# Quarterly Bulletin

## Summer 2005

Bank of England

Volume 45 Number 2

# Foreword

Every three months, the Bank of England publishes economic research and market reports in its *Quarterly Bulletin*. This quarter, the *Bulletin* includes analysis of: how government spending impacts on inflation; the link between durables spending and the housing market; and inflation targeting in an historical perspective. It also reports on the Bank's prospective reforms to its money market operations. In addition, Professor Adrian Pagan has updated his recent report on economic forecasting at the Bank to include an assessment of the new Bank of England Quarterly Model (BEQM).

In their article *The impact of government spending on demand pressure*, Bob Hills, Ryland Thomas and Tony Yates set out part of the analytical framework used by the Monetary Policy Committee (MPC) to assess the outlook for inflation. Traditionally, economists come to a judgement about inflationary pressure by comparing actual GDP growth to some notion of 'trend', or potential, economic growth. But this approach can be misleading as it often fails to treat the government sector appropriately.

The CPI inflation measure targeted by the MPC is calculated from the prices of a representative basket of goods and services. These prices are almost entirely set by private sector businesses. So the prospects for CPI inflation are influenced by the balance of demand and supply in the private sector, rather than demand and supply in the economy as a whole. Government spending is therefore likely only to have a material effect on inflation if it affects the demand for, or the supply of, resources in the private sector in some way.

The article identifies two ways in which government spending can affect demand for resources in the private sector: via procurement and via competition in the labour market. It also constructs an illustrative 'demand for resources' measure that treats the government sector appropriately, and so provides a better guide to potential inflationary pressures than does GDP.

A potential link between the housing market and consumer spending is explored in *How important is housing market activity for durables spending?*, by Andrew Benito and Rob Wood. As the MPC has set out in the *Minutes* of past policy meetings and in the *Inflation Report*, the potential links between the housing market and consumer spending are less straightforward than commonly presumed. In particular, rising house prices do not make everybody better off — higher house prices benefit those selling a second home or trading down to a cheaper property, but they simultaneously disadvantage those trading up as well as first-time buyers.

There are two potential channels via which the housing market can affect consumer spending: the 'collateral' channel, whereby higher house prices enable more, or cheaper, borrowing by raising the collateral at households' disposal; and the 'transactions' channel, whereby a rise in the number of housing transactions increases spending on those goods and services directly associated with moving home. This article focuses on the second of these two channels. It concludes that under plausible assumptions, the recent slowdown in the housing market is likely only to have had a

moderate effect on consumer spending via the 'transactions' channel. Of course, the housing slowdown may also have affected consumer spending in other ways.

Luca Benati uses 400 years of data to assess changes in economic stability in his article *The inflation-targeting framework from an historical perspective*. Among his conclusions are that the post-1992 inflation-targeting regime has been associated with the most stable macroeconomic environment on record. Although the change in regime has probably played some part in this stability, other factors — including good luck — have almost certainly been important too.

The Bank has previously announced plans to reform fundamentally its money market operations. These are described in *Implementing monetary policy: reforms to the Bank of England's operations in the money market*, by Roger Clews. The changes are aimed at giving the Bank greater control over short-term market interest rates, at providing better banking system liquidity management in both normal and stressed circumstances and at fostering more stable and efficient money markets.

In 2003, Professor Adrian Pagan published a report on modelling and forecasting at the Bank. In this edition of the *Bulletin*, Professor Pagan provides a postscript to that report with an assessment of the new Bank of England Quarterly Model (BEQM). His overall assessment is a positive one and he suggests that 'the construction of BEQM has been a success'. The Bank would like again to thank Professor Pagan for the valuable insights that his report has provided.

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

Also in this edition of the *Quarterly Bulletin*:

- *Markets and operations*. This article reviews developments in financial markets, UK market structure and the Bank's official operations since the Spring *Bulletin*;

- *Monetary policy news and market reaction to the* Inflation Report *and MPC* Minutes (by James Bell and Robin Windle). This article presents research carried out for a recent speech by Rachel Lomax, Deputy Governor;

- *Public attitudes to inflation* (by Colin Ellis). Over the past five and a half years, NOP has surveyed public attitudes to inflation on behalf of the Bank. This article analyses the results of the surveys from May 2004 to February 2005;

- *Chief Economist Workshop April 2005: exchange rate regimes and capital flows* (by Gill Hammond and Ole Rummel). The Chief Economist Workshop, organised by the Bank of England's Centre for Central Banking Studies (CCBS), brought together economists from more than 30 central banks; and

- *A review of the London Foreign Exchange Joint Standing Committee in 2004*. The Joint Standing Committee met six times in 2004 and discussed a variety of market issues.

**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.**

# Bank of England Quarterly Bulletin

## Summer 2005

*Recent economic and financial developments*



*Research and analysis*

*Reports*



*MPC speeches and papers*



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

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# Markets and operations

*This article reviews developments since the Spring* Quarterly Bulletin *in sterling financial markets, UK market structure and the Bank's official operations.*(1)

- *Short-term nominal sterling interest rates fell as market participants appeared to revise downwards their views on the likely future path of monetary policy. Longer-term sterling forward rates also fell. In effective terms, sterling depreciated.*
- *UK equity prices declined over the review period, perhaps reflecting a perception of a slightly weaker outlook for UK companies' earnings prospects, and/or a revision to investors' risk appetite.*
- *The Bank of England implemented interim reforms to its operations in the sterling money markets.*

Sterling short-term market interest rates fell over the period accompanied by weaker UK equity prices and a small depreciation in the sterling effective exchange rate (Table A). This pattern of asset price movements seemed to reflect both international influences and market participants perceiving a slightly weaker domestic outlook.

Activity data for the UK economy have been weaker than the market expected. In particular, the slowdown in consumer spending over recent months may have led market participants to give more weight to the downside risks to growth through the rest of the year, although Consensus surveys of economists' forecasts did not show any significant downward revision to average expectations for UK GDP growth in 2005 (Chart 1).

A second factor influencing sterling asset markets has been global economic prospects. Early in the review period, weaker activity data were released in a number of overseas economies, particularly in the euro area. And subsequently, forecasts for GDP growth were revised down a little for the United States, the euro area and Japan.

**Table A**
**Summary of changes in market prices**

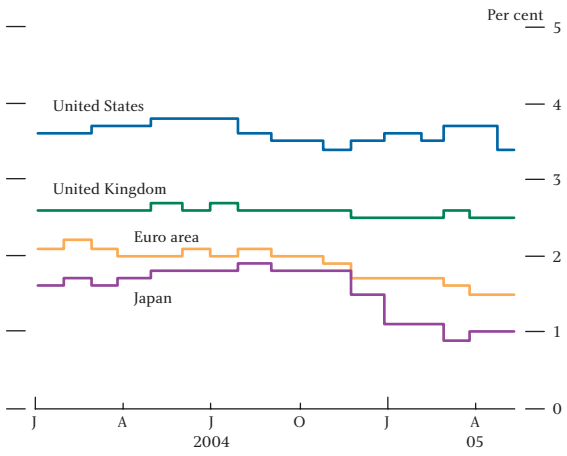
| | 18 Feb. | 27 May | *Change* |
|---|---|---|---|
| **Three-month sterling Libor rate** (per cent) | | | |
| June 2005 | 4.98 | 4.86 | *-12 bp* |
| December 2005 | 5.00 | 4.63 | *-37 bp* |
| **Sterling nominal forward rates** (per cent)(a) | | | |
| Three-year | 4.59 | 4.27 | *-33 bp* |
| Ten-year | 4.57 | 4.46 | *-12 bp* |
| **Equity indices** | | | |
| FTSE 100 | 5057 | 4986 | *-1.4%* |
| FTSE All-Share | 2535 | 2492 | *-1.7%* |
| **Exchange rates** | | | |
| Sterling effective exchange rate | 101.1 | 100.2 | *-0.9%* |
| €/£ exchange rate | 1.45 | 1.45 | *0.2%* |
| $/£ exchange rate | 1.89 | 1.82 | *-3.7%* |

Columns may not correspond exactly due to rounding.

Sources: Bank of England and Bloomberg.

(a) Three-month forward rates, derived from the Bank's government liability curves. Estimates of the UK curve are published on the Bank of England's website at www.bankofengland.co.uk/statistics/yieldcurve/index.htm.

**Chart 1**
**Expected real GDP growth for 2005**



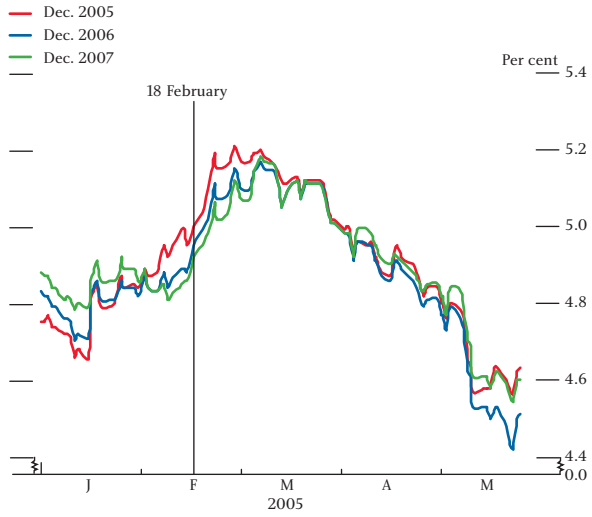

Source: Consensus Economics.

(1) This article focuses on sterling markets. The reader is referred to 'Risks in the international system', Chapter 2 of the Bank of England's forthcoming *Financial Stability Review* for a broader review of international financial markets. The period under review in this article is 18 February (the data cut-off for the previous *Quarterly Bulletin*) to 27 May.

## Short-term interest rates

Forward interest rates for end-2005 implied by short sterling futures contracts declined by nearly 40 basis points (Chart 2). Initially, forward rates rose a little following comments by members of the UK Monetary Policy Committee (MPC) and publication of the *Minutes* of the February MPC meeting. But rates declined following the release of a series of weaker-than-expected activity data, with a particularly marked fall following the publication of the May *Inflation Report*. Since their peak at the beginning of March, end-2005 implied rates fell by nearly 60 basis points.

### Chart 2
### Implied sterling interest rates from short sterling futures contracts



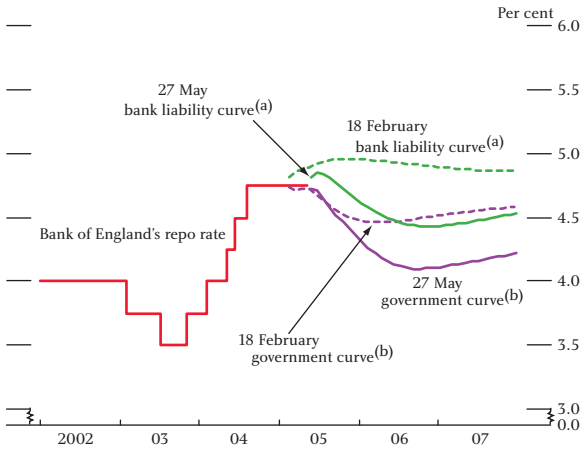

Source: Euronext.liffe.

At the end of the review period, the profile for sterling interest rates (derived from instruments that settle on Libor) implied a forward rate of around 4.6% for the end of 2005 (Chart 3). This was suggestive of some expectation of a 25 basis point reduction in the policy rate during 2005 H2, but many market contacts and economists continued to expect official rates to remain unchanged through 2005.

In line with the fall in near-term nominal interest rates, two-year real spot rates (derived using survey data of inflation expectations) have fallen slightly since the previous *Bulletin* (Chart 4).

As well as a slightly lower central expectation for the path of sterling interest rates, information from options prices suggested that the perceived risks to near-term sterling interest rates had moved to the downside, having been broadly balanced around the time of the previous *Bulletin* (Chart 5). Over the same period, uncertainty

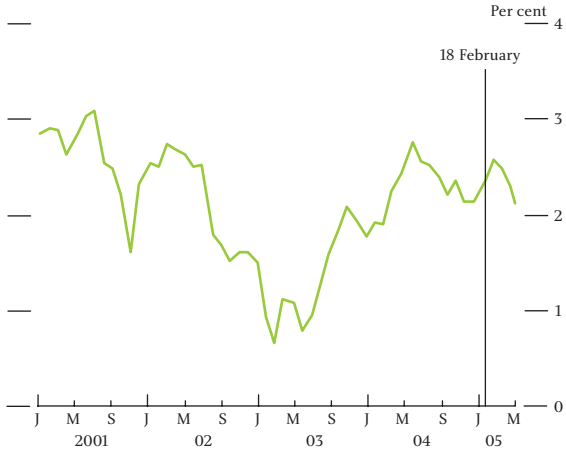
### Chart 3
### Sterling official and forward market interest rates




Sources: Bank of England, Bloomberg and Euronext.liffe.

(a) Two-week nominal forward rates implied by a curve fitted to a combination of instruments that settle on Libor (continuously compounded).
(b) Two-week nominal forward rates implied by GC repo/gilt curve (continuously compounded).

