	Other	Residual	Total, all currencies
7,389	6,401	227	226	2,599	5,771	3,720	158,098
1,805	1,873	21	34	595	1,324	837	41,224
5,583	4,528	205	192	2,005	4,447	2,882	116,874
5,654	6,766	368	291	1,669	3,812	2,601	134,654
1,123	1,787	120	46	304	942	643	35,728
4,531	4,979	248	245	1,364	2,870	1,958	98,926
1,475	1,895	85	125	532	1,132	770	42,688
414	761	18	30	204	392	159	13,019
1,061	1,134	67	95	328	739	611	29,669
14,518	15,062	680	641	4,799	10,714	7,091	335,440
712	746	40	78	235	882	669	36,988
167	167	10	27	61	205	145	8,024
545	579	30	51	175	678	524	28,964
2,230	1,291	373	428	794	1,691	1,401	61,592
274	279	151	145	214	392	488	20,229
1,956	1,012	222	283	580	1,299	914	41,362
333	516	65	159	352	754	337	25,623
137	145	15	41	101	248	104	8,437
195	371	50	118	251	506	233	17,186
3,275	2,553	477	664	1,382	3,328	2,408	124,203
1,525	857	446	377	121	2,337	2,521	419,406
212	183	220	92	12	883	659	117,314
1,313	674	225	286	109	1,454	1,862	302,091
3,245	5,546	1,124	410	835	3,511	1,122	374,752
396	2,057	48	101	114	359	307	155,527
2,849	3,489	1,076	309	721	3,152	815	219,225
932	927	299	237	559	1,270	618	105,303
301	211	77	64	136	395	76	29,394
631	717	221	173	423	875	542	75,909
5,702	7,330	1,868	1,024	1,515	7,118	4,261	899,460
23,494	24,945	3,025	2,330	7,696	21,160	13,760	1,359,103
43	63	53	40	46	49	65	78
56	35	45	58	51	48	33	21
2	2	2	2	2	3	1	1

Table E Average daily net-gross OTC currency derivatives turnover (April 2007)^(a)

US\$ millions (rounded to the nearest million)

	US dollar against:							Sterling against:							
	Euro	¥	SwFr	Can\$	Aus\$	Skr	Other	US\$	Euro	¥	SwFr	Can\$	Aus\$	Skr	Other
Currency swaps															
Reporting dealers	2,072	758	795	622	173	162	1,254	2,373	501	27	2	0	0	0	21
Local	715	108	97	0	37	20	312	244	169	0	2	0	0	0	0
Cross-border	1,357	650	698	622	137	142	943	2,129	332	27	0	0	0	0	21
Other financial institutions	2,515	1,034	110	40	78	105	992	579	426	0	1	0	0	0	11
Local	362	49	22	0	2	16	300	202	172	0	0	0	0	0	6
Cross-border	2,154	985	87	40	76	89	692	377	254	0	1	0	0	0	5
Non-financial institutions	644	195	60	71	106	0	428	569	115	3	0	0	0	29	3
Local	28	2	0	0	0	0	5	281	99	3	0	0	0	0	0
Cross-border	616	193	60	71	106	0	422	288	16	0	0	0	0	29	3
Subtotal	5,231	1,987	964	734	357	267	2,674	3,521	1,042	29	3	0	0	29	35
OTC options sold															
Reporting dealers	4,465	3,567	405	473	820	16	1,768	2,139	467	324	168	8	22	1	30
Local	1,278	1,197	147	116	258	3	733	747	120	71	45	0	12	1	12
Cross-border	3,187	2,370	259	356	561	13	1,035	1,392	346	253	123	8	9	0	18
Other financial institutions	4,859	4,801	491	646	503	23	4,608	1,607	550	692	168	41	17	6	27
Local	1,272	1,263	118	95	147	4	754	453	157	472	88	1	5	0	21
Cross-border	3,587	3,538	373	551	356	19	3,853	1,155	393	219	80	40	12	6	6
Non-financial institutions	2,612	1,548	299	290	402	32	1,931	1,007	196	142	131	25	6	7	50
Local	809	931	140	109	118	29	662	415	110	113	83	0	2	3	37
Cross-border	1,803	617	160	181	284	3	1,269	592	86	29	48	25	4	4	13
Subtotal	11,935	9,915	1,195	1,409	1,725	72	8,307	4,753	1,212	1,157	467	73	45	14	107
OTC options bought															
Reporting dealers	4,510	3,829	540	492	900	16	2,269	2,370	485	590	188	14	12	22	49
Local	1,239	1,304	117	144	281	9	851	743	119	100	45	1	11	8	17
Cross-border	3,271	2,526	422	348	619	7	1,419	1,627	366	490	143	12	1	15	32
Other financial institutions	4,595	3,583	510	576	619	56	2,811	1,621	574	767	157	10	26	0	35
Local	1,111	687	149	104	128	26	607	433	107	505	58	0	6	0	23
Cross-border	3,485	2,896	361	472	491	31	2,204	1,187	466	262	100	10	20	0	12
Non-financial institutions	2,486	1,795	296	291	353	14	2,635	961	221	181	94	22	16	5	39
Local	755	973	152	87	102	7	690	555	111	106	56	0	13	0	31
Cross-border	1,732	822	144	204	250	7	1,945	406	110	75	38	21	3	5	7
Subtotal	11,591	9,208	1,345	1,359	1,872	87	7,715	4,952	1,280	1,537	440	46	55	28	123
Total options	23,527	19,123	2,541	2,768	3,596	158	16,022	9,705	2,492	2,695	906	119	100	42	230
Total OTC currency derivatives	28,758	21,110	3,505	3,502	3,953	425	18,696	13,226	3,534	2,724	909	119	100	72	265

(a) Adjusted for local double counting.

Euro against:

¥	SwFr	Can\$	Aus\$	Skr	Other	Residual	Total, all currencies
102	27	20	0	4	100	58	9,072
39	1	0	0	0	13	38	1,794
64	26	20	0	4	87	19	7,277
202	61	0	0	81	88	56	6,378
67	1	0	0	2	4	0	1,204
135	60	0	0	80	84	56	5,174
8	0	14	0	72	44	11	2,373
0	0	0	0	0	0	0	418
8	0	14	0	72	44	11	1,955
312	88	34	0	157	232	125	17,823
1,093	925	26	90	178	693	1,281	18,956
295	309	8	25	58	257	229	5,922
798	616	18	65	120	436	1,051	13,034
1,341	1,235	55	73	207	1,021	1,056	24,026
607	214	38	25	33	385	271	6,423
734	1,022	17	47	173	636	785	17,603
1,752	350	10	13	59	350	306	11,518
201	203	0	7	17	164	146	4,299
1,552	147	10	6	42	186	160	7,219
4,186	2,510	91	176	443	2,064	2,642	54,499
1,098	972	12	72	223	790	753	20,207
340	332	1	30	79	219	251	6,242
758	640	12	42	144	571	502	13,965
1,073	1,228	21	54	172	891	959	20,339
204	221	0	16	18	169	205	4,777
868	1,008	21	38	153	722	754	15,563
585	471	12	12	74	378	297	11,238
256	288	5	7	20	135	186	4,537
329	184	7	5	54	242	110	6,702
2,756	2,672	45	138	468	2,059	2,008	51,785
6,941	5,182	136	314	912	4,124	4,651	106,284
7,254	5,270	170	314	1,069	4,356	4,776	124,107

Table F Average daily net-gross OTC interest rate derivatives turnover (April 2007)^(a)

US\$ millions (rounded to the nearest million)

	£	US\$	€	¥	SwFr	Can\$	Aus\$	Dkr	HK\$	Skr	Other	Total
FRAs												
Reporting dealers	27,232	35,510	24,274	756	1,611	40	234	105	0	5,302	4,940	100,005
Local	16,240	8,212	6,982	531	357	0	28	57	0	650	663	33,721
Cross-border	10,992	27,298	17,292	225	1,253	40	206	48	0	4,652	4,277	66,285
Other financial institutions	9,694	6,292	12,827	273	351	140	195	155	1	3,789	2,749	36,466
Local	3,371	1,440	4,541	13	66	0	48	57	0	566	428	10,531
Cross-border	6,323	4,852	8,286	260	285	140	147	98	1	3,223	2,320	25,936
Non-financial institutions	7,035	1,267	3,156	45	24	0	201	0	0	4,128	2,166	18,023
Local	720	58	51	0	0	0	0	0	0	0	3	832
Cross-border	6,316	1,209	3,105	45	24	0	201	0	0	4,128	2,163	17,192
Subtotal	43,962	43,070	40,257	1,074	1,986	180	630	261	1	13,219	9,855	154,495
Swaps												
Reporting dealers	70,199	36,941	169,452	22,428	2,034	189	1,404	40	652	3,798	21,404	328,539
Local	39,622	10,332	43,124	7,942	600	36	386	21	158	2,221	1,115	105,557
Cross-border	30,577	26,609	126,328	14,486	1,434	153	1,018	18	493	1,577	20,288	222,982
Other financial institutions	44,050	29,988	215,053	35,990	1,913	212	772	73	601	7,311	11,530	347,494
Local	17,194	6,903	30,783	7,800	584	7	122	14	60	828	742	65,037
Cross-border	26,856	23,084	184,271	28,190	1,329	205	650	60	541	6,483	10,788	282,456
Non-financial institutions	4,931	8,619	6,218	3,492	57	30	259	9	55	943	9,433	34,045
Local	1,043	1,337	281	543	0	14	2	0	2	1	10	3,233
Cross-border	3,888	7,282	5,938	2,949	57	16	256	9	52	942	9,422	30,812
Subtotal	119,180	75,547	390,723	61,910	4,003	431	2,435	122	1,307	12,052	42,366	710,078
OTC options sold												
Reporting dealers	1,411	6,652	16,429	366	70	0	12	7	8	63	902	25,921
Local	583	1,326	3,222	127	34	0	9	0	3	14	47	5,365
Cross-border	828	5,326	13,208	239	36	0	3	7	5	49	855	20,556
Other financial institutions	1,282	3,519	11,964	857	143	0	37	1	23	23	190	18,039
Local	558	719	2,888	205	13	0	22	0	5	0	5	4,415
Cross-border	724	2,800	9,076	652	130	0	15	1	19	23	185	13,624
Non-financial institutions	518	1,996	1,442	121	10	0	5	0	1	4	12	4,109
Local	311	612	39	3	0	0	0	0	0	0	0	965
Cross-border	207	1,384	1,403	118	10	0	5	0	1	4	12	3,144
Subtotal	3,211	12,167	29,836	1,345	223	0	54	8	32	90	1,104	48,069
OTC options bought												
Reporting dealers	1,457	8,952	14,683	466	96	0	14	0	23	79	557	26,328
Local	518	2,007	3,584	116	7	0	13	0	6	8	90	6,348
Cross-border	939	6,946	11,099	351	89	0	1	0	17	71	467	19,980
Other financial institutions	947	2,522	10,748	830	16	0	30	4	13	7	106	15,223
Local	332	692	3,629	107	4	0	10	0	4	6	41	4,826
Cross-border	615	1,830	7,119	723	12	0	21	4	9	2	64	10,397
Non-financial institutions	483	1,443	817	132	0	0	3	0	0	8	14	2,900
Local	336	695	52	11	0	0	0	0	0	0	0	1,094
Cross-border	147	748	765	121	0	0	3	0	0	8	14	1,806
Subtotal	2,886	12,918	26,248	1,428	112	0	48	4	36	94	677	44,451
Total options	6,097	25,085	56,083	2,773	335	0	102	12	68	184	1,781	92,520
Total OTC interest rate derivatives	169,239	143,702	487,064	65,757	6,325	611	3,167	394	1,376	25,455	54,002	957,093

(a) Adjusted for local double counting.

References

Bank for International Settlements (2007), *Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity in April 2007 – Preliminary Global Results*. Available at www.bis.org/publ/rpfx07.htm.

Bank of England (2003), 'Foreign Exchange Joint Standing Committee e-commerce subgroup report', *Bank of England Quarterly Bulletin*, Summer, pages 235–39.

Bank of England (2003), 'Markets and operations', *Bank of England Quarterly Bulletin*, Winter, pages 393–406.

Bank of England (2007), 'Markets and operations', *Bank of England Quarterly Bulletin*, Vol. 47, No. 3, page 346–61.

Gieve, J (2007), 'The City's growth: the crest of a wave or swimming with the stream?', *Bank of England Quarterly Bulletin*, Vol. 47, No. 2, pages 286–90.

Greenwich Associates (2007), 'Electronic trading systems capture one half of global FX volume', March.

International Monetary Fund (2007), *Currency Composition of Official Foreign Exchange Reserves*, March. Available at www.imf.org/external/np/sta/cofer/eng/index.htm.

The Times (2007), 'The Kimono Traders', 3 August.

Speeches



The Governor's speech⁽¹⁾ in Northern Ireland

Three weeks ago, thousands of depositors queued on the streets outside branches of Northern Rock to take their money out. Those scenes, broadcast around the world, were shocking. How did they come about and how can we prevent them in future?

My focus tonight will be on why the incentives facing banks, investors, and depositors led them to behave as they did. Most of what happened can be understood in terms of those incentives. And, if we are to create a structure for our banking system so that such scenes are not repeated, we must ensure that the temporary measures put in place in recent weeks evolve into permanent reforms in the coming months.

But I want to start with the story of how these events came about. It begins in the international capital markets. One of the most remarkable changes in the world economy over the past decade has been the fall in interest rates. Some of that stems from the fall in inflation as central banks have regained control after the Great Inflation of the 1970s and 1980s. But even adjusting for inflation, low-risk borrowers have been able to borrow on world capital markets at very low rates. In the United Kingdom, the yields on ten-year inflation-protected government bonds have, in the past year, been close to 1%. At the turn of the millennium, they were 2%. Back in 1990, they were 4%.

Why have these real interest rates fallen so much? The primary explanation is the high rates of saving in other parts of the world. Japan has been a net saver for more than a quarter of a century. Following the Asian crisis in the mid-1990s, many of Japan's neighbours also raised their national saving rates. That group includes the country which is now the world's biggest saver — China. And more recently, after the tripling of oil prices, they have all been joined by the oil-producing nations from Saudi Arabia to Norway.

The savings of these countries, evident in their trade surpluses, have flooded into world capital markets. Faced with what Ben Bernanke has called a 'glut' of savings, borrowers in the rest of the world have been able to attract long-term loans at remarkably low interest rates. Those rates of interest have, in the developed world, encouraged borrowing and spending, and reduced saving. From the United States to Australia, and also here at home, we have increasingly spent more than we earn,

resulting in large and expanding trade deficits. Our own trade deficit is more than 3% of GDP, but that is dwarfed by the United States, with a trade deficit of more than 6% of GDP.

The response of central banks in the developed world to these changes was predictable. To keep overall demand growing — and inflation stable — in the face of trade deficits, they needed to keep short-term interest rates low and domestic spending strong. In the United Kingdom, Bank Rate has averaged just 4½% in the past five years. In 2003, it was as low as 3½%. But even then, the United Kingdom had the highest interest rate in the G7. In the United States, the Federal Reserve cut its interest rate to just 1%, and in Japan, experiencing deflation, interest rates were just 0.1%.

Those developments were inevitable if the world economy was to continue to grow. But the price was unusually low interest rates — both short and long-term — which were considerably below the levels to which most investors had become accustomed in their working lives. Dissatisfaction with these rates gave birth to the 'search for yield'. This desire for higher yields could not be met by traditional investment opportunities. So it led to a demand for innovative, and inevitably riskier, financial instruments and for greater leverage. And the financial sector responded to the challenge by providing ever more sophisticated ways of increasing yields by taking more risk. But some of those new instruments were so opaque and complex that investors lost sight of the risks involved. Until, that is, they were brought down to earth with a bump on 9 August.

Occasional tremors in financial markets had been evident over the past year or so, and again in July this year. It was impossible to tell whether they constituted a gradual release of pressure on risk premia that had become overly compressed, or whether they signalled a more disruptive movement to come. On 9 August the question was answered.

As if to highlight the global nature of the crisis, the unexpected revelation by a French bank that its investment funds could no longer value their exposures to US sub-prime mortgage loans produced a sharp reappraisal of the risks they were taking by investors around the globe. The returns demanded by

(1) Given at the Northern Ireland Chamber of Commerce and Industry, Belfast on 9 October 2007. This speech can be found on the Bank's website at www.bankofengland.co.uk/publications/speeches/2007/speech324.pdf.

investors on all risky assets rose — from packages of bank loans to plain vanilla company shares — so the prices of those assets fell. And in some markets for complex financial instruments, investors realised that perhaps they did not understand as much about the nature of the risks involved as they should. So not only did asset prices fall, but the markets in some of these instruments virtually closed. There were no buyers.

This freezing of capital markets led to a chill in banking systems around the developed world. Banks that had relied on selling packages of loans in securitised form found that they couldn't sell them. Investment vehicles that held securitised loans have found it difficult to finance their holdings by borrowing. Faced with the possibility that they would have to finance these vehicles themselves, banks with spare cash have hoarded it and have become reluctant to lend to other banks beyond very short maturities. That has been evident in the spreads between interbank lending rates and central bank interest rates in the United Kingdom and equally in the euro area and the United States. The bottom line is that banks that had financed themselves by borrowing from their peers, or by securitising and selling their loan assets, found that their funding dried up. In the United Kingdom, Northern Rock was particularly exposed. It was able to borrow only at shorter and shorter maturities.

The present financial crisis is of a most unusual nature in that it comes against a background of five years of strong growth of the world economy and a decade and more of remarkable economic stability at home. Moreover, most banking and financial crises in the past — from the failure of Overend and Gurney in 1866, to the collapse of BCCI in more recent times — were associated with bad loans and significant losses on assets. The remarkable fact about this crisis has been the relatively small size of the bad loans compared with the total assets of banks. The crisis has arisen instead from the way banks have managed their liabilities.

What did the Bank of England — as the central bank — do for the banking system?

First, we did our routine work in the money markets of lending to the banking system against high-quality collateral, such as government debt, and at Bank Rate set each month by the Monetary Policy Committee. After some initial volatility, we achieved our primary objective in the money markets of bringing interest rates on overnight borrowing into line with Bank Rate. And over the past two months as a whole, overnight interest rates have, on average, been as close to Bank Rate in the United Kingdom as in the euro area and closer than in the United States.

We were, however, pressed to do more than our routine job and to lend in exchange for other collateral, including the

financial assets for which the markets had virtually closed. Banks, in particular, said they wanted us to help them turn illiquid assets into cash.

As I told the House of Commons Treasury Committee on 20 September, we were cautious about doing this. The case for caution is, in the jargon, moral hazard. Put simply, such action by us encourages the very risk-taking that caused the present problems. It is crucial that, in making their lending and borrowing decisions, banks face the right incentives. That is why we did offer to lend in exchange for illiquid assets but only at a penalty rate of interest.

Support on the scale required by Northern Rock would have been difficult to undertake without it becoming 'stigmatised' — regardless of the method adopted. The only way to avoid that would have been to offer to lend to all banks at a rate that many others — in addition to Northern Rock — found attractive to pay. And to do that without drawing attention to Northern Rock's take-up would have required a truly massive injection of cash into the banking system. That could happen only if there were no penalty rate or if conditions in money markets generally were difficult enough to make the penalty rate attractive to many banks over a prolonged period.

Nothing would have been easier than for the Bank of England to lend freely without a penalty rate. Almost every actor in this drama saw advantage in cheap money and plenty of it. The role of the central bank is to ensure that the appropriate incentives are in place to discourage excessive risk-taking and the underpricing of risk, and in so doing to avoid sowing the seeds of an even greater crisis in future. That we have done in each action we have taken — by maintaining the principle of the penalty rate.

Some commentators have taken issue with these concerns about moral hazard, arguing, by analogy, that fire departments put out fires started by people who smoke in bed. I agree that we have fire services to do precisely that. And if a fire starts in the financial system, the central bank will put it out if it threatens to spread. But fire services do not offer free insurance for people who smoke in bed or set fire to their own house, thereby encouraging them to take risks that endanger others.

When it became clear that Northern Rock could not find funding elsewhere, it came to the tripartite authorities (FSA, Treasury and Bank) to seek financial support from the Bank of England. Rather than stabilise the situation, the actions of the authorities seemed, at least initially, to fan the flames. There are lessons for us to learn. And I will come to those in a minute. But let me return to the queues of depositors. Here is an extract from a local newspaper:

'By noon on Friday, more than 40... customers... were waiting in line at the branch... waiting upward of an hour and a half to withdraw money from their accounts.'

'Anxious depositors clutching withdrawal slips filled the offices for a second straight day. ... The company placed extra chairs in a waiting area and asked customers to write their names on a sign-in sheet.'

This wasn't Newcastle or London. It was Los Angeles on 17 and 18 August. The bank experiencing the run was not Northern Rock but Countrywide, a US mortgage bank. It is a Tale of Two Banks — banks of similar sizes and facing similar difficulties with funding — just a few weeks apart. Like Northern Rock, Countrywide took risks and relied on short-term funding from investors. But the similarity ends there. There were two significant differences.

First, Countrywide had paid millions of dollars each year to big banks as a liquidity insurance policy so that, in the event of difficulty, they would provide it with long-term loans. So on 17 August Countrywide was able to claim on that insurance and draw down \$11.5 billion of committed credit lines. Northern Rock had not taken out anything like that level of liquidity insurance. So when it came to the Bank of England for support, it was important that liquidity was not provided free.

Second, even though Countrywide had insurance, its depositors were still worried. On hearing that it had claimed on its insurance, queues formed. But those queues were short and soon dissipated. The depositors simply did not face the same incentives to withdraw their money. The United States has a well-developed insurance scheme for depositors. If a bank is forced into administration, there are mechanisms in place to repay depositors in full, up to \$100,000 per account. And most importantly, the depositors are paid within just a few days. Without such a scheme in the United Kingdom, once the queues started to form at Northern Rock, other depositors faced every incentive to join them. The only way to stop the run was for the Chancellor to announce a government guarantee of the deposits of Northern Rock, which today was extended to new depositors as part of the continuing stabilisation plan for the business.

So what are the main lessons for us from the recent episode? Time will provide an opportunity for deeper reflection, and it is important that careful thought does come before action. But I would identify three lessons.

First, liquidity should be central to the regulation of banks. Regulation worldwide has paid insufficient attention to liquidity, focusing instead on capital. Northern Rock did not face a problem of inadequate capital. But it was vulnerable to a shock that reduced the liquidity in markets for securitised

mortgages. Banks need to face the right incentives to manage their funding positions. Smaller banks with reliance on wholesale funding should be encouraged to put in place insurance. We should not, however, expect regulation alone to solve this problem. That is why I think it is so important to create the right incentives.

Second, the single largest impediment to dealing with Northern Rock was the absence of a mechanism for intervening pre-emptively in a bank in trouble to separate the retail deposit book — the insured deposits — from the rest of the bank's balance sheet. The ability to do this is central to the way the United States and other systems operate, where the authorities are obliged to step in early — 'prompt corrective action' — to protect depositors. One tool at their disposal, currently unavailable in the United Kingdom, is a special insolvency law for banks. Legislation to create the powers to deal with a bank in this way seems to me the single most important necessary reform. Deposit insurance is another area that requires change. To pretend that retail depositors can be treated in the same way as unsecured creditors in a business as complex and opaque as some of today's banks is wholly unrealistic. The upper limit on deposits that qualify for 100% insurance has sensibly been raised, and the Government has made clear that a longer-term reform of deposit insurance is also under review.

Third, central banks operate as lenders of last resort. We need to be able to lend against good, albeit illiquid, collateral, and at a penalty rate, without destabilising further any bank to which we lend. Reform of deposit insurance will go a long way to achieving this. But in an age of instant communications, where the news of a facility for Northern Rock was leaked even before it was officially announced, it may be difficult to adopt the quiet methods used by central banks in the past. We will, however, explore ways to restore the use of discretion in central bank operations.

Finally, it is worth remembering that, unlike the cases of BCCI and Barings a decade or more ago, or the problems with pensions and life insurance more recently, not a single depositor has lost a penny. I hope, however, that the three lessons I have identified will be incorporated in future legislation.

It is equally important that the Bank is not distracted from the job of setting interest rates to meet the 2% target for CPI inflation. In March this year, inflation rose to 3.1% and I wrote an open letter to the then Chancellor explaining why and what we were doing about it. Over the past twelve months, we have raised Bank Rate by 1 percentage point. And, notwithstanding some claims at the time of the open letter, inflation has since fallen back quite sharply, mainly as retail gas and electricity prices have stopped rising and, more recently, fallen. CPI inflation was, in August, a fraction below the 2% target. The

challenge now for the Monetary Policy Committee is to keep it there.

The current turmoil in financial markets is not over. Conditions have eased a little — share prices have recovered and interbank interest rates have fallen back. Indeed, spreads between interbank rates and anticipated central bank interest rates are now lower in the United Kingdom than in the euro area or United States. But for the moment, some markets remain virtually closed. And even as they re-open, there will not be a return, I hope, to the excessive risk-taking — and associated rapid expansion of credit — of the past few years. With investors more wary of risks, banks will find it harder to raise funds. So credit will not be so readily or cheaply available to businesses and households.

As we said in August, pressures on capacity mean that output growth needs to slow moderately over the next year or so if we are to continue to meet the inflation target. We will be monitoring closely the impact of tighter credit conditions on demand and output over the coming months. Even though inflation is close to the target and pay pressures are muted, we will continue to look ahead and monitor the risks to inflation that we identified in August: the signs from surveys and financial markets that people expect inflation to pick up; the strength of company pricing intentions, and the recent increases in world commodity prices.

Keeping inflation close to the 2% target is the biggest contribution the Bank of England can make to economic stability generally. Changes in Bank Rate could not prevent the profound change in the world economy that pushed down yields on low-risk financial assets and led investors to take on

more risk. They cannot now prevent the repricing of that risk. And just as Bank Rate was not set to insulate the manufacturing sector from the trade deficit that resulted from the earlier change in the world economy, it will not be set now to insulate the banking system from the repricing of risk. But you can be sure that we will do whatever is necessary to keep inflation close to the 2% target.

Tonight is the first time that the Court of the Bank of England, and the Monetary Policy Committee, have gathered in Northern Ireland. So much has changed in the Province since the troubles started and I first came to Belfast to speak at Queen's University. Given that we are the Bank of England, it would be understandable if many in Northern Ireland were suspicious of our role. But I can assure you that we are most definitely the central bank of the whole of the United Kingdom, including Northern Ireland. We pay great attention to events here, and, along with other members of the Monetary Policy Committee, I visit regularly. We have a full-time Agency with a team who live and work in Northern Ireland and report back every month on what is happening in the local economy.

At this momentous time in the history of Northern Ireland, I can assure you that the Bank will continue to place great importance on its presence here. During my visits, I have discovered some extraordinarily successful companies, many set up during the troubles. As you continue to build the political success and economic prosperity of the new Northern Ireland, the Bank of England will support you wholeheartedly through our efforts to provide a platform of economic stability.

Current monetary policy issues

In this speech,⁽¹⁾ Rachel Lomax,⁽²⁾ Deputy Governor for monetary policy, discusses the difficult policy issues facing the Monetary Policy Committee. On financial market turmoil, she argues that the problem is one of uncertainty about both the size and location of losses from defaults on US sub-prime mortgages. The impact of this turmoil on UK monetary policy will depend on the likelihood of a credit crunch, and on whether there is a significant impact on credit conditions in the longer term. She notes that rising energy prices remain an important influence on interest rate decisions, even though they have a smaller impact than 20 or 30 years ago. She concludes that the MPC face a tricky period as they try to weigh the risk of an unduly sharp downturn against the threat to inflation posed by a sharp surge in energy prices.

Tonight I want to talk about the current issues confronting the Monetary Policy Committee (MPC).

It's hard to tell the story of an economy as open as the United Kingdom without starting with global developments. That's not a point I need to labour here in Hull, the Gateway to Europe, and home to a brand new World Trade centre. And it's never been more true than today.

The past four years have seen the fastest growth in the world economy since the early 1970s.⁽³⁾ But even more striking than its pace has been the change in the balance of global growth, with emerging economies contributing nearly three quarters of the increase in world output.⁽⁴⁾ This has become even more pronounced over the past year, as Chinese growth has picked up even as the US economy has slowed.

The world's economic see-saw has tilted. That's the new reality behind two dramas that have held the world's attention since last August: the turmoil in financial markets; and the renewed surge in energy prices.

Both these developments are highly unusual and very recent. No one knows how they will play out. So you would be right to take all forecasts — including our own — with a large pinch of salt. But the MPC has to take a view, when it sets interest rates. My aim tonight will be to share some of that thinking with you.

Financial market developments

Let me start with the problems in global financial markets.

Over the course of the summer, growing arrears in the US sub-prime mortgage market triggered a global loss of

confidence in the valuation of securities backed by bundles of mortgages and other loans. How could a relatively limited problem — confined to the bottom end of the US housing market — spark a global financial crisis? It's a good question.