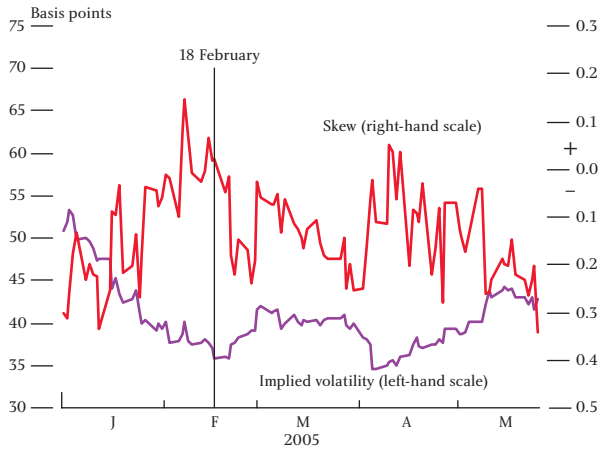
### Chart 4
### Indicative two-year real spot rates(a)(b)




Sources: Consensus Economics and Bank of England calculations.

(a) Two-year nominal spot rates (from Bank's government liability yield curve) less Consensus inflation expectations. Real rates shown are indicative: any inflation risk premia present in nominal spot rates will not be removed by subtracting a survey-based inflation expectation.
(b) Inflation expectations refer to RPIX.

### Chart 5
### Six-month implied volatility and skew from sterling interest rate options




Sources: Bank of England and Euronext.liffe.

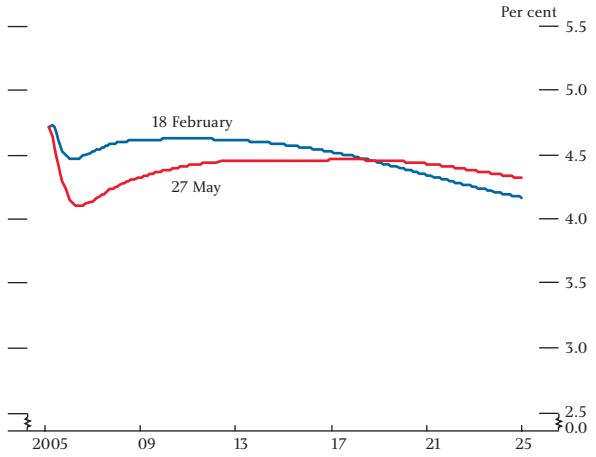
surrounding market participants' expectations for short-term rates, as measured by implied volatilities from options prices, rose slightly. However, implied volatilities on sterling interest rate options have remained low by historical standards, which in part might reflect structural developments in these markets (see box on pages 130–31).

## Long-term interest rates

At maturities up to around 14 years ahead, sterling nominal forward rates fell, though there was a slight increase at very long horizons.

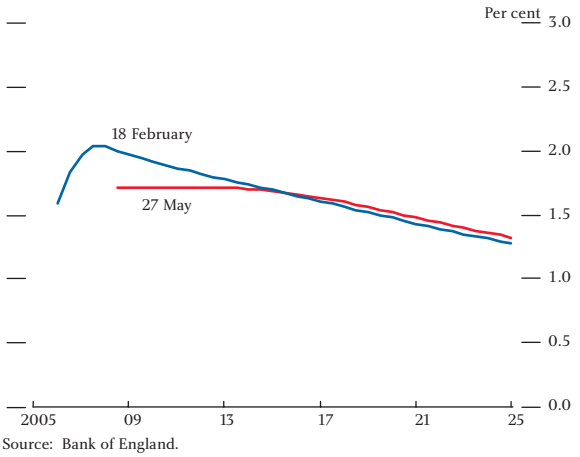
A broadly similar pattern was observed in real forward rates derived from index-linked gilts — they fell at maturities up to around ten years and rose slightly at longer horizons (Chart 7). At short-to-medium horizons (up to around five years) the falls in real forwards were consistent with a downward revision to the expected path of monetary policy. Beyond the ten-year horizon, real forwards remained close to the historically low levels discussed in the previous *Bulletin*.

**Chart 6**
**Sterling nominal forward rates**




Source: Bank of England.

**Chart 7**
**Sterling real forward rates**




Source: Bank of England.

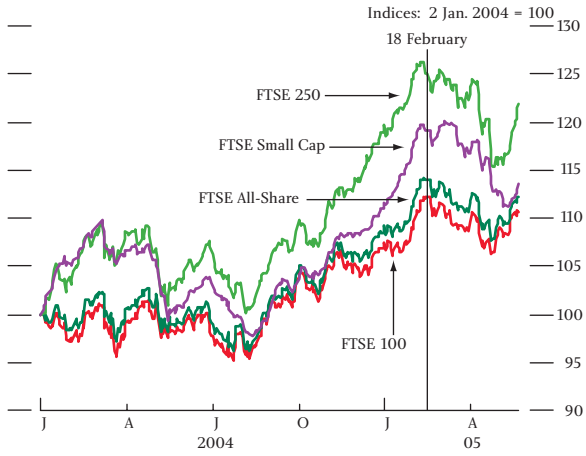
Yields on index-linked gilts may reflect more than just expected future short-term real interest rates. Investors may demand a risk premium to compensate them for uncertainty about future short-term real interest rates. In addition, changes in bond supply and demand can affect yields and move forward rates temporarily away from expectations of future short-term rates.

It is difficult to assess and quantify the relative importance of these influences on gilt prices. The box on pages 132–33 takes a statistical approach to evaluate the relative contribution of different factors in affecting gilt returns over the past two decades. The results of this method suggest that only a relatively small proportion of unexpected index-linked gilt returns in the past can be attributed to changes in expectations about future risk-free real rates — other factors, such as changes in risk premia, seem to have been more important.

## Equity markets

Other things being equal, lower real interest rates might be associated with higher equity prices. But UK equity indices fell over the period (Chart 8); the FTSE All-Share decreased by 1.7%. Despite these falls, most UK equity indices remained higher than at the start of the year, and the FTSE All-Share was 13.2% higher than at the time of the Summer 2004 *Bulletin*.

**Chart 8**
**Domestic equity indices**




Source: Bloomberg.

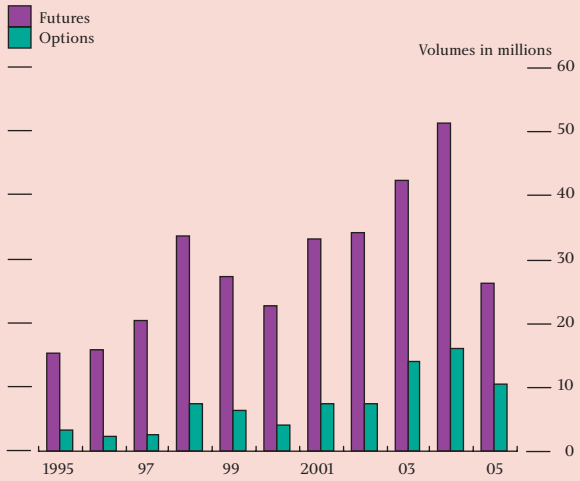
In principle, equity prices should reflect the discounted value of expected future corporate earnings streams. Against the background of lower real interest rates, and assuming no change in equity risk premia, this suggests that the fall in equity prices might have reflected a

# Structural developments in sterling volatility markets

## Short-term interest rate volatility

Trading volumes in sterling short-term interest rate (STIR) futures have grown rapidly in recent years. In 2000, around 22.5 million contracts were traded. By 2004, this had risen to 51 million or around £25 trillion in notional value terms. This trend seems to have continued in 2005 (Chart A).

**Chart A**
**Volumes traded on LIFFE of short sterling interest rate derivatives**(a)




Source: Euronext.liffe.

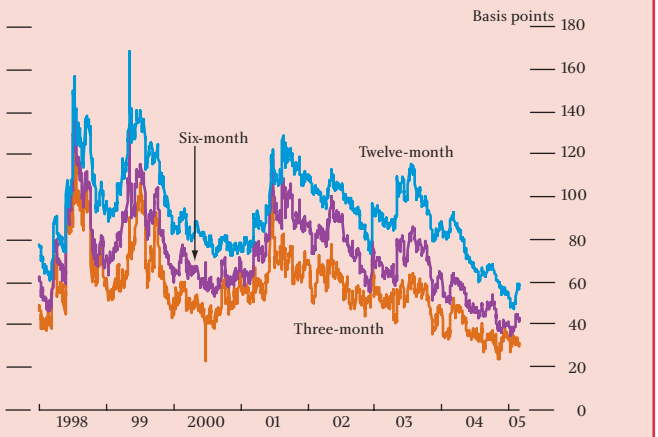
(a) 2005 figures are to the end of May.

Volumes in exchange-traded sterling STIR options have also increased, from just over 4 million contracts in 2000 to 16 million in 2004 or £8 trillion in notional value. According to market contacts, trading in over-the-counter STIR options has also increased in recent years.

Market contacts have suggested that much of the recent increase in sterling STIR futures and options volumes has been due to an increase in participation by hedge funds. In part, the rise in hedge fund activity may be linked to a decline in implied volatility in the sterling STIR option market (Chart B). Traders may have increased the size of their positions in order to maintain targeted returns in a less volatile market.

At the same time, increased hedge fund participation and greater market liquidity might have reduced the premia investors must pay for interest rate protection via options. This could have reinforced the falls in implied volatility.

**Chart B**
**Short sterling implied volatility**




Source: Bank of England.

## Longer-term interest rate volatility

Implied volatility of long-maturity sterling interest rates has also drifted down over recent years (Chart C). In the past, the implied volatility of long-dated interest rates derived from swaptions prices was typically higher in sterling than in euro. More recently, this differential has narrowed.

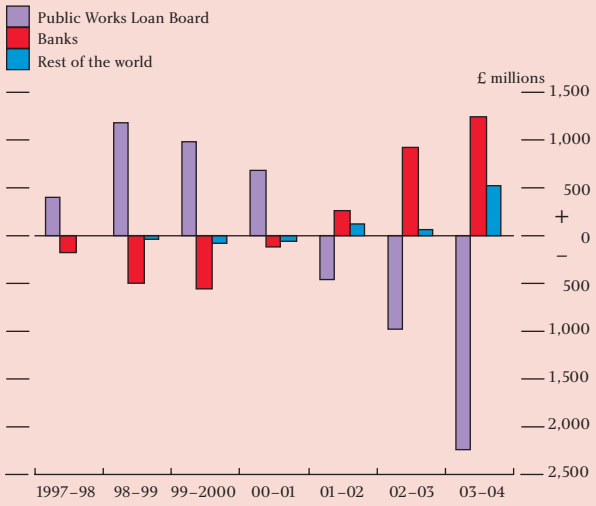
In principle, the decline in sterling interest rate volatility may have been associated with an increase in the perceived credibility of the United Kingdom's monetary regime. An increase in credibility should reduce uncertainty about long-term inflation rates, which in turn should lead to lower uncertainty surrounding long-term nominal interest rates. However, it is difficult to find reasons why policy credibility would have increased over the past year and so this is unlikely to account for the most recent fall in long-dated sterling volatility that began in mid-2004.

Another possible explanation for the fall in sterling interest rate volatility could be related to

**Chart C**
**Sterling and euro one-year into twenty-year swaption implied volatility**


Source: JPMorgan Chase and Co.

**Chart D**
**Net changes in outstanding local authority long-term borrowing from various sources**




Sources: ODPM borrowing and lending inquiries; Public Works Loan Board.

the hedging of guaranteed annuity liabilities by UK life insurance companies. Guaranteed annuities offered investors a certain return on their annuity investments, but also gave them the option to buy annuities at prevailing market rates, if market rates were higher than the guaranteed rates. When market annuity rates fell in the 1990s, the option to take the guaranteed rate became more valuable to investors, and the insurers who had sold them needed to hedge their positions. One way of hedging guaranteed annuity liabilities has been by buying long-dated interest rate protection via swaptions. But many insurance companies are reputed to have completed much of the hedging of these liabilities, resulting in lower demand for swaptions. In turn, this could have reduced volatility implied from swaption prices.

A third explanation, offered by some market contacts, is that the recent fall in long-dated sterling implied volatility may have reflected banks hedging loans to local authorities, in particular instruments known as lender's option, borrower's option (LOBO) loans.

LOBOs are a form of long-term (for example, 30 years) bank debt to UK local authorities. Traditionally, local authorities have sought funding from the Public Works Loan Board (PWLB). But Chart D shows that in recent years the amount of long-term borrowing sourced from the PWLB has declined while alternative sources have become more popular. Though not all of these borrowings will be in the form of LOBOs, financial statements from local authorities indicate that they have remained popular recently.

The typical LOBO structure offers the borrower a long-term loan at a fixed rate that is normally below market rates at the time the loan is agreed. After an initial period, the lender has the option to reset the interest rate. But if the lender chooses to reset the rate, the borrower has the option to repay the loan.

Lenders can realise the value of the option to reset the rate by selling sterling swaptions — although they remain exposed to some risk that the terms of the swaptions do not mirror exactly those of the embedded option in the LOBO. Contacts say that the resulting increased supply of long-dated swaptions from this activity may have been one factor pushing down on long-dated sterling volatility.

## What factors affect UK government bond returns?

Over any given period, the expected return on a conventional (ie nominal) gilt incorporates market views about future risk-free real interest rates and inflation. In addition, the expected return may include risk premia to compensate investors for uncertainty about future real rates and inflation, which in turn are likely to be related to uncertainty about future macroeconomic conditions. The risk premia may also reflect other factors, such as the potential illiquidity of the bond.

During the life of the bond, new information may cause investors to revise their interest rate and inflation expectations and/or the required risk premium. Other factors, such as changes in regulation, may also influence supply and demand in bond markets at particular times. Gilt prices react to all of these developments, with the result that bond holders can realise (positive or negative) 'unexpected' returns.

Risk premia and expectations of inflation and risk-free interest rates are not directly observable. But using the approach first taken by Campbell and Ammer (CA) (1993),(1) it may be possible to model the expectations-formation process of bond market investors using a statistical forecasting model. Specifically, CA use a vector autoregression (VAR) model, which assumes that the information with which bond investors form expectations for the future can be adequately proxied by a small set of key financial variables.(2) Differences between forecasts made by the model and subsequent outturns can be used to calculate unexpected returns ($\tilde{x}$). Then, using the CA framework, these unexpected returns can be decomposed into revisions to expectations of future risk-free real rates, ($\tilde{r}$), and revisions to expectations of future inflation, ($\tilde{\pi}$), leaving a residual term that captures changes in required risk premia and/or other market factors, ($\tilde{\rho}$). That is:

$$\tilde{x} \equiv \tilde{r} + \tilde{\pi} + \tilde{\rho}$$

CA show that the relative importance of each component can be assessed by decomposing the variance of unexpected returns. More specifically:

$$Var(\tilde{x}) \equiv Var(\tilde{r}) + Var(\tilde{\pi}) + Var(\tilde{\rho}) + 2Cov(\tilde{r}, \tilde{\pi}) + 2Cov(\tilde{r}, \tilde{\rho}) + 2Cov(\tilde{\pi}, \tilde{\rho})$$

The model was estimated using monthly data between May 1982 and March 2005, and also over two subsamples — before and after 1997 — in order to study the possible effect of the granting of operational independence to the Bank of England.(3)

Table A shows the share of the variance of unexpected returns on conventional gilts accounted for by the variance of expected inflation, real rates and risk premia/other market factors, and the covariances between them, for each of the stated periods.

The variance decomposition suggests that expectations of future inflation have been the dominant factor in driving unexpected conventional gilt returns over the entire sample. But the contribution of inflation has declined in recent years, perhaps reflecting a more stable inflationary environment. Since 1997, the

(1) 'What moves the stock and bond markets? A variance decomposition for long-term asset returns', *Journal of Finance*, Vol. 48, No. 1, pages 3–37.
(2) The model used in this box includes four variables that are needed to implement the CA methodology: the one-month real interest rate (the one-month nominal interest rate less RPI inflation); the change in the one-month nominal interest rate; the ten-year, one-month nominal yield curve slope; and the excess return on ten-year index-linked bonds. In addition, the model includes two forecasting variables as additional sources of information: the three-month, one-month nominal yield curve slope; and the relative bill rate (the one-month rate less its average over the past year), which helps to capture some of the longer-run changes in interest rates.
(3) The model is estimated using a generalised method of moments (GMM) technique to jointly determine the VAR coefficients and the covariance matrix of the residuals. The GMM method provides heteroscedasticity-consistent estimates of the covariance matrix.

**Table A**
**Variance decomposition of 'unexpected' returns: conventional gilts**(a)(b)(c)

| Share of $Var(\tilde{x})$ attributable to: | 1982–2005 | 1982–97 | 1997–2005 |
|---|---|---|---|
| $Var(\tilde{r})$ | 0.04 | 0.04 | 0.05 |
| | (0.03) | (0.04) | (0.05) |
| $Var(\tilde{\pi})$ | 0.99 | 1.12 | 0.53 |
| | (0.31) | (0.4) | (0.30) |
| $Var(\tilde{\rho})$ | 0.07 | 0.10 | 0.14 |
| | (0.16) | (0.25) | (0.06) |
| $2Cov(\tilde{r}, \tilde{\pi})$ | -0.02 | 0.01 | -0.17 |
| | (0.12) | (0.15) | (0.22) |
| $2Cov(\tilde{r}, \tilde{\rho})$ | -0.09 | -0.11 | 0.00 |
| | (0.12) | (0.16) | (0.12) |
| $2Cov(\tilde{\pi}, \tilde{\rho})$ | 0.02 | -0.16 | 0.45 |
| | (0.40) | (0.59) | (0.23) |

(a) Heteroscedasticity-consistent standard errors shown in parentheses.
(b) Reported variances and covariances are scaled by the variance of unexpected conventional gilt returns so that the columns sum to one.
(c) Rows may not sum to one due to rounding.

**Table B**
**Variance decomposition of 'unexpected' returns: index-linked gilts**(a)(b)(c)

| Share of $Var(\tilde{x})$ attributable to: | 1982–2005 | 1982–97 | 1997–2005 |
|---|---|---|---|
| $Var(\tilde{r})$ | 0.12 | 0.13 | 0.09 |
| | (0.10) | (0.13) | (0.10) |
| $Var(\tilde{\pi})$ | 0.01 | 0.02 | 0.00 |
| | (0.12) | (0.01) | (0.00) |
| $Var(\tilde{\rho})$ | 0.98 | 0.97 | 1.08 |
| | (0.12) | (0.15) | (0.15) |
| $2Cov(\tilde{r}, \tilde{\pi})$ | 0.00 | 0.00 | -0.02 |
| | (0.03) | (0.04) | (0.02) |
| $2Cov(\tilde{r}, \tilde{\rho})$ | -0.18 | -0.18 | -0.24 |
| | (0.20) | (0.25) | (0.24) |
| $2Cov(\tilde{\pi}, \tilde{\rho})$ | 0.07 | 0.07 | 0.08 |
| | (0.03) | (0.04) | (0.04) |

(a) Heteroscedasticity-consistent standard errors shown in parentheses.
(b) Reported variances and covariances are scaled by the variance of unexpected index-linked gilt returns so that the columns sum to one.
(c) Rows may not sum to one due to rounding.

variance of revisions to inflation expectations has accounted for only around half of the variance of unexpected nominal bond returns. In addition, revisions to expected inflation have been positively correlated with changes in required risk premia and/or market factors since 1997. This suggests that if investors have been revising down inflation expectations post-1997, they might also have revised downwards the required risk premia, possibly because they expected inflation and/or macroeconomic conditions to be less variable than in the past.

Table B shows the results of a similar decomposition exercise for unexpected returns on index-linked gilts. In this case, the effect of changes in inflation expectations on index-linked bonds has been very small. This is unsurprising, since the only inflation exposure in these bonds arises from an eight-month lag in indexation.(4)

Perhaps more interesting is that, according to the model, changes in expected risk-free real rates account for only a small share of the variance of unexpected returns for both conventional and index-linked bonds. This is in line with the findings of a similar study by Barr and Pesaran (1997),(5) who suggest that while the real interest rate may vary in the short run, investors expect it to revert to some normal level over the life of a ten-year bond.

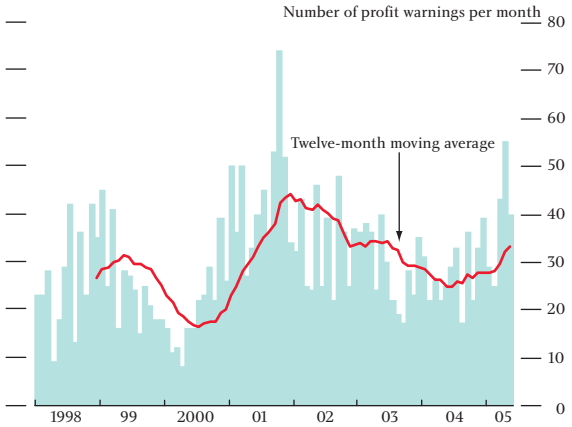
In contrast to the results for conventional bonds, changes in risk premia and/or market factors are by far the most important influence on unexpected index-linked gilt returns.

At face value, the results in Table B suggest that past unexpected variations in UK index-linked gilt returns have tended to be driven more by news about future risk premia and/or market factors than news about real risk-free rates and inflation. However, the decomposition results for both conventional and index-linked gilts are subject to important caveats. Most important, if the VAR models do not fully capture expectations of future inflation or real rates, the contribution of risk premia and/or other factors will be overstated. More generally, the results of the decomposition depend heavily on the way the models are set up and estimated.

(4) In the United Kingdom, interest payments and the principal repayment depend on the level of RPI around eight months before the payment is made. (See the box 'Inflation-protected bonds and swaps' in the Markets and operations article, *Bank of England Quarterly Bulletin*, Summer 2004, page 125.)
(5) 'An assessment of the relative importance of real interest rates, inflation and term premiums in determining the prices of real and nominal UK bonds', *The Review of Economics and Statistics*, Vol. 79, No. 3, pages 362–66.

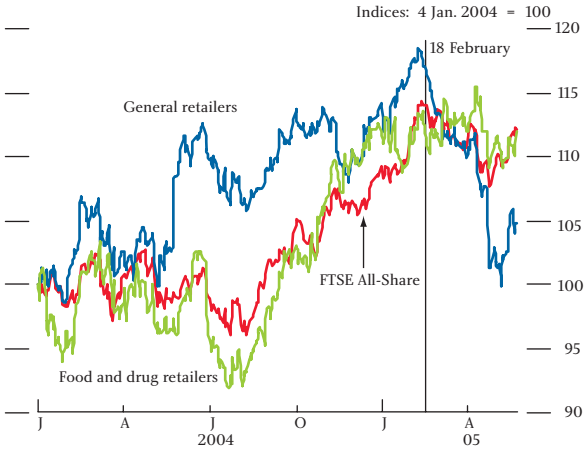
weaker outlook for expected future earnings. Although IBES long-term earnings forecasts were little changed over the period, UK profit warnings reached a three and a half year high in April (Chart 9). Within the total, profit warnings by retailers were particularly significant, and most likely reflected the slowdown in UK high street spending. Up to the end of the review period, 34 companies within the 'general retail' sector of the FTSE All-Share index had issued profit warnings in 2005; companies in the same sector had issued only 25 profit warnings during the whole of 2004. The 'general retailers' sector equity index fell by around 10% over the period (Chart 10).

## Chart 9
## Profit warnings issued by UK firms




Source: Bank of England.

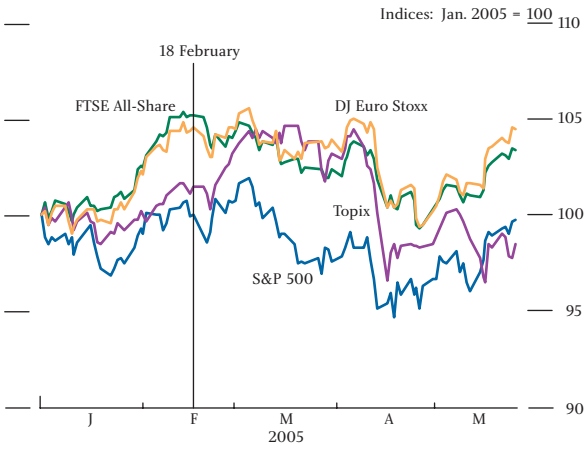
## Chart 10
## UK retail sector and FTSE All-Share equity indices




Sources: Bloomberg and Bank calculations.

The fall in UK equity prices occurred against a backdrop of slightly weaker international equities. Stock markets in the United States, Japan and Europe all fell during the first half of the period (Chart 11). This international weakness could have been associated with concerns about global activity. However, with the publication of some stronger data later in the review period, especially in the United States, equity markets in a number of countries have recovered somewhat.

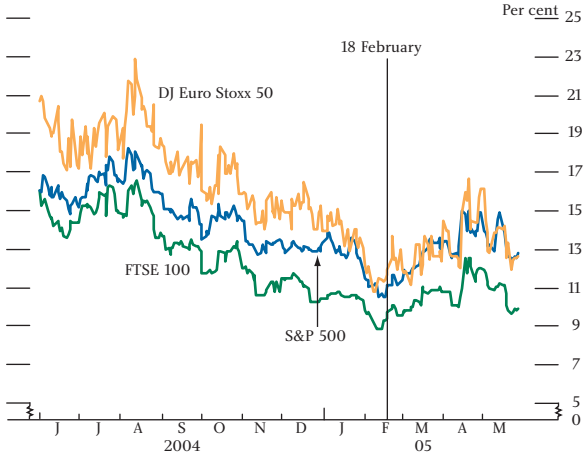
## Chart 11
## International equity indices




Source: Bank of England.

The fall in equity prices over the period might alternatively be related to an increase in risk premia. Information from options suggests that implied volatility rose sharply during March and April (Chart 12), although it fell towards the end of the period. The initial rise in implied volatility could have reflected a general increase in uncertainty about the global macroeconomic outlook following the release of weak activity data. There was also a significant widening of spreads in credit markets over the period (Chart 13). In part, this reflected concerns about some companies in the global auto sector — for example the debt securities of General Motors and Ford were downgraded during the period. This company-specific news may also have triggered some reassessment of investors' appetite for risk across asset markets.(1)

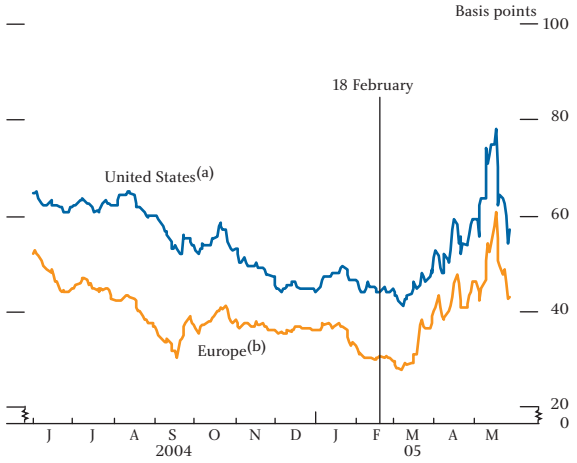
## Chart 12
## Six-month implied equity volatility




Sources: Bank of England, CME, Eurex and Euronext.liffe.