The short answer goes as follows. Investors had come to rely too heavily on the ability of rating agencies to value what had become exceedingly complex financial instruments. The realisation that their faith had been misplaced cast doubt on the value of a wider class of asset-backed securities. Many of these were embedded in ever more complex, highly leveraged, investment vehicles.

This set the stage for a period of turmoil in international money and credit markets which has now been through several phases, and may go through several more.

At its heart, the problem is one of uncertainty.

First, there is great uncertainty about the eventual size of losses from defaults on US sub-prime mortgages that the global financial system will have to absorb. There are different estimates and they change all the time as the news from the the US housing market deteriorates.

Second, there is great uncertainty about where these exposures will end up. So banks have become more worried about the creditworthiness of their counterparties.

(1) Given to Hull & Humber Chamber of Commerce at KC Football Stadium, Hull, on 22 November 2007. This speech can be found on the Bank's website at www.bankofengland.co.uk/publications/speeches/2007/speech329.pdf.

(2) I am very grateful to Gareth Ramsay for his help in preparing this speech, and to several other colleagues at the Bank of England for useful comments.

(3) Calculated using purchasing power parity (PPP) exchange rates.

(4) Again, calculated at PPP exchange rates.

And third, this lack of information, in a complex and globally interconnected financial system, breeds fear: of ratings downgrades, of fire sales and just of unknown consequences. And fear breeds more uncertainty.

So banks have been hoarding liquidity, to protect themselves against further upsets; and they have become more reluctant to lend to other banks. So the rates at which they lend to each other have risen, relative to the levels which are expected to be set by central banks.

The squeeze in core liquidity markets has already been unusually prolonged. And it is very hard to say when conditions will return to something more like normal. When the dust has settled, the financial landscape may look a bit different. Investors may be more aware of risk and warier of complexity. Some recent financial innovations will disappear. Others may survive but in modified form, and probably at an increased cost to final borrowers.

What does all this mean for UK monetary policy? The MPC's remit is to keep inflation at its 2% target, so the key issue for us is how far the financial crisis will affect the wider economy. That will depend on the answer to three broad questions.

First, in the short term, how far will the severe liquidity squeeze that has already happened turn in to a full-scale credit crunch — by which I mean a sharp tightening in the price and availability of credit to households and firms.

Second, how well placed are households and firms to weather any such change in credit conditions?

And third, in the longer term, will there be a significant lasting impact on credit conditions, for any given level of Bank Rate?

It is too early to answer these questions with any great confidence, especially the last. But we do have some early evidence.

There are signs that credit conditions facing firms have already tightened. The terms on corporate bank borrowing are often directly linked to the rates that banks charge each other. These rates have risen and remained high. Our latest intelligence suggests that the main lenders have tightened the terms on which they are willing to lend to businesses, and they plan to tighten them further. UK firms' financial position is currently pretty healthy, on average, and large corporate borrowers in particular may have good alternatives to bank borrowing. But smaller and more highly geared firms may be more adversely affected.

In time tighter credit conditions could mean weaker business investment, though so far forward indicators of investment intentions still point to fairly strong growth. And any marked

increase in uncertainty about demand conditions could lead to investment plans being shelved. But it is still early days — too early to draw strong conclusions about the size of these effects.

Even more uncertainty surrounds the possible impact of tighter credit conditions on household spending, which alone accounts for three fifths of total domestic demand. There is already some evidence that banks are tightening the price and non-price terms on which they lend, especially to borrowers with relatively poor credit histories. And quoted fixed-rate mortgage rates have already risen relative to market expectations of Bank Rate — though since markets now expect Bank Rate to fall instead of rising, the pickup in actual mortgage rates remains quite small.

Overall, households seem to be in a relatively strong position: debt has risen a lot relative to incomes, but so too have holdings of financial and real assets. Mortgage arrears and repossessions remain well below their peak levels in the early 1990s. But the share of income which needs to be devoted to interest rate payments was already set to rise sharply, largely as a result of rising debt levels. And there is a growing minority of households who are reporting difficulties with their debts.

In short, it looks as if events in financial markets are beginning to affect the terms offered to retail borrowers. This should act as a brake on consumer spending and investment. But the size of this effect is highly uncertain, partly because so far it seems to be focused on certain groups. Much may depend on whether recent developments shake consumers' confidence in future income growth and employment — and so far that does not seem to have happened.

What about possible longer-term effects on the price and availability of credit?

Over the past three years, competition and financial innovation have put steady downward pressure on the rates at which banks have been prepared to lend, at any given level of Bank Rate. Between 2003 and the beginning of this year, two-year fixed mortgage rates fell by around 50 basis points relative to the wholesale interest rates they are usually priced off. This is one reason why credit has gone on rising so strongly, despite increases in official interest rates.

At this stage, we can only speculate about what will happen next. My guess is that over the next three to five years, we will see a sustained — though not necessarily complete — reversal in these trends, as banks reappraise the risks around certain business models and complex financial instruments. This would increase the cost of credit to final borrowers, for any given policy rate.

If that happens, this summer's crisis will influence the economy — and potentially the interest rates set by the MPC — for some time to come.

Energy prices

Let me now turn to the second of the global developments I mentioned earlier: higher energy prices.

During the past month, the oil price has threatened to breach the \$100 a barrel. Just last January a barrel of oil cost \$55; four years ago, it cost less than \$30. Some of this is due to the weakness of the dollar. But the rise in sterling terms has been pretty spectacular too — from £17 a barrel four years ago, to £27 last January, to around £45 now. At these levels, oil is almost back to its 1979 high, after correcting for inflation.⁽¹⁾

What's going on? It's always hard to disentangle underlying demand and supply factors from the speculative froth. It's possible to point to some short-run factors behind the recent surge. Stocks of oil across the OECD economies have been falling, at a time of year when they should be rising. This reflects temporary supply disruptions such as weather-related problems in Mexico and in the North Sea. As production comes back on stream, the market should ease.

But short-run influences can only have this kind of leverage over the price because underlying market conditions are so tight. World demand for oil has been boosted by a strong world economy, led by booming emerging markets. China alone has been responsible for a third of the growth in global oil demand over the past four years. Meanwhile supply has struggled to keep pace — partly because of policy decisions by oil-producing economies, but partly because it takes quite a long time for investment in extra production capacity to come on stream.

What are the risks that oil prices will stay around their current level for a time — and maybe go even higher? It's hard to say — but the market is not discounting the possibility of even higher oil prices. Options prices point to an increase in near-term uncertainty — and an increasing concern about further large price rises.

There are risks on the downside too: the last time the world economy slowed significantly, oil prices slumped. Could a slowdown in the world economy cause oil prices to collapse again? Projections for the growth in oil demand over 2007 and 2008 have been revised downwards a little recently. But much may depend on the pattern of any slowdown — and in particular whether China continues to expand strongly even as the US economy slows.

What's the likely impact of higher oil prices on the UK economy? Twenty or thirty years ago, sharp increases in

energy prices coincided with much higher inflation and much lower growth. Over the past four years, our experience has been very different: inflation has been better behaved, and growth much steadier. There are several reasons for that, including major changes to the energy intensity and flexibility of the UK economy. But one important difference has been monetary policy. Unlike in the 1970s, the MPC's focus has very clearly been on controlling inflation.

Today, higher energy prices are an important influence on interest rate decisions. That is because they have an immediate impact on inflation, which has the potential to fuel inflationary expectations. And they may also affect the balance between overall demand and supply, though it is hard to judge the timing and size of this effect. Soaring oil prices were an important reason why some members of the MPC, including myself, were reluctant to cut interest rates when the economy slowed in 2005.

The policy dilemma

Today, in 2007, global developments — in financial and oil markets — are posing downside risks to output as well as upside risks to inflation. That's a very difficult combination. So how well placed is the UK economy to weather these headwinds?

As far as output goes, we start from a strong position. The latest official figures show annual growth still above its average rate, as it has been for more than a year, reflecting robust domestic spending by households and businesses as well as a buoyant world economy. But in the past month, the business surveys have started to weaken — a few quite sharply. And retail spending may be slackening, though heavy discounting has clouded the underlying picture. There are clearer signs that the slowdown in the housing market is gathering pace. But the impact of this on consumer spending and ultimately on inflation is highly uncertain. And that is what matters for monetary policy.

So growth does now seem to be slowing. But what is less clear is whether the scale of this easing is likely to be broadly what we need to keep inflation on target in the medium term — neither too much nor too little. That's not just because we don't know how much slowing is in the pipeline. There are a couple of other important uncertainties too.

First, it's hard to judge the underlying strength of inflationary pressures.

When inflation picked up quite sharply last winter, there was a lively debate about how far this reflected strong monetary

(1) Using US consumer expenditure deflator to adjust for inflation.

growth, and how far it was due to the temporary effect of a very big jump in gas and electricity prices. Although inflation has now come down sharply, there is still room for debate about the margin of spare capacity in the economy. Various indicators seem to be telling slightly different stories. On the one hand, overall wage growth seems to have been moderate, by past standards. On the other hand, business surveys of capacity pressures and price expectations remain above average.

Second, there is a lot of uncertainty about the risks to inflation, if oil prices do continue at their present levels. Should we take heart from the relatively muted impact of previous increases in oil prices? Or does the fact that workers had already absorbed the impact of a doubling in oil prices since 2004, even before the latest surge, make it more not less likely that they will hold out for higher pay?

A key point for the MPC is that its own actions will help to determine how far oil prices have a lasting impact on inflation. There are always risks in signalling that policy will be eased, at a time of rising energy prices. This is all the more so after a year when inflation has been above target and on some measures remains uncomfortably high.

On the other hand, we need to be very alert to the risk that the economy may be slowing too abruptly. At current interest rate levels, monetary policy may be on the restrictive side. And the duration and impact of financial turbulence is very hard to call. There must be a risk that at some stage it will spill over into asset and property markets more generally, and trigger a damaging loss of confidence.

Conclusions

The MPC faces a tricky period as we try to weigh the risk of an unduly sharp downturn, against the threat to inflation posed by a sharp surge in global energy prices. Much will depend on

developments in the rest of the world; on whether the slump in the US housing market causes a sharp slowing in the wider US economy; and on how far this acts as a brake on demand — and inflationary pressures — in the rest of the world, especially Asia and the euro area.

The projections we published in last week's *Inflation Report* were centred around a relatively mild slowdown, by historical standards — on the same scale as we experienced in 2005 — based on the assumption of a gradual and modest easing in interest rates over the next two years. But those projections are subject to a very wide margin of error — in both directions. The MPC's monthly decisions are always grounded in a careful analysis of all the evidence. Given the uncertainties we face, now is a time to pay extra attention to the emerging data.

We can, and should, respond quickly and flexibly to early signs of the changing economic weather. According to most recent official economic statistics, the weather is still set fair. But we know fouler weather is brewing off shore. What is still far from clear is whether we are in for a force 6 strong breeze, or a full force 8 gale.

We will need to deploy all our meteorological skills. In the *Inflation Report* we highlighted a number of early warning indicators on both output and inflation, which will help us judge the strength of the wind. These include the reports from our own Agents around the country, drawing on businesses such as your own. If you are one of our regular contacts, let me take this opportunity to thank you warmly on behalf of the MPC for your help. We may be making additional demands on you over the coming months. I hope my remarks tonight have helped to explain why your co-operation is so necessary — and so valuable.

The global economy and UK inflation

In this speech,⁽¹⁾ Andrew Sentance,⁽²⁾ a member of the Monetary Policy Committee, reviews the way in which the global economy affects UK inflation and hence monetary policy. He argues that global inflationary pressures have become more significant in recent years, reflecting strong world economic growth and rising commodity prices. This contrasts with the more disinflationary global climate in the late 1990s and early 2000s. While these global factors have the potential to create short-term inflation volatility, monetary policy should be able to keep UK inflation on target over the medium term through its influence on overall demand, the exchange rate and price expectations. For the MPC, judging the appropriate monetary response to global economic developments is a continuing challenge.

The global economy and UK inflation

Good evening, Ladies and Gentlemen. I am delighted to have the opportunity to speak this evening at this event organised by the Leeds Financial Services Initiative. The financial services industry is a major contributor to economic activity and growth in the United Kingdom, accounting for nearly 10% of total GDP.⁽³⁾ Leeds is one of the United Kingdom's major financial centres outside London, and financial and business services account for around 270,000 jobs in this City region.⁽⁴⁾

Because of the international nature of financial markets, the financial services industry is heavily influenced by global economic developments. Events over the past two months have provided a very clear reminder of that! These financial linkages to global markets are just one of the many ways in which broader international developments affect the UK economy.

Global economic developments — such as the recent turbulence in financial markets — also have an important bearing on the decisions of the Monetary Policy Committee (MPC). Our objective is to keep inflation low and stable, and as close as we can to the target level of 2% (as measured by the consumer prices index). In an open economy like the United Kingdom, global forces can cause inflation to fluctuate around its target level in the short term, and also inject volatility into the real economy. We have seen rising oil and commodity prices driven by strong global demand push up inflation in the United Kingdom and other major economies over the past couple of years. By contrast, the recent changes in global financial market conditions could weaken demand conditions in the United Kingdom and internationally —

exerting downward pressure on inflation. These are all factors we need to take into account in our interest rate decisions.

Ultimately it is domestic monetary policy — not the state of the global economy — which will determine the UK inflation rate. The challenge for the MPC therefore is to adjust interest rates to ensure that global influences do not create prolonged and significant deviations in inflation from its target. It was the failure to do that in response to the oil price shocks of the 1970s which resulted in high inflation in many countries in that decade.

The challenges which the world economy throws at monetary policy makers are many and various. Deciding the 'appropriate' response to global developments has been a recurrent theme of discussions within the MPC throughout the past decade. And the past year — while I have been a member — has been no exception.

This evening, I want to discuss in more detail the influence of changes in the global economy on UK inflation and how monetary policy should respond to them. I will first talk about this in general terms, and then relate these general principles to the experience of the past decade. I will conclude by talking about some of the current UK monetary policy challenges posed by the changing global demand and inflation picture.

(1) Given at the Leeds office of RSM Bentley Jennison, in association with the Leeds Financial Services Initiative, on 24 September 2007. This speech can be found on the Bank's website at www.bankofengland.co.uk/publications/speeches/2007/speech322.pdf.

(2) I would like to thank Andrew Holder and Ben Westwood for research assistance and invaluable advice. I am also grateful for helpful comments from other colleagues. The views expressed are my own and do not necessarily reflect those of the Bank of England or other members of the MPC.

(3) The financial services share of UK GDP was 9.4% in 2006, up from 5.3% in 2001.

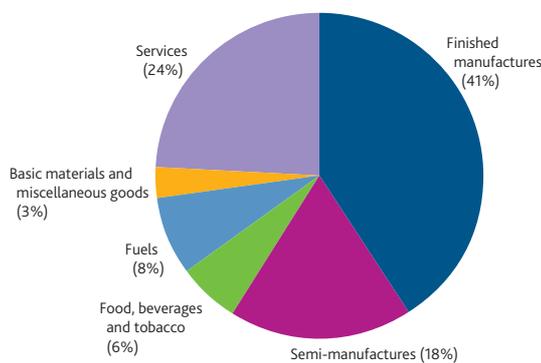
(4) Source: Leeds Financial Services Initiative.

How the global economy affects UK inflation

There are a wide variety of ways in which global economic developments impact the UK economy and hence influence our rate of inflation. The whole process of globalisation has structural effects on the UK economy, including the impact of labour migration, which I do not plan to discuss in detail this evening.⁽¹⁾ Rather, in this speech I will focus on the main channels of influence from the global economy to UK inflation in the shorter term.

The first of these is the impact of the prices of imported goods and services. Directly and indirectly, imports account for around 30% of the value of goods and services sold by UK business at home and abroad.⁽²⁾ As **Chart 1** shows, finished and semi-manufactured goods account for the bulk of this import bill, and imported fuels and basic materials make up a relatively small proportion of the total — around 10%. However, the prices of imported manufactured goods will also reflect the raw materials and energy used in their manufacture, creating an additional indirect impact from commodity markets.

Chart 1 Composition of UK imports by value, 2006



Note: Data adjusted for fraud.

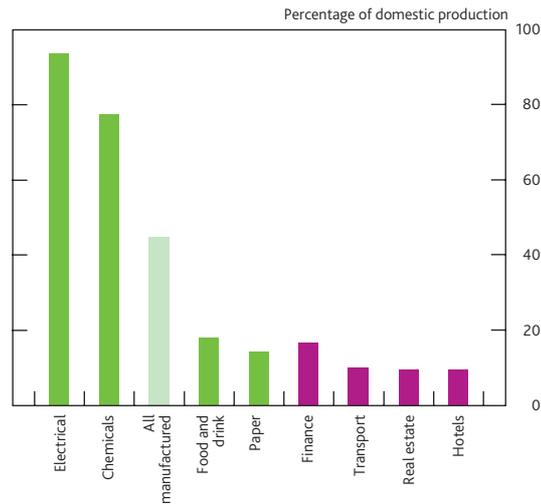
The second channel of influence from the global economy is via demand. Strong growth of demand — whether it originates at home or abroad — allows profit margins to expand and can put upward pressure on costs, particularly when the economy is operating close to its capacity limits. By the same token, weak demand exerts a dampening influence on cost and price increases. Influencing demand conditions through interest rates is one of the main ways through which the MPC controls UK inflation.

Global economic developments affect demand conditions in the United Kingdom both directly and indirectly. The direct influence comes through changes in the demand for UK exports of goods and services, which make up around a quarter of the output of UK businesses on average.⁽³⁾

As **Chart 2** shows, the importance of overseas demand varies greatly between different sectors of the UK economy. Some

manufacturing sectors sell a large proportion of their output overseas, and for manufacturing industry as a whole exports are around half the value of production. For most services sector activities, the figure is closer to 10%, though financial services is one of the most export-intensive services industries. We should therefore expect to see more sensitivity to fluctuations in the global economy in manufacturing and financial services than in other sectors.⁽⁴⁾

Chart 2 Exports as a share of production



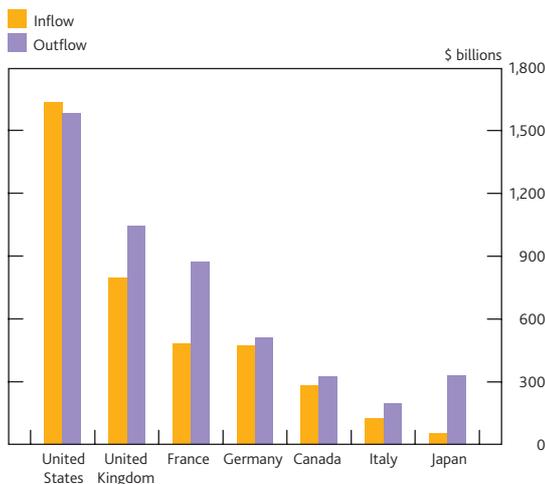
Note: Figures calculated as five-year average 2000–04.

In addition to this export channel, there are also indirect financial linkages through which global economic conditions can influence UK demand. The UK business community is very international, reflecting our tradition as a trading nation and the openness of our financial markets to overseas investment. **Chart 3** shows that, apart from the United States, we have been the largest major industrialised economy in terms of flows of inward and outward direct investment over the past decade.⁽⁵⁾ Many UK businesses are part of larger international groupings, which is likely to reinforce the sensitivity of their investment and other business decisions to global demand and profitability.

The globalisation of business activity we have seen in the 1990s and over the past decade has reinforced this pattern. UK-owned companies have expanded their overseas production facilities, often to take advantage of lower costs, while global corporations and other foreign-owned companies have sought to expand their presence here, often with a view

(1) See Bean (2006) and Blanchflower (2007) for more detailed analysis of these issues.
 (2) UK business is defined as the whole economy excluding public administration, defence, education, health and social work. In 2004, UK imports were 28.5% of final expenditure at factor cost on this basis. Given the significant rise in imports as a share of GDP since 2004, 30% is a reasonable estimate.
 (3) For UK business (as defined above), exports of goods and services accounted for 24.3% of final demand in 2004.
 (4) However, the impact of services exports on UK GDP will generally be greater than for manufactures (£ for £) due to their lower import content, which means their contribution to UK value added is higher.
 (5) OECD (2007).

Chart 3 G7 foreign direct investment, cumulative flows 1997–2006



Source: OECD.

to serving the wider European market from a UK location. I was intrigued to hear recently that four out of the top five fastest growing IT services suppliers in the United Kingdom were Indian companies.⁽¹⁾

There are also linkages from the global economy to UK demand through financial markets. Because many UK financial institutions operate in global markets, the cost and availability of finance to UK customers is affected by global financial market conditions. UK financial markets can also be directly influenced by market movements overseas, as we have seen recently. Assessing the impact of these changes in global financial market conditions is clearly a key issue now for the MPC.

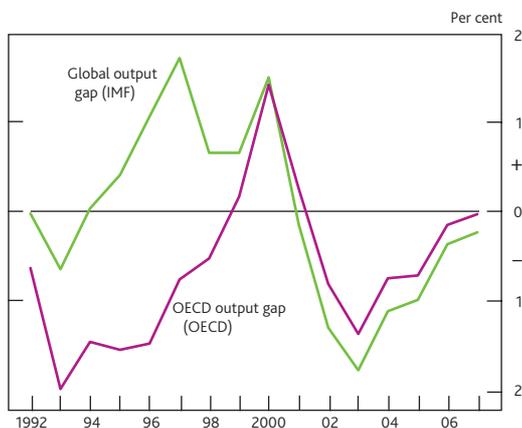
In addition to these cost and demand impacts, there is a third way in which global economic conditions might also affect UK inflation, which is through their impact on the pricing climate. As businesses become more specialised and international in focus, some economists have argued that global conditions have become increasingly important in affecting pricing behaviour, relative to domestic factors.⁽²⁾

According to this view, the global balance of demand and supply and competitive pressures on global markets may come to have a significant impact on prices in economies which are open to international trade, such as the United Kingdom. Excess global capacity represents a ready supply of traded goods which can readily enter the UK market, exerting a competitive discipline on price increases by UK businesses and holding down inflation. When global capacity is tight, this disciplining effect on price-setting will be much weaker.

Chart 4 shows measures of global spare capacity produced by the OECD and IMF. They show different trends in the 1990s, but over this decade there is a consistent picture. The reduction in spare capacity on global markets may account for

some of the upward pressure on traded goods prices we have recently seen in the more international sectors of the UK economy, such as manufacturing. The impact is likely to be weaker in sectors which are less open to international trade, including many services activities.

Chart 4 Measures of global spare capacity



Sources: IMF and OECD.

The role of monetary policy

In a world in which global developments have an important bearing on UK inflation, how should monetary policy respond? One conclusion you might draw from my discussion so far is that UK inflation will be heavily influenced by global developments. And yet, despite the shifts we have seen in the global economy over the past decade, UK inflation has been low and remarkably stable. So what has been going on? One view is that we have been living in a lucky period, where global influences on inflation have been exceptionally benign. Another view is that the credit lies with the way in which monetary policy has responded to the shocks from the global economy, and the stabilising role it has played.

Chart 5 shows three main ways in which monetary policy can act as a stabilising influence on inflation when the UK economy is buffeted by global shocks. The first of these is the impact of interest rates on the exchange rate. The exchange rate is not directly controlled by monetary policy. But monetary policy has an important influence. The interest rate differential between different currencies — and the factors which are expected to influence it — affect currency markets through their impact on the potential returns to investors. If monetary policy is tightened relative to other countries, or is expected to be tightened, this will tend to push up the exchange rate in the near term.⁽³⁾ Such a rise in the exchange rate should have a dampening impact on import price

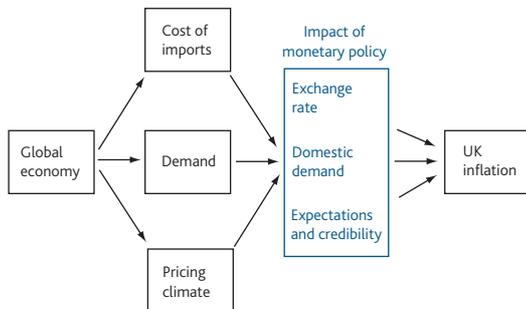
(1) Source: UK software and IT services industry ratings, published by Ovum, September 2007. Information supplied by Intellect (IT trade association).

(2) See Borio and Filardo (2007) for an exposition of this hypothesis and evidence from developed countries, although Ihrig, Kamin, Lindner and Marquez (2007) have cast some doubt on the robustness of the empirical evidence.

(3) According to economic theory, this appreciation occurs because a future depreciation is then expected to compensate for the interest rate differential.

increases, and can therefore counter a rise in global inflationary pressures. It also influences how attractive overseas markets are to exporters and therefore has an additional impact via the state of demand.

Chart 5 Monetary policy, the global economy and inflation



The second way in which monetary policy can counter global economic forces is through its impact on domestic demand — spending by consumers and investment by the private sector, both of which are affected by interest rate changes. Consumer spending is the largest single component of demand in the United Kingdom, and accounts for about 60% of domestic spending. A tightening in policy — such as we have seen over the past year — should have a significant impact on the growth of consumption, and hence domestic demand.

However, it has been difficult to predict how consumers will respond to higher borrowing costs. The increased gearing of the household sector in the United Kingdom may well have heightened the sensitivity of consumer spending to changes in domestic interest rates in the longer term — though it may take longer for interest rate changes to feed through to households because of the increased prevalence of fixed-rate mortgages. Judging how these factors are affecting the response of consumer spending to changes in interest rates and financial conditions is a key issue at present for the MPC.⁽¹⁾

A third stabilising factor is the credibility of monetary policy and its impact on price expectations. If inflation expectations remain anchored at or close to the inflation target, disturbances to the inflation path should prove temporary, and it will be easier for monetary policy to ride out a temporary shift in inflation. But when inflation expectations are not well anchored, it is much easier for an external shock to set off an inflationary wage-price spiral, as we experienced in the 1970s and early 1980s. The task of the MPC is now made easier by the experience of a decade and a half of low and stable inflation which has helped to anchor UK inflation expectations.

The practice of monetary policy continually involves judgements about how to react to shocks to UK demand and

inflation arising from the global economy. It is clearly not practical for policymakers to try and offset every shock. We do not have the information to do it perfectly, and the lags and uncertainties in the operation of monetary policy mean that we could inject unwanted volatility into the economy in the attempt to do so.

However, if the MPC is to be true to our mandate, we should be trying to avoid large and persistent deviations in inflation from our target arising from shifts in the global economy. On the upside, there is the risk that a temporary rise in inflation becomes embedded in expectations, and begins to affect companies' pricing behaviour and the level of wage settlements. We have learnt from past experience that unwinding such a rise in expectations can be very costly — in the early 1980s and early 1990s it led to two damaging recessions.

On the downside, there is an outside risk that very sharp falls in global prices could tip the economy into deflation, which was a concern for some MPC members earlier this decade.⁽²⁾ More likely, however, is the situation where downward global price pressures are associated with weak demand in international markets. In these circumstances, the MPC's mandate allows us to offset this by allowing domestic demand to grow more rapidly, which helps to stabilise the real economy, as long as this does not compromise our ability to meet the inflation target.

The most difficult situation for policymakers is where an upward shift to prices and costs is associated with weak demand. This could occur if rising prices reflect a change in supply conditions, rather than strong demand. Then, trying to stabilise the real economy by increasing demand could add to inflationary pressures and compromise the inflation target. This appeared to be the policy dilemma in the wake of the two oil price shocks of the 1970s, though the difficulties then were compounded by high inflation expectations and labour market inflexibility.⁽³⁾ This experience highlights the importance of ensuring that inflation expectations do remain well anchored when there are upward price shocks from the global economy.

The global economy since 1997

Earlier in this speech, I highlighted import costs, demand and the pricing climate as the three main ways in which global factors are likely to impact UK inflation and influence monetary policy in the short term. Looking back over the past decade, while the MPC has been in charge of monetary policy, there have been two distinct periods in terms of the way these pressures have impacted the UK economy.

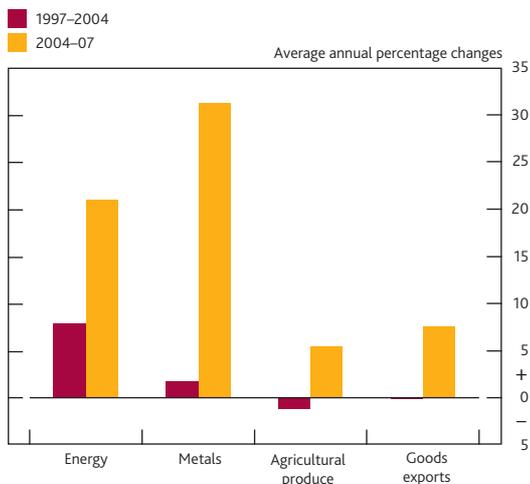
(1) See Besley (2007) for a fuller discussion.

(2) Julius (2000) and Wadhvani (2001).

(3) See Walton (2006) for an analysis.