(1) This issue is discussed in more depth in 'Risks in the international financial system', Chapter 2 of the Bank of England's forthcoming *Financial Stability Review* (June 2005).

**Chart 13**
**Credit default swap index spreads**



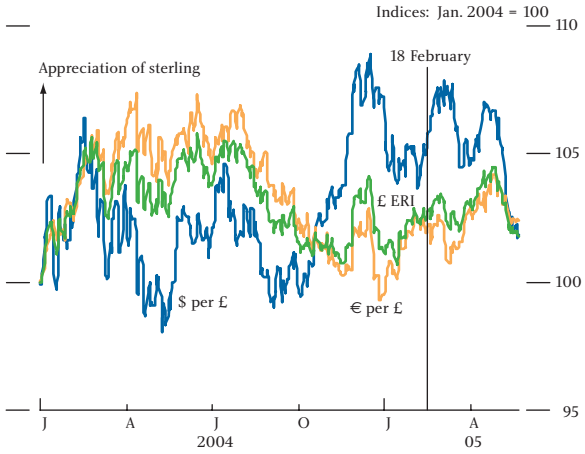

Source: JPMorgan Chase and Co.

(a) Five-year on-the-run DJ.CDX.NA.IG.
(b) Five-year on-the-run DJ iTraxx Europe.

## Exchange rates

The sterling exchange rate index (ERI) rose in the first two months of the review period to reach a level around 1.7% higher than at the time of the February *Bulletin*. But the sterling ERI fell in May to end the period 0.9% lower and close to its level at the turn of the year.(1) Comparing movements over a longer window, the sterling ERI has remained in a relatively narrow range (Chart 14).

**Chart 14**
**Sterling exchange rates**




Source: Bank of England.

The recent depreciation in sterling was most significant against the US dollar — the sterling/US dollar exchange rate was 3.7% lower than at the time of the previous *Bulletin*. Some of this fall could have reflected relative movements in international interest rates with sterling interest rates falling relative to US dollar rates.

## Developments in market structure

### Issuance of new UK 50-year gilt

On 26 May 2005, the United Kingdom's Debt Management Office issued an 'ultra-long' gilt. The bond, which matures in 2055 and has a coupon of 4.25%, was the first 50-year gilt issued since 1960. It provides a new instrument that UK pension funds and life insurers can use to match better the duration of their assets to their liabilities. According to market commentators, they were the biggest category of investors in the new gilt. The auction of £2.5 billion was covered 1.6 times.

## Changes in the Bank of England balance sheet

The size of the sterling components of the Bank's balance sheet increased in line with trend growth in banknotes in circulation and fluctuated with seasonal and weekly variation in demand for banknotes (Table B). The stock of lending via open market operations (OMOs) increased slightly over the quarter (Chart 15).

Gilt purchases were made in accordance with the published screen announcements; £16 million of 5% 2014 in February, £31.4 million of 4¾% 2010 in March, £31.4 million of 5% 2012 in April, and £31.4 million of 5% 2014 in May. A screen announcement on 1 June 2005 detailed the purchases to be made over the following three months.

The sterling value of the foreign currency components of the Bank's balance sheet rose over the review period, in line with the slight depreciation of sterling. On 15 March 2005, the Bank auctioned €1,000 million of the 2008 note as part of its euro-denominated notes programme; as mentioned in the previous *Bulletin*, the first €1,000 million tranche had been auctioned on 18 January 2005. Cover in the auction of the second tranche was 2.1 times and the average accepted yield was 2.723%, approximately 9.7 basis points below the euro swaps curve. This was the second and final auction of the 2008 note and increased its outstanding value in the market to €2 billion. The total nominal value of Bank euro notes outstanding in the market rose to €6 billion.

(1) On 11 April 2005, the Bank of England released a new sterling effective exchange rate index. For more details of the new ERI see Lynch, B and Whitaker, S (2004), 'The new sterling ERI', *Bank of England Quarterly Bulletin*, Winter, pages 429–41.

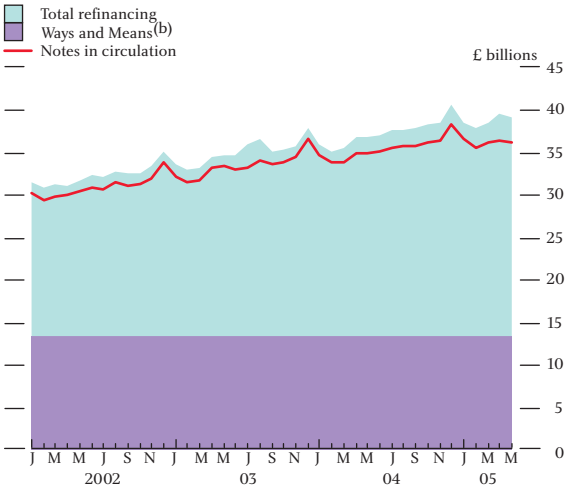
## Table B
## Simplified version of Bank of England consolidated[a] balance sheet[b]

£ billions

| Liabilities | 27 May | 18 Feb. | Assets | 27 May | 18 Feb. |
|---|---|---|---|---|---|
| Bank note issue | 39 | 38 | Stock of refinancing | 28 | 27 |
| Settlement bank balances | <0.1 | <0.1 | Ways and Means advance | 13 | 13 |
| Other sterling deposits, cash ratio deposits and the Bank of England's capital and reserves | 9 | 8 | Other sterling-denominated assets | 4 | 3 |
| Foreign currency denominated liabilities | 15 | 13 | Foreign currency denominated assets | 18 | 15 |
| **Total**[c] | **63** | **59** | **Total**[c] | **63** | **59** |

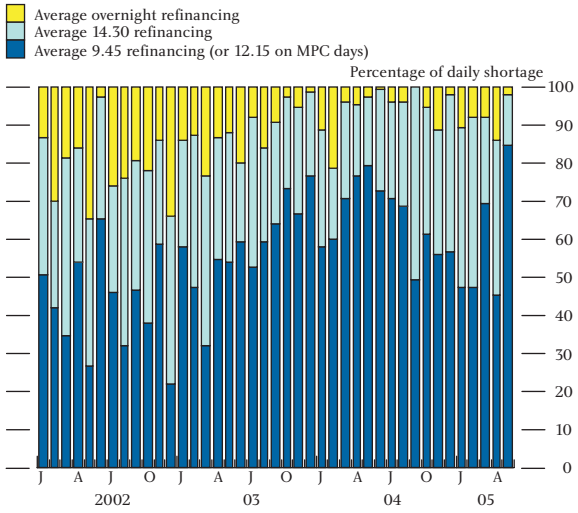
(a) For accounting purposes the Bank of England's balance sheet is divided into two accounting entities: Issue Department and Banking Department. See 'Components of the Bank of England's balance sheet' (2003), *Bank of England Quarterly Bulletin*, Spring, page 18.
(b) Based on published weekly Bank Returns. 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 2003 *Annual Report*, pages 53 and 73–79 for a description.
(c) Figures may not sum to totals due to rounding.

## Chart 15
## Bank notes in circulation, the stock of OMO refinancing, and 'Ways and Means'[a]



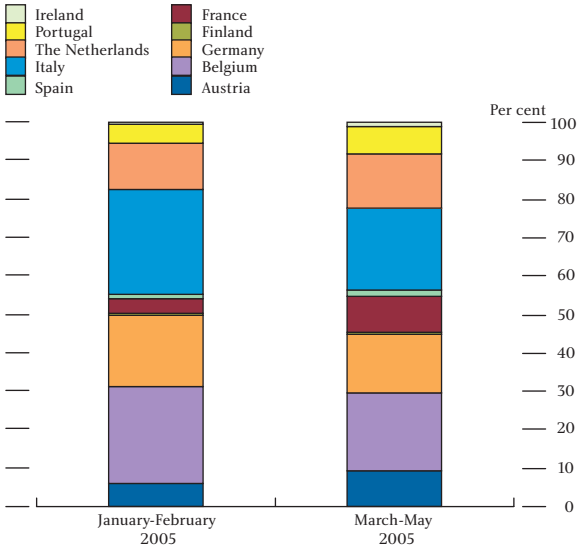

(a) Monthly averages.
(b) An illiquid advance to HM Government. This fluctuated prior to the transfer of responsibility for UK central government cash management to the UK Debt Management Office in April 2000. The Ways and Means is now usually constant.

## Chart 16
## Refinancing provided in the Bank's open market operations[a]




(a) Monthly averages.

## Chart 17
## Percentage of euro collateral taken in the Bank's open market operations provided by each issuing government




The Bank maintained the value of its three and six-month euro-denominated bills outstanding at €3.6 billion, issuing new bills on a monthly basis as old bills matured. The average indicative spread to Euribor of three-month issuance narrowed slightly to 10.0 basis points below Euribor, compared with 10.2 basis points over the previous review period; for six-month bills, the average issuance spread widened slightly to 10.7 basis points below Euribor, from 10.6 basis points.

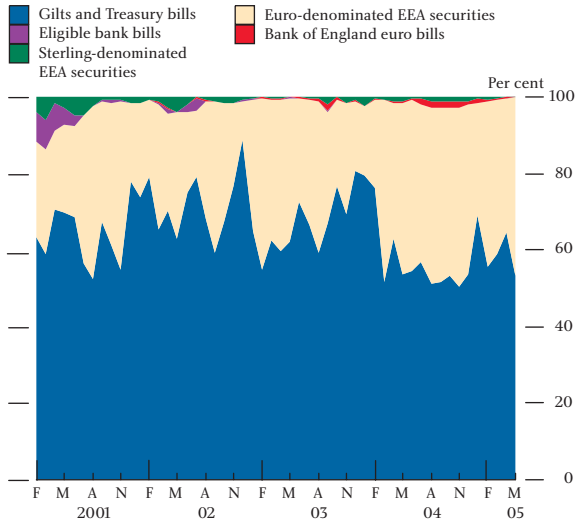
In the Bank's daily OMOs in the sterling money markets, the majority of financing continued to be provided at the Bank's official rate (at a two-week maturity) in the 9.45 and 14.30 rounds, although there was a slight increase in the amount being provided in the overnight facilities. Financing in the overnight facilities was at 25 basis points above the repo rate following the introduction of interim reforms to the Bank's operations in the sterling money market (see box on page 139) (Chart 16).

Concentration limits on the amount of collateral from a single issuer (excluding HM Government and the Bank of England) that a participant can hold with the Bank at

any one time took effect on 1 March 2005.[1] This has resulted in some change in the composition of euro collateral taken in operations and a more even distribution of collateral across issuers (Chart 17).

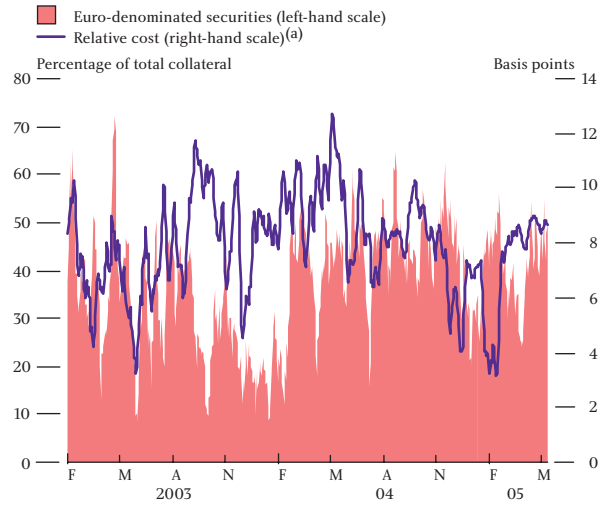
On average, use of euro-denominated collateral by counterparties participating in the Bank's OMOs increased slightly over the latest quarter (Chart 18), in line with a fall in its cost relative to gilt collateral (Chart 19).

## Chart 18
## Instruments used as OMO collateral(a)




(a) Monthly averages.

## Chart 19
## Relative cost and use in OMOs of euro-denominated EEA government securities

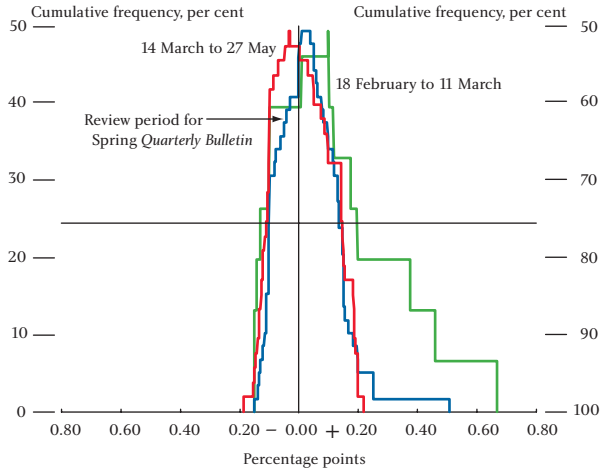



(a) Relative cost calculated as the difference between one-month BBA repo and Libor fixing spread and one-month European Banking Federation repo and Euribor spread. A wider spread indicates a lower cost of repoing euro-denominated debt relative to repoing gilts.

## Short-dated interest rates

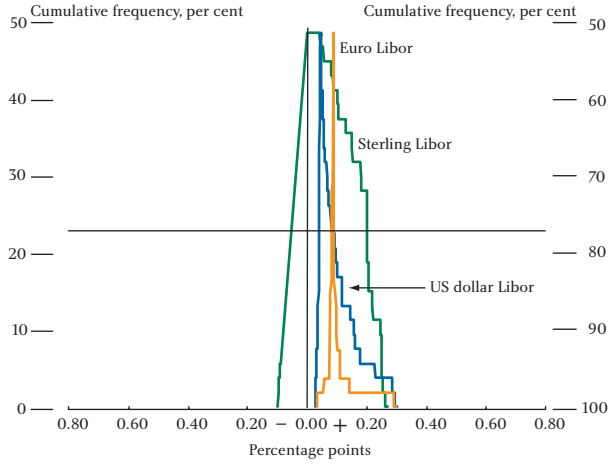
Chart 20 shows that the distribution of the spread between the sterling secured (gilt GC repo) overnight rate and the official Bank repo rate peaked at 0.67 percentage points during the review period. But the distribution narrowed following the introduction of the interim reforms, reflecting the reduction in rates on the Bank's overnight facilities to 25 basis points above the Bank's official rate.

## Chart 20
## Cumulative folded distribution of sterling secured overnight rates(a)




(a) Distribution of the spread between the GC repo rate and the MPC's repo rate. A negative spread indicates that the market rate is less than the official rate; if more than 50% of the spread distribution is below zero, it has a negative bias.

## Chart 21
## Cumulative folded distribution of international unsecured overnight rates since 14 March(a)



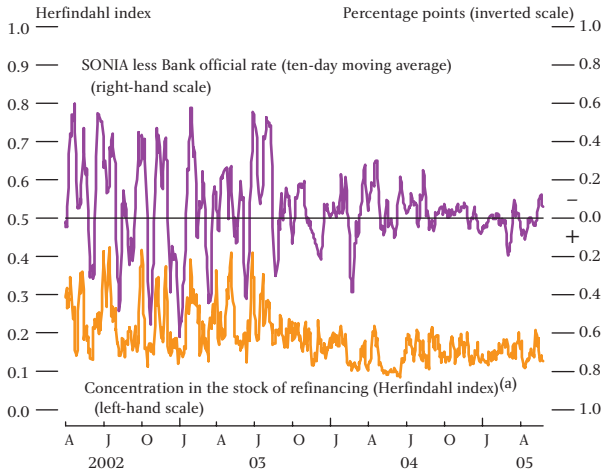

(a) Distribution of the spread between the Libor rate and the official policy rate. A negative spread indicates that the market rate is less than the official rate; if more than 50% of the spread distribution is below zero, it has a negative bias.

(1) The amendments to the Operational Notice that governs OMOs, which were published in November 2004 (and described in the Winter 2004 *Quarterly Bulletin*), took effect on 1 March 2005.

The 'narrower' corridor between the overnight lending and deposit facilities may also have contributed to the greater symmetry in the distribution of spreads between unsecured overnight (Libor) and the Bank's official rate. But the spread between unsecured sterling overnight rates and the Bank's official rate remained more variable than the comparable spread in US dollar and euro (Chart 21).

Over a longer period, the average spread of the sterling overnight indexed average rate (SONIA) below the Bank's official rate has decreased (Chart 22). This may have encouraged wider participation in Bank OMOs, as evidenced by a decrease in the concentration in the stock of refinancing.

## Chart 22
## SONIA relative to the Bank official rate and concentration in the stock of OMO refinancing




Source: Bank of England.

(a) The Herfindahl index is calculated by squaring the share of refinancing held by each counterparty and then summing the resulting numbers. An index of one implies a single counterparty accounted for the entire stock of refinancing ie high concentration. As the index approaches zero, concentration falls.

## Forecasting the liquidity shortage

The accuracy of the Bank's liquidity forecast remained broadly similar to previous quarters (Table C).

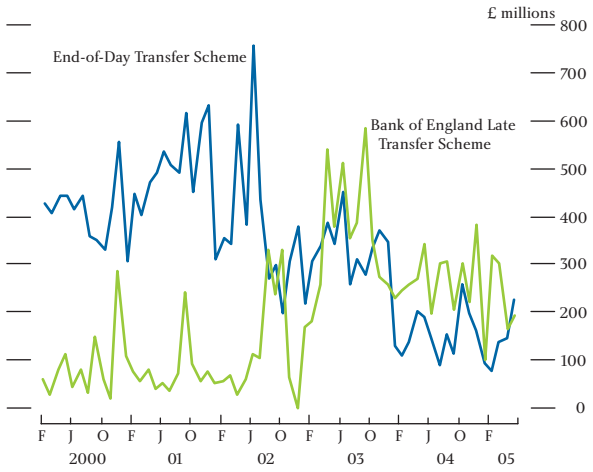
## Table C
## Intraday forecasts versus actual liquidity shortages

Mean absolute difference (standard deviation), £ millions

| | 9.45 forecast | 14.30 forecast | 16.20 forecast |
|---|---|---|---|
| 2002 | 83 (107) | 43 (79) | 30 (73) |
| 2003 | 101 (123) | 61 (96) | 51 (85) |
| 2004 Q1 | 120 (108) | 79 (77) | 55 (43) |
| 2004 Q2 | 115 (123) | 58 (78) | 61 (74) |
| 2004 Q3 | 89 (69) | 62 (44) | 52 (32) |
| 2004 Q4 | 107 (114) | 74 (86) | 55 (63) |
| 2005 Q1 | 117 (121) | 87 (101) | 63 (77) |
| April-May 2005 | 124 (94) | 56 (68) | 50 (66) |

Average payments in the Bank of England Late Transfer Scheme (BELTS) for settlement banks decreased over the period, but there was a small rise in the End-of-Day Transfer Scheme (EoDTS) flows, from a low level in February (Chart 23). The volatility of daily flows rose in both the EoDTS and the BELTS, suggesting settlement banks continued to experience large but infrequent variability in their end-of-day positions.

## Chart 23
## Bank of England Late Transfer Scheme and End-of-Day Transfer Scheme(a)



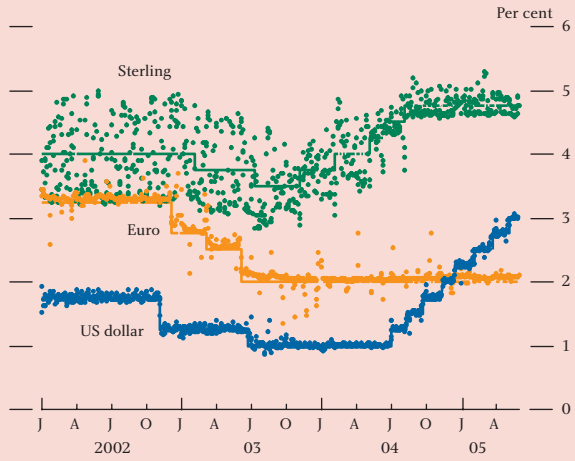

(a) Monthly averages.

## Money market developments since interim reform to the Bank's OMOs

As described in the Spring 2005 *Bulletin*, the Bank announced, in February, a package of interim measures with the aim of stabilising overnight interest rates further ahead of the launch of the Bank's fully reformed framework for operations in the sterling money markets. The measures, which took effect on 14 March, were as follows:

- narrowing the interest rate 'corridor' formed by the Bank's current overnight lending and deposit facilities to +/- 25 basis points from +/- 100 basis points;
- indexing the rate charged on the two-week reverse repos undertaken as part of the Bank's daily open market operations to the Bank's official rate;
- no longer purchasing bills outright in the Bank's open market operations; and
- ceasing to accept newly issued bankers' acceptances as eligible collateral.

**Chart A**
**Overnight interest rates and policy rates**

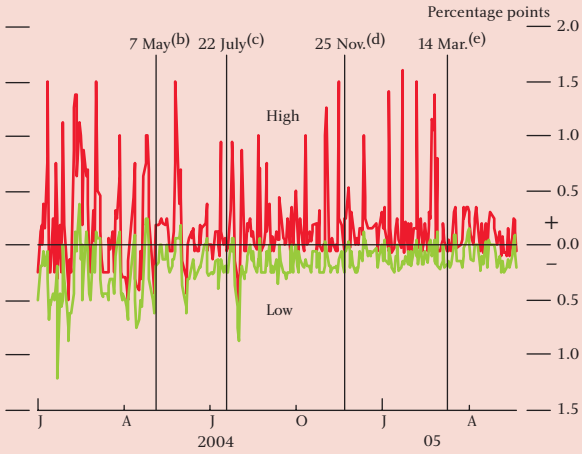



The indexing provisions have not yet been tested by an actual or expected change in the official interest rate. But since the reforms, interest rates out to the next MPC meeting have been more stable around the official rate. The volatility of SONIA(1) has fallen (Chart A). Between 14 March and 27 May, the standard deviation of daily changes in SONIA was 13 basis points, compared with 27 basis points in the six weeks prior to interim reform.

The average spread between the highest and lowest sterling overnight market interest rate traded each day has narrowed, and peaks in the overnight rate have been lower (Chart B). Since 14 March 2005, the average spread between the daily high and low has been 20 basis points, compared with 34 basis points for the period from 25 November 2004 to 11 March 2005.

These changes are a welcome step towards the stability that full-scale reform is designed to produce.

**Chart B**
**Volatility of the sterling overnight interest rate(a)**




(a) High and low of the day observed by the Bank's dealing desk as a spread to the policy rate.
(b) On 7 May 2004, the Bank published a consultative paper on the reform of its operations in the sterling money markets.
(c) On 22 July 2004, the Bank announced the results of the review of its official operations in the sterling money markets.
(d) On 25 November 2004, the Bank published a second consultative paper on the reform of its operations in the sterling money markets.
(e) On 14 March 2005, the Bank implemented interim reforms to its operations in the sterling money markets.

(1) The Sterling Overnight Index Average is an average of the rates on sterling unsecured overnight cash transactions brokered in London, weighted by the size of trade (minimum size £25 million).

# The impact of government spending on demand pressure

**By Bob Hills and Ryland Thomas of the Bank's Structural Economic Analysis Division and Tony Yates of the Bank's Monetary Assessment and Strategy Division.**

*When assessing the outlook for inflation, the growth of real GDP is commonly used as an indicator of changes in current demand pressures. But as GDP includes the output of the government sector, this approach can in some circumstances be misleading. Government output is not necessarily an informative guide to the impact of government spending on the balance of demand and supply pressures in the marketed sector of the economy. Instead, it may be more informative to consider the quantity of resources that the government absorbs — that is, how much private sector output it buys and how much labour it hires — rather than the quantity of output it produces.*

## Introduction

In the National Accounts, gross domestic product (GDP) includes the output of both the private sector and the government. When assessing the outlook for inflation, the growth of real GDP is commonly used as an indicator of changes in current demand pressures. But this can give a misleading impression of the impact of the government sector.

There are well-documented difficulties of accurately measuring the government output component of real GDP, which was the subject of a recent review led by Sir Tony Atkinson (2005). But even if government output were measured perfectly, GDP would not necessarily provide a useful guide to inflationary pressures in the economy. That is because, as this article explains, the government's demand for inputs (consisting of private sector goods and services and labour) tends to be a better indicator of the impact of the public sector on inflation than the outputs that the government produces (eg health and education services). So a different measure of aggregate activity may be a more informative indicator of inflationary pressures than GDP.(1)

The structure of the article is as follows. First, we discuss how the government's demand for private sector resources can have an impact on inflationary pressure. Within this, we briefly consider the measurement of government output and productivity in the National Accounts, and explore the channels by which government output might in theory influence the inflation outlook. Second, we consider the implications for macroeconomic analysis. We look at what this means for the role of government output and GDP in macroeconomic models. We then look at alternative methods of constructing measures of aggregate activity, which may be more informative about the outlook for inflation than those based on GDP.

## The role of government spending in the determination of inflation

The prices that make up the consumer prices index (CPI) basket and other price indices are almost entirely set by private sector firms. So the prospects for CPI inflation are likely to depend on the balance of demand and supply pressures exerted within the marketed sector of the economy. The output of this sector is produced almost entirely by private sector employees, working for private sector firms, largely using private sector capital. In the rest of this article we will refer to this concept loosely as 'private sector' output. But perhaps a more precise description would be 'marketed' or 'business sector' output.(2)

There are two main channels by which government behaviour has an effect on activity and prices in the marketed sector. First, the government purchases output directly from the private sector (typically called 'procurement'). Second, the government's demand for labour competes with the demand for labour from

(1) For an earlier discussion of this issue, see Bank of England (2004).
(2) For example, some elements of the private sector, such as charities, produce non-marketed services. Similarly, in practice, the government sector does produce some output that can be interpreted as 'marketed' (eg the provision of sports facilities or passports, on which revenue is earned).

private sector firms, and so will affect wage costs in the private sector.(1)

So it is the government's demand for *inputs* (eg purchases of schoolbooks and employment of teachers) that is of primary relevance for CPI inflation, rather than the output those inputs are used to produce (eg education services). The government's demand for inputs adds directly to the demand for private sector output, and absorbs scarce resources (in the form of labour inputs) that could have been used to produce private sector output. In doing so it affects the balance of demand and supply of marketed output in the economy as a whole. By contrast, under assumptions that we discuss below, it is not clear that how much *output* the government actually produces, given its purchases of inputs (ie how productive the government is), is directly relevant for private sector activity or firms' pricing decisions in the short to medium term.