In terms of both price and demand pressures, the period 1997 to 2003 was a very different environment to the period since 2004. **Chart 6** shows this in terms of measures of global prices. Until the beginning of 2004, energy and commodity prices were either falling or rising very slowly and goods export prices were on average flat. For some manufactured goods, prices fell very sharply, as production shifted to lower-cost locations, particularly China. These trends contributed to the disinflationary global pricing environment which provided the backdrop to MPC discussions in the late 1990s and early 2000s.

Chart 6 Global price trends, 1997–2007



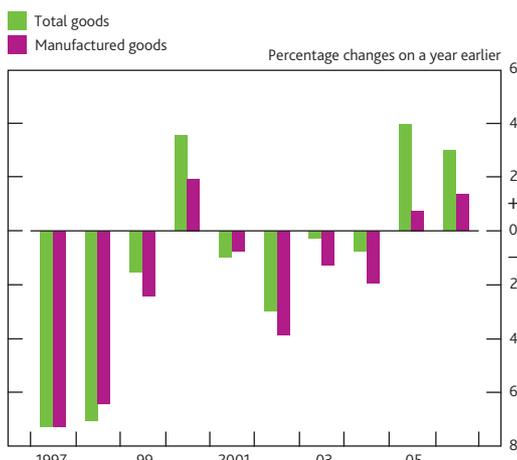
Notes: Figures calculated in US dollars; goods exports inflation shown for the periods 1997–2003 and 2003–06, based on annual data.

Sources: Goldman Sachs, IMF and Thomson Datastream.

Since 2004, the global environment has been much more inflationary. Goods export prices have risen on average by over 7% per annum in dollar terms (though by less in sterling), and energy and commodity price inflation has been around 20%–30% a year. This has created a very different import cost environment for economies like the United Kingdom in recent years, compared to the period in the late 1990s and early 2000s, as **Chart 7** shows. The prices of imported goods have risen significantly over the past two years, compared with the earlier experience of falling imported goods prices (with the exception of the year 2000). The strong deflation in manufactured import prices in the late 1990s has been replaced by rising prices.

This change in global inflationary pressures has been accompanied by — and is closely linked to — changes in the strength of demand across the global economy. The early years of the MPC were dominated by the Asian crisis and its aftermath. Then after a couple of strong years of global growth in 1999 and 2000 came the bursting of the ‘dot-com’ bubble, and associated sharp falls in equity markets. Global growth and business confidence was also affected by the political events between mid-2001 and mid-2003: the 9/11

Chart 7 UK goods import price inflation

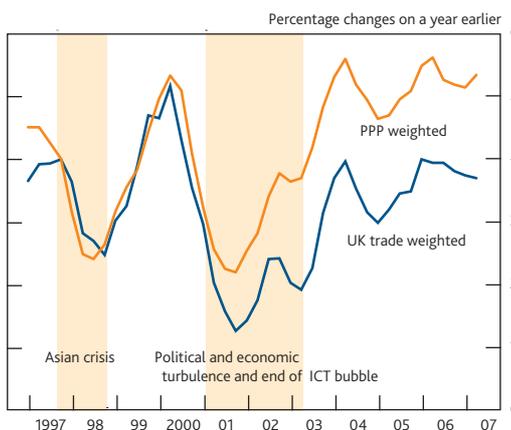


Note: Excludes estimated impact of fraud.

attacks; war in Afghanistan and Iraq; and the general background of concern about global terrorism.

However, as **Chart 8** shows, since the second half of 2003, the global economy has been in a very strong growth phase. Based on the current forecast from the IMF, 2004 to 2007 will be the strongest four-year period of world growth since the late 1960s and early 1970s. On a UK trade-weighted basis, global growth is not quite as strong, reflecting the United Kingdom’s greater exposure to slower-growing European markets and the lower weighting of dynamic Asian markets. However, the dynamism of the global economy may have boosted UK demand conditions in other ways — for example through its impact on business investment, which has recently recovered strongly.

Chart 8 World GDP growth

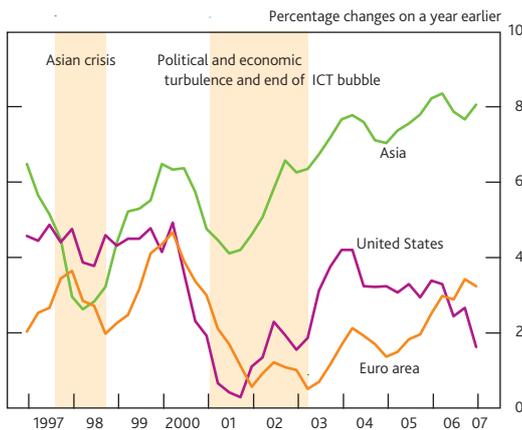


Sources: Thomson Datastream and Bank calculations.

What is providing the momentum for this period of strong global growth? Three factors have, I believe, played a part. The first is the relaxation of monetary policy in the world’s major economies in response to the weakness of demand in the early years of this decade. This loosening of policy was most striking in the United States, where interest rates fell to

1% and did not start to rise again until the summer of 2004. It is not surprising therefore that strong growth in the United States was a feature of the early years of this period of global expansion, as **Chart 9** shows. More recently, however, the US economy has slowed as the monetary stimulus was withdrawn through interest rate rises from mid-2004 to mid-2006. However, so far, strong growth in other regions of the international economy has offset the impact of this US slowdown, and global demand conditions more generally have remained buoyant.

Chart 9 Regional world GDP growth



Sources: Thomson Datastream and Bank calculations.

One reason for this is that global growth is also being supported by structural changes in the world economy. In particular, growth in Asia is being powered ahead by the shift of production to lower-cost economies, including China and India, with abundant labour supply. The strength of demand in Asia has played an important part in generating recent price pressures in energy and commodity markets. This provides a reminder that globalisation is not a one-way street when it comes to inflation, and there is a flip side to the 'China tailwind' of downward pressure on manufactured goods prices.⁽¹⁾ As well as putting upward pressure on energy and commodity prices, strong growth in Asia has also created capacity pressures in some sectors of manufacturing where previously there was excess capacity, changing the global pricing climate.

The third element supporting global growth in recent years has been a liberalised financial system, which has provided access to relatively easy credit and channelled finance from surplus countries such as China and energy producers in the Middle East into investments in the United States and Europe.⁽²⁾ This has prevented the negative demand impacts we saw in the 1970s, when barriers to capital movements created difficulty in 'recycling' oil revenues. However, it may be that this time round credit and finance have been too readily available for some risky investments as lending and borrowing have been sustained by relatively easy credit and the expectation of rising asset values.

In this respect, the financial market background to the global economy may now be changing. Over the summer, markets have begun to reassess the risks in the wake of the fall out from US sub-prime mortgages, and this has created difficulties in interbank markets and financial turbulence. It remains to be seen how significant the resulting changes in the financial climate will be. The MPC is monitoring the situation in credit markets closely and will be assessing carefully the consequences for the real economy, in the United Kingdom and overseas markets.

Monetary policy implications

As I mentioned earlier, we should not be surprised to see short-term fluctuations in inflation driven by changes in the global economy. Indeed, in the face of the global volatility we have seen over the past decade, it is perhaps surprising that it took nearly ten years of operation of the MPC before the Governor had to write his now famous letter to the Chancellor to explain why inflation had moved more than 1 percentage point away from the target. Interestingly, in that letter, the Governor highlighted the Bank's forecast that inflation would come back to target later this year, which is exactly what has happened.

The key to ensuring that inflation stays on target lies not with the state of the world economy, but in ensuring that the monetary policy response to external events is appropriate. In the era of global disinflation and weak global demand in the early years of this decade, the MPC was able to loosen policy to support domestic demand and counter the negative impact on inflation from the global economy. Interest rates fell to 3.5% in the United Kingdom as a result and were reduced even further in the United States and in the euro zone. This relaxation in UK monetary policy should not have put the inflation target at risk as long as policy was tightened appropriately when economic conditions improved and if inflationary pressures picked up.

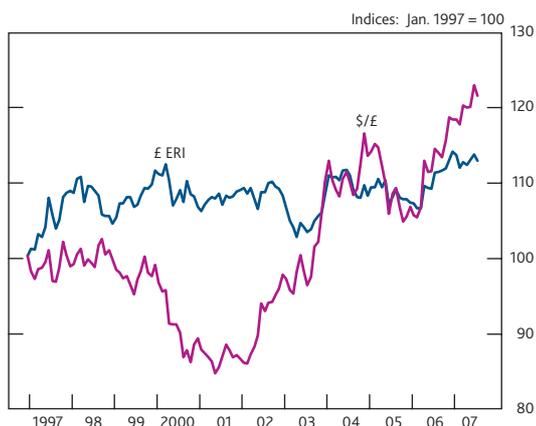
Over the past few years, there has been a need to reverse this relaxation of policy to offset a recovery in demand at home and abroad, associated with increasing price pressures from energy, commodities and other traded goods. In the United Kingdom, this policy tightening has taken place in two phases — in 2003/04 and over the past year. As I noted earlier, tighter policy should help stabilise inflation through its impact on the exchange rate, on domestic demand and by anchoring price expectations.

(1) See King (2006) for a more detailed discussion.

(2) See Sentance (2007) for a discussion of the implications of global financial imbalances more generally.

The exchange rate has certainly helped to moderate the inflationary impact of robust global demand and rising commodity prices. As **Chart 10** shows, the sterling effective exchange rate has been strong relative to its trading range in the MPC era, and there has been a marked appreciation of the pound against the dollar. The sustained appreciation of the pound against the dollar since the early 2000s has helped to moderate the rise in sterling import prices we have faced in the United Kingdom.⁽¹⁾

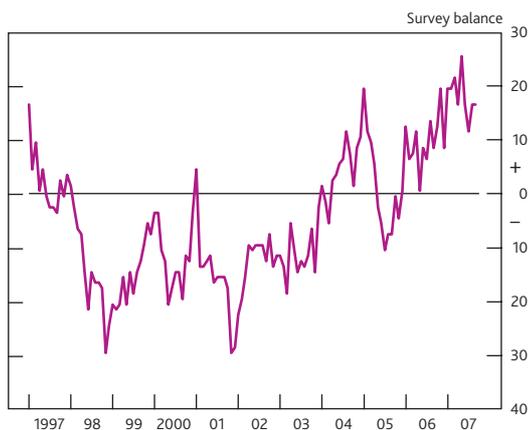
Chart 10 Movements in UK exchange rates since January 1997



Over the summer, there have also been some signs that the recent tightening in policy is beginning to slow the rate of growth of domestic demand — particularly consumer spending — though these indications are still tentative. In the Bank's latest *Inflation Report*, we projected that the annual rate of UK GDP growth would slow by about 1 percentage point as a result of weaker consumption and a moderation in investment. That moderation in demand underpinned our view that CPI inflation would stabilise at around 2% in the medium term. We will be updating that assessment in November, when we will be better able to take account of the recent financial turbulence, which will clearly have some impact on the balance of risks for growth and inflation.

The fall-back in CPI inflation in the past few months is also a welcome development — though the recent surge in the oil price is a reminder that global inflationary pressures are still a potential threat. Earlier this year, I was concerned that a prolonged period of above-target inflation would result in a broader upward shift in inflation expectations. So far, the evidence on the wage front has been reassuring on this point. And some of the business survey evidence which was causing concern about pricing expectations, such as the CBI manufacturing survey shown in **Chart 11**, have moderated somewhat. The MPC's actions in raising interest rates over the past year should have reinforced the view that demand conditions would not support a sustained rise in inflation above the 2% target — helping to moderate price expectations in the business community.

Chart 11 Manufacturers' price expectations



Note: Expectations refer to average prices for domestic orders over the next three months.

Source: CBI Monthly Trends Enquiry.

As a Committee, we now face a new challenge — of assessing the impact of financial market developments over the summer and deciding how they should affect our monetary policy judgements over the remainder of this year and into 2008. I am not going to pre-judge that issue this evening. As the public statement from the MPC earlier this month made clear, we need to assess the impact on the real economy and inflation before coming to any judgements on monetary policy. So far the full implications are far from clear. To inform our judgements we will be monitoring closely any changes in the cost and availability of credit to businesses and households alongside all the other data relevant to the outlook for inflation.

Over the past decade, the strength of demand from the world economy and the impact of global inflationary pressures have both had an important bearing on UK monetary policy. They have certainly been important factors over my first year on the MPC and I would expect this to continue to be the case in the future. Looking ahead, a key issue will be how far recent financial market developments affect the current momentum of global demand. Evidence on that issue will be an important influence on my policy judgements as a member of the MPC in the months ahead.

(1) Commodity and other traded goods price indices in sterling have increased by around 3% per annum less than the dollar equivalents since the start of 2004.

References

Bean, C (2006), 'Globalisation and inflation', *Bank of England Quarterly Bulletin*, Vol. 46, No. 4, pages 468–75.

Besley, T (2007), 'Consumption and interest rates', *Bank of England Quarterly Bulletin*, Vol. 47, No. 3, pages 471–76.

Blanchflower, D (2007), 'The impact of the recent migration from Eastern Europe on the UK economy', *Bank of England Quarterly Bulletin*, Vol. 47, No. 1, pages 131–35.

Borio, C and Filardo, A (2007), 'Globalisation and inflation: new cross-country evidence on the global determinants of domestic inflation', *BIS Working Paper no. 227*.

Ihrig, J, Kamin, S, Lindner, D and Marquez, J (2007), 'Some simple tests of the globalization and inflation hypothesis', *Board of Governors of the Federal Reserve System International Finance Discussion Paper no. 891*.

Julius, D (2000), 'Back to the future of low global inflation', *Bank of England Quarterly Bulletin*, February, pages 77–87.

King, M (2006), 'The Governor's speech in Ashford, Kent', *Bank of England Quarterly Bulletin*, Spring, pages 80–82.

OECD (2007), *Trends and Recent Developments in Foreign Direct Investment: 2007*.

Sentance, A (2007), 'The changing pattern of savings: implications for growth and inflation', *Bank of England Quarterly Bulletin*, Vol. 47, No. 2, pages 291–99.

Wadhvani, S (2001), 'The current policy conundrum', speech to the South East and East Anglia Agency's contacts in Norwich on 24 July.

Walton, D (2006), 'Has oil lost the capacity to shock?', *Bank of England Quarterly Bulletin*, Spring, pages 105–14.

Trends in European labour markets and preferences over unemployment and inflation

In this speech,⁽¹⁾ Professor David Blanchflower,⁽²⁾ member of the Monetary Policy Committee (MPC), examines the extent to which differing labour market institutions can provide an explanation of variations in unemployment rates across Europe over the past 50 years. He finds little evidence in the data to support this line of argument; rather he observes that poor labour market performance is due to rigidities in product, capital and housing markets. Turning to wages, he discovers that while there is little empirical evidence to support the existence of a stable Phillips curve across countries or time, there is considerable stability in the impact of unemployment on wages across countries, as described by the wage curve. Finally, using happiness equations, he measures the marginal rate of substitution between unemployment and inflation, discovering that in aggregate, society prefers a reduction in unemployment over a reduction in inflation.

'Inspiration is most likely to come through the stimulus provided by the patterns, puzzles and anomalies revealed by the systematic gathering of data, particularly when the prime need is to break our existing habits of thought.' Ronald Coase, Nobel Prize lecture (1991).

In this lecture I am going to consider the similarities and differences between European labour markets. This is going to be grounded in various pieces of research I have done in this area. A good deal of this work is joint with Andrew Oswald, and involves examining microdata files on individuals across space and through time. It mostly involves estimating equations of a similar form across countries. Our main focus has been on comparisons between EU countries and the United States but we have also looked at other OECD countries. What is striking is how similar the various patterns in the data we observe are, despite the different labour market institutions. Following Harberger (1993), I think of economics as essentially an observational discipline.

I will start by sketching out the evolution of unemployment across Europe and the United States over the past 50 years or so. I will then look at the received wisdom that has been used to explain the changes we observe, which suggests the importance of labour market institutions. Somewhat surprisingly I find little supporting evidence that such institutions play a major role. I will then go on to consider the implications of unemployment for wages, finding considerable stability in the impacts across countries. The talk will culminate with a discussion of happiness and people's preferences between unemployment and inflation, which is

the subject of a new paper I am releasing today (Blanchflower (2007)). The main conclusion of this lecture may be rather surprising: there are more similarities than there are differences in the observed patterns across EU labour markets. Perhaps this finding is much less surprising in light of recent developments in financial markets, reinforcing the message that we are operating in a global economy.

Unemployment

I will assume for simplicity that the ILO unemployment rate is a measure of labour market slack. **Table A** sets out the relevant decadal averages for the EU15 plus Japan and the United States. A number of observations can be made.

1. Unemployment was low in the 1950s, 1960s and 1970s.
2. It was considerably higher in the 1980s and 1990s and has fallen again in the 2000s.
3. Unemployment has been particularly high since the 1980s in France, Germany, Italy and Spain.
4. Unemployment has remained low in the Northern European countries of Sweden, Norway and Denmark plus Japan.
5. Unemployment dropped dramatically in Ireland in the 2000s.

(1) Given at the Dresdner Kleinwort Seminar on European Labour Markets and Implications for Inflation and Policy on 27 September 2007. This speech can be found on the Bank's website at www.bankofengland.co.uk/publications/speeches/2007/speech323.pdf.

(2) Bruce V Rauner Professor, Dartmouth College, University of Sterling, IZA, CESifo and NBER. I am most grateful to Roger Kelly, Nicola Scott and Chris Shadforth for their invaluable assistance. I would also like to thank Andrew Sentance for his helpful comments.

Table A Average unemployment rates, 1955–2007

Per cent	1955–69	1970s	1980s	1990s	2000s
Belgium	3.2	4.8	10.8	8.6	7.7
Denmark	3.1	3.8	8.9	9.6	4.6
Finland	1.7	3.6	4.9	11.8	8.6
France	2.0	3.8	9.0	11.0	9.2
Germany	2.6	2.3	6.0	7.8	8.2
Ireland	4.8	6.9	14.3	12.1	4.4
Italy	5.7	6.4	10.1	11.0	8.1
Japan	1.8	1.7	2.5	3.1	4.7
Netherlands	1.4	3.9	9.7	6.0	3.5
Spain	2.5	4.3	17.7	19.8	10.0
Sweden	1.9	2.1	2.5	6.2	6.0
United Kingdom	2.2	4.4	9.9	8.2	5.1
United States	4.0	6.2	7.3	5.8	5.0

Source: OECD statistics for 2000s (2000–07 Q2).

Is the explanation for the differences in unemployment experiences across countries due to their labour market institutions? Probably not. For example, the decline in unemployment in Ireland in the 2000s was not brought about by reforms of the labour market institutions but by tax and product market reforms. Similarly the increase in unemployment in the 1990s in Finland was not driven by labour market reform, but was in part the result of the collapse of its preferred bilateral trade deal with Russia.

Chart 1 makes it clear that unemployment has been higher in Europe as a whole than in the United States over the past 20 years, but prior to the 1980s the reverse was true. That picture is also true for the United Kingdom — unemployment rates up to the 1980s were below US rates and then during the 1990s they were higher. I remember the time of the switch well. I was a member of the Centre for Labour Economics at the LSE and every week we would attend the Unemployment Seminar and try to work out why unemployment had risen so rapidly. Subsequently, the explanation, notably as set out by Layard, Nickell and Jackman (2005),⁽¹⁾ tells us that this switch was brought about by the oil price shocks of the 1970s interacting with supply-side rigidities in the EU, such as union power and more generous and easily available benefits. As the oil price rose, unions across the EU resisted falls in real wages, causing the NAIRU to rise, while a more generous benefit system reduced the fear of unemployment. In contrast, US workers' real wages adjusted down, and unemployment increased less. Given the apparent causes of the increase, the policy prescription required to solve the unemployment problem was to undertake structural labour market reforms to remove these rigidities.

That is an interesting theoretical story. Unfortunately, as I set out in Blanchflower (2001), it turns out that there is little or no connection in the actual data between changes in most of the

various labour market rigidity variables and changes in unemployment. Indeed, **Charts 2–6** illustrate that it is difficult to show any significant relationships between rigidity variables and levels and changes in unemployment rates even in the raw data.⁽²⁾

Benefit duration

Chart 2 shows unemployment rates across 20 OECD countries in 2002 against the ratio of the net replacement rate in the 60th month of benefit receipts to their value in the first month of entitlement. The traditional view is that long duration benefits help to explain high unemployment, but this chart seems to suggest a negative correlation between these variables.

Employment protection

Chart 3 plots from 1980–98 for three five-year periods and one four-year period (1995–98) the unemployment rate against a job protection index for each OECD country. No significant relationship is found. Interestingly, in a recent paper published by the OECD (2004) it was shown that Ireland had very low job protection rates at the end of the 1980s and none of the various indicators they reported for Ireland had subsequently changed! Overall job protection strictness measures for Ireland estimated by the OECD for 2003 ranked below every country except Canada, the United Kingdom and the United States. Changes in the unemployment rate in Ireland had more to do with housing, product and tax reforms than with labour market reforms.

Trade unions

Chart 4 plots from 1980–98 for three five-year periods and one four-year period (1995–98) the unemployment rate against union density for each OECD country. There is no significant relationship. The World Bank has recently argued as follows.

'Union density per se has a very weak association, or perhaps no association, with economic performance indicators such as the unemployment rate, inflation, the employment rate, real compensation growth, labor supply, adjustment speed to wage shocks, real wage flexibility, and labor and total factor productivity.' Aidt and Tzannatos (2002, page 11).

Changes in replacement rates

However, there is evidence in **Chart 5** that changes in gross replacement rates and changes in unemployment rates between 1982 and 2002 have the expected positive sign ($R^2 = .075$). Oswald and I have also found evidence for the role of benefits in explaining unemployment across US states.

(1) Layard, Nickell and Jackman (2005) is the second edition of their 1991 book, which 'is identical to the first except for a long introduction', (Blanchard (2007)).

(2) These data have been provided by David Howell, to whom I am very grateful and are reported in Howell *et al* (2007) and Baker *et al* (2004).

Chart 1 Unemployment in the United Kingdom, United States and EU15

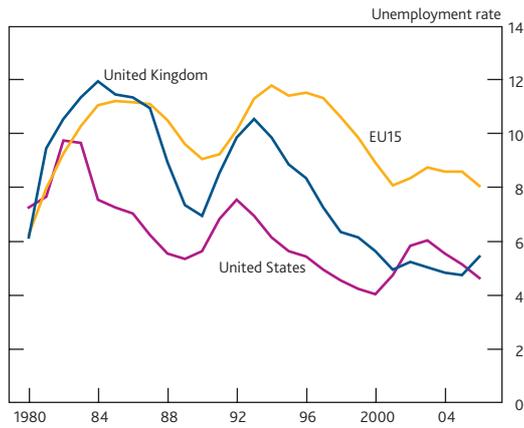


Chart 2 Unemployment benefit duration and unemployment for 20 OECD countries, 2001

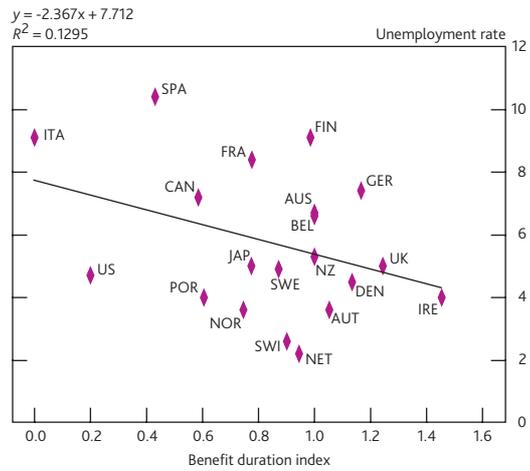


Chart 3 Employment protection and unemployment, OECD, 1980–98

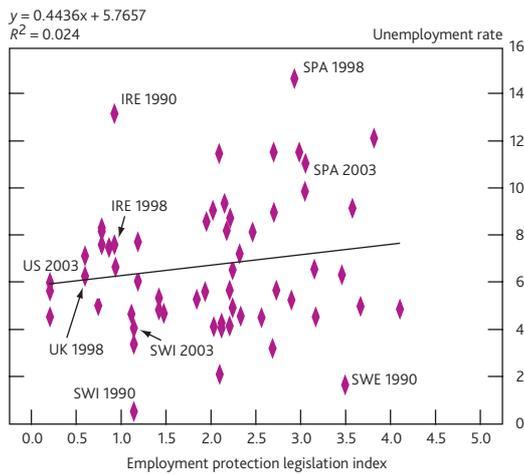
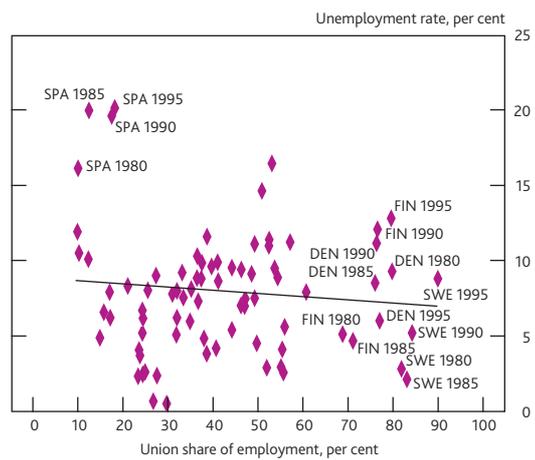


Chart 4 Union density and unemployment, OECD, 1980–98



Source: Howell, Baker, Glyn and Schmitt (2007).

Chart 5 Change in gross replacement rates and unemployment rates for 20 OECD countries, 1982–2002

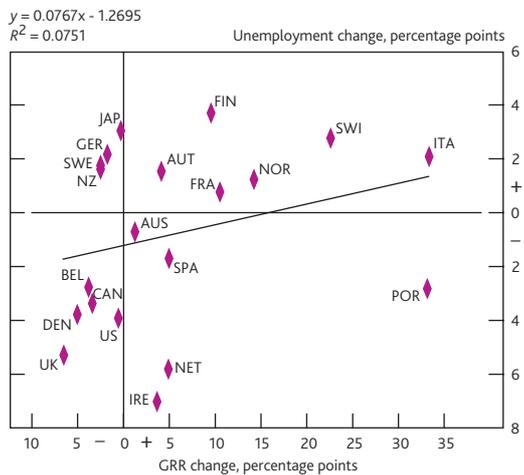
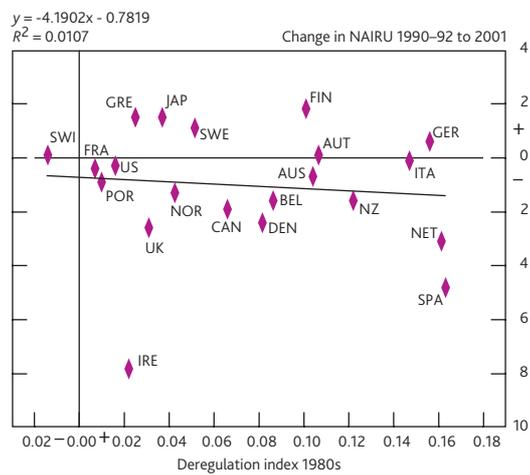


Chart 6 Labour market deregulation and changes in the NAIRU for 21 OECD countries in the 1990s



Inequality

What is clear though is that countries that rely on institutions to set wages and working conditions do have lower rates of inequality or dispersion of earnings. The United States, which ranks as the most market-driven labour market, has the highest dispersion of wages. Other economies with relatively market-driven labour markets also have high levels of inequality. By contrast, Norway, where institutions set wages, has the lowest dispersion.

Labour market deregulation

A central pillar of OECD labour market policy has been that reforms that reduce labour market rigidities are the answer to persistent high unemployment. An enumeration of such reforms was carried out by the OECD (1999) as part of its follow-up to *The Jobs Study* (OECD (1994)). Howell *et al* (2007) created an index based on a list of reforms related to unemployment benefits, employment protection, and wage-bargaining systems, as these constitute the key labour market institutions typically regarded as employment-unfriendly. **Chart 6** is taken from their study and shows no significant relationship between this measure of deregulation and the change in unemployment across OECD countries.

The orthodox rigidity explanation of unemployment has been subject to fairly extensive econometric testing, and in recent years, the validity of the empirical results supporting this view has been called into question. To put it technically, it has proved difficult to estimate a set of cross-country panel unemployment regressions that contain a lagged unemployment rate and a full set of year and country dummies and show that any of the labour market rigidity variables work. This is the first main similarity between European labour markets: labour market institutions do not tend to cause unemployment. The major exception is changes in the replacement rate, which do appear to be negatively correlated with changes in the unemployment rate.

In a recent article, Howell *et al* (2007) econometrically examined the impact of these rigidity variables, or what they call Protective Labor Market Institutions (PLMIs), and concluded that:

'While significant impacts for employment protection, benefit generosity, and union strength have been reported, the clear conclusion from our review of these studies is that the effects for the PLMIs is distinctly unrobust, with widely divergent coefficients and levels of significance.'

Howell *et al* (2007) go on to argue a point of view I have held for quite some time, that the confidence with which labour market rigidities are held to be the root of poor employment performance is in contrast to the fragility of the findings.

Indeed, in his published comments on the Howell *et al* article, Nobel Laureate, Jim Heckman (2007) concurs, arguing that the authors

'...are convincing in showing the fragility of the evidence on the role of labour market institutions in explaining the pattern of European unemployment, using standard econometric methodology'.

Freeman (2007) also finds the evidence for the impact of these institutional variables less than convincing.

'Movement toward market-determined pay widens earnings distributions... By contrast, despite considerable effort, researchers have not pinned down the effects, if any, of institutions on other aggregate economic outcomes, such as unemployment and employment.'

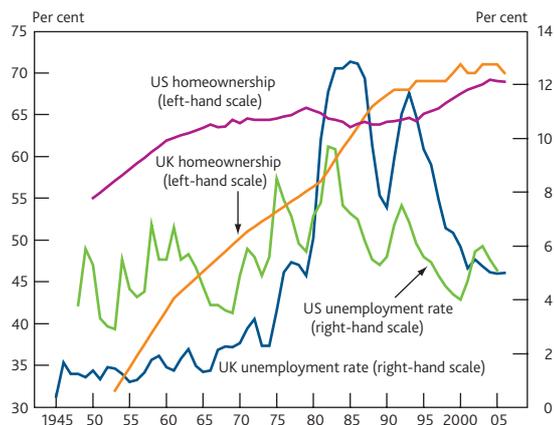
What is true is that unemployment in Europe is higher than it is in the United States and Western Europe has more job protection, higher unemployment benefits, more union power, and a more generous welfare state. But that is a cross-section correlation and it tells us little or nothing about time-series changes. That leaves us looking for alternative explanations for the observed crossing of US and European unemployment rates in the 1980s.

I'm now going to set you a brief challenge — can you think of another series that has followed a similar trend to that of unemployment rates in the United Kingdom and United States, ie

- was lower in the United Kingdom than in the United States for the period 1945–80; and
- was higher in the subsequent period.

I'll even give you a hand by showing you the series in **Chart 7**. Well I'll put you out of your misery — it's the housing market, and the homeownership rate more specifically. This seems pretty topical these days.

It seems that unemployment is positively correlated with changes in rates of homeownership. I would characterise this as a major similarity between European labour markets. **Chart 7** shows the relationship for the United States and the United Kingdom, but the evidence holds for many more countries. Of the major industrial nations Spain has the highest unemployment and the highest rate of homeownership and Switzerland the lowest unemployment and the lowest rate of homeownership. During the 1990s there were two European countries with unemployment rates close to 20% and these three had the highest homeownership rates (Ireland and Spain).

Chart 7 Unemployment and homeownership

In the 1950s and 1960s the United States had the highest unemployment and the highest rate of homeownership. This pattern also holds within US states: for example, Michigan has both a high unemployment rate (6.9% in 2006) and a high homeownership rate (77.4%), while California has a low unemployment rate (4.9% in 2006) and a low homeownership rate (60.2%). In new work for the United States Andrew Oswald and I have estimated a state level unemployment equation for the period 1977–2006 with a lagged dependent variable and a full set of year and state dummies. Homeownership lagged two or more years enters significantly and positive. Union status is insignificant.⁽¹⁾ Higher homeownership raises unemployment, presumably because it reduces labour market mobility.

Over the past few decades European governments have made concerted efforts to reduce the size of the private rented sector and to increase homeownership. Yet homeowners are relatively immobile, partly because they find it much more costly than private renters to move around. Unemployment rates have grown most rapidly in the nations with the fastest growth in homeownership. Workers in Michigan laid off from GM own their own homes which they can't sell and it is hard then for them to move to new jobs in other parts of the country. The large increase in European homeownership has considerable advantage over the other possible explanations for the rise in unemployment — it seems to fit the data!

In a recent paper written with my colleague Chris Shadforth (2007), we examined the striking growth in self-employment that has been observed in the United Kingdom over the past couple of years. Self-employment accounts for about 13% of the stock of workers. However, over the period May-June 2005 to May-June 2007 self-employment accounted for 199,000 out of an increase in total employment 356,000 or 56% of total job growth.⁽²⁾ We estimate that approximately half of this growth in self-employment could be explained by the rise in house prices freeing up capital

constraints. What goes on in the housing market, matters for the labour market.

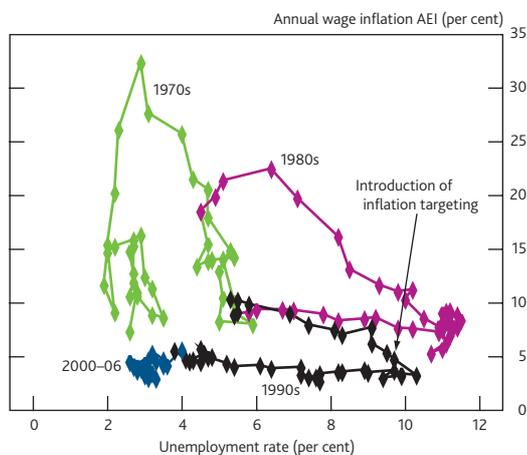
In the very first meeting of my introductory Labour Economics class I tell the students that the demand for labour is a derived demand, derived from the demand for the product. Reforming the labour market is unlikely to work if you don't reform the product market. In the absence of freely functioning capital and housing markets the labour market can't work efficiently. There is much work still to do in this area but the role of labour and capital mobility in improving the functioning of the labour market seems to be important. Reforming the product, capital and housing markets are likely more important than reforming the labour market. The labour market follows.

Wages

So that is what has happened to unemployment, but what are the consequences of unemployment? I'm now going to talk briefly about the impact of unemployment on wages.

The relationship between wage inflation and unemployment is usually thought of as being described by the Phillips curve, but the empirical evidence does not provide much support for the theory. The results of estimated Phillips curve relationships — that is how the level of unemployment impacts wage inflation — appear to be time-specific, data-specific and/or country-specific.

There is evidence of a downward-sloping Phillips curve in the United Kingdom at points during the 1970s and 1980s, but since the 1990s the curve has been flat (**Chart 8**). In other words, for the past fifteen or so years there has been no trade-off between (wage) inflation and unemployment.

Chart 8 Phillips curve (quarterly observations)

(1) Estimated equation is as follows and also includes 50 state and 28 year dummies.
 $\ln U_t = .8223U_{t-1} + .0020 \ln \text{Union density}_{t-2} + .0027 \ln \text{Homeownership rate}_{t-2}$
 (53.62) (1.33) (2.23)
 $N = 1428, R^2 = .9269$. *T*-statistics in parentheses.

(2) Source: *Labour Market Statistics*, First Release, September 2007, ONS.

But that does not mean there isn't a relationship between wages and unemployment. For many years I have argued for the use of microdata and described an empirical regularity or law linking the level of pay to the unemployment rate in the local area — known as the wage curve (Blanchflower and Oswald (1994)). This was the title of the book Andrew Oswald and I published in the 1990s which documented this pattern across 16 countries; for these countries we found that the data are well described by a wage curve with an unemployment elasticity of approximately -0.1 — in other words a doubling of the unemployment rate is associated with a 10% decline in the level of the real wage.

Just to be clear, there is evidence of a stable relationship between changes in real wages and changes in unemployment (the wage curve). In contrast there is no evidence of a relationship between changes in the real wage and the level of unemployment (the Phillips curve). This empirical finding has subsequently been verified for 43 countries and many time periods some by us and by many other authors.⁽¹⁾ It suggests that macroeconomic time-series analyses of the labour market suffer from aggregation and missing variable biases of uncertain sign and magnitude.

An extensive meta-analysis was conducted by Nijkamp and Poot (2005) on a sample of 208 wage/unemployment wage curve elasticities from the literature, and concluded that, unlike the Phillips curve, the wage curve is 'an empirical phenomenon'. **Chart 9** shows such a wage curve, traced out for the EU15 countries (excluding Spain) and United States for the period 1995–2005. It plots changes in real wages on changes in unemployment rates by country from 1995–2005. It is clear that the countries experiencing the highest falls in unemployment over the period also experienced the largest increases in real wages.

Sanz-de-Galdeano and Turunen (2006) examined the wage curve for the euro area over the period 1994–2001. They found

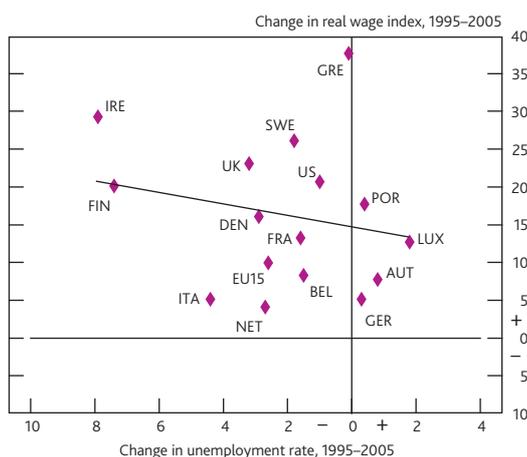
that the overall unemployment elasticity in the euro area is -0.14 once they had controlled for individual level fixed effects.⁽²⁾ The elasticity varies across groups of workers. They found that wages of workers at the bottom of the distribution are more responsive to the local unemployment rate.

Based on these findings, I would characterise a major similarity in European labour markets to be the existence of remarkably similar wage curves. Why do we find evidence of wage curves, but not Phillips curves? Margo (1993) cites two principal reasons related to the use of microeconomic versus macroeconomic data, the former being typically used for the estimation of wage curves and the latter for Phillips curves. First, less-aggregated data provide many more degrees of freedom than a decade or so of time-series data. And second, he suggests that work at a lower level of aggregation can reveal aspects of human behaviour that lie hidden in the aggregate time series.

A number of authors, including myself, have attempted to model the Phillips curve using microdata, controlling for country/region and time-fixed effects. When we do, we find that the autoregressive nature of the macroeconomic theory tends to disappear (Blanchflower and Oswald (2005)). These two factors suggest that much macroeconomic data is suspect as it suffers from aggregation biases of uncertain sign and magnitude. Except in isolated specifications, there is not persuasive support for a simple Phillips curve. It seems more sensible to view the data as being characterised by dynamic fluctuations around a long-run stable wage curve.

So what has happened to wages in the United Kingdom in recent times? Over the past two years wage growth in the United Kingdom has been benign. For example, average earnings growth without bonuses was 4.2% (4.6%) in July 2005; 3.3% (3.9%) in July 2006 and 3.7% (3.8%) in July 2007, with the numbers in parentheses with bonuses.⁽³⁾ These surveys exclude workers in the smallest workplaces of less than 20 workers whose wages are the most flexible downwards. Wage settlements over the past year have remained flat. Part of the reason for this is given by the wage curve — wage pressures have been constrained because unemployment has increased.

Chart 9 Wage curve, Europe and the United States, 1995–2005



(1) Wage curves have been found in Argentina, Australia, Austria, Belarus, Belgium, Brazil, Bulgaria, Burkina Faso, Canada, Chile, China, Côte d'Ivoire, Czech Republic, Denmark, East Germany, Estonia, Finland, France, Great Britain/United Kingdom, Holland, Hungary, India, Ireland, Italy, Japan, Latvia, New Zealand, Norway, Poland, Portugal, Romania, Russia, Slovakia, Slovenia, South Africa, South Korea, Spain, Sweden, Switzerland, Taiwan, Turkey, United States, and West Germany (Blanchflower and Oswald (2005)).

(2) All models include a set of control variables (time-invariant variables are omitted from the fixed-effects models): age, age squared, female dummy, married dummy, 2 education level dummies (primary education is the omitted category), 8 occupation dummies (elementary occupation is the omitted category), public sector dummy, 7 year dummies (2001 is the omitted category) and 65 region dummies.

(3) Source: *Labour Market Statistics*, First Release, September 2007, ONS, Tables 15 and 16.

The degree of slack in the labour market directly influences wage pressures, and it can also impact migration, which itself can have second-round effects on pay. The United Kingdom, Ireland and Sweden were the only countries to fully open their borders to workers from the eight Eastern European EU accession countries in May 2004.⁽¹⁾ These workers have helped to contain wage pressures in the United Kingdom by increasing the labour force available to UK firms, both by moving to the United Kingdom to fill vacancies in low-skilled, low-paid jobs, but also by providing outsourcing opportunities in their home nations. The increase in available workers has therefore increased the ‘threat’ of unemployment for UK workers (Blanchflower (1991)), which tends to have a downward impact on pay especially in the non-union sector. The fear of unemployment lowers wages.

One measure of the ‘threat’, and the fact that it has increased in the United Kingdom since A8 accession, is captured in a monthly survey of consumers conducted by the European Union. The Directorate General for Economic and Financial Affairs of the European Commission conducts regular harmonised surveys for consumers in which they are asked:

‘How do you expect the number of people unemployed in this country to change over the next twelve months? The number will: a) increase sharply; b) increase slightly; c) remain the same; d) fall slightly; e) fall sharply; f) don’t know’. The answers obtained from the survey are aggregated into a survey ‘balance’. Balances are constructed as the difference between the proportion giving positive and negative replies. **Chart 10** shows a clear correlation between changes in the fear of unemployment and actual unemployment over the past few years in the United Kingdom. Fear of unemployment has also risen in Ireland, where there has also been a significant inflow of workers from Eastern Europe, even though unemployment has remained low. In contrast, **Chart 11** shows that the fear of unemployment has not risen across the rest of the EU, ie in those countries that didn’t open their borders to A8 workers. In combination with rising unemployment, the ‘fear’ of unemployment is likely to have contained wage pressures in the United Kingdom. Here is an example of a major difference across EU countries.

Happiness, unemployment and inflation

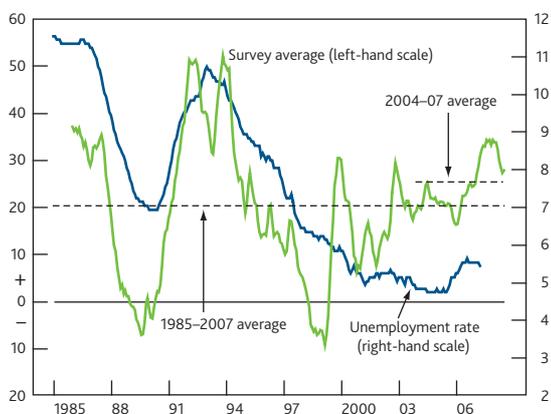
So far I have pursued the general theme that institutions have less influence on unemployment than has previously been considered to be the case. By examining microdata, we have seen that rather than there being a trade-off between wage inflation and unemployment in recent years, in fact it is the level of the real wage that is linked to changes in the unemployment rate. Now, before concluding, I’m going to consider the same issues, but from a different perspective, and look at preferences between unemployment and inflation, based on a paper I am releasing today. This paper is available from the Bank’s website now.

The paper I am releasing has its roots in work that I and others have undertaken on the economics of happiness. I have worked in this field for a number of years and am impressed by the stability of results obtained from analysing individuals’ responses to questions about levels of happiness or life satisfaction. Considering the theme of this lecture, I will also look at the differences and similarities across European countries in preferences between inflation and unemployment.

As part of its remit, the Monetary Policy Committee is responsible for achieving the Government’s target rate for inflation. I am pleased to say that both inflation and unemployment have fallen in recent years, but individuals seem to have rather different preferences over unemployment and inflation.

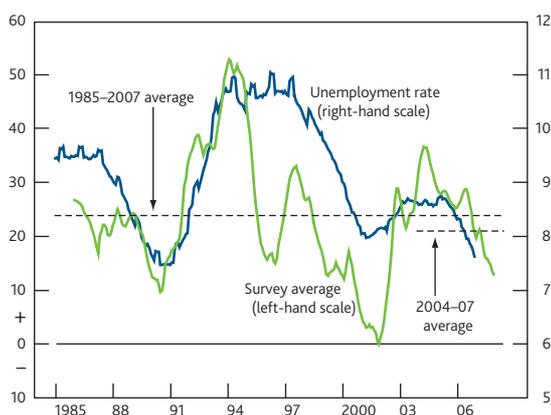
Happiness equations estimated in one EU country look much like those estimated in all others. There are once again more

Chart 10 UK unemployment expectations over the next twelve months^(a)



(a) Three-month average — advanced twelve months.

Chart 11 EU15 unemployment expectations over the next twelve months^(a)



(a) Three-month average — advanced twelve months.

(1) The A8 countries are the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia.

similarities than differences and here is the third major empirical similarity. In every EU country happiness is highest for those who are married compared with those who are single, higher among the more educated and those in work. Conversely, happiness is especially low for the unemployed, those who are divorced, widowed or separated and the least educated (Blanchflower and Oswald (2004, 2007a,b)). Money does buy happiness but it takes a lot to compensate for life events. It also turns out that individuals and countries with high levels of happiness have lower levels of hypertension (Blanchflower and Oswald (2007a); Mojon-Azzi and Sousa-Poza (2007)).

Interestingly, happiness is U-shaped in age and minimises in the mid-to-late 40s across most EU countries. On average happiness minimised at age 47 in the EU, age 45 in the United States and 46 for the world (Blanchflower and Oswald (2007b))!

	Age at minimum
World average (WVS 55 countries)	46
United States (GSS)	45
EU15 average	47
Belgium	46
Denmark	50
Finland	50
France	50
Germany	43
Greece	53
Ireland	38
Italy	64
Luxembourg	41
Netherlands	47
Portugal	66
Spain	50
Sweden	50
United Kingdom	36

There is also evidence that individual happiness is correlated with macro variables. In the raw data, life satisfaction is negatively correlated with the unemployment rate (Chart 12) and with inflation (Chart 13). Previous work has shown that people are happier when both inflation and unemployment are low (Di Tella *et al* (2001); Wolfers (2003)). These previous studies also find that unemployment depresses well-being more than does inflation. And it appears that life satisfaction is positively correlated with higher GDP per capita too. When a nation is poor it appears that extra riches raise happiness but has little impact in the richest countries. Inequality also lowers happiness (Alesina *et al* (2004)).

I extend the area of research in the new paper to a wider sample of countries over a longer time period. In my paper I make use of data at the individual level from Eurobarometer surveys for a number of EU member countries, as well as Norway, Croatia and Turkey for the period 1973–2006. In these surveys, individuals are asked, 'On the whole, are you

Chart 12 Life satisfaction and unemployment

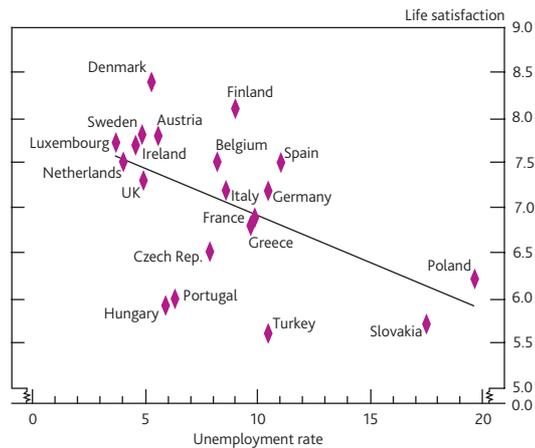
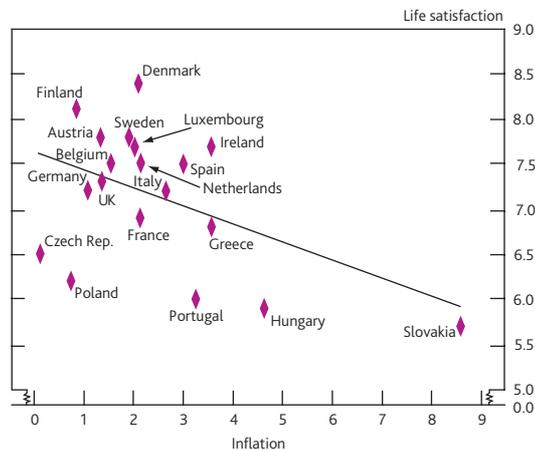


Chart 13 Life satisfaction and inflation (HICP, 2003)



very satisfied, fairly satisfied, not very satisfied, or not at all satisfied with the life you lead?'. In total, we have data on 680,000 individuals, and for each of them we know their sex, age, employment status, marital status, education, occupation etc, and we map in annual data on unemployment, inflation, GDP and the interest rate for each country.

As with the previous literature, both inflation and unemployment enter significantly negatively — higher unemployment and higher inflation both lower happiness. But what do my estimates suggest about the relative size of the effects from the unemployment rate and the inflation rate? Is the evidence consistent with the misery index which weights unemployment and inflation equally?

From my happiness equations it is possible to calculate the slope of the indifference curve between inflation and unemployment. The issue here is to measure the effects of a 1 percentage point change in unemployment compared to a 1 percentage point change in inflation — the so-called marginal rate of substitution between unemployment and inflation.

To do this, however, it should be borne in mind that the social cost of unemployment contains both an aggregate and a personal component — with an increase in the unemployment rate, society as a whole becomes more fearful of unemployment and at the same time some people actually lose their jobs. It is apparent that the person who actually becomes unemployed experiences a much larger cost, and is calculated from the coefficient on being 'unemployed' in our estimation procedure. One needs to add in the personal cost to the 1% of people who become unemployed.

My estimates imply that the well-being cost of a 1 percentage point increase in the unemployment rate equals the loss brought about by an extra 1.62 percentage points of inflation. The so-called 'misery' index, which simply sums the unemployment rate with the inflation rate then understates the importance of unemployment. In aggregate, society would prefer a reduction in unemployment over a reduction in inflation. Please note that I'm not advocating any change to the Bank's legislated goals here, just stating an empirical observation!

It is also possible to obtain estimates for subgroups. I find that females have a similar trade-off to males (1.61 and 1.58 respectively). The least educated and the old are more concerned about unemployment — they put the highest weight on unemployment. Conversely, the young and the most educated and those still studying put the greatest weight on inflation. This runs counter to the idea that older people care more about inflation as they are more likely to have

experienced it during their adult lives. The results are also consistent with this finding when the analysis is done by cohorts defined by year of birth. Older cohorts care more about unemployment than younger cohorts. I estimate the trade-off for the United Kingdom at 1.92.

It is perfectly feasible, though, that an individual who experienced high inflation, and especially hyper-inflation, during their adult lifetime would be more concerned about the consequences of higher inflation than somebody who had, say, only experienced low and stable inflation. To isolate any such effects I mapped onto the data file a variable representing the highest annual inflation rate an individual had experienced in their adult lifetime. I find that an individual who has experienced high inflation in the past has lower happiness today, even holding constant today's inflation and unemployment rates. Inflation has its greatest impact when it is high and such effects remain through time. This is especially the case in Austria and Germany where inflation rates of over 1,000% had been experienced by some in our surveys during their adult lives.

I shall leave the analysis there. I have shown that there are a number of similarities between European labour markets — indeed there seem to be many more similarities than differences. Contrary to the received wisdom, the differences do not appear to be attributable to labour market institutions: a more plausible explanation appears to be that poor labour market performance is due to rigidities in product, capital and housing markets: the labour market follows.

References

- Aidt, T and Tzannatos, Z (2002)**, *Unions and Collective Bargaining. Economic Effects in a Global Environment*, World Bank, Washington, DC.
- Alesina, A, Di Tella, R and MacCullough, R J (2004)**, 'Inequality and happiness: are Europeans and Americans different?', *Journal of Public Economics*, Vol. 88, pages 2,009–42.
- Baker, D, Glyn, A, Howell, D and Schmitt, J (2004)**, 'Unemployment and labor market institutions; the failure of the empirical case for deregulation', *SCEPA Working Paper no. 2004–4*, September.
- Blanchard, O (2007)**, 'A review of Richard Layard, Stephen Nickell, and Richard Jackman's unemployment: macroeconomic performance and the labour market', *Journal of Economic Literature*, Vol. XLV, June, pages 410–18.
- Blanchflower, D G (1991)**, 'Fear, unemployment and pay flexibility', *Economic Journal*, March, pages 483–96.
- Blanchflower, D G (2001)**, 'Unemployment, well-being and wage curves in Eastern and Central Europe', *Journal of the Japanese and International Economies*, Vol. 15(4), pages 364–402.
- Blanchflower, D G (2007)**, 'Is unemployment more costly than inflation?', *NBER Working Paper no. 13505*.
- Blanchflower, D G and Oswald, A J (1994)**, *The wage curve*, MIT Press, Cambridge, MA.
- Blanchflower, D G and Oswald, A J (2004)**, 'Well-being over time in Britain and the United States', *Journal of Public Economics*, Vol. 88(7–8), pages 1,359–86.
- Blanchflower, D G and Oswald, A J (2005)**, 'The wage curve reloaded', *NBER Working Paper no. 11338*.
- Blanchflower, D G and Oswald, A J (2007a)**, 'Hypertension and happiness across nations', *Journal of Health Economics*, forthcoming.
- Blanchflower, D G and Oswald, A J (2007b)**, 'Is well-being U-shaped over the life-cycle?', *NBER Working Paper no. 12935*.
- Blanchflower, D G and Shadforth, C (2007)**, 'Entrepreneurship in the UK', *Foundations and Trends in Entrepreneurship*, Vol. 3(4), pages 257–364.
- Coase, R H (1991)**, 'The institutional structure of production', *American Economic Review*, Vol. 82, pages 713–19.
- Di Tella, R, MacCulloch, R J and Oswald, A J (2001)**, 'Preferences over inflation and unemployment: evidence from surveys of happiness', *American Economic Review*, Vol. 91, pages 335–41.
- Freeman, R B (2007)**, 'Labor market institutions around the world', *NBER Working Paper no. 13242*.
- Harberger, A C (1993)**, 'The search for relevance in economics', *American Economic Review*, papers and proceedings, Vol. 83, pages 1–16.
- Heckman, J (2007)**, 'Comments on 'Are protective labour market institutions at the root of unemployment? A critical review of the evidence by Howell, D, Baker, D, Glyn, A and Schmitt, J'', *Capitalism and Society*, Vol. 2(1), Article 5, pages 1–5.
- Howell, D, Baker, D, Glyn, A and Schmitt, J (2007)**, 'Are protective labour market institutions at the root of unemployment? A critical review of the evidence', *Capitalism and Society*, Vol. 2(1), Article 1, pages 1–71.
- Layard, R, Nickell, S N and Jackman, R (2005)**, *Unemployment, macroeconomic performance and the labour market*, Oxford University Press, 2nd edition.
- Margo, R A (1993)**, 'Employment and unemployment in the 1930s', *Journal of Economic Perspectives*, Vol. 7(2), Spring, pages 41–59.
- Mojon-Azzi, S and Sousa-Poza, A (2007)**, 'Hypertension and life satisfaction: an analysis of data from the Survey of Health, Ageing and Retirement in Europe (SHARE)', *mimeo*.
- Nijkamp, P and Poot, J (2005)**, 'The last word on the wage curve? A meta-analytic assessment', *Journal of Economic Surveys*, Vol. 19(3), pages 421–50.
- OECD (1994)**, *The Jobs Study. Evidence and explanations*, OECD, Paris.
- OECD (1999)**, *Implementing the OECD Jobs Study: assessing performance and policy*, OECD, Paris.
- OECD (2004)**, 'Employment protection legislation and labour market performance', *OECD Employment Outlook*, OECD, Paris.
- Sanz-de-Galdeano, A and Turunen, J (2006)**, 'The euro area wage curve', *Economics Letters*, Vol. 92, pages 93–98.
- Wolfers, J (2003)**, 'Is business cycle volatility costly? Evidence from surveys of subjective wellbeing', *International Finance*, Vol. 6:1, pages 1–26.

Fear, unemployment and migration

In this speech,⁽¹⁾ Professor David Blanchflower, member of the Monetary Policy Committee (MPC), looks at the impact on the UK economy of the recent wave of migration from Eastern Europe, following the accession of ten new countries to the EU. He estimates that on aggregate, the inflow of workers has increased potential supply more than demand, thereby reducing inflationary pressures. While their arrival is found to have lowered wage inflation among the least skilled, he finds scant evidence that the increase in unemployment (and in particular youth unemployment) that has been experienced in the United Kingdom is related to the influx. In spite of the latter, he finds evidence of an increased fear of unemployment in both the United Kingdom and Ireland — the other major country to have experienced a big increase in migration from the A10 — since accession.

I am delighted to be able to make this speech in support of so worthy a cause as the Esmée Fairbairn Foundation, one of the largest independent grant making foundations in the United Kingdom. The Esmée Fairbairn Foundation provides grants to organisations which aim to improve the quality of life for people and communities in the United Kingdom, and the Foundation's work is particularly important in that it often considers work that others find hard to fund, either because it breaks new ground, appears too risky, requires core funding or needs a more unusual form of financial help such as a loan.

I have to admit (and this may not come as a surprise to those who know my background as a labour economist) that I am particularly interested in the work the Esmée Fairbairn Foundation does in promoting enterprise and independence. At a microeconomic level, supply-side initiatives to help people to help themselves provides a sure-fire route out of poverty and social exclusion. At a macroeconomic level, such initiatives produce positive labour market outcomes by making the workforce more flexible and increasing skills, thereby increasing the efficiency of the labour market, and boosting economic growth.