This raises the issue of whether GDP is the most informative guide to demand pressures in the economy. GDP includes the government's output. In the current System of National Accounts,(2) the government sector is assumed to consume all of the non-marketed output it produces (which is typically provided free at the point of delivery to citizens). This consumption is treated as a component of final demand in GDP — called 'General Government final consumption'. So, in principle at least, the volume of real government consumption is estimated by measuring the volume of government outputs provided free at the point of delivery to the private sector, rather than by the real inputs the government uses.

As a result, GDP may not always be the best indicator of demand pressures in the marketed sector of the economy. This does not imply that including government output in ONS-measured GDP is in any sense 'wrong' — simply that it is aiming to capture a different concept. As discussed in detail in Atkinson (2005), several purposes are served by measures of national income, and no single number can serve all of these purposes.(3) In particular, GDP is often used as a broad measure of welfare, and it is clear that the contribution of the government's output should be reflected in such a measure. In a later section, we discuss an alternative indicator of aggregate activity that better reflects the two components of the government's demand for resources than does GDP.

So the issue here is not one of measurement: even if government output were perfectly measured, it may not necessarily provide an appropriate guide to the impact of government spending on demand pressures in the economy. It is worth noting in passing, though, that measuring the volume of government output is not a straightforward task; the box on page 142 discusses some of the recent developments in this area.

To make clear the distinction between the role of government inputs and outputs in determining demand pressures, and why movements in GDP can be a misleading guide, it may be helpful to look at an example. Take a situation in which the National Health Service becomes more efficient, such that more operations are performed, to the same quality, for a given number of doctors and nurses employed, and surgical instruments and other equipment bought from the private sector. The ONS would (rightly) measure this as increased real government consumption and GDP. This might, in the first instance, appear to be an increase in the volume of resources being consumed in the economy. But we know there is no extra demand pressure on the marketed sector of the economy, because the health service is not acquiring any more private sector goods and services, or hiring any more labour to produce this extra output.

Contrast this with the case where the increase in operations is largely the result of more procurement from the private sector (eg an increase in hospital equipment). Again GDP would increase, reflecting the increase in private sector output. But in this case the impact of the rise in procurement spending is likely to be more similar to that of an increase in private consumption expenditure. The resulting increase in private sector output is likely to require an increase in factor inputs hired by the private sector and, depending on the monetary policy response, may lead to higher wage costs and prices.

There are, of course, some channels through which changes in government output and productivity might potentially have an impact on the balance between demand and supply in the marketed sector. We consider

(1) This assumes that the two labour markets are not completely segmented, so that some workers could in principle work in either sector.
(2) See United Nations (1993). For alternative proposals of how to treat government consumption in the National Accounts, see for instance: Nordhaus and Tobin (1972), Horz and Reich (1982), Eisner (1988) or Bournay (2002).
(3) Hicks (1940) makes the same point: 'There may be more than one money value of the social income, each corresponding to a different purpose of calculation'. Of the many papers since that have discussed the different purposes to which National Accounts data can be used, see in particular: Okun (1971), Nordhaus and Tobin (1972), Weitzman (1976), Mamalakis (1996), and Asheim and Weitzman (2001).

## Measuring government output in the United Kingdom: recent developments

In the United Kingdom, the ONS — which is at the forefront of international best practice in this area — currently measures about two thirds of government output by directly estimating the change in the volume of services provided. For instance, health output is partly measured by counting the number of patient consultations in the NHS, and education output partly by counting the number of pupils taught. An associated implied price can then be imputed by dividing nominal spending by this estimated volume of output.(1)

The outputs of the government sector are particularly difficult to measure accurately. The *Atkinson Review* was set up to consider these problems, and produced its final report in January 2005 (Atkinson (2005)). A particular problem is allowing adequately for quality improvements. For instance, if the NHS spends money improving the clinical effect of an operation, the measured output (one operation) would not change. The Department of Health has in fact commissioned research from the University of York and the National Institute for Economic and Social Research into developing measures of clinical outcomes. Under the current system, though, to the extent that resources are put into improving the quality as well as the quantity of public services, we might expect that the level and growth of measured government outputs are biased downwards.

The remaining one third of real government consumption is assumed to grow at the same rate as the real value of the inputs used to produce it. This is used mainly for services such as defence, which are consumed collectively, and for which the benefits are particularly difficult to quantify.

The problem of measuring the government's output may have been particularly important in recent years. An indicator of this is that since 1997 Q1, nominal government consumption — current spending on labour and procurement for services such as education, health, defence, law and order and local government, which comprises about a fifth of GDP — has risen by 71%. Over the same period, the ONS measure of real government consumption has risen by just 23%. So the implied price deflator has risen by 39%; by contrast, the CPI has risen by just 11% over that period, and the GDP deflator (which includes the government consumption deflator) has risen by only 20% (see Charts A and B).

In fact, this difference is now somewhat less acute than it was prior to the revisions in the *Blue Book* 2004. The ONS has been developing more sophisticated measures of government output, as part of the *Atkinson Review*. One result of this work was that a new measure of health output was introduced in the June 2004 *Blue Book*. The new measure (see Pritchard (2004)) includes services that were excluded from the old one, such as NHS Direct and Walk-in Centres. It also involves looking at output data in more detail — the new measure distinguishes between 1,700 different activity types, compared with 16 types covered in the old one. The new measure raised the growth rate of health output in most years since 1996, and added about 0.5 percentage points a year to the growth of real government consumption since 1999, but did not affect nominal consumption. So the difference between real and nominal government consumption growth is now considerably less marked. But real government consumption is still not fully adjusted for quality, so it would be reasonable to conclude that its growth is still somewhat understated. The ONS continues to develop new measures to address this issue.

**Chart A**
**Nominal and real government consumption**

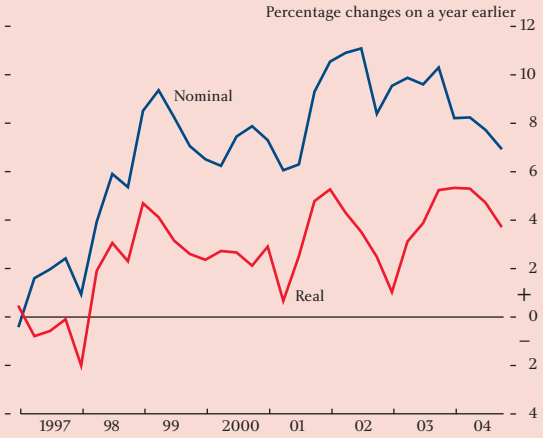
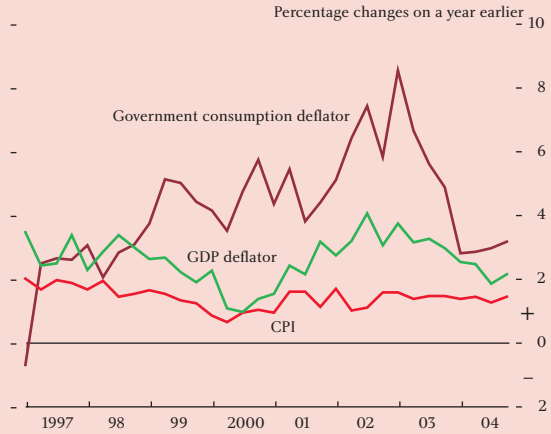



**Chart B**
**Comparative deflators**




(1) See Pritchard (2003) for detailed explanation of current ONS practice.

two of these channels below, and an appendix provides a technical discussion. The issue is whether these effects are likely to be sufficiently large to have a material impact on demand and supply within the usual timescale for monetary policy making of two to three years.

### (i) Effect of public consumption on private consumption

If government outputs affect private consumption decisions, then they could matter for overall demand pressure. An obvious example, at a disaggregated level of spending, is that households might respond to increased government provision of healthcare by reducing their own spending on private healthcare.(1) But, the key issue for analysing inflationary pressures is whether an increase in government output has an effect on *aggregate* private consumption and saving behaviour. For instance, even if households responded to the government's increased provision of public healthcare by decreasing their consumption of private health services, they may increase their consumption of other consumer goods, with little impact on aggregate private consumer spending.

Whether government output and private consumption are complements or substitutes will determine the response of private consumption to an increase in government output. And whether the increase is permanent or temporary will also matter. Naturally the strength of any effect is an empirical question. Unfortunately, the evidence is somewhat inconclusive, but the effects found so far are relatively small.(2) So it seems a reasonable central assumption that this effect is not material, at least over the 2–3 year period relevant for monetary policy.

### (ii) Effect of public capital or output on private productivity

Government capital often raises private sector productivity.(3) If the government did not provide transport infrastructure, for instance, the returns to private capital would decrease enormously. The same also applies to certain other kinds of government output — for instance, education increases human capital and the provision of health services leads to healthier, more productive workers.(4)

The issue from the point of view of monetary policy, though, is quite a narrow one: do movements in public capital materially affect potential private supply within a 2–3 year forecast horizon? It is reasonable to conclude that they do not over this time period, although they may well do so over a longer period.

One key reason for this is that the proportionate change in public capital is likely to be relatively small over a 2–3 year horizon. Even a large increase in government investment (say 10% per annum) would tend to have a relatively small impact (of around 1%) on the public sector capital stock over a 2–3 year period. So even if public sector capital were a perfect substitute for private capital, the implied proportionate increase in the total capital stock available to the private sector would be small (around 0.25%).

The basic insight from the discussion above is that inflationary pressures depend on the government's demand for inputs of private sector output and labour, rather than its output of services. In the rest of the article, we describe how this insight can inform the ways in which we should analyse the economy, and how we can construct more useful indicators of aggregate demand pressure than those based on GDP.

## Implications for macroeconomic analysis

Most standard macroeconomic models are based on profit-maximising behaviour by private sector firms, which are assumed to sell their goods and services in (imperfectly) competitive markets at market-determined prices. As noted earlier, this suggests that the measure of demand relevant to firms is a measure of the volume of expenditure on 'marketed' or 'business sector' output rather than GDP. This implies combining both private sector and government expenditure on private sector goods and services and then removing imports from overseas to get expenditure on the 'value added' of the domestic private sector:(5)

(1) If, as in this example, an increase in government output lowers the marginal utility of private consumption, then the two are said to be 'substitutes'. If, instead, it increases the marginal utility of private consumption, the two are said to be 'complements'. In either case, the two are said to be 'non-separable' in utility. See the Appendix for an example of a utility function that embodies this non-separability, and how this affects private sector behaviour in a simple model of the economy.
(2) In particular there is no consensus as to whether aggregate private and government consumption (or indeed their subcomponents) are substitutes or complements. And in most cases the estimate of the elasticity of substitution between the two aggregates is quite small. See for instance Aschauer (1985), Graham (1993), Karras (1994), Ni (1995), Kuehlwein (1998), Bouakez and Rebei (2003), Cardia, Kozhaya and Ruge-Murcia (2003), or Okubo (2003).
(3) For a survey of the literature in this area, see Gramlich (1994), Sturm *et al* (1998), Seitz (2001) or IMF (2004, Appendix 1).
(4) See the Appendix for an example of how this works in a simple model of the economy.
(5) In practice this aggregate should be constructed by weighting the different components of demand together using chain-linking techniques, but we use an additive description here for simplicity of exposition. Also the aggregate should be adjusted for indirect taxes (net of subsidies) on products. Note also that government procurement includes imported goods and services.

$$Y_p = C + I + P + X - M$$

where $Y_p$ is expenditure on private sector output, $C$ is private consumption spending, $I$ is total (ie private and public) investment spending,(1) $P$ is real government procurement of private (consumption) goods and services, $X$ is real spending on exports and $M$ is real expenditure on imports.

We can compare this with the equivalent relationship for GDP:

$$GDP = C + I + G + X - M$$

where $G$ is real total government final consumption spending. As noted earlier, $G$ represents the government's real consumption of its own non-market output of goods and services.

The difference between the government's final consumption spending, $G$, and the government's procurement of private goods and services, $P$, is implicitly the government's output in 'value added' terms ($Y_g$). The government's value added is essentially the quantity of government output after accounting for the contribution of inputs of private sector goods and services used in their production. So the difference between GDP and private sector output is the exclusion of the government's value added output from GDP.

$$GDP - Y_p = G - P = Y_g$$

As noted earlier, there is an additional channel through which government spending affects private sector prices. The government's labour demand competes with the private sector for scarce labour resources, and so affects private sector pricing behaviour via the supply side, through its impact on private sector wages and costs. For example, in a simple model of the labour market where there is a supply of labour $L_s$, then wages must move to ensure that the aggregate demand and supply for labour are consistent:

$$L_p + L_g = L_s$$

where $L_g$ is the government's labour demand and $L_p$ is the private sector's labour demand (which will depend on the level of private sector output $Y_p$). An increase in government employment will use resources that otherwise could be used to produce private sector goods and services, and this is likely to imply higher wage costs for private sector firms. Provided the private and public sector labour markets are not entirely segmented, and labour can move between sectors, then in general the government's demand for labour is likely to influence private sector wages.

So macroeconomic analysis should try to capture two key channels via which government spending can affect the demand for private sector output and prices:

(i) The 'direct' effect resulting from the government's procurement of private sector goods and services.

(ii) The 'indirect' effect resulting from the government's purchases of factor inputs (largely labour) which affects private sector prices largely through the impact on private sector (wage) costs.

This can be done straightforwardly in a macroeconomic model by making private sector production the underlying concept of output on the supply side and articulating the government's role in the labour market. The box on page 145 discusses the details of how this is implemented in the Bank's quarterly forecasting model BEQM. Other macroeconomic models also articulate these channels, though to varying degrees.(2)

More generally, we may want to analyse inflationary pressures in the economy without the use of an explicit model. The analysis above suggests the use of a broader set of activity indicators. In particular, the two important indicators identified above are: private sector output — because this directly reflects the demand pressures on the marketed sector of the economy and ultimately pins down its demand for labour — and government employment which, together with the private sector's demand for labour, affects the overall tightness of the labour market. How difficult is it to construct or obtain these indicators in practice?

Estimates of private sector output can be estimated from both the output and expenditure sides of the National Accounts. For example, on the output side of the accounts, we can aggregate together all of the industry components of GDP, except for those that can be

(1) Note this includes government purchases of capital goods from the private sector.
(2) See Pain and Westaway (1996) and Finn (1998) for examples which make these distinctions clear.

## The role of government output in the Bank of England's Quarterly Model (BEQM)

The treatment of government demand in the Bank's Quarterly Model (BEQM) largely follows the description in this article.(1) The determination of inflation in BEQM is based on the production and pricing of private goods and services. So rather than using the ONS estimates of GDP, the primary concept of output in the model is a measure of private sector output, which excludes the government's value-added.(2) The measure of private sector output in BEQM also excludes actual and imputed rentals on dwellings as this type of output is assumed not to require (non-housing) capital and labour inputs to produce. So the relationship between GDP and BEQM's measure of private sector output is given by:

$$GDP = Y_p + Y_g + Y_{rents}$$

where $Y_p$ is private sector value-added, $Y_g$ is government value-added and $Y_{rents}$ is the consumption of actual and imputed rentals on dwellings. On the supply side, BEQM uses a constant elasticity of substitution production function to relate private sector output to private sector inputs of labour and capital.

In the labour market, the government is assumed to compete with the private sector for scarce labour resources, and so affects private sector pricing behaviour through its impact on private sector wages. In BEQM, private sector wages are determined by a wage-bargaining process. The government affects this in two ways. First, its labour demand affects the number of unemployed workers, which influences the nature of the private sector wage bargain and hence the pressure on wages. Second, the government wage affects the options of private sector workers. So a higher government wage means private sector workers may push for higher wages, because the alternative of working in the government sector is more rewarding than it was. The government's labour demand and wage in BEQM are determined in a relatively straightforward way. Its demand for labour depends on a simple rule governing the government's wage bill. And there is a simple mark-up relationship between private and public sector wages, although for most shocks this mark-up is usually assumed to stay constant so that public and private sector wages are assumed to move together.

(1) The exact approach that we have taken is described in more detail in Harrison *et al* (2005).
(2) Although private sector output is the main activity variable used in the production of the MPC's inflation forecast, the *Inflation Report* includes a forecast for GDP rather than private sector output. This is because GDP is a more familiar concept and allows greater comparability with external forecasters.

attributed to the government sector. From the expenditure side, an estimate of private sector output requires data on government procurement in nominal terms. And to construct a chained volume measure, an estimate of the deflator for government procurement is required. An important issue here for the construction of either measure is how the government and the private sector are defined. For example, should public corporations or non-profit institutions such as charities and universities be included in the definition of the government sector? The Bank of England has recently undertaken a joint project with the ONS to develop a measure of output for the marketed or business sector of the economy. So far, the project has developed some preliminary estimates based on the output side of the accounts. This measure is described in detail on the ONS website.(1) The project will also examine whether a consistent estimate of marketed output can be derived from the expenditure side of the National Accounts.

For public sector employment, the ONS has recently published estimates on a quarterly basis, although at present these are only available up to 2004 Q1.(2) These estimates are based on a survey of government departments and other public sector institutions. Estimates of government sector employment can also be derived from the Labour Force Survey (LFS) of households. But these estimates may be less precise to the extent that respondents may not know or misreport in which sector they are working. The workforce jobs (WFJ) survey can also be used to

(1) www.statistics.gov.uk/cci/article.asp?ID=1171.
(2) See Hicks and Lindsay (2005).

## Constructing an alternative indicator of aggregate demand

There are a number of issues to deal with when constructing an aggregate demand indicator that captures the pressure on resources arising from government spending. In particular, how do we combine the government's procurement of private sector output and the government's demand for labour to construct a measure of the government's total demand for resources? The two components are measured in different units, so it would not be meaningful simply to add them together. One way we can convert them into the same units is to work out how many private sector goods the government's labour force could have produced, if they had instead worked in the private sector. This is done by multiplying the number of workers employed by the government by a measure of private sector labour productivity. This gives a measure of the 'opportunity cost' of workers employed by the government, in terms of private output foregone. So the government's total demand for resources (*GDFR*), in terms of private sector output units, can be expressed as:

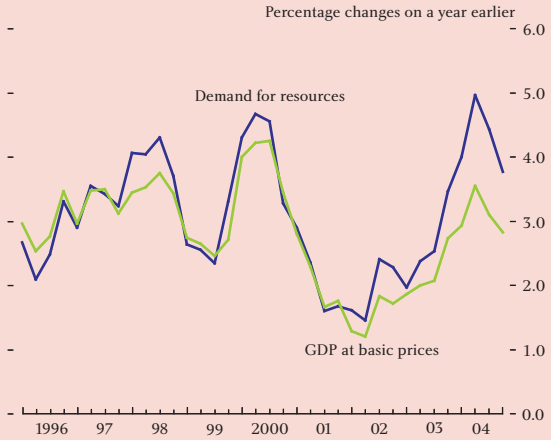
*GDFR* = *Real volume of procurement of private sector goods and services*
*+ Opportunity cost of government employment*

The private sector's demand for resources, expressed in the same units, is simply the sum[1] of the private sector expenditure components. So the aggregate demand for resources (*DFR*) in the economy as a whole is given by:

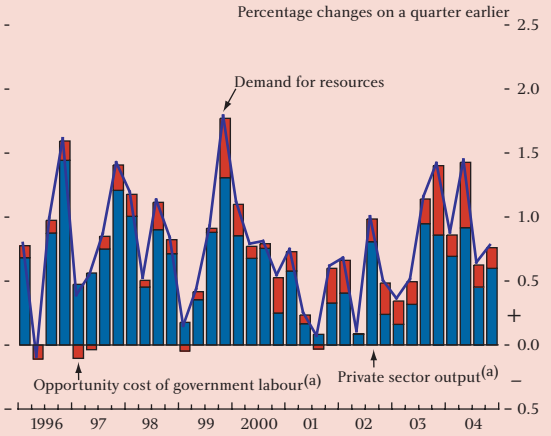
*DFR* = *Total private and government expenditure on private sector output* ($Y_p$)
*+ Opportunity cost of government employment*

There are clearly a large number of issues in developing such a 'demand for resources' measure in practice. In particular, when estimating the opportunity cost of government labour we could make a number of assumptions about government workers' hypothetical productivity in the private sector. We could simply assume they would have exactly the same average productivity as a private sector worker. But public sector workers typically work shorter hours than private sector workers. So should we assume that government employees work private sector hours or the average hours they currently work in the public sector, when estimating the opportunity cost? In addition, labour productivity depends critically on the capital-labour ratio. Should we assume that the public sector workers work at the existing private sector capital-labour ratio, or at the government's, or at some other ratio? There are no 'right' answers to questions such as these. The main lesson is that we should not read too much into small differences between different estimates.
In Chart A we show an estimate of the growth rate of the aggregate demand for resources, along with the volume of GDP as estimated by the ONS. Chart B shows the contribution to the growth of the demand for resources by private sector output and the opportunity cost of government labour. To construct the opportunity cost of government labour we have taken the recently published ONS estimates of government employment up to 2004 Q1 and then extended those data to 2004 Q4 using figures from the LFS survey. We have then multiplied this series by average private sector output per head, using the measure of marketed or business sector output derived from the output side of the National Accounts discussed earlier. Those estimates suggest that the ONS measure of real GDP has recently been growing more slowly than the demand for resources (implied by the growth in private sector output and the opportunity cost of the government's labour). Although the measurement issues discussed above mean that this is not in any sense a definitive measure of the demand for resources, it nevertheless gives a rough idea of the extent of the differences between the two measures of demand.

### Chart A
### Different aggregate activity measures




### Chart B
### Contributions to demand for resources growth




(a) Percentage point contributions to the growth of the demand for resources.

(1) Strictly the chain-weighted aggregate rather than the sum.

estimate employment in the public sector dominated industries.

Clearly we can look at these indicators separately along with a wide variety of other indicators of demand pressures in the economy, as is currently done in the Bank's *Inflation Report*. But it may also be useful to create an aggregate demand indicator that combines the demand for private sector output and the government's labour demand in a consistent way, and which reflects the two sectors' aggregate demand for resources in the economy. This would then allow a comparison with GDP and estimate how far we might be wrong by using GDP as an indicator of aggregate demand pressures. The box on page 146 discusses such an estimate and shows that recent GDP growth may have significantly understated changes in demand pressure in the recent past.

## Conclusion

This article has shown that published GDP may not be the most appropriate guide to demand pressures in the economy because it includes the output of the government. It is more important to consider the quantity of resources the government absorbs and how that affects the ability of the private sector to meet the demand for its goods and services. This has important implications for the macroeconomic models and corroborative indicators that are used to analyse inflationary pressures in the economy.

## Appendix

Here we explore formally the interaction between private sector output and government output and productivity using a simple model. We first derive expressions for private sector output under the following conditions: that government output is valued non-separably from private consumption; and that government output affects private sector productivity. We contrast this with a situation when government output is valued separably from private consumption; and private sector productivity is unaffected by government output.

Consumers maximise a utility function $U$, in which they gain utility from private consumption $(c)$, services provided by government to consumers $(g_c)$ and leisure $(h)$. In addition, the increment to utility from an additional unit of private consumption is dependent on the level of government output.

$$U = \ln(c + \phi g_c) + \theta \ln g_c + \ln h \qquad \textbf{(1)}$$

They maximise utility subject to a standard time constraint and budget constraint, where $l$ is hours spent labouring; the number of hours in the day has been normalised to 1; $w$ is the wage rate; and $\tau$ is a lump-sum tax levied by the government.

$$1 = l + h \qquad \textbf{(2)}$$

$$c = l.w - \tau \qquad \textbf{(3)}$$

Consumers maximise utility by choosing the hours that they work given the constraints, the wages they face, and taxes. Substituting the constraints into the utility function, we get:

$$U = \ln(l.w - \tau + \phi g_c) + \theta \ln g_c + \ln(1 - l) \qquad \textbf{(4)}$$

We can write the consumers' first-order condition:

$$w(1 - l) = c + \phi g_c \qquad \textbf{(5)}$$

This is the labour supply curve in this model. We assume that we can aggregate up labour supply curves of individuals to get an aggregate labour supply curve. Consumers, once they decide how much to work $(l)$, work some part of $l$ in the public sector $(l_g)$ and some part in the private sector $(l_p)$, the division being chosen to clear markets. So the time constraint is actually:

$$1 = h + l_p + l_g \qquad \textbf{(6)}$$

Firms are perfectly competitive and maximise profits:

$$\pi = y - w.l_p \qquad \textbf{(7)}$$

Where $\pi$ is profits, $y$ is the revenue from selling output, and $l_p$ is the amount of labour employed by private sector firms. They maximise profits subject to a constant returns to scale production function, in which government capital $g_k$ is assumed to contribute to firms' productive capacity:

$$y = A_p g_k^a l_p \quad \textbf{(8)}$$

Firms' labour demand comes from their first-order condition, which we get by substituting the production constraint **(8)** into the profit function **(7)**, and differentiating with respect to $l_p$. Thus:

$$w = A_p g_k^a \quad \textbf{(9)}$$

Or, in words, wages equal the marginal product of labour. Rearranging the production function **(8)**, private sector labour demand will be:

$$l_p = \frac{y}{A_p g_k^a} \quad \textbf{(10)}$$

The government runs a balanced budget, choosing a level of tax revenues $\tau$, taking the wage rate $w$ as given, and spending all of its taxes on wages:

$$\tau = w.l_g \quad \textbf{(11)}$$

The government produces output $g$ using a linear technology:

$$g = A_g l_g \quad \textbf{(12)}$$

It then divides up $g$ into a portion handed directly to consumers as services $(g_c)$ and a portion given to firms as capital $(g_k)$.

$$g \equiv g_c + g_k \equiv \psi g + (1 - \psi) g \quad \textbf{(13)}$$

Substituting the expression for the wage rate from **(9)** into the government's budget constraint **(11)** gives an expression for the government's labour demand:

$$l_g = \frac{\tau}{A_p g_k^{\alpha}} \quad \textbf{(14)}$$

Adding together the expressions for private **(10)** and public **(14)** labour demand, we get an expression for aggregate labour demand:

$$\frac{y}{A_p g_k^a} + \frac{\tau}{A_p g_k^a} \quad \textbf{(15)}$$

To derive an expression for equilibrium output, we equate total labour demand to labour supply (combining equations **(5)**, **(9)** and **(15)**), and equate the demand and supply for goods *(y = c)*. The expression that results is:

$$y = \frac{1}{2}\left[ A_p g_k^a - \tau - \phi g_c \right] \qquad \textbf{(16)}$$

This tells us that output and consumption rises if government capital rises (since it increases firms' capacity). By contrast, if the government increases taxes, then private output and consumption both fall. The effect of an increase in government services $g_c$ depends on the sign of its coefficient $\phi$: if $\phi$ is positive, then an increase in government services decreases the marginal utility of private consumption (ie the two are substitutes), decreasing private output and consumption; and *vice versa*.