One sector of society that has traditionally suffered from social exclusion is immigrants — indeed this is sometimes seen as a reason why the rate of self-employment tends to be higher among immigrants than the indigenous population. For today's talk I am going to look at a specific group of recent arrivals — namely workers from the EU Accession countries — and consider their impact on the UK labour market and on the wider economy.

Migration has been one of the key areas of economic debate in the United Kingdom over the past few years. We have all been

exposed to stories of Eastern European migrants moving *en masse* to the United Kingdom, ready to work longer hours and for less money than Britons. And there is some truth to these stories. But I believe these flows have been very good for the UK economy, not bad as some would have us believe.

As a backdrop to this discussion, I'd like to briefly characterise what has been happening to the UK labour market over the past couple of years or so. This has heavily influenced my voting behaviour on the MPC, and given rise to my reputation for being a 'dove', because I believe that there is considerably more slack in the labour market at present than is popularly held to be the case.

- Unemployment has risen since 2005, but has slowed only a little in 2007.
- The inactivity rate fell when unemployment was rising but has recently increased alongside the fall in unemployment. This increasingly looks like a discouraged-worker effect where workers withdraw from the labour force in recessions when they can't find jobs.
- There have been very few employee jobs created. Indeed over the past twelve months the number fell by 1,000.
- There have been strong increases in temporary workers who can't find permanent jobs and part-timers who can't find full-time jobs.

(1) Esmée Fairbairn Memorial Lecture given on 30 October 2007 at Lancaster University. I am most grateful to Roger Kelly, Nicola Scott and Chris Shadforth for their invaluable assistance. This speech can be found on the Bank's website at www.bankofengland.co.uk/publications/speeches/2007/speech326.pdf.

- The number of self-employed has grown at a rate that has never been seen in the past and is clearly unsustainable in the future. One need only compare the data for the United Kingdom to that of the European Union and the United States to see the significance of this change. In a recent paper (Blanchflower and Shadforth (2007a)) I argued that at least half of that increase had to do with rising house prices freeing up capital constraints.
- Even though there has apparently been strength on the demand side based on reports from business pricing surveys, wage growth has been muted. I have been arguing that this is the dog that hasn't and will not bark for some time now. This can be seen from the series on average earnings (Chart 1) and on wage settlements (Chart 2). The fact that wages have been flat remains a puzzle principally to those who believe demand is booming and the labour market is tight.

Chart 1 Average weekly earnings and the CPI

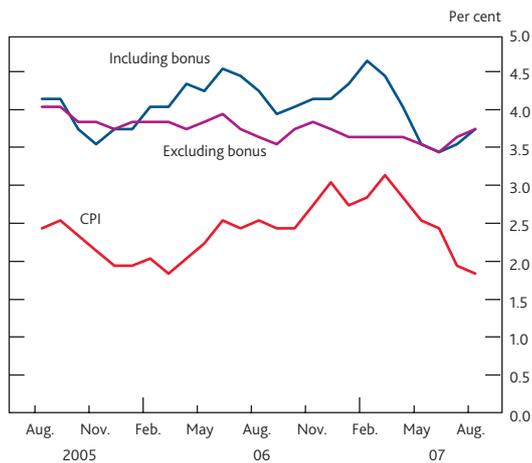
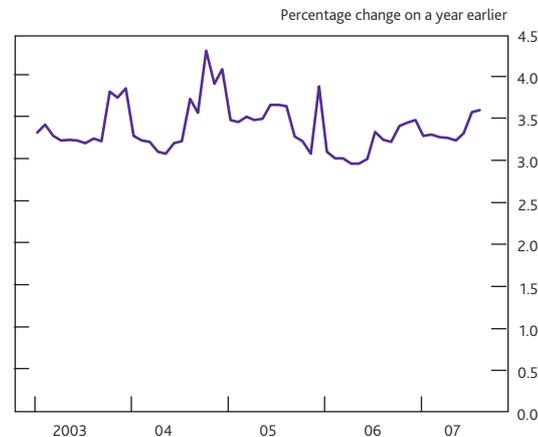


Chart 2 Whole-economy AEI-weighted three-month mean wage settlements



To what extent have these changes been driven by these 'so-called' migrants? I use the term 'so-called' because many

of these individuals have no intention of living or moving abroad for any more than a few months at a time — they are more akin to guest workers. While by 2007, approximately 700,000 had come to the United Kingdom since 2004, the data shown in Table A suggest that as many as half of that number have actually returned home, perhaps moving back and forth several times. And the intentions of the latest waves of workers appear to support this trend; 55% of workers arriving in 2007 Q1 anticipated staying less than three months. This ebb and flow of workers reflects what some would call the 'globalisation' of labour markets — the pool of individuals from which UK firms can pull workers increased overnight on 1 May 2004, the date on which the EU expanded to 25 nations.

Table A WRS applications, intended stay

Intended length of stay	Twelve months ending March 2007	Per cent
Less than three months	126,100	55
Three to five months	3,840	2
Six to eleven months	7,605	3
One to two years	10,520	5
More than two years	21,225	9
Do not know	58,480	26
Total	227,770	100

So who has come? Table B helps us characterise the flows of people from the A8 as follows:

Table B WRS applications, 2004–2007 Q1

	Thousands	Per cent of population	GDP
Czech Republic	29	0.28	€5,200
Estonia	6	0.47	€4,000
Hungary	19	0.19	€5,000
Latvia	33	1.43	€3,100
Lithuania	63	1.85	€2,500
Poland	394	1.02	€4,200
Slovakia	61	1.13	€4,200
Slovenia	1	0.03	€11,400

1. The biggest numbers have come from Poland — to this point approximately 400,000. The smallest numbers have come from Slovenia. These numbers are taken from the Worker Registration Scheme — numbers from National Insurance records are even larger.
2. The highest numbers in terms of proportion of the home population that have come are from Lithuania and Latvia.
3. Workers from countries with lower GDP per head, such as Lithuania are more likely to be registered on the UK WRS than those from countries with higher GDP, such as Slovenia.
4. It is well known that East Europeans are especially likely to report that they are unhappy. It turns out that the

propensity to migrate is even more highly correlated with happiness and life satisfaction than it is with GDP per capita (Blanchflower and Shadforth (2007b)). The lower the level of happiness the greater the propensity to migrate. **Table C** shows that there has been some improvement in the life satisfaction scores in a number of these Eastern European countries since accession in 2004, particularly in the Czech Republic; Hungary; Latvia; Lithuania and especially Slovakia. The increase in happiness might suggest a reduction in the flows in the future.

5. Over time the life satisfaction scores and the GDP levels with repatriation of funds lowers the subsequent probability of people coming as does other countries opening their borders. The OECD (2006) has recently projected that GDP will grow particularly rapidly in both Poland and Slovakia over the next couple of years. The OECD projects a growth rate of around 8% in Slovakia in 2007, and 5% in Poland, where, it suggests remittances from migrants will sustain consumption. The other member of the OECD is Hungary, which is projected to grow by just 2% in 2007. Rapid GDP growth in some A10 countries and improvements in their unemployment rates might suggest a reduction in the flows of both permanent migrants and especially temporary workers to the United Kingdom from the A10 countries in the future.

These data fit with other information available from a Candidate Eurobarometer Survey conducted by the European Commission in April 2001, which considered the migration intentions of the A8 plus Cyprus and Malta residents well before the borders opened in May 2004. Respondents in these countries, plus Bulgaria, Romania and Turkey, were asked 'do you intend to go and live and work — for a few months or several years — in a current EU country in the next five years?'. Obviously, one cannot assume that everyone who expresses an interest in migration will actually move, but it turns out that there are patterns in the data consistent with the actual flows to the United Kingdom. Intentions to move were higher for men, the young, the most educated, unmarried or divorced, the unemployed, students and professionals.

Interestingly, the World Bank addressed the issue of the mobility of the young in their 2007 *World Development Report*. They found that the propensity to migrate increases over the teenage years peaking in the early twenties in many destination countries, such as Spain and the United States. Hence, young people make up a higher proportion of the flow of international migrants than the stock. Young people are likely to face lower costs of moving and have higher lifetime returns. The World Bank notes that when the only legal options for the young are through high-skilled immigration, categories requiring tertiary education or substantial job experience, migrants are less likely to be young.

Table C Life satisfaction in Eastern Europe

	2004	2006
Bulgaria	2.06	1.99
Czech Republic	2.82	2.92
Estonia	2.74	2.74
Hungary	2.44	2.50
Latvia	2.52	2.62
Lithuania	2.55	2.62
Poland	2.81	2.80
Romania	2.32	2.33
Slovakia	2.59	2.70
Slovenia	3.17	3.09
United Kingdom	3.22	3.18

The typical new arrival from Eastern Europe who has come to work in the United Kingdom can be characterised as follows. He (for it tends to be he, not she) tends to be young, educated and unmarried. Approximately one third work for recruitment agencies. They disproportionately work in East Anglia and the West and East Midlands in low-paid, non-unionised jobs in agriculture, hospitality and catering. Holding constant a variety of characteristics including age, qualifications and location, A10 workers have higher self-employment rates, lower wages and have higher employment to population ratios than natives.

The World Bank also conducted a survey of youths aged 15–24 in seven developing countries (Albania, Bangladesh, Ethiopia, Iraq, Malaysia, Romania and Tajikistan) and asked 'if it were possible for you legally to move to another country to work would you?'. Selected results are presented in **Table D**. Very high proportions of young people in the World Bank survey said they would like to move, especially in Romania and Albania, but the vast majority of those who wanted to move expressed a desire to move for only a short period allowing

Table D World Bank survey of youth migration aspirations

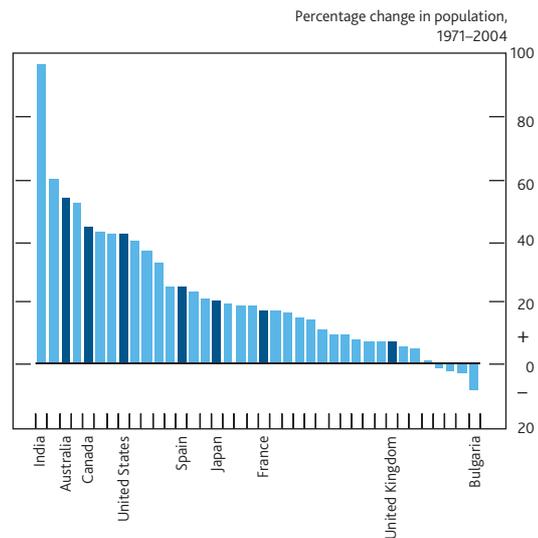
Per cent	Per cent			
	Move permanently	Move temporarily	Try it out	Not move
Albanian males	23	39	30	8
Albanian females	21	40	30	8
Bangladeshi males	3	70	20	7
Bangladeshi females	3	44	17	36
Ethiopian males	7	59	7	24
Ethiopian females	12	51	13	17
Iraqi males	21	32	28	20
Iraqi females	16	28	27	29
Romanian males	21	58	12	9
Romanian females	11	58	16	15

them to save money to buy a house, open a business, or achieve other goals in their home countries (World Bank (2007), Chapter 8, Figure 8.5). A high proportion of such moves would not then conform to the UN recommended definition of a migrant as an individual who changes their country of residence for at least one year.

What has caused this wave of immigration? The data indicate that these individuals have come to work — they have not come to claim benefits. Indeed, by 2007 Q1, only 744 applications for income support had been approved; 1,858 applications for income-based Jobseeker's Allowance were approved; 46 applications for state pension credit; and 1,992 applications for homelessness assistance had been allowed to proceed. There have only been 235 local authority lettings to A8 workers in England. It seems that, explicitly or implicitly, each individual has made a cost/benefit calculation and decided that given the relative propensities for employment, and the prevailing wages in their home and destination countries, that working abroad will provide them and their families with a better life. And who could blame them? The United Kingdom has enjoyed a very low level of unemployment for many years, much lower than the unemployment rates in any of the A8 countries, and wages are significantly higher here too. But other EU15 countries have low unemployment and higher wages, so why have many migrants chosen to come to the United Kingdom? The primary reason reflects the limited opportunities available in other EU countries following enlargement. Only the United Kingdom, Ireland and Sweden opened their borders fully to individuals from the A8 countries in 2004. Many of the other EU15 members have subsequently alleviated some restrictions on the free movement of Eastern European workers, but the United Kingdom remains one of the few whose borders are fully open. As such, A8 workers have had little choice in terms of their opportunities.

Can the United Kingdom accommodate these immigrants? What are the implications for the United Kingdom? According to official estimates published by the Office for National Statistics, the UK population grew by just 8.2% between 1971 and 2006, from 55.9 million to 60.5 million (**Chart 3**). In contrast, the US population grew by 44.6% over the same period. Indeed population growth across most advanced countries has been greater than in the United Kingdom over the past three decades. Over the period 1971–2004, population growth in the United Kingdom ranks 31 out of 38 European and other large nations for which data are available with only Germany (East and West) and seven East European countries having had slower population growth. All the other major industrialised nations have had faster rates of population growth. Since UK population growth appears to have been extremely low by international standards over the past three decades it would seem likely that the United Kingdom has the capacity to absorb a reasonably large

Chart 3 Population growth since 1971



number of immigrants without too many undesirable consequences.

The fear of unemployment

One possible consequence of the increase in the numbers of migrants to the United Kingdom may have been an increase in the 'fear' of unemployment, which tends to have a downward impact on pay especially in the non-union sector (Blanchflower (1991)). I recently released a paper, co-authored with a colleague at the Bank, in which we looked at what drives the fear of unemployment across countries (Blanchflower and Shadforth (2007b)). I'm going to summarise our findings here, and I refer those of you who are interested to the paper for more details.

As part of the 2005 *European Working Conditions Survey*, workers were asked (Q37a) 'How much do you agree or disagree with the following statements describing some aspects of your job? I might lose my job in the next six months — Strongly agree; Agree; Neither agree nor disagree; Disagree; Strongly disagree?'. Across all 32 countries asked, 14.1% of workers agreed or strongly agreed that they might lose their job in the next six months. The proportions were particularly high in Eastern Europe, but low in Denmark, Luxembourg, Norway and the United Kingdom.

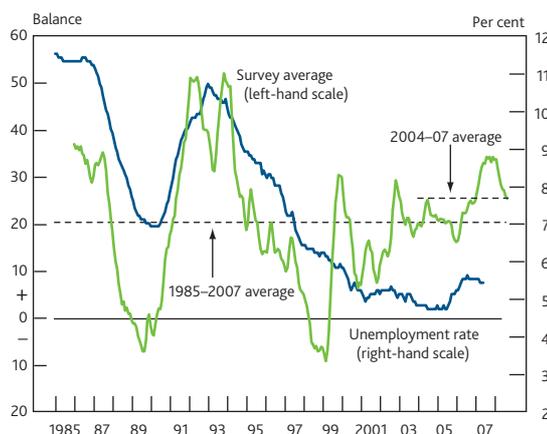
We can identify the characteristics of those individuals who are most fearful about losing their job by modelling the responses to this question across the available countries. We find that the fear of unemployment is higher the longer a job has been held, controlling for characteristics such as age, gender, schooling, immigrant, type of contract, years of job tenure, private sector along with country dummies. It is also apparent that fear is lower for the more educated, for those on indefinite contracts, full-timers and those who work in the public sector. These results are as we might expect.

We can also model the direct impact 'fear' of unemployment has on earnings. We control for similar characteristics as before, these being pretty much standard for wage equations; additional controls are added for days and hours worked. The results confirm that the 'fear' of unemployment lowers wages. Also, and perhaps somewhat unsurprisingly, the measure we use to proxy for fear of unemployment becomes more significant (ie the fear rises) for those who 'strongly agree' that they are likely to be made unemployed in the next six months. The effects appear to be large.

So what has happened to 'fear' since accession, and the ability of Eastern European workers to enter the United Kingdom? A recent, monthly survey of consumers conducted by the European Union is also consistent with the view that the fear of unemployment in the United Kingdom has risen and been above its long-run average since around 2005. The Directorate General for Economic and Financial Affairs of the European Commission conducts regular harmonised surveys for different sectors of European Union and applicant country economies. They are addressed to representatives of the industry (manufacturing), the services, retail trade and construction sectors, as well as to consumers. Consumers in each monthly survey are asked: 'How do you expect the number of people unemployed in this country to change over the next twelve months? The number will a) increase sharply b) increase slightly c) remain the same d) fall slightly e) fall sharply f) don't know'. The answers obtained from the survey are aggregated into a survey 'balance'. Balances are constructed as the difference between the proportion giving positive and negative replies. The Commission calculates EU and euro-area averages on the basis of the national results and seasonally adjusts the balance series.

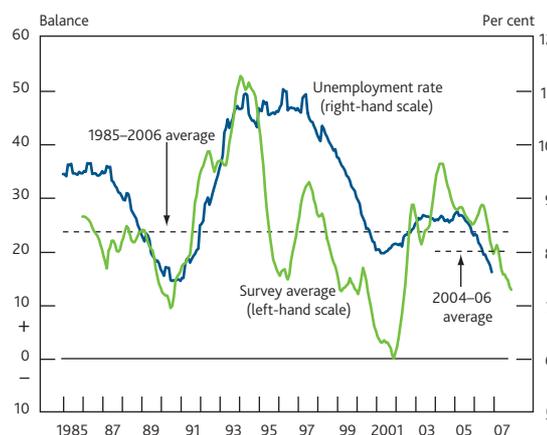
Charts 4–6 plot three-month averages of the survey balances against the actual unemployment rate for the United Kingdom, EU15 and Ireland respectively. The survey balances have been advanced twelve months, to make comparisons between what individuals expected and the actual unemployment outturns clearer. **Chart 4** shows that fear of unemployment and actual unemployment have risen over the past few years in the United Kingdom — consistent with a larger pool of workers being available to firms, but demand for workers not increasing by as much. **Chart 5** shows that the fear of unemployment has declined in the euro area since 2003/04. Interestingly, the survey balances fell in Austria, Belgium, Denmark, Finland, France, Germany, Luxembourg, the Netherlands, Portugal and Sweden since mid-2003. The main exceptions are the United Kingdom and Ireland, which experienced increases and Greece, Italy and Spain where the series were essentially flat. Among the A10 Accession countries — whereby I mean the A8 plus Bulgaria and Romania, who acceded to the EU on 1 January 2007 — there was a decline in the survey balances of all but Hungary, which saw an increase. So the increased availability and

Chart 4 UK unemployment expectations over the next twelve months^(a)



(a) Three-month average — advanced twelve months.

Chart 5 EU15 unemployment expectations over the next twelve months^(a)



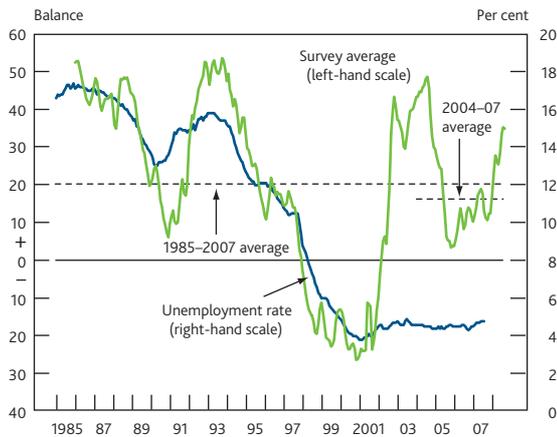
(a) Three-month average — advanced twelve months.

mobility of Eastern European workers has reduced the 'fear' of unemployment at home, but increased it abroad.

Chart 6 reports the survey balance and unemployment rate in Ireland, which is the only other major country in the EU that has experienced a big increase in migration from the A10. This shows a similar story to the United Kingdom. Ireland's population increased by 313,000, or 8.1%, between 2002 and 2006. Of this increase 213,000 was from migration. The largest increases were from Poland (+60k); Lithuania (+22k) and +40k from the rest of the EU25 excluding Britain and Northern Ireland. According to the 2006 Census (Table 29A) 129,000 people whose birthplace was in Eastern Europe were living in the Irish Republic. These numbers are dramatically higher than they were in the 2002 Irish Census, when there were only approximately 2,000 Poles and Lithuanians living in Ireland.

Interestingly, the chart shows that fear of unemployment in Ireland rose, as it did in the United Kingdom as the number of

Chart 6 Ireland unemployment expectations over the next twelve months^(a)



(a) Three-month average — advanced twelve months.

East Europeans in the country increased since 2002, even though there has been no change in unemployment in Ireland. ILO unemployment has remained steady in Ireland at 4.4% since 2002. Consistent with a rise in the fear of unemployment, average earnings growth has fallen since 2003 from 6.4% to 3.1%.

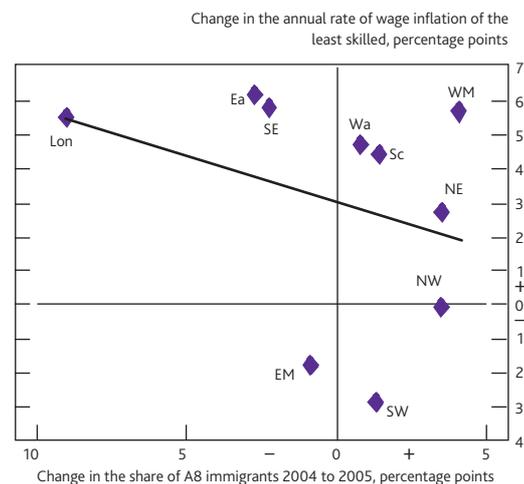
The only other EU15 country to open its borders fully to individuals from the A8 in 2004 was Sweden. The Swedish labour market had been relatively tight and the Swedish government was concerned about skill shortages and so opened its borders to workers from Eastern Europe. In contrast with the United Kingdom and Ireland, the fear of unemployment in Sweden as measured by the balance in the European Commission's survey has actually declined since mid-2003. It appears that the scale of the worker flows have been relatively small though. According to *Statistics Sweden* the numbers of immigrants in 2004 was 62,028; in 2005, 65,229; and in 2006, 95,750, compared with 36,586, 38,118 and 44,908 emigrants respectively. The number of immigrants in the first half of 2007 was slightly higher, however, than it was in the first half of 2006 (46,970 and 45,649 respectively). The decline in the 'fear' of unemployment predated a fairly substantial decline in actual unemployment. Swedish ILO unemployment for June 2007 for those aged 16–64 was 4.9%, down from 6.3% a year earlier. But as unemployment fell so did respondents' perceptions of what was going to happen to the number of unemployed in the subsequent twelve months.

The macroeconomic policy consequences of A10 migration

Turning first to the impact of recent immigration on labour market outcomes, there is tentative evidence to suggest that A8 workers have lowered wage inflation among the least skilled. **Chart 7** shows a negative relationship between the change in the annual rate of wage inflation of those in

elementary occupations between 2005 and 2006 and the change in the share of A8 workers one year earlier, as recorded in the WRS in 2004 and 2005, across regions. The downward-sloping line is consistent with a reduction in wage pressures brought about by immigration, or an increase in the fear of unemployment, or both.

Chart 7 The change in low-skill wage inflation



Has the recent rise in immigration caused UK unemployment to increase? We know that most immigrants are young (43% of workers on the WRS are aged 18–24), and that the most recent rise in the aggregate unemployment rate has been disproportionately driven by an increase in youth unemployment. In fact, the proportion of total unemployment accounted for by 18–24 year olds has been rising steadily, from 24.3% of the total in 2000, to 30.7% in 2006 Q3 and 31.6% March–May 2007. So what about the possibility that the influx of migrants has increased the youth unemployment rate? There is only a weakly positive, but statistically insignificant, relationship between those regions that have witnessed the largest increases in youth unemployment and those that have seen the biggest influxes of new immigrants.

It seems that the increase in unemployment in the United Kingdom has had relatively little to do with the influx of temporary workers from Eastern Europe. The United Kingdom has a flexible labour market and has policies in place (Jean and Jiménez (2007)), which are likely to have minimised the impact on employment and unemployment of the recent inflow of workers from the A10. Replacement rates, for example, are low and job protection measures are also well below OECD averages. Rising labour market slack, which has occurred in the United Kingdom since mid-2005 has likely reduced workers' bargaining power as has a rising fear of unemployment.

The impact of immigration on inflation and growth is not clear-cut. The theory is relatively simple: as outlined above,

immigration causes a supply shock to the labour market, in other words an unanticipated increase in the supply of workers. As such, there are more workers willing to work at the prevailing market wage, so firms are less inclined to accept higher wage demands. It follows that weaker real wage growth leaves households with less disposable income to purchase goods and services, and will therefore tend to slow the rate at which prices of those products (inflation) increase. And it doesn't have to be workers moving from one country to another to induce this type of effect, it's enough for UK firms to be able to threaten a relocation of their business to a lower labour cost economy, such as one of the A8. There is clear evidence that these effects are taking place.

However, the effects of immigration are not only on the supply side. On the demand side, immigrants are extra consumers and thus they raise aggregate consumption demand. However, it is likely that immigrants spend a lower fraction of their income when compared to domestic workers, perhaps because they send remittances back home or spend less on durable goods while temporarily resident in the United Kingdom — this would, on its own, suggest that immigrants raise demand by less than they raise supply. However, the funds that migrants send home might be recycled back to the United Kingdom through greater export demand, and UK consumers might also benefit from lower prices as a result of the extra productivity of migrants. Aggregate demand might also rise because of increased investment.

On balance I would suggest that at present it appears that the recent inflow of workers from the A10 is likely to have raised potential supply by more than it has raised demand, and thereby has acted to reduce inflationary pressures. This argument holds for three reasons. First, the consumption behaviour of native workers may have been affected by the increased 'fear' of unemployment resulting from a more flexible labour market. Second, the recycling of remitted funds back to the United Kingdom is unlikely to be perfect. Third, firms may be able to substitute between capital and labour, offsetting some of the potential for investment spending to rise.

This brings me neatly back to my starting point, and hopefully clarifies the reason I am such an advocate of the work of the Esmée Fairbairn Foundation. We have seen that the UK labour market faced a supply shock from the recent rise in immigration from the A8 countries. This could have had an adverse impact on the UK economy, causing increased unemployment among natives. However, supply-side initiatives to help people help themselves, such as those promoted by the Foundation through their programme supporting enterprise and independence, help the labour market respond appropriately to shocks such as these. Such initiatives mean that workers are better able to match to available jobs and the workforce is more flexible than it would otherwise be, and hence result in an improvement in the (non-inflationary) growth potential of the UK economy.

References

Blanchflower, D G (1991), 'Fear, unemployment and pay flexibility', *Economic Journal*, March, pages 483–96.

Blanchflower, D G and Shadforth, C (2007a), 'Entrepreneurship in the UK', *Foundations and Trends in Entrepreneurship*, Vol. 3(4), pages 257–364.

Blanchflower, D G and Shadforth, C (2007b), 'Fear, unemployment and migration', *NBER Working Paper no. 13506*.

Jean, S and Jiménez, M (2007), 'The unemployment impact of immigration in OECD countries', *Economics Department Working Paper #563*, OECD, Paris.

OECD (2006), *Economic Outlook*, Vol. 80, November, Paris.

Risk, uncertainty and monetary policy

In this speech,⁽¹⁾ Charlie Bean, Executive Director, Chief Economist and member of the Monetary Policy Committee (MPC), notes that interest rate decisions are necessarily taken in a context of incomplete knowledge. He considers two examples. The first relates to the past and the fact that mature estimates of GDP growth occasionally look quite different to that provided by the initial estimates. Such discrepancies could potentially translate into significant policy differences, so it is important for policymakers to attempt to extract the underlying signals from official data. The Bank has recently completed a substantial project that uses new techniques to do this, based on the pattern of past revisions and the information contained in other indicators. Starting with the November 2007 *Inflation Report*, the MPC's projections will include a fan describing its best collective judgement of the past, as well as future prospects. The second example relates to those future prospects and, in particular, the impact on the economy of recent turmoil in credit and money markets. The effects could be quite mild. But it is also possible to envisage a sequence of events that generate a more prolonged contractionary impact. Given the complexity of the channels involved, it is difficult to assess with any degree of precision the impact on the economy of recent financial markets developments.

Good evening! One of former US Secretary of Defence Donald Rumsfeld's most noted musings runs thus:

'...as we know, there are known knowns; there are things we know we know. We also know there are known unknowns; that is to say we know there are some things we do not know. But there are also unknown unknowns — the ones we don't know we don't know'.

For this rumination, Rumsfeld was awarded a 'Foot in Mouth' award from the Plain English campaign. But in truth, it represents one of the pithier encapsulations of the economists' distinction between risk and uncertainty of which I am aware.

Risk applies to those random events to which one can attach probabilities, such as the number of times a fair coin comes up heads in 100 tosses. These are the 'known unknowns'. In contrast, uncertainty — or more accurately Knightian uncertainty, after the Chicago economist Frank Knight — applies to random events to which it is difficult to attach probabilities, say because we have no previous experience of them or do not understand enough about their nature. An example might be the number of coins in this building right now. These are the 'unknown unknowns'. The Monetary Policy Committee faces both sorts of randomness when it sets interest rates each month. Tonight I want to discuss an example of each.

Data uncertainty

My first example relates not to the future but to the past. Steering the economy has sometimes been likened to driving along a winding road looking only in the rear-view mirror. I wish it were that easy. In practice, the rear window is also a little misted up (the steering is also pretty wobbly, but that is for another day). Not only do we not know where we are going, but we have only an imperfect idea of where we have been.

Our primary signposts are, of course, provided by the Office for National Statistics. But the slew of macroeconomic indicators that we review each month ahead of our policy decision typically provides only an imperfect guide to the underlying reality. There are a couple of reasons for this. First, it may be intrinsically difficult correctly to define or measure economic concepts such as value added in the financial sector or the user cost of owner-occupied housing. In that case, the ONS has to employ a variety of proxy variables instead. Second, even if a concept can in principle be measured, there may nevertheless be significant sampling error. However, if more information accrues over time, then the data can be

(1) Hosted by Dow Jones at the City Club, London on 31 October 2007. This speech can be found on the Bank's website at www.bankofengland.co.uk/publications/speeches/2007/speech327.pdf.

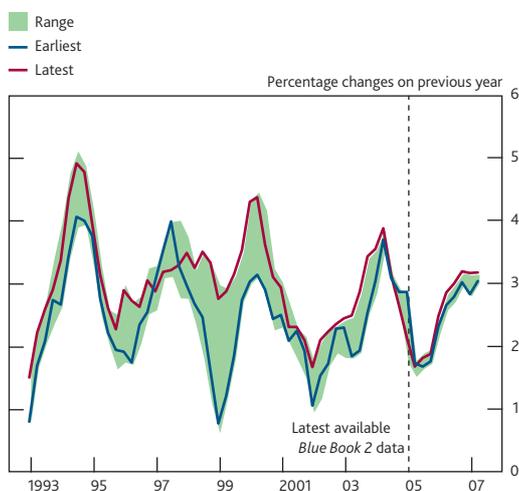
revised in the light of that new information and the measurement error will tend to shrink.

That much official data are revised is clearly not in itself a cause for concern. The MPC would clearly not want to wait until all the information is in and reconciled before receiving any official data — that would mean, for instance, the first GDP estimates appearing well after the fact. Far better that we receive timely, albeit inaccurate, initial estimates to factor into our decisions. But we do need to recognise that such early estimates may be revised in framing our interest rate decisions.

Given the extensive revision history of many of the key variables, it is reasonable to try to form a judgement about the distribution of eventual data outturns. To accord with my earlier classification, we perhaps ought to call this 'data risk'. However, the term 'data uncertainty' is now well established in the literature, so I shall retain it here.

To see why data uncertainty might matter, first look at **Chart 1**. This plots the initial and current official estimates of four-quarter UK GDP growth, as well as the range of the intervening estimates. It is apparent that the mature data occasionally looks quite different to that provided by the initial estimates. For instance, the initial estimates suggested a sharp slowdown in 1998 in the wake of the Asia and Long-Term Capital Management crises, whereas the current estimates suggest that the pace of expansion barely eased at all. For more recent quarters, the initial and current estimates are closer together, but that may simply reflect the comparative youth of the latest estimates, as well as the fact that the 2007 *Blue Book* did not involve a full balancing of the National Accounts.

Chart 1 Initial and current estimates of GDP



Such discrepancies would be unimportant if they did not potentially translate into significant policy differences. But the differences between initial and mature estimates can be large

enough to matter. For instance, if we employ a simple 'Taylor Rule' to evaluate policy using a 'real-time' measure of the output gap based on the initial data and on a measure based on the mature data, the difference quite often exceeds 50 basis points (though some of that is down to the difficulties of identifying potential output in real time).⁽¹⁾ The presence of such measurement error therefore provides a reason for rational policymakers to partially discount early estimates of variables like GDP, particularly if they seem at odds with other indicators, for instance from business surveys.

In dealing with such data uncertainty, the policymaker is essentially faced with a set of 'signals' of the underlying state of the economy that are contaminated by 'noise' in the shape of measurement error. What the policymaker needs to do, therefore, is extract an estimate of these underlying signals. For some time now, Bank staff have been developing the tools to do this. Our initial work used simple regression analysis to forecast what the mature estimates would look like based on their past relationship with early estimates and with other indicators, for instance from business surveys. That approach has been used for some time to help the Committee form its judgements about the conjuncture and about the prospects for growth and inflation.

Recently, we have completed a substantial project that applies more powerful techniques.⁽²⁾ First, the approach allows for richer and more realistic models of the data revision process. For instance, for some series, revisions may typically result in significant changes in the quarterly profile with less noticeable changes to the corresponding annual figure; the new approach allows for this interdependence. And as the ONS improves its measurement capability, so revisions should tend to become smaller in absolute magnitude; if we know this, then the new approach can allow for it too.

Second, as in our earlier work, other information — for instance from business surveys or the Bank's regional Agents — can be introduced. But in addition the methods can exploit information in variables that are only indirectly related. For instance, output is by definition equal to the sum of the expenditure components, and this accounting identity should hold not only in the original noisy data but also in any estimates that are purged of that noise. A similar argument applies to the identity relating nominal spending, real spending and the associated price deflator.

(1) The US economist John Taylor found that Federal Reserve policy could be roughly described by an interest rate reaction function in which the deviation of the policy rate from its long-run or neutral level was equal to half the output gap plus half the deviation of inflation from its target level. For the initial estimates of GDP, the output gap is computed by taking the deviation of those initial estimates from a measure of potential output obtained by applying a Hodrick-Prescott filter to the latest release then available of the previous 20 years of data. For the mature data, potential output is computed by HP-filtering the data in the most recent release.

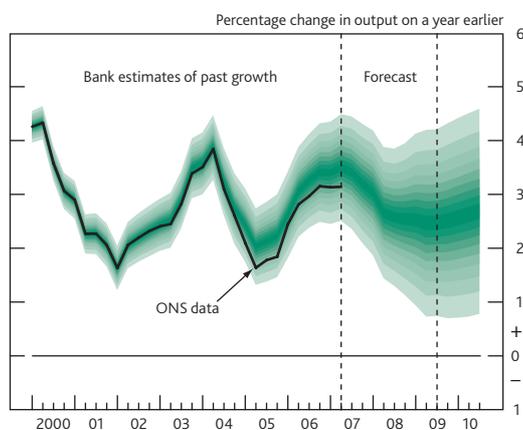
(2) Specifically using the Kalman filter. See Cunningham, A and Jeffery, C (2007), 'Extracting a better signal from uncertain data', *Bank of England Quarterly Bulletin*, Vol. 47, No. 3, pages 364–75.

In past *Inflation Reports*, the fan chart showing the Committee's best collective judgement for the outlook for GDP was drawn using the latest vintage of ONS data for the past, even though the Committee sometimes indicated that it thought the data were more likely to be revised in one direction or the other. Exceptionally, in our August *Inflation Report* this year, we also included a second fan chart drawn conditional on an alternative path for the past data, derived using our (earlier) toolkit for handling data uncertainty.

In the future, in order to enhance transparency, the Committee intends to provide its growth projections in a fashion that reveals its best collective judgement of the past, as well as future prospects. In other words, it will provide a 'backcast' as well as a forecast. However, just as the forecasts describe an uncertain outlook, so too do the backcasts as the future course of revisions is unknown. So the fan will henceforth extend backwards as well as forwards.

Chart 2 provides an example of what the fan chart will look like. This assumes the same projection for quarterly growth over the future as in our August projections, but uses our new technology to generate mechanically a probability distribution for the back data as well. For the past, the centre of the darkest band of the fan reflects an assessment of the most likely path for four-quarter GDP growth once the revisions process is complete. The fan around this path describes the degree of uncertainty around this path, while the width of the fan — which covers 90% of the distribution — is calibrated using historical information on data revisions. The fan becomes progressively narrower the further back in time one goes, reflecting the decreased incidence of revisions for more distant periods. In practice, the distribution for the back data

Chart 2 August 2007 *Inflation Report* GDP projection with 'backcast'



The fan chart depicts the probability of various outcomes for GDP growth. To the left of the first vertical dashed line, the distribution reflects the likelihood of revisions to the data over the past; to the right, it reflects uncertainty over the evolution of GDP growth in the future. If economic circumstances identical to today's were to prevail on 100 occasions, the MPC's best collective judgement is that the mature estimate of GDP would lie within the darkest central band on only 10 of those occasions. The fan chart is constructed so that outcomes are also expected to lie within each pair of the lighter green areas on ten occasions. Consequently, GDP growth is expected to lie somewhere within the entire fan on 90 out of 100 occasions. The bands widen as the time horizon is extended, indicating the increasing uncertainty about outcomes. The second dashed line is drawn at the two-year point of the projection.

need not be generated mechanically and, like the forecast, will be subject to the Committee's judgement. For instance, the statistical modernisation programme currently being undertaken by the ONS should lead to more accurate early estimates of growth and we will want to take this into account by narrowing the fan accordingly.

The current vintage of official GDP growth data is shown by the black line. For the most recent period, the most likely path for the mature estimates of growth lies above the current vintage of data, reflecting the fact that other indicators and the past history of revisions suggest that recent official estimates are somewhat more likely to be revised up than down. But the width of the fan is considerable, serving to emphasise the significant degree of uncertainty about the past faced by the Committee.

The projection for the quarterly growth of GDP over the future is the same as in the August *Report*, so the fan looking forward looks rather similar to the one we published then. There are, however, a couple of minor points of note that arise from the appearance of the quarterly growth rates over the past year in the calculation of the projected four-quarter growth rates over the first year of the forecast. First, the four-quarter growth rates in the first year of the projection are now expressed taking on board the Bank's assessment of the most likely path for GDP in the recent past, rather than the current vintage of official data. That means care will be necessary in making any comparisons either with current estimates of the data or with the projections of other forecasters. Second, the fan is a little narrower during the first year of the forecast, as the central estimate of growth over the recent past should be less prone to revision than the official estimate itself.

All this relates to the Committee's projections for GDP. The presentation of the CPI projections will not change as the data for CPI are almost never revised and the official statistic for CPI inflation represents our target measure.

In concluding this part of my discussion, let me note that some recent media commentary has described our work on data uncertainty as indicating a loss of faith by the Bank in the ONS, which has led us to start producing our own independent estimates of key macroeconomic indicators. This represents a major misunderstanding of our respective roles and of the aims of our data uncertainty work. The ONS's task is primarily one of *measurement*. This is a particularly difficult task in an evolving economy and one that they execute outstandingly well. Moreover, the data produced by the ONS represents far and away the single most important source of information for us. But we do know that early official estimates are affected by unavoidable measurement error and therefore need to be *interpreted* in the light of our economic understanding and other available sources of information. Just as we do not have the resources to get into serious measurement of the wide

range of variables we care about, so it would be inappropriate for the ONS to stray too far from measurement into interpretation. This just represents a natural division of labour between the two of us.

The implications of the recent developments in financial markets

Let me now turn to a case where it is presently particularly difficult to form a view about the distribution of outcomes — Rumsfeld's 'unknown unknowns', if you like. That is the impact on the economy of the recent turmoil in credit and money markets.

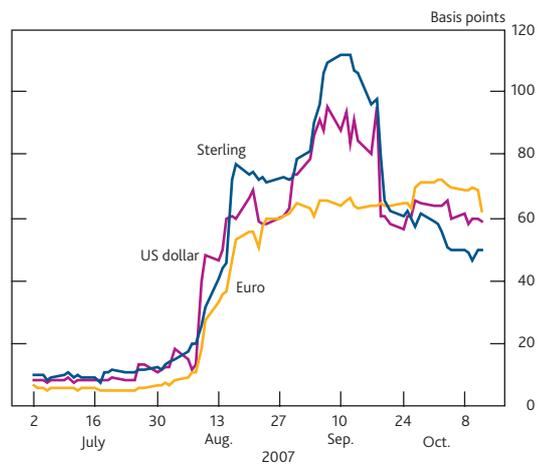
Now episodes of financial market turmoil do occur from time to time and often share common features, such as a period of over-exuberance leading to asset price appreciation and increased leverage, followed by a retrenchment as asset prices fall back. And maturity mismatches between assets and liabilities often make an appearance when banking systems come under strain. But even so, each episode tends to unfold in a unique fashion, making it harder to predict the macroeconomic consequences.

The latest episode contains some such features, though the disruption it has wrought on some of the largest and most liquid markets in the world has been exceptional. We and other central banks had warned about the risk of a sharp unwinding of the compression in risk premia across a range of assets that had occurred over the past three years, and the potential risks to institutions with a growing dependency on wholesale funding markets of impaired market liquidity. But I do not think anyone quite foresaw the chain of events that would take place. To begin with, a further rise in defaults in a subsector of the US mortgage market prompted a general loss of confidence in asset-backed securities and other structured credit instruments, including those based on unrelated markets. Investment vehicles with exposures to these assets found it much harder to fund themselves in asset-backed commercial paper markets. These events led to a seizure of international money markets as banks hoarded liquidity in the face of a reduced ability to continue securitising loans and the potential activation of credit lines to their off balance sheet vehicles. Our latest *Financial Stability Report* explores these events in some detail and I do not propose to add to what is said there.

Instead, I want to consider the possible macroeconomic consequences of recent events. First, the good news is that there have been signs that conditions in some markets have been improving. Investors appear to be becoming more discriminating across different classes of securities, with more trade taking place, particularly in prime vanilla mortgage-backed securities. Asset-backed commercial paper

spreads have fallen back from peaks in September. In the money markets, the excess of term US and UK interbank rates over measures of expected policy rates, though still elevated, are well below their early-September peaks (**Chart 3**). And the round of third-quarter earnings announcements by the major financial institutions has also revealed something about the distribution of losses across institutions. But it is likely to be a while before the valuation of the more complex securities is clarified and the financial markets return to normality. In the mean time, they remain vulnerable to further shocks.

Chart 3 Premium of term interbank interest rates over expected policy rates^(a)



Sources: Bloomberg and Bank calculations.

(a) Three-month Libor spread over overnight interest rate swaps.

So what does all this mean for the real economy? Could we be heading for a significant slowdown? First, I should note that both the world and UK economies start from a strong position. While the US economy has already slowed on the back of falling house prices and weak residential investment, that has not so far significantly affected consumer spending and non-residential business investment. In the euro area, growth has been somewhat faster than trend over much of the past year, though there are signs that the pace of expansion has eased a little latterly. And Asia, led by China, has continued to grow rapidly.

Here in the United Kingdom, according to the official estimates, we have seen seven consecutive quarters of growth in the range 0.7% to 0.8% and, in line with **Chart 2** above, the Committee judges that actual growth is, if anything, likely to have been slightly stronger. It is true that CPI inflation at 1.8% is now just a little below our target 2%. But even so, we cannot afford to relax on the inflation front. Business surveys suggest that the margin of spare capacity is relatively limited and that firms are finding it a bit easier to make price increases stick. The price of oil has just exceeded \$90 per barrel and other commodity prices, especially food, have been rising strongly. Moreover, the best of the beneficial 'tailwind'

afforded by off-shoring and outsourcing to China and the other emerging economies is probably behind us now.

Against that background, the Committee thought in August that some slowing in UK growth was probably necessary to keep inflation on track to meet the target in the medium term. And at least some of that slowing was probably already in the pipeline before the onset of the turmoil in financial markets as a result of the earlier increases in Bank Rate.

The recent developments in financial markets are likely to have led to a softening in the outlook for growth. There are a number of ways the quantity and/or price of credit supplied to households and businesses may be adversely affected. First, banks find themselves no longer able to securitise loans as expected and anticipate having to fund committed credit lines to conduits. That will reduce the supply of funds for new loans. But the investor funds that are not used to purchase mortgage-backed securities and asset-backed commercial paper have to go somewhere else instead, so some of the funds that have been lost may find their way back into the banking sector.

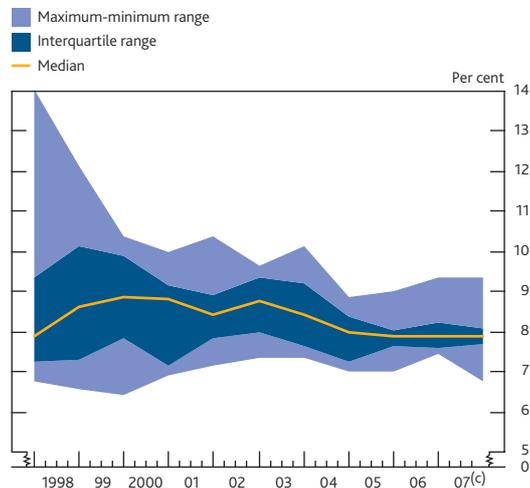
Second, even if the funds do find their way back, they will not necessarily go to the same banks. In normal times, the interbank market redistributes funds within the sector at low cost. But in present circumstances that cost is elevated and some loan rates will reflect that. However, this should be a temporary effect that will only last as long as the dislocation in money markets persists. Moreover, it should be noted that, beyond the very near term, the rise in term interbank premia has already been largely offset by a decline in risk-free market interest rates as market participants anticipate a more accommodating monetary policy stance.

Third, looking to the longer run, it is unclear how banks will respond to the weaknesses in the 'originate and distribute' model that have been revealed by recent events. Some of the compression in risk premia over the past three years will have reflected the onward distribution of risks by banks which have been adopting this model. If that no longer takes place to the same extent and the risks instead remain on banks' balance sheets, then the rates charged to borrowers will rise. Moreover, there are already signs that some lenders are exiting the riskier segments of the credit market. That will lead to a reduction in competition and a rise in interest rates charged, particularly to less creditworthy borrowers.

Fourth, if banks are forced to take loans back onto their balance sheets from conduits, then their capital ratios will, other things being equal, deteriorate. British banks are generally well capitalised and hold well above regulatory minima — quite enough to cover all the loans that might come back onto their balance sheets (Chart 4). But that said, banks may be unwilling to tolerate that much erosion of their capital

buffers because of the impact it would have on their ratings and their ability to raise funds. So this 'bank capital' channel may also lead to a reduction in the supply of credit.

Chart 4 Major UK banks' Tier 1 capital ratios^{(a)(b)}

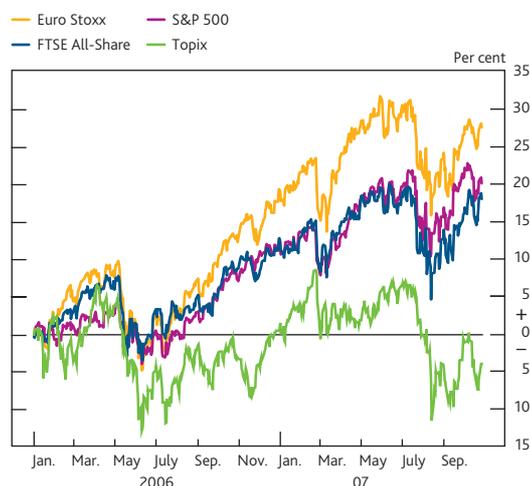


Sources: Published accounts and Bank calculations.

- (a) Tier 1 capital includes ordinary shares, associated reserves and retained earnings.
 (b) All ratios reported on a Basel I basis.
 (c) 2007 H1 figure.

Fifth, the quantity of credit advanced to a borrower and the interest rate charged thereon is frequently related to the value of the available collateral. Past episodes of significant contractions in activity in the wake of financial market turmoil have often been driven by falling asset prices and the sharp deterioration in net worth associated with highly leveraged portfolios. So far most asset prices have held up. After an initial hiccup in midsummer, equity prices have been buoyant, despite the heightened concerns about growth prospects (Chart 5). That could reflect the expectation that the US Federal Reserve and other central banks will lower policy rates

Chart 5 Cumulative changes in equity prices since January 2006

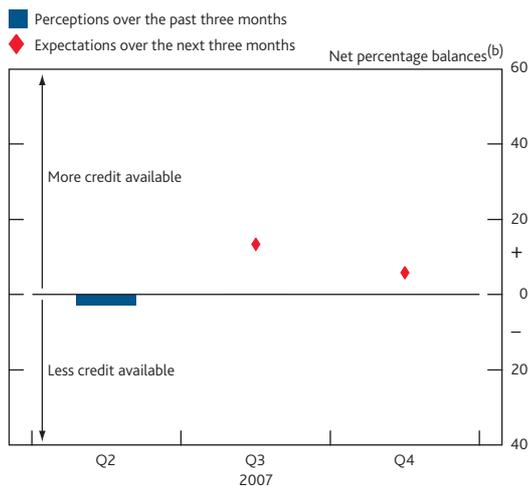


Source: Thomson Datastream.

enough to maintain a reasonable rate of growth. But commercial property price inflation has slowed sharply. And though house prices have so far broadly held up, some of the forward-looking indicators point to a weaker outlook. If equity or property prices were to fall significantly, then that would probably affect both the quantity of credit advanced and its price.

The complexity of the channels makes it difficult to judge the likely magnitude of the reduction in the supply of credit. For that reason, the information from the Bank's new quarterly survey of lenders could prove valuable. The results for the third quarter suggested little prospective tightening in conditions to households (Chart 6) and, consistent with that, lending to individuals remained buoyant in September. However, loan approvals did fall back and anecdotal evidence suggests that some lenders at least are in the process of tightening standards on secured lending.

Chart 6 Credit conditions survey for households: secured credit availability^(a)



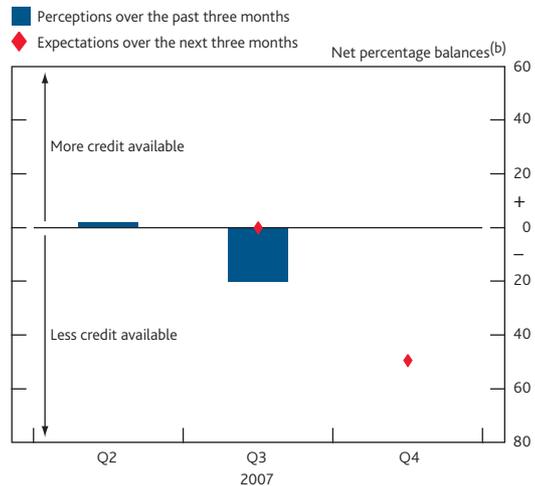
(a) Net percentage balances are calculated by weighting together the responses of those lenders who answered the question. The blue bars show the responses over the previous three months. The red diamonds show the expectations over the next three months. Expectations balances have been moved forward one quarter so that they can be compared with the actual outcomes in the following quarter.
 (b) A positive balance indicates that more credit is available.

The credit conditions survey did suggest that some deterioration in the availability of credit to businesses was in prospect (Chart 7). However, banks are likely to focus on cutting back on the riskier forms of lending, including for mergers and acquisitions and leveraged buyouts. The bulk of lending for fixed capital formation — which is what matters most for growth prospects — is perhaps likely to be affected less.

Changes in the supply of credit are not the only thing that matters, as the impact on spending also depends on the availability of alternative sources of finance. In particular, larger companies can borrow on the corporate bond markets or raise equity. While the required rate of return on

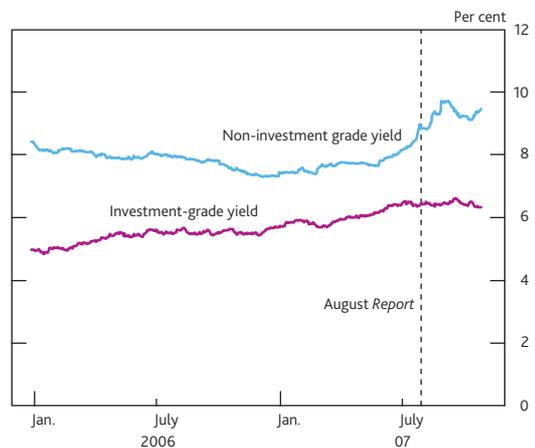
sub-investment grade bonds has risen, that on investment-grade bonds is little changed since early August (Chart 8). And so long as equity markets remain buoyant, equity finance also looks an attractive alternative option.

Chart 7 Credit conditions survey for businesses: overall credit availability^(a)



(a) Net percentage balances are calculated by weighting together the responses of those lenders who answered the question. The blue bars show the responses over the previous three months. The red diamonds show the expectations over the next three months. Expectations balances have been moved forward one quarter so that they can be compared with the actual outcomes in the following quarter.
 (b) A positive balance indicates that more credit is available.

Chart 8 Corporate bond rates^(a)



Source: Merrill Lynch.

(a) Investment-grade yields are calculated using an index of bonds with a composite rating of BBB3 or higher. Non-investment grade yields are calculated using an index of bonds with a composite rating lower than BBB3.

Finally, recent developments in financial markets may directly affect the expectations and behaviour of households and businesses. Any anticipated reduction in access to consumer debt will encourage households to increase their precautionary saving. And any anticipation of lower demand growth may lead businesses to put off investment or hiring. Although most indicators remained fairly strong in the latest *CBI Industrial Trends Survey*, business optimism did slip which might presage such an effect.

Overall, it is difficult to assess with any degree of precision the impact on the economy of the recent developments in financial markets. That impact could be quite mild but it is also possible to envisage a sequence of events that generate a greater or more prolonged contractionary impact, particularly if some of the risks to the financial markets discussed in our latest *Financial Stability Report* were to crystallise. So this is one of the key 'unknown unknowns' that face us at the current juncture.

Policymakers lie awake at night worrying about both the 'known unknowns' and the 'unknown unknowns'. There are plenty of both around right now. But there is at least one 'known known' that you should take away from my address tonight: the MPC's absolute commitment to doing its best to meet the Chancellor's 2% inflation target. And doing that is the best contribution we can make to the United Kingdom's economic stability.

New markets and new demands: challenges for central banks in the wholesale market infrastructure

In this speech,⁽¹⁾ Nigel Jenkinson, Executive Director for financial stability, discusses some of the structural changes in the trading, clearing and settlement infrastructure supporting financial markets. He observes that, while central banks' typical objectives of monetary and financial stability emerged from an early role in settling claims between banks, the financial infrastructure has broadened and deepened over time, stretching beyond the traditional locus of central banks. And it continues to evolve, driven by the forces of ever faster technological and financial innovation, regulatory change and the globalisation of banking. These developments are exposing new sources of risk, posing fresh policy challenges for central banks.

Introduction

Central banks sit at the heart of the monetary economy providing the ultimate settlement asset and typically operating the large-value payment systems that underpin financial activity. The modern central bank's twin objectives of monetary and financial stability emerged from their early role in settling claims between banks.

But this traditional payments function is subject to the same forces for change that are transforming the rest of the economy. In particular, developments in technology, the financial innovation they allow, and the globalisation of finance are reshaping the landscape, exposing new sources of risk and posing fresh challenges for regulators and central banks.

As markets become more interconnected and international, national authorities have to work more closely together, co-operating in their oversight and operational activities and co-ordinating their risk assessments. As new products and players emerge in the commercial sector, they may also need to adapt the scope of their oversight and regulatory response.

I would like to take some time this afternoon to explore some of these issues, many of which will resurface over the course of this two-day conference.

Early demands: the historical context

First some history. How did central banks come to assume their 'central' role in the financial infrastructure?

Internationally, Venice claims a key role in the story, but I will start later with the activities of goldsmiths in 17th century London. Starting from their custody business, goldsmiths began to settle transactions between merchants, across their books or via the transfer of deposit receipts — the early bank notes. Merchants were thereby able to settle obligations with one another without having to carry, count out and value coins: a welcome development, considering that a £100 sterling bag of silver coins — a commonly used value for notes — weighed over 30 pounds (14kg for those in the audience baffled by imperial measures)!

Over time, so as to accommodate transfers between customers of different 'banks', the banks started accepting claims on each other and, once they found ways to settle these claims, established the first British interbank payment systems.

So what were these early settlement mechanisms? At first, banks started settling interbank claims using gold and silver coins. But these were in short supply and, again, costly to transport and exchange.

Banks thus eventually innovated by switching to settlement in assets convertible into gold and silver. For example, by the 1770s, London bankers had begun to settle in notes issued by the Bank of England, a highly regarded, but at that time, private bank.

(1) Delivered at the Bank of England/European Central Bank Conference on Payments and Monetary and Financial Stability, 12 November 2007. I am very grateful to Mark Manning for his help in preparing this speech and to John Gieve, Victoria Cleland and Ben Norman for helpful comments. This speech can be found on the Bank's website at www.bankofengland.co.uk/publications/speeches/2007/speech328.pdf.

A low-risk settlement asset was particularly important in the unregulated world of the goldsmiths, in which credit risk was acute and liquidity shocks — like the one we have experienced of late — were common and dangerous. In a sorry letter to an associate,⁽¹⁾ one goldsmith wrote to another in the 1660s: 'I have beene by many accidents much postpon'd... ye money due to mee is soe farre off that I can not make it useful to mee. All Credit in London is much Shortened of late'.

Showing all the optimism which continues to characterise bankers today, he added: 'I am attempting a way to enlarge my owne (credit) and doubt not to effect it to his Maties. [Majesties] advantage as well as my owne, if I am (like ye lame dogg) but helpt over this style'.

Further efficiency gains were then obtained by settling interbank obligations over the accounts of a single institution. This innovation was sometimes put in place by the public authorities; in other cases it developed naturally, such as when the London bankers adopted Bank of England deposits as the ultimate settlement asset in 1854.

Payments and monetary and financial stability

To ensure that its liabilities continue to be perceived of higher quality than those of any other issuer, the institution at the apex of the payment system — typically the central bank — has an incentive to exercise close control over the terms on which they are made available to the banking system.

That translates into the traditional monetary stability objective: preservation of the role of the ultimate settlement asset as a store of value and unit of account. It also gives the central bank a strong interest in the stability of the financial system. And within that a reliable and resilient infrastructure for distributing the ultimate settlement asset is a key condition of stability (and of implementing monetary policy effectively).

In an advanced monetary economy, of course, bank deposits constitute by far the largest component of 'money'; in the United Kingdom they make up some 96% of the broad monetary aggregate, M4. Agents rely on interbank payment systems to facilitate the direct transfer of deposits between banks and thereby also preserve their role as a medium of exchange. And as the sophistication of securities and other markets has grown, the core payment systems have become intertwined with the settlement and clearing systems for the key markets. Together they have become a critical part of the infrastructure not just for the financial system but for the economy more widely. And in the wake of 9/11, all central banks have been giving more attention to the physical and financial resilience of these systems. For example, in our

regular *Financial Stability Report*, the Bank of England has included the risk of infrastructure disruption in the list of the top six vulnerabilities facing the financial system over the past two years.

As Alan Greenspan notes in his memoirs: 'We'd always thought that if you wanted to cripple the US economy, you'd take out the payment systems. Banks would be forced to fall back on inefficient physical transfers of money. Businesses would resort to barter and IOUs; the level of economic activity across the country could drop like a rock'.

In a paper to be presented at this conference tomorrow, Andrea Gerali and Franco Passacantando consider this in the context of the Great Depression. As confidence in the banking system evaporated, bank deposits ceased to function as a medium of exchange. 'Scrip', or substitute money, emerged, typically taking the form of vouchers or coupon books. Such monies had otherwise only been commonly used in isolated lumber or coal-mining communities in the United States — communities lacking banks or financial intermediaries.⁽²⁾ But while adequate for the purchase of provisions at the local general store, such forms of money were clearly an imperfect medium of exchange and created otherwise unintended credit exposures between agents.

The recent market turbulence offers a further reminder of the importance of resilient infrastructure for conditions in financial markets. When markets are fragile, any interruption to normal service could have particularly serious implications: further clouding judgements as to individual participants' solvency; undermining agents' risk management; or affecting asset prices in dependent markets. With volumes and values in several markets having hit record levels during the market turmoil and remaining high for a sustained period, infrastructure providers have experienced a severe stress test and, by and large, have passed with flying colours. CLS, for instance, processed nearly 860,000 transactions (more than \$8 trillion in value) on 19 September, 2½ times the daily average in June.

Current trends in the wholesale market infrastructure: new markets and new demands

Today, central banks around the world still typically provide the ultimate settlement asset and sometimes operate, and also own, key components of the payment and settlement infrastructure. For key elements of the infrastructure central banks have assumed an oversight role. Depending on the particular regulatory architecture in place, this is sometimes shared with the financial regulator, as in the United Kingdom.

(1) Quoted in Quinn (1997).

(2) Timberlake (1987).

But this is a dynamic environment: the landscape is broadening and deepening, with niche market-specific facilities, cross-border systems, new entrants and commercial bank providers becoming more important. New sources of risk are emerging, presenting new challenges for central banks in their pursuit of monetary and financial stability.

Financial innovation and technological advancement

The way technology is transforming markets and therefore payment systems is illustrated in the rapid growth in OTC derivatives markets; and the increased penetration of electronic trading platforms — and automated trading strategies — across a range of markets.

According to data released by the Bank for International Settlements,⁽¹⁾ notional amounts outstanding in global OTC derivatives markets rose by almost 40% in 2006 — up more than 260% over the past five years. The outstanding value of the credit segment of the market doubled in value in 2006 alone and trading activity has remained high through 2007, especially during the recent market turmoil.

These markets have traditionally been cleared and settled via bilateral arrangements between the counterparties to the trade, but new automated infrastructure services have emerged, partly in response to an international regulatory initiative led by the Federal Reserve Bank of New York (FRBNY). Major dealers now confirm almost 90% of credit derivatives trades electronically, as against less than 50% two years ago.

An important recent addition to the landscape is DTCC Deriv/SERV's Trade Information Warehouse, which maintains a so-called 'golden copy' of each credit derivatives trade. With appropriate interoperability between systems, these data can support a range of ancillary services: calculating and settling payment obligations, managing collateral, terminating trades and reconciling portfolios. The Warehouse is likely ultimately to be rolled out for other products.

The declining cost of technology has also been a key driver of the rise of electronic trading in recent years. Almost 60% of trade in foreign exchange is now executed electronically and close to 50% in repo.

Automated and algorithmic trading strategies are becoming more widespread across asset classes. The London Stock Exchange (LSE) reports that the proportion of the order flow on the exchange that is automated has risen from negligible amounts just four or five years ago to approaching half today. This not only has implications for the scale of trading activity — volumes have tripled on the LSE's SETS system over the past five years — but also the design and location of the trading infrastructure. For many algorithmic trading strategies, processing speed is critical. The faster systems can process

trades in just one or two milliseconds: a tiny fraction of the blink of an eye. But ultimately speed and thus the ability to gain a competitive advantage depends on proximity to the platform; hence, the old geographical pull of markets has begun to re-emerge with exchanges selling space near their trading platforms to those who want to be first in the queue.

Many new entrants to the trading arena are therefore competing with incumbent exchanges on the basis of processing speed. These new platforms are also looking for lower cost post-trade solutions. As such, those emerging in Europe have looked beyond incumbent providers: new entrants and commercial bank providers of clearing and settlement services have featured strongly in their plans. Such providers not only aim to meet demands in terms of flexibility and cost, but also to offer sufficient breadth to deliver a multicurrency clearing and settlement service.

Globalisation, regulatory change and the market structure of infrastructure

This is part of a general reshaping of the infrastructural landscape in a global market place. Market participants are becoming increasingly international, operating in multiple markets and facing obligations in multiple currencies. Latest international banking data from the Bank for International Settlements⁽²⁾ revealed growth in excess of 20% in reporting banks' total cross-border claims in the year to 2007 end-Q1, taking the total to \$28.5 trillion.

Banks, therefore, seek infrastructural solutions that will accommodate the international organisation of their businesses. So, while, historically, financial infrastructure has typically evolved along national lines, cross-border alliances and mergers are now more common, both in trading and post-trade: eg NYSE Euronext; LCH.Clearnet; Euroclear Group. And alliances in the form of cross-border clearing and settlement links are also widespread, enabling, for instance, securities traded in Italy to be settled and held in an account in the securities settlement system in Germany.

Commercial bank providers — namely, correspondent banks and global custodians — may be best placed to meet the demand for multicurrency settlement, leveraging their extensive international connections. This could then reinforce their important position in the infrastructural landscape. Indeed, the major global custodians each posted growth in assets held in custody in excess of 20% in just the past year.

And differences between the regulatory regimes for incumbent providers of infrastructure and those for either commercial bank providers or smaller new entrants could tilt the playing field. For example, CLS is subject to close central bank

(1) Bank for International Settlements (2007a).

(2) Bank for International Settlements (2007b).

scrutiny, operates as a narrow bank, and has to meet exacting — and costly — resilience standards. New clearing arrangements and bilateral netting schemes are now penetrating the foreign exchange markets, threatening the volumes passing through CLS. In messaging, too, SWIFT — which submits voluntarily to central bank oversight — is beginning to face competition in certain markets from new entrants not subject to oversight. Authorities must be alert to the challenges these competitive developments provide.

Other regulatory initiatives are contributing to a reshaping of the landscape. MiFID, in the EU, and RegNMS, in the United States, have sought to encourage increased competition in trading; and the Code of Conduct, recently signed in the European Union, establishes terms under which infrastructures operating in one member state can clear and settle (initially equity) trades in another.

Whether trading, clearing and settlement infrastructure markets can support a wide range of providers in the long term remains an open question. There is generally a tendency towards concentration in infrastructure provision because of increasing returns to scale in a fixed-cost business and often powerful network effects. This applies equally in the case of commercial bank provision of infrastructure: ECB survey evidence reveals that the ten largest correspondent banks in euro account for around 80% of correspondent banking payment values; and the top-four global custodians now account for three quarters of total assets in custody. Indeed, regulators have been giving increasing attention to the potential systemic spillovers from operational or business failures at major commercial bank providers of infrastructural services. That has led, for example, to the initiative in the United States to implement 'New Bank', a dormant shell company to take over the functions should one of the two major clearers in the US Treasury market cease operations.

It may be that a competitive environment can be sustained, particularly as the cost of technology falls, lowering barriers to entry, and liquidity bridges and other forms of interoperability are established between systems. But, the jury is still out. Recent evidence on the trading side, particularly in the United States, is mixed: some trading platforms, such as Archipelago and INET, have been swallowed up by the incumbent exchanges; others, such as BATS Trading are thriving, keeping the pressure on the exchanges to cut costs and upgrade their services.

I suspect what we are seeing is a redefinition of the market on an international scale. In the process, national incumbents are being challenged by a combination of ambitious foreign incumbents eager to exploit economies of scale and nimble, unencumbered new entrants sometimes specialising in niche products. A process that is likely to lead in time to greater consolidation at international level is currently manifesting

itself in terms of fragmentation at the national level as local incumbents are challenged.

The end-game may well be lower transaction costs at both the trade and post-trade level and more concentrated (if not monopoly) cross-border infrastructure in each. But it may take some time to reach a new equilibrium. Central banks and regulators need not only to prepare for and perhaps help shape the end-game, but also address challenges arising during the transition.

Issues and challenges for central banks and regulators going forward

Two key challenges, in particular, will need to be met:

(i) Preserve enough influence to protect the collective interest while maintaining a level regulatory playing field.

The resilience and efficiency of the core infrastructure is an important public good and, given the tendency to monopoly, the authorities need to ensure that they maintain sufficient influence to ensure resilience in this increasingly complex landscape. That requires consistent and objective criteria to be applied to new as well as established systems. Such criteria might include: size — the volume and value of flows; type of flow — the extent to which interdependencies are generated with other systems or underlying financial markets; and substitutability — the potential for rerouting flows to other systems.

A changing market structure may also alter the nature of risks posed by the systems themselves. For instance, to the extent that we are entering a phase of competing provision of services at the national level, issues might arise around the potential fragmentation of system liquidity. Equally, we are also seeing pressures for greater consolidation of systems at an international level, where the challenges of lowering single point of failure risks remain at the top of the agenda.

Where new services are offered by commercial bank providers, central banks need to co-operate closely with banking supervisors to ensure that potential sources of financial stability risk in their infrastructure roles are embedded within regulatory assessments. Indeed, to the extent that new services are multicurrency in nature an international dialogue may be necessary. I am pleased that the Basel Committees on Banking Supervision (BCBS) and Payment and Settlement Systems (CPSS) have agreed to strengthen communication between the committees, for example by holding joint meetings of subgroups, which will help to support this dialogue.

As recent events have underlined, regulation and public intervention can not only change market incentives for the

better but can also have unintended side effects. For instance, the creation of the off balance sheet vehicles at the centre of the recent market turbulence may be seen in part as a response to the crude regime for capital charges established under the original Basel Accord, under which liquidity facilities under a year in maturity were exempt. That is being remedied under Basel II. But it is a reminder that we need to be very careful to watch for these distortions in the regulation and oversight of payment systems and other infrastructures, so as to ensure that we do not inadvertently alter incentives in a way that may hamper the future development of the landscape.

This issue arises for example in the context of the establishment of ESCB-CESR standards for securities settlement systems. The Bank of England supports the principle of risk-based functional regulation, which implies that similar regulatory standards should be applied to a function — such as settlement — regardless of the status of the institution providing that function. We hope that further moves towards implementation will adhere to this principle, thereby establishing a level regulatory playing field at least between CSDs and ICSDs, but ideally also between traditional infrastructures and commercial banks offering infrastructural services.

Finally, with a wider spectrum of participants, issues arise around the way in which members interface with infrastructures. It is important to ensure that individual member behaviour cannot threaten the smooth functioning of the system. Some incidents during the recent market turbulence revealed issues around members' processing capacity, underlining the value in member-level testing to ensure that participants can always support the delivery of the network benefits from the smooth operation of the infrastructure.

(ii) Ensure effective international co-operation in oversight and operations, and co-ordination in risk assessment activities.

The second main challenge is to allow market participants to reap the benefits of globalisation, while ensuring that the risks are adequately controlled. An extended and highly connected network can simultaneously be both robust and fragile: robust, because risks may be more effectively shared and dispersed across the system; fragile in that major risks can flow more rapidly through the system.

Naturally, market participants have been pushing hard for the removal of obstacles to efficient cross-border settlement and barriers to the seamless cross-currency management of liquidity. Central banks have been urged to consider accepting foreign collateral or implementing other arrangements to facilitate cross-currency liquidity management. Some already do so — the Bank of England, for instance, routinely accepts

euro-denominated collateral in its operations — and a recent report from the CPSS⁽¹⁾ encouraged other central banks to consider accepting foreign collateral, at least in emergency circumstances. The Eurosystem has recently begun to explore new options.

Provision of cross-border collateral arrangements may entail a high degree of co-ordination and co-operation between central banks internationally, for instance in opening custody and correspondent accounts, and sharing information on local infrastructures and market practices.

More generally, strong international co-operation in the sphere of risk assessment and crisis management responses is also clearly important. With increased links between infrastructure providers in different centres and the emergence of new cross-border infrastructures, greater co-operation is also required in the conduct of oversight: not only in terms of assessment of particular overseen cross-border infrastructures against international standards, but also in identifying potential interdependencies between national infrastructures. While existing co-operative arrangements work well, the model needs to expand and continue to evolve.

Concluding remarks

The resilience of the infrastructure of wholesale payment, clearing and settlement systems to both operational and financial shocks remains a key requirement of financial and monetary stability. But the landscape is changing fast in response to technological change and the financial innovation and globalisation it allows. Cross-border and global networks are squeezing our national monopolies and commercial banks are playing an increasing role. These changes present several challenges for central banks and regulators:

- we need to establish and apply consistent criteria for the scope of oversight, in order to maintain a level regulatory playing field;
- we need to take full account of new interdependencies between systems when assessing financial stability risks at a national and international level;
- we need to work more closely together in risk assessment and oversight and ensure that cross-border operational arrangements are robust; and
- we need to ensure that financial stability risks posed by financial firms operating key infrastructure functions are adequately captured in their regulation.

Meeting these challenges will deliver a robust, resilient financial infrastructure, which the global financial system and the global economy depend upon.

(1) Bank for International Settlements (2006).

References

Bank for International Settlements (2006), 'Cross-border collateral arrangements', Committee on Payment and Settlement Systems, January. Available at www.bis.org/publ/cpss71.htm.

Bank for International Settlements (2007a), Semiannual OTC derivatives statistics. Available at www.bis.org/statistics/derstats.htm.

Bank for International Settlements (2007b), *Locational banking statistics*. Available at www.bis.org/statistics/bankstats.htm.

Gerali, A and Passacantando, F (2007), 'The loss of confidence in bank money in the Great Depression', a paper presented at the joint Bank of England/European Central Bank conference on 'Payments and Monetary and Financial Stability'.

Greenspan, A (2007), *The age of turbulence: adventures in a new world*, Penguin UK.

London Stock Exchange (2007), Conference on Innovation and Regulation in Trading Technology, June.

Quinn, S (1997), 'Goldsmith-banking: mutual acceptance and interbanker clearing in restoration London', *Explorations in Economic History*, Vol. 34, pages 411–32.

Timberlake, R (1987), 'Private production of scrip-money in the isolated community', *Journal of Money, Credit and Banking*, Vol. 19, No. 4, pages 437–47.

A tale of two shocks: global challenges for UK monetary policy

In this speech,⁽¹⁾ Andrew Sentance,⁽²⁾ a member of the Monetary Policy Committee (MPC), discusses the challenges currently facing the MPC in assessing the impact of two major global shocks: rises in oil and other commodity prices, and the recent problems on financial markets. These shocks have potentially opposing impacts on inflation, so judging the appropriate monetary policy response will not be easy. The MPC will be watching economic indicators closely but will remain focused on its remit of keeping inflation on course to meet the 2% target, as experience shows that low and stable inflation provides a solid platform for healthy growth and a more stable economy over the longer term.

I am delighted to have the opportunity to speak at this inaugural meeting of the Warwick City Alumni Group, and I hope this is the first of many such meetings. Warwick alumni have made, and continue to make, a significant contribution to the Bank of England's work. Many of the Bank's economists have either a first degree or postgraduate degree from the University. At least one Warwick alumnus has served on the MPC — my predecessor David Walton, who died so tragically last year. My own association with Warwick is relatively recent, but I am very grateful for the opportunity the University has provided me to pursue my interest in the economic issues surrounding climate change, in parallel with my role on the Monetary Policy Committee.

Recent events have given us plenty to think about on the Monetary Policy Committee. Until this summer, our main preoccupation was how far we needed to tighten monetary policy to counter the strength of demand globally and nationally and to dampen down associated inflationary pressures. But over the past six months, two major global shocks have come along to complicate our task.

The most noticeable and widely discussed has been the turbulence on financial markets, prompted by emerging losses in the US sub-prime mortgage market.⁽³⁾ Spreads have widened significantly in interbank markets and in credit markets more generally. The liquidity of interbank markets was significantly disrupted in August and September. And there are indications of a tightening of the availability of credit, particularly to more risky borrowers, leading to worries that there will be a knock-on effect constraining consumer spending and business investment, not just in the United Kingdom but across Europe, North America and other developed countries.

However, while attention has been focused on these developments in the financial system, we have had another global shock which has not generated so many headlines, but is just as significant. Over the past six months, the oil price has risen by around a further \$30/barrel. This is a much sharper rise than we saw in the period from early 2004 to late 2005, when it took about 18 months for the oil price to travel roughly the same distance — from \$30 to \$60/barrel. If these high prices are sustained, there are likely to be upward pressures on inflation, at least in the short term.⁽⁴⁾

Both these shocks threaten to reinforce trends which may already have been present in the economy. On the growth side, five successive rises in interest rates were already expected to dampen domestic consumer spending and business investment over the second half of this year and into 2008. So one important issue is how far the financial turmoil will reinforce this slowdown, and whether it will create a bigger dampening impact on the economy than is necessary to keep inflation on target.

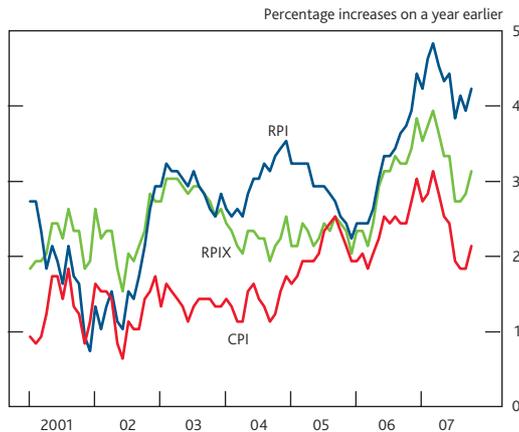
Similarly, the oil price rise has added to inflationary risks which were already apparent in the UK economy earlier this year. As **Chart 1** shows, with the exception of a couple of brief periods, consumer price inflation has been above the 2% target now

(1) Given at the University of Warwick City Alumni Group, London on 27 November 2007. This speech can be found on the Bank's website at www.bankofengland.co.uk/publications/speeches/2007/speech330.pdf.

(2) I would like to thank Andrew Holder and Ben Westwood for research assistance and invaluable advice. I am also grateful for helpful comments from other colleagues. The views expressed are my own and do not necessarily reflect those of the Bank of England or other members of the Monetary Policy Committee.

(3) For discussion of these events, see King (2007) and the October 2007 *Financial Stability Report*.

(4) Though the rise in sterling against the dollar has ameliorated the increase in sterling oil prices recently, this was also true in 2004 and 2005. From the first half of 2004 to the second half of 2005, the sterling oil price rose by £15, from an average of around £18.50 to £33.50. Over the winter of 2006/07, the sterling oil price averaged £29, and has since risen to £46, a similar increase of £17.

Chart 1 Recent inflation performance

since the summer of 2005. Other measures of inflation, including the retail prices index, have been at relatively high levels over the same period. Strong growth has created capacity pressures in some sectors of the economy and surveys of both business and the public show elevated expectations of price rises. And price pressures are in the pipeline from other global commodity markets, particularly in terms of food price inflation.

The objective of the Monetary Policy Committee is to keep inflation on target. So these upside inflationary risks from oil and other commodity prices need to be weighed in the balance against the downside risks to growth — and hence inflation — from the recent financial turmoil. The fact that these shocks are pushing in different directions adds to the uncertainty surrounding the outlook for inflation. In the face of these uncertainties, the latest evidence on activity, costs and prices will be an important guide to how the various risks are unfolding.

The Bank of England's recent *Inflation Report* sought to highlight some of the key issues on which the MPC will be looking for evidence to inform our judgements in the months ahead.

First, to what extent is UK domestic demand slowing, both in response to past rate rises and the knock-on impact of the financial turbulence?

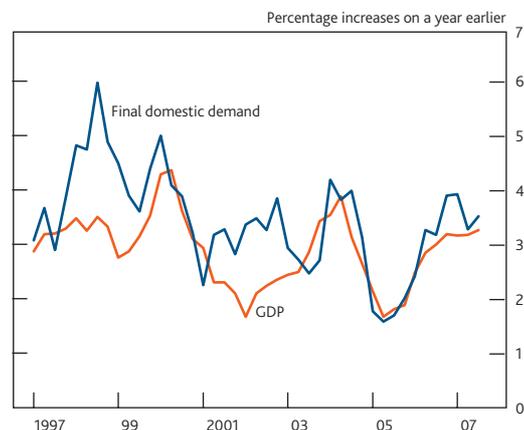
Second, how much momentum will the United Kingdom continue to receive from the global economy, which has been growing particularly strongly in recent years?

Third, how much price pressure will be generated in the United Kingdom by rising oil and commodity prices?

And finally, what will be the influence of other domestic factors — price expectations, capacity pressures and wage growth — on the medium-term inflation outlook?

I will discuss these issues in turn, before turning to their implications for UK monetary policy.

The background to any discussion of the influence of domestic demand must be a recognition that we are starting from a position where the UK economy has been growing strongly, supported by healthy increases in domestic demand, as **Chart 2** shows. The two main components of private sector demand — consumption and investment — drove a strong pickup in activity over the course of 2006 and the first half of 2007. According to the Office for National Statistics, GDP growth in the year to the third quarter was 3.2% with final domestic demand up 3.5%. Indeed, business surveys and the Bank's own staff analysis suggest that these figures may understate the momentum of growth.⁽¹⁾

Chart 2 GDP and final domestic demand

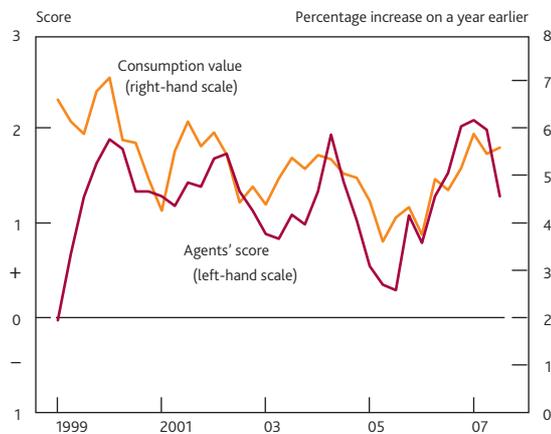
Even before the recent financial turmoil, the MPC was expecting a slowdown in the growth of consumption and investment in response to higher interest rates. This weakening in demand growth was expected to help damp down cost pressures coming through from the global economy and head off domestically generated inflation. The likelihood is that the recent financial market turmoil will tend to reinforce this slowdown in the short term — particularly through its effect on the cost and availability of finance for riskier borrowers in both the household and corporate sectors, and by adding to uncertainty about business conditions. But the timing and scale of these impacts is highly uncertain.

So what does the latest evidence show? There are growing indications — particularly from the Bank of England's regional Agents' reports — that we may have passed a turning point in recent months for both consumption and investment. But the extent of the slowdown is still very hard to gauge.

(1) The new GDP fan chart in the November *Inflation Report*, explained in the box on page 39 of the *Report*, shows the MPC's best collective judgement of the most likely path of output over the past, and the uncertainty around it. Further information is available in Bean (2007) and Cunningham and Jeffery (2007).

Chart 3 shows the picture in relation to consumer spending. If anything consumption has so far proved more resilient than we might have expected in the face of five rises in Bank Rate. The annual growth in the value of consumer spending hit a peak of nearly 6% earlier this year, the strongest rate of growth for five years, and has only eased back slightly since then. The retail sales data, however, show a more pronounced easing in the growth in sales values, though in volume terms spending has been sustained by price discounting. Reports from the Bank of England’s Agents also show a turning point in consumer spending, but we are still a long way off the weak scores for consumption growth which were recorded as recently as 2005.

Chart 3 Value of consumer spending

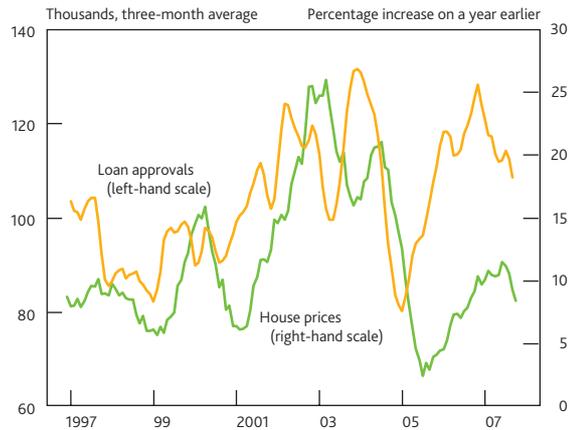


Note: Agents’ score is weighted average of Agents’ scores for retail sales values and consumer services turnover, using respective consumption shares of goods and services.

Housing market developments have often been correlated with consumer spending. They also have an added impact on demand through their effect on house building. Here too we see signs of a turning point, as **Chart 4** shows. This has been most noticeable in terms of measures of activity — such as loan approvals, shown on this chart. Some other activity measures — such as the RICS survey of new buyer enquiries — show an even more pronounced downward movement. More recently, measures of house prices have also begun to reflect the weakness of the market. However, as with the broader consumption picture, it is still too early to say how significant the current housing market correction will turn out to be.

Though house price inflation has dropped back in recent months, the annual increase was in double digits until a few months ago. Some further slowing is probably in the pipeline, as the market adjusts to higher interest rates and riskier borrowers find it harder to obtain finance for house purchase. Some commentators are now predicting house price falls, but it is too early to say whether we will actually see this. And even if we do see a fall in house prices, the economic impact will depend greatly on how significant and sustained it is. It goes without saying that the MPC will continue to monitor housing market developments closely, as part of our

Chart 4 Housing market indicators



Note: House prices shown are the average of Halifax and Nationwide indices.

Sources: Bank of England, HBOS and Nationwide.

assessment of how significantly household spending will slow over the year ahead.

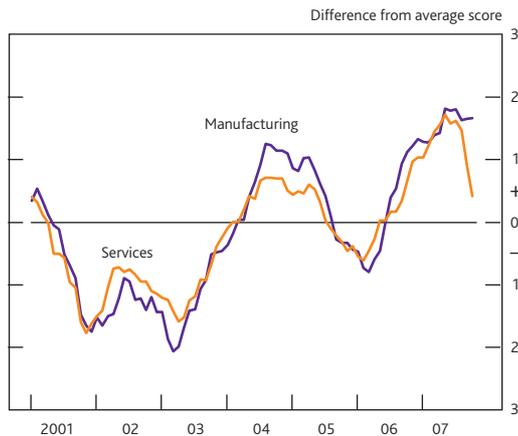
The other key component which is expected to contribute to weaker domestic demand is business investment. Though the value of business investment is just one sixth of consumer spending by households, it tends to be more volatile, and hence can still be an important contributor to swings in total demand.

Robust investment growth in 2006 has been followed more recently by indications of a slowdown, according to the latest official data.⁽¹⁾ This evidence of slowing investment is also consistent with a weakening in investment intentions in the services sector detected by the Bank’s Agents in recent months, as **Chart 5** shows. Though manufacturing investment intentions have remained resilient, reflecting the continued strength of demand on world markets, the services sector accounts for a much larger share of business capital spending — over 70% of the total.

This slowdown in investment growth is not unexpected and has been a feature of the Bank’s forecasts for some time. First, the prospect of weaker consumer demand reduces the need for additional capacity to serve these markets. Second, commercial property investment is likely to be dampened by higher interest rates and increased uncertainty about future prospects. Third, there may be financing constraints and higher borrowing costs for some companies resulting from the recent financial turbulence. The Bank’s credit conditions surveys have pointed to a tightening of lending criteria, which might be expected to affect small and medium-sized

(1) Early estimates of business investment are especially prone to revision so this evidence from the official statistics needs to be treated with caution. See Cunningham and Jeffery (2007) for a more detailed discussion of the reliability of this data source.

Chart 5 Investment intentions



Note: Figures based on average scores from the Bank of England's regional Agents for investment intentions.

companies in particular. However, the latest evidence from the CBI surveys shows little indication of credit constraints affecting investment yet.⁽¹⁾

Global economic growth

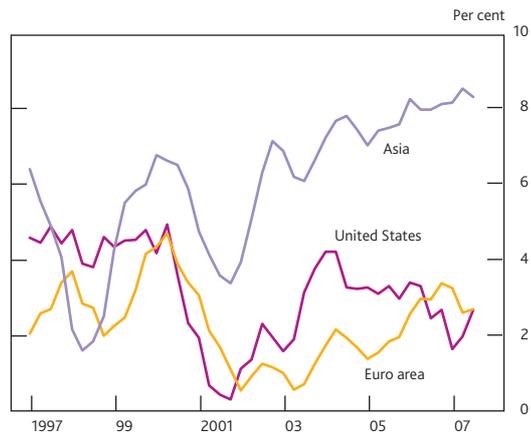
The picture for global economic growth is not dissimilar to the domestic economy. Like domestic demand, the recent momentum of global growth has been strong. Indeed, we have to go back to the early 1970s to find a period of sustained economic growth as strong as we have seen in the past four years.⁽²⁾

As **Chart 6** shows, strong growth in Asia has been an important contributor to this buoyant global economic picture. Over the past two years, Asian GDP growth (excluding Japan) has averaged over 9% per annum, while Chinese growth alone has averaged over 11%. Of more significance to the United Kingdom though, has been the healthy state of European markets, which account for the majority of our exports. In the past 18 months, the euro zone has enjoyed its strongest growth phase since the late 1990s.

The situation in the United States is very different. While growth has been picking up elsewhere, the US economy has been slowing. As **Chart 6** shows, US GDP growth actually peaked at around 4% year on year in early 2004, slowing to a rate of around 2% in the first half of this year. The past two quarters have seen stronger growth. But with renewed uncertainty created by the recent financial turmoil and potential knock-on effects from the downturn in the US housing market, most forecasters — including the Federal Reserve — expect US growth of around 2% next year.

There has been quite a bit of discussion about the impact of slower growth in the United States on the wider global economy. Can healthy growth in Asia and Europe be sustained if the United States turns down more sharply? Given the

Chart 6 Regional GDP growth



Source: Thomson Datastream.

importance of the American economy to world demand — the United States accounts for around a quarter of world GDP at market exchange rates⁽³⁾ — there could be some further negative impact on world growth from a more pronounced weakening across the Atlantic. But we can take some comfort from the fact that the world economy has already survived an effective halving in the US growth rate since early 2004.

Perhaps the bigger risk to the world economy as a whole is not the US economy *per se*, but the possibility that financial market developments will have an impact on consumer and business spending across a wide range of advanced economies, including Europe as well as the United States. This risk would increase if the global financial system was hit by further financial shocks, such as a sharp fall in equity prices and the value of financial assets more generally.

Though further shocks to the global financial system cannot be ruled out, most current forecasts point to a fairly modest slowdown in world economic growth in 2008. For example, the IMF is still forecasting growth above its long-run average in 2008 — as **Chart 7** shows. With strong domestic demand sustaining growth in Asia and other emerging markets, the performance of these economies is expected to largely offset the negative impact of weaker US growth.

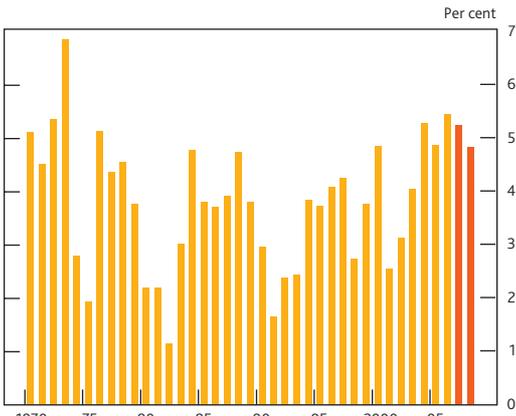
For the United Kingdom, a key issue will be what happens to growth in the euro zone, and in Europe more broadly. As **Chart 8** shows, these European markets account for nearly 60% of total UK exports, more than three times as important as the United States. A sustained slowdown in European growth therefore poses a bigger risk to the UK economy than potential developments in the United States. The most recent

(1) According to the October *CBI Industrial Trends Survey*, only 2% of companies reported the availability of finance as a constraint on investment, which is a very low figure by historical comparisons.

(2) Growth calculations using purchasing power parity (PPP) exchange rates.

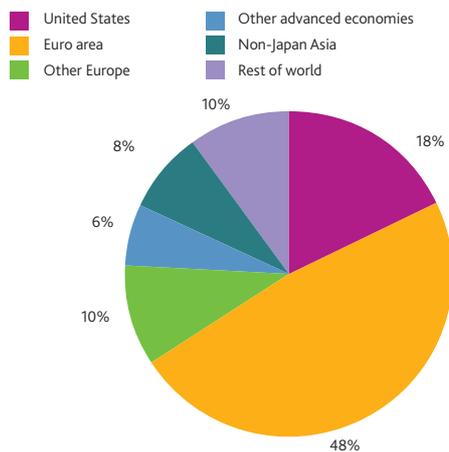
(3) Figures for 2007 from October 2007 IMF World Economic Outlook Database.

Chart 7 World GDP growth



Note: 2007 and 2008 are IMF forecasts.
 Source: IMF *World Economic Outlook*, October 2007.

Chart 8 UK export markets



Note: Figures based on shares of UK exports in 2004.

data point to reasonably healthy euro-zone growth so far in the second half of the year, with third-quarter data showing a bounceback from a more muted second-quarter growth performance. However, some business survey and confidence indicators have weakened. Over the months ahead, data on economic activity from the major European economies and survey evidence on UK export orders will indicate whether these are early indicators of a broader European slowdown or simply short-term confidence effects which will unwind next year.

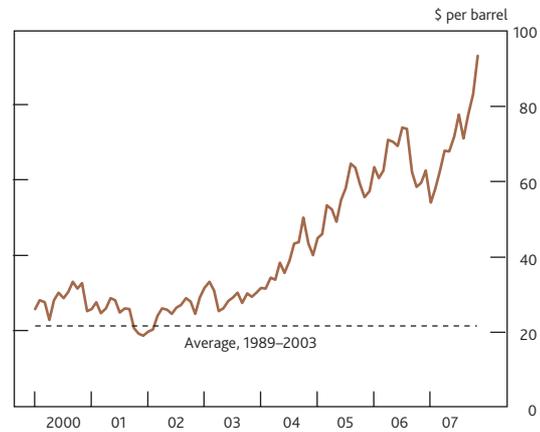
International price pressures

One of the most significant consequences of the recent strength of the global economy is the upward pressure that this has exerted on energy and other commodity prices.⁽¹⁾

This is reflected most clearly in the recent moves in the oil price, shown in **Chart 9**. Of course, a rising oil price is not a new phenomenon. The oil price has been on an upward trend

on and off since early 2004. But, as I observed earlier, the rise we have seen over the past six months has been much sharper than the more gradual drift upwards between early 2004 and early 2006.

Chart 9 Brent crude oil price



Source: Thomson Datastream.

Early last year, talking to another audience of Warwick alumni, David Walton posed the question: 'Has oil lost the capacity to shock?'.⁽²⁾ He concluded then that the chances of a benign economic outcome were higher than in the 1970s and early 1980s for three main reasons. First, the shock to oil prices was more gradual and the economy was less dependent on oil. Second, the UK economy was in a better position to absorb the shock, starting from a position with fewer inflationary pressures, less excess demand and a more flexible labour market. Third, the monetary policy framework has helped to anchor expectations much better than in previous episodes.

This prognosis has turned out to be broadly correct, though CPI inflation and other measures were pushed above target by higher energy prices in late 2006 and early 2007, they have since come back down again. As past energy price rises have dropped out of the annual inflation calculation, CPI inflation has returned to around its target level of 2% in recent months.

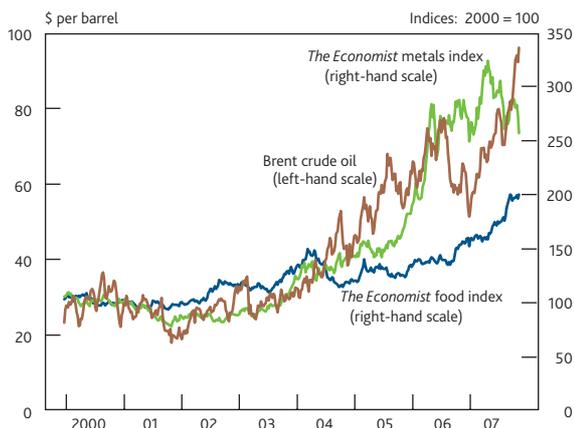
However, in some respects we might be less sanguine about the impact of this further oil shock than David Walton was in early 2006. First, the shock itself has been more severe. As I have already observed, the oil price movement in this latest shock has been much sharper this time round than in 2004 and 2005.

Second, we have not just seen upward shocks to the oil price, but a more general upward pressure on commodity prices. As **Chart 10** shows, metals prices rose sharply in 2005 and early

(1) See Sentance (2007) for a more detailed discussion of how changes in the global inflation climate and recent strong global growth have affected UK inflation and monetary policy.
 (2) See Walton (2006).

2006, and remain at elevated levels. More recently, food prices have risen sharply. Strong global demand, particularly from Asia and other emerging markets, has played a major part in driving these price developments. However, supply factors have also contributed in the case of food — including impacts related to climate change, such as changing weather patterns and a switch in the use of agricultural land towards biofuels.

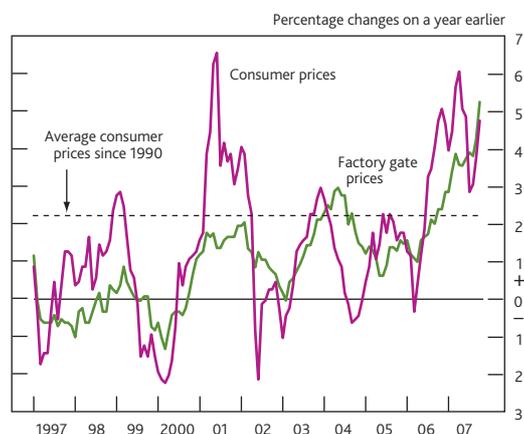
Chart 10 Commodity prices



Source: Thomson Datastream.

As **Chart 11** shows, both consumer food price inflation and the price of food products at the factory gate are at elevated levels relative to the past decade — running at more than twice the average rate of food price inflation since 1990. This is not totally unprecedented — there was a sharp spike in food price inflation in 2001 (associated with the impact of flooding and foot-and-mouth disease).⁽¹⁾ However, rising food prices do run the risk of aggravating an upward short-term move in CPI inflation in response to the latest oil price shock, unless other prices adjust downwards to compensate.

Chart 11 Food price inflation



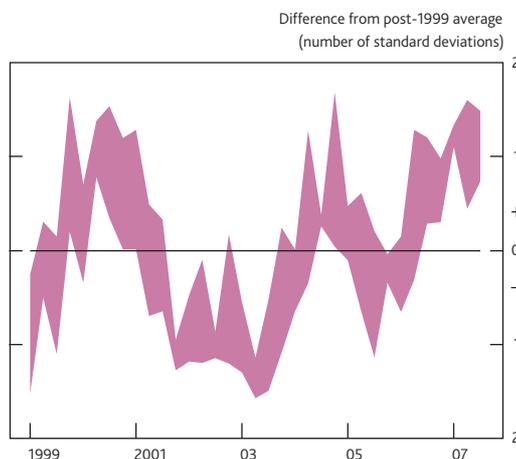
Note: Factory gate prices are producer output prices for food and beverages; consumer prices are the CPI component for food and non-alcoholic beverages.

Capacity pressures, pay and inflation expectations

Short-term external shocks such as recent rises in energy and food prices should not affect the path of inflation over the medium term, as long as price expectations are not destabilised and demand and cost pressures do not turn a temporary rise in inflation into a more sustained increase. In his speech last year, David Walton noted that the monetary policy framework — which had by then established a track record of low inflation — would help to anchor inflation expectations. Inflationary pressures in the economy more generally were also muted when oil prices were rising in 2004 and 2005. Both factors helped to limit the inflationary impact of the oil price rise.

The conjunctural situation now is less reassuring. First of all, the strong growth in the economy over the past 18 months has resulted in increasing reports of capacity pressures. This is shown in **Chart 12**, where business surveys and the reports from the Bank's Agents are used to compile a 'swathe' of measures of capacity pressure. This contrasts with the position in the run-up to the oil price rises in 2004 and 2005, when the economy had been operating below capacity for a number of years.

Chart 12 Capacity pressures



Note: The swathe shows the difference between the highest and lowest measures, based on weighted survey balances from the Bank's regional Agents, the BCC and the CBI.

Sources: Bank of England, BCC and CBI.

The fact that the economy is running at a relatively high level of activity relative to capacity increases the risk that cost increases will feed through more rapidly into prices. That makes it all the more important that we do see some slowdown in demand and a reduction in capacity pressures, if we are to mitigate the inflationary impact of the recent rise in energy and food prices.

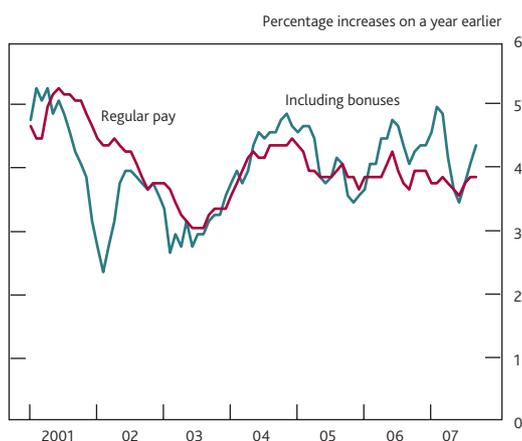
(1) See the August 2001 *Inflation Report* for further details.

Another important difference from the situation in 2004 and 2005 is the potential impact that the recent experience of inflation might have on expectations and hence wage and price behaviour. Inflation was running below target in the run-up to the oil price rises in 2004 and 2005, and this reduced the risk that an upward shift in inflation in the short term would dislodge expectations. Recently, CPI inflation has been running above target and other measures of inflation have also been at elevated levels. The risk that further upward shocks to inflation begin to dislodge expectations is therefore probably greater now than when oil prices were rising two or three years ago.

Inflation expectations implied from financial markets, along with surveys of business and the public, do provide some evidence of some slight upward movement in inflation expectations. Another important set of key indicators is the evidence on the rate of wage growth. If employees and employers expect inflation to be higher, pay settlements and other measures of wage increases are likely to drift upward.

On this score, we can take some comfort from the recent trends in average earnings, shown in **Chart 13**. With the exception of movements driven by bonuses, the main official measure of pay growth — the average earnings index — has been remarkably stable at below 4%, despite recent fluctuations in measures of price inflation. Pay settlements also show a similar pattern of stability. This broad stability in wage growth has been one of the more reassuring indicators for the MPC at a time when global factors have been exerting upward pressure on inflation.

Chart 13 Wage growth



Note: Figures are based on three-month averages of the private sector average earnings index.

But there are some contrary straws in the wind. The average weekly earnings index, which is a newer and less well-established measure,⁽¹⁾ does show some signs of a rise in pay increases — which could point to upside risks to wages. So, in the months ahead, the Monetary Policy Committee will need to monitor closely the full range of indicators of pay growth to establish whether inflation expectations are shifting.

In this context, the evidence from pay settlements struck in the early months of 2008 is likely to be particularly important.

Implications for monetary policy

The UK economy has probably passed a turning point and a slowdown now appears to be under way, driven mainly by a weakening in domestic demand. That is not an unexpected or indeed an unwelcome development. The starting point for the slowdown is a healthy growth rate of GDP and domestic demand around 3½% per annum, which appears to have been sustained up to the third quarter. Slower growth of demand should help to ensure we will meet the inflation target over the medium term, by reducing the risk of a build-up of inflationary pressures.

At the same time, the economy has been hit by two shocks — financial market turbulence and a sharp rise in oil and some other commodity prices. These shocks are operating in opposing directions in terms of their impact on inflation. So judging the appropriate monetary policy response will not be easy.

One benefit of the MPC process is that we meet monthly and base our decisions on a detailed analysis of the latest data and evidence. This evidence-based approach has been a strong hallmark of the MPC's past response to economic shocks and should serve us well in the current climate. At our forthcoming meetings, we will need to weigh the evidence on the extent and likely duration of the slowdown in UK growth against the impact of inflationary pressures coming through from the global economy, and their potential impact on inflation expectations. The effect of financial market and credit developments on growth in other major global economies, particularly the United States and Europe, will be a significant factor on both sides of the equation.

The months ahead look set to be a challenging time for UK monetary policy — and I am sure that the MPC won't be short of external advice over this difficult period! I should emphasise that our primary objective is to maintain price stability. As the experience of the past decade and a half has shown, low and stable inflation provides a solid platform for healthy growth and a more stable economy over the longer term.

However, in the wake of recent shocks from global financial and commodity markets, we cannot guarantee that the economic road ahead in the short term will be easy or smooth. On the MPC, we will be focused on our remit of keeping inflation on course to meet the 2% target. But against a background of global financial turbulence and a sharp rise in the oil price, it may be a bumpy ride.

(1) See Duff (2007) for an ONS analysis of the difference between the two AEI and AWE estimates of earnings growth.

References

Bean, C (2007), 'Risk, uncertainty and monetary policy', *Bank of England Quarterly Bulletin*, Vol. 47, No. 4, pages 600–06.

Cunningham, A and Jeffery, C (2007), 'Extracting a better signal from uncertain data', *Bank of England Quarterly Bulletin*, Vol. 47, No. 3, pages 364–75.

Duff, H (2007), 'A preliminary analysis of the differences between Average Weekly Earnings and the Average Earnings Index', *mimeo*, Office for National Statistics.

King, M (2007), 'The Governor's speech in Northern Ireland', *Bank of England Quarterly Bulletin*, Vol. 47, No. 4, pages 566–69.

Sentance, A (2007), 'The global economy and UK inflation', *Bank of England Quarterly Bulletin*, Vol. 47, No. 4, pages 574–81.

Walton, D (2006), 'Has oil lost the capacity to shock?', *Bank of England Quarterly Bulletin*, Spring, pages 105–14.

Appendices



Bank of England speeches

Speeches made by Bank personnel since publication of the previous *Bulletin* are listed below.

[A tale of two shocks: global challenges for UK monetary policy](#) (Reproduced on pages 613–20 of this *Bulletin*.)

Speech given by Andrew Sentance at the University of Warwick City Alumni, London on 27 November 2007.

www.bankofengland.co.uk/publications/speeches/2007/speech330.pdf

[Current monetary policy issues](#)

(Reproduced on pages 570–73 of this *Bulletin*.)

Speech given by Rachel Lomax to Hull and Humber Chamber of Commerce, at KC Football Stadium, Hull, on 22 November 2007.

www.bankofengland.co.uk/publications/speeches/2007/speech329.pdf

[New markets and new demands: challenges for central banks in the wholesale market infrastructure](#)

(Reproduced on pages 607–12 of this *Bulletin*.)

Speech given by Nigel Jenkinson at a Bank of England/European Central Bank Conference in Frankfurt on 12 November 2007.

www.bankofengland.co.uk/publications/speeches/2007/speech328.pdf

[Risk, uncertainty and monetary policy](#)

(Reproduced on pages 600–06 of this *Bulletin*.)

Speech given by Charles Bean to Dow Jones at City Club in Old Broad Street on 31 October 2007.

www.bankofengland.co.uk/publications/speeches/2007/speech327.pdf

[Fear, unemployment and migration](#)

(Reproduced on pages 592–99 of this *Bulletin*.)

Esmée Fairbairn Memorial Lecture given by David Blanchflower at Lancaster University on 30 October 2007.

www.bankofengland.co.uk/publications/speeches/2007/speech326.pdf

[Financial instability and UK monetary policy](#)

Speech by Kate Barker to the Institute of Chartered Accountants in England and Wales on 23 October 2007.

www.bankofengland.co.uk/publications/speeches/2007/speech325.pdf

[Speech by Mervyn King, Governor](#)

(Reproduced on pages 566–69 of this *Bulletin*.)

Given at the Northern Ireland Chamber of Commerce and Industry, Belfast on 9 October 2007.

www.bankofengland.co.uk/publications/speeches/2007/speech324.pdf

[Trends in European labour markets and preferences over unemployment and inflation](#)

(Reproduced on pages 582–91 of this *Bulletin*.)

Speech by David Blanchflower at a Dresdner Kleinwort Seminar on European Labour Markets and Implications for Inflation and Policy on 27 September 2007.

www.bankofengland.co.uk/publications/speeches/2007/speech323.pdf

[Is unemployment more costly than inflation?](#)

Paper referred to in speech above.

www.bankofengland.co.uk/publications/speeches/2007/speech323paper.pdf

[The global economy and UK Inflation](#)

(Reproduced on pages 574–81 of this *Bulletin*.)

Speech by Andrew Sentance at an event organised by the Leeds Financial Services Initiative on 24 September 2007.

www.bankofengland.co.uk/publications/speeches/2007/speech322.pdf

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)

Summer 2005

- The impact of government spending on demand pressure
- How important is housing market activity for durables spending?
- The inflation-targeting framework from an historical perspective
- Monetary policy news and market reaction to the *Inflation Report* and *MPC Minutes*
- Addendum to *Report on modelling and forecasting at the Bank of England*
- Public attitudes to inflation
- Chief Economist Workshop April 2005: exchange rate regimes and capital flows
- Implementing monetary policy: reforms to the Bank of England's operations in the money market
- A review of the work of the London Foreign Exchange Joint Standing Committee in 2004
- Monetary policy: practice ahead of theory
The Mais Lecture 2005: speech by the Governor (S)
- Inflation targeting in practice: models, forecasts and hunches (S)
- Monetary policy, stability and structural change (S)
- How much spare capacity is there in the UK economy?
- Communicating monetary policy in practice (S)
- Monetary policy in the United Kingdom — the framework and current issues (S)
- A matter of no small interest: real short-term interest rates and inflation since the 1990s (S)

Autumn 2005

- Assessing the MPC's fan charts
- Long-run evidence on money growth and inflation
- The determination of UK corporate capital gearing
- Publication of narrow money data: the implications of money market reform
- The Governor's speech at Salts Mill, Bradford (S)
- The Governor's speech at the Mansion House (S)
- Monetary policy making: fact and fiction (S)

Winter 2005

- Introducing the Agents' scores

- Do financial markets react to Bank of England communication?
- Financial stability, monetary stability and public policy
- Share prices and the value of workers
- Stabilising short-term interest rates
- The Governor's speech to the CBI North East annual dinner (S)
- UK monetary policy: the international context (S)
- Economic stability and the business climate (S)
- Challenging times for monetary policy (S)
- Monetary policy challenges facing a new MPC member (S)

Spring 2006

- New information from inflation swaps and index-linked bonds
- The distribution of assets, income and liabilities across UK households: results from the 2005 NMG Research survey
- Understanding the term structure of swap spreads
- The information content of aggregate data on financial futures positions
- The forward market for oil
- The Governor's speech in Ashford, Kent (S)
- Reform of the International Monetary Fund (S)
- Global financial imbalances (S)
- Monetary policy, demand and inflation (S)
- Has oil lost the capacity to shock? (S)

Summer 2006

- House prices and consumer spending
- Investing in inventories
- Cost-benefit analysis of monetary and financial statistics
- Public attitudes to inflation
- The Centre for Central Banking Studies
- A review of the work of the London Foreign Exchange Joint Standing Committee in 2005
- Uncertainty, the implementation of monetary policy, and the management of risk (S)
- Reflections on operating inflation targeting (S)
- Cost pressures and the UK inflation outlook (S)
- The UK current account deficit and all that (S)
- A shift in the balance of risks (S)
- What do we now know about currency unions? (S)

2006 Q3

- The UK international investment position
- Costs of sovereign default
- UK export performance by industry
- The Governor's speech in Edinburgh, Scotland (S)
- The Governor's speech at the Mansion House (S)

- Stability and change (S)
- Financial system risks in the United Kingdom (S)

2006 Q4

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

2007 Q1

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

2007 Q2

- Public attitudes to inflation and interest rates
- National saving

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

2007 Q3

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

2007 Q4

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

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. 325 Inter-industry contagion between UK life insurers and UK banks: an event study (May 2007)

Marco Stringa and Allan Monks

No. 326 Asset pricing implications of a New Keynesian model (June 2007)

Bianca De Paoli, Alasdair Scott and Olaf Weeken

No. 327 A model of market surprises (June 2007)

Lavan Mahadeva

No. 328 Cash-in-the-market pricing and optimal resolution of bank failures (June 2007)

Viral Acharya and Tanju Yorulmazer

No. 329 The impact of yuan revaluation on the Asian region (July 2007)

Glenn Hoggarth and Hui Tong

No. 330 Escaping Nash and volatile inflation (July 2007)

Martin Ellison and Tony Yates

No. 331 Wage flexibility in Britain: some micro and macro evidence (July 2007)

Mark E Schweitzer

No. 332 Investment adjustment costs: evidence from UK and US industries (October 2007)

Charlotta Groth and Hashmat Khan

No. 333 Labour market institutions and aggregate fluctuations in a search and matching model (October 2007)

Francesco Zanetti

No. 334 Using copulas to construct bivariate foreign exchange distributions with an application to the sterling exchange rate index (November 2007)

Matthew Hurd, Mark Salmon and Christoph Schleicher

No. 335 Business cycle fluctuations and excess sensitivity of private consumption (November 2007)

Gert Peersman and Lorenzo Pozzi

No. 336 A state space approach to extracting the signal from uncertain data (November 2007)

Alastair Cunningham, Jana Eklund, Christopher Jeffery, George Kapetanios and Vincent Labhard

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. 17 The impact of the recent migration from Eastern Europe on the UK economy (April 2007)

David G Blanchflower, Jumana Saleheen and Chris Shadforth

No. 18 Vector autoregression analysis and the Great Moderation (October 2007)

Luca Benati 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.

Following user consultation, printed editions of *Bankstats*, which were previously published twice a year in January and July, have been discontinued since July 2006.

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 in April and October. 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 (MPC) 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/redbookfeb07.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.

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.

Summary pages of the *Bulletin* from February 1994, giving a brief description of each of the articles, are available on the Bank's website at:

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

Individual articles from May 1994 are also available at the same address.

The *Bulletin* is also available from National Archive Publishing Company: enquiries from customers in Japan and North and South America should be addressed to ProQuest Information and Learning, 300 North Zeeb Road, PO Box 998, Ann Arbor, Michigan 48106-0998, United States of America; customers from all other countries should apply to The Quorum, Barnwell Road, Cambridge, CB5 8SW, telephone 01223 215512.

An index of the *Quarterly Bulletin* is also available to customers free of charge. It is produced annually, and lists alphabetically terms used in the *Bulletin* and articles written by named authors. It is also available at:

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

Bound volumes of the *Quarterly Bulletin* (in reprint form for the period 1960–85) can be obtained from Schmidt Periodicals GmbH, Ortsteil Dettendorf, D-83075 Bad Feilnbach, Germany, at a price of €105 per volume or €2,510 per set.

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 2008 are as follows:

Quarterly Bulletin

Q1	17 March
Q2	16 June
Q3	22 September
Q4	15 December

Inflation Report

February	13 February
May	14 May
August	13 August
November	12 November

Financial Stability Report

24 April
23 October

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	2008					
	<i>QB, IR and FSR</i> package	<i>QB and IR</i> package	<i>IR and FSR</i> package	<i>QB</i> only	<i>IR</i> only	<i>FSR</i> only
United Kingdom						
First class/collection ⁽¹⁾	£31.50	£27.00	£13.50	£21.00	£10.50	£5.25
<i>Students/schools</i> (concessionary rate UK only)	<i>£10.50</i>	<i>£9.00</i>	<i>£4.50</i>	<i>£7.00</i>	<i>£3.50</i>	<i>£1.75</i>
<i>Academics</i> (concessionary rate UK only)	<i>£21.00</i>	<i>£18.00</i>	<i>£9.00</i>	<i>£14.00</i>	<i>£7.00</i>	<i>£3.50</i>
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 fsrenquiries@bankofengland.co.uk.

General enquiries about the Bank of England should be made to +44 (0)20 7601 4878.
The Bank of England's website is at www.bankofengland.co.uk.

Issued by the Bank of England Publications Group.

© Bank of England 2007

ISSN 0005-5166

Printed by Park Communications Limited



Mixed Sources

Product group from well-managed
forests and other controlled sources
www.fsc.org Cert no. SGS-COC-2842
© 1996 Forest Stewardship Council