We can explain this more formally by writing down an equation **(17)** that shows how the marginal utility of private consumption varies with the quantity of government services provided. This is obtained by differentiating the utility function **(1)** first with respect to *c* and then with respect to $g_c$. This shows that, if $\phi$ is positive, then an increase in government services decreases the marginal utility of private consumption, and *vice versa*.

$$U_{cg} = \frac{-\phi}{(c + \phi g_c)^2} \qquad \textbf{(17)}$$

We turn to derive output under our contrasting set of assumptions. These are: that the marginal utility of private consumption is unaffected by the level of government output, so $\phi = 0$ in equation **(4)**; and that government capital is unproductive, so $\alpha = 0$ in equation **(8)**. In this case, our expression for output is:

$$y = \frac{A_p - \tau}{2} \qquad \textbf{(18)}$$

This tells us that output and consumption rises if private sector productivity rises, and falls if the government increases taxes. But it is unaffected by the level of government output or government productivity.

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# How important is housing market activity for durables spending?

**By Andrew Benito and Rob Wood of the Bank's Structural Economic Analysis Division.**

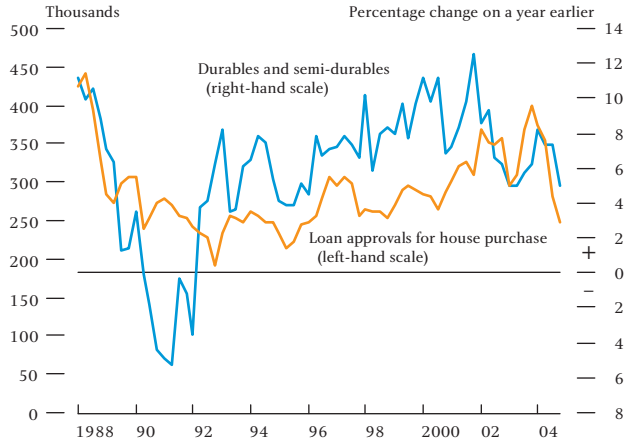
*The links between the housing market and consumer spending have been the source of much debate. In this article we examine the evidence for a link between housing transactions and consumer spending, which could exist if households were more likely to purchase some goods and services when they move home. Using survey data from the British Household Panel Survey we find that households are two to three times more likely to purchase certain durable goods when they move home. But those households that move home are a small proportion of all households: so in aggregate a change in housing transactions seems likely to have only a moderate impact on durables spending. Estimates of the extent of the overall effect are, however, subject to considerable uncertainty. Furthermore, any such link can only affect spending in the short run and cannot influence consumer spending in the medium term.*

## Introduction

The link between house prices and spending is less straightforward than is often supposed. While higher house prices benefit households that are intending to trade down or sell a second home, they disadvantage first-time buyers and those households trading up.(1) But there are two other ways in which the housing market can potentially influence household spending. First, higher house prices can enable more, or cheaper, borrowing by raising the collateral at households' disposal. That might provide a short-run boost to spending. Second, a rise in housing transactions might directly boost spending in the short run if households are more likely to purchase certain goods and services when they move home. It is this second potential link that we explore in this article.

There are a number of reasons why a rise in housing transactions might bolster spending, at least in the short run. Households might prefer certain durables, such as a fridge, freezer or washing machine, to match their new home. Alternatively, moving home could be a good time to make durables purchases. Chart 1 suggests that housing transactions have been positively correlated with the growth of expenditure on durable and semi-durable goods since 1988.(2)(3)

**Chart 1**
**Durables expenditure and housing market transactions**




Sources: Bank of England and ONS.

Very little work has been published on the importance of these transactions-related effects.(4) We aim to help fill that gap in this article. Analysis of this missing link is also particularly timely because the recent slowing in consumption growth has largely been accounted for by declines in the growth of expenditure

(1) See 'House prices and consumer spending' box in the November 2004 *Inflation Report* and pages 15–16 of the May 2005 *Inflation Report*.
(2) Durable goods are defined by the ONS as goods that can be used repeatedly over a period of considerably more than one year and have a 'high' price relative to other goods. Semi-durable goods also have an expected lifetime that exceeds a year but it is less than that for durable goods and their price is lower. For example, a CD player is a durable good; a CD is a semi-durable.
(3) Housing transactions are measured by loan approvals for house purchase throughout this article. That is because there is a break in the Inland Revenue total transactions series, which was caused by a switch from the use of Particulars Delivered forms to Land Transaction Returns in December 2003.
(4) Although, see Hamilton and Morris (2002) and Power (2004) for recent analyses of UK durables spending and Caballero (1994) for an overview of the academic literature.

on durable and semi-durable goods. That slowdown has coincided with a fall in the number of housing transactions.

In this article we analyse both aggregate data from the ONS and disaggregated survey data from the British Household Panel Survey (BHPS), an annual survey broadly representative of the UK population. Such microdata allow direct analysis of individual households' behaviour, so they can often shed more light on household behaviour than aggregate data.(1) We focus on durable and semi-durable goods expenditure and do not analyse spending on services. That is because expenditure on legal fees and surveys, which is likely to account for most of the spending on services that are highly correlated with house purchase, is classified as investment rather than consumption in National Accounts.(2) Removals services are classified as consumption, however.

## Why might housing market transactions affect consumption?

Durable goods, as their name suggests, last and deliver their benefits for some time. So individual households tend to purchase them less frequently than non-durable goods. The timing of those purchases might be affected by a household's decision to move home.(3) That may be because some durables may be more desirable in one home than another. For instance, a fridge, washing machine or dishwasher may fit one kitchen better in terms of size or design.(4)

Alternatively, it may be more efficient to purchase a range of durable goods when moving house. If a household intended to borrow to purchase a new durable, they would incur some transactions costs in arranging that borrowing. If they were moving house they could extract some home equity to fund purchases of durable goods at a much lower cost, as a new mortgage contract is already being drawn up. So households may bring forward purchases they were otherwise going to make in the months or years to come. It may also be cheaper to search and take delivery of several durables at the same time, because some costs that households incur for each individual purchase could be incurred once rather than a number of times. For instance, free delivery may only be available for a bundle of goods or there may be discounts for purchasing more than one large durable item at the same time.

To a significant extent, these effects represent a reallocation of spending across time, rather than an increase in spending over a household's lifetime. Households' spending is constrained by their lifetime resources and moving home is unlikely to affect those resources, particularly in aggregate. So we may expect a rise in housing transactions to cause a short-term boost to durables expenditure, at the expense of expenditure that would have occurred in future years.

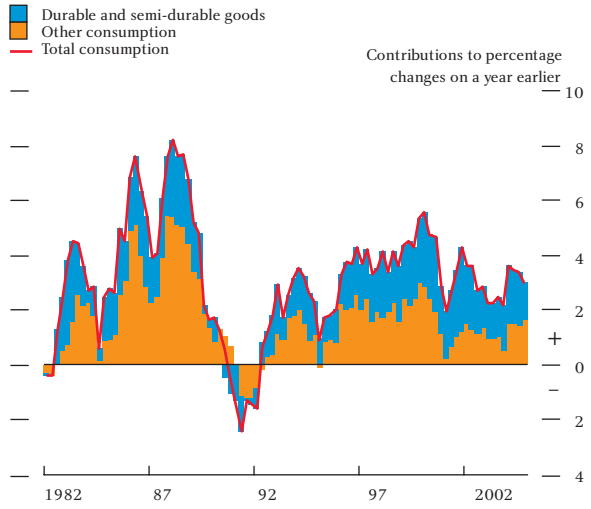
Moving home would be associated with an increase in lifetime resources, and the rise in durables expenditure would represent an increase in spending over a household's lifetime, if both had been prompted by an increase in income expectations. For example, a household that found better-paid employment may wish to move to a larger house and spend more on durable goods (they may, for instance, buy a bigger television). But in that case it is the rise in income expectations that would have caused a rise in durables expenditure, not the act of moving house. Because any relationship between moving home and durables expenditure could be caused by income expectations, we attempt to control for expectations in our analysis. We first focus on aggregate ONS data, before turning to the BHPS microdata.

## Aggregate data

Chart 1 shows that there is a positive association between durables and semi-durables spending growth and housing transactions. The (contemporaneous) correlation coefficient is 0.37 — although, as is the case with any correlation, these do not necessarily imply any causal relationship between the variables.(5) Durable and semi-durable goods together account for around 25% of consumption and a much larger proportion of the growth in the volume of total consumption over the past 20 years or so, and especially in the past 10 years (Chart 2).

(1) Indeed, that observation partially motivated previous work on the link between house prices and consumption (eg Attanasio and Weber (1994)).
(2) They form part of what is termed 'transfer costs of non-produced assets', which is part of gross fixed capital formation.
(3) This intuition is formalised in models of purchasing durables described as (S,s) models (Caballero (1994)).
(4) In principle, a moving household could buy these durables in a second-hand market, which would not imply a link between housing transactions and the household sector's expenditure on durables (the purchase of a second-hand durable by one household from another is just a transfer within the household sector, not new expenditure). But imperfections in second-hand markets (eg the 'lemons problem') are likely to reduce their importance in practice.
(5) The correlation between these two series is statistically significant at the 1% level.

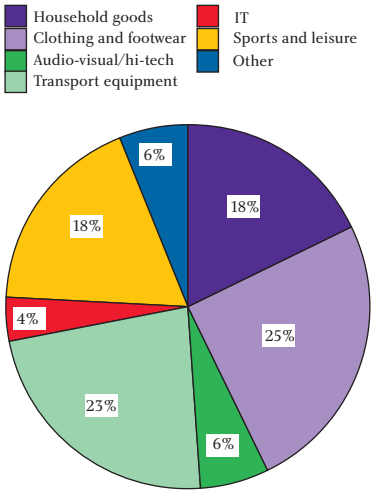
## Chart 2
## Contributions to consumption growth




Source: ONS.

Not all durable and semi-durable goods purchases are likely to be affected by moving home in the same way. We might expect expenditure on 'household goods' to be most closely associated with moving house. Those goods account for around one fifth of total durables and semi-durables spending (Chart 3), and restricting our attention to them in fact results in a weaker correlation

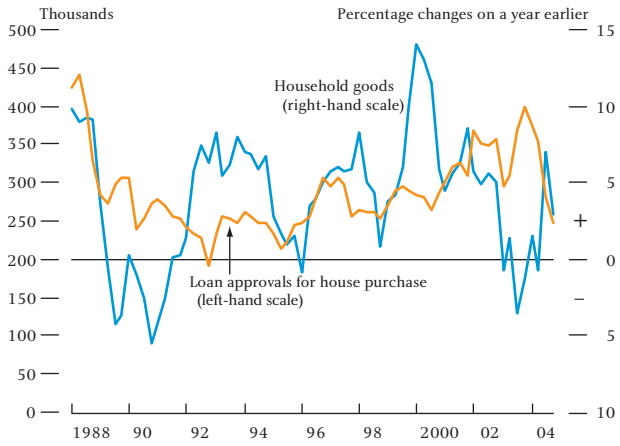
## Chart 3
## Composition of real durable and semi-durable goods expenditure in 2004




Source: ONS.

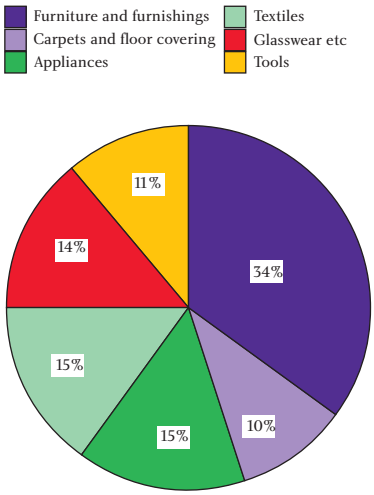
with housing transactions (Chart 4).[1] That weaker correlation, in itself, suggests that something else may account for the apparent link between durables spending and housing transactions. But, as with durable and semi-durable goods purchases, we might not expect purchases of all types of household goods to be affected

## Chart 4
## Household goods expenditure and housing market transactions




Sources: ONS and Bank of England.

## Chart 5
## Composition of real household goods expenditure in 2004




Note: Figures do not sum to 100 because of rounding.

Source: ONS.

to the same extent by moving home (see Chart 5 for all the components of 'household goods'). Purchases of tools (eg power-drills and chainsaws) and glasswear etc (eg cups, plates and cutlery), may be less affected by moving house than, say, purchases of appliances (eg freezers, fridges and cookers).

Although there is a significant correlation between spending on all durable and semi-durable goods and housing market transactions, spending on categories of durable and semi-durable goods that might be thought to be most strongly affected by moving home is, in fact, less correlated with housing transactions. But studying microdata can provide more detail on this question.

(1) The correlation coefficient between the two series in Chart 4 is 0.09; as a regression coefficient the correlation is not statistically significant ($p$-value = 0.49).

## Microdata

Microdata offer an opportunity to look directly at how spending on durables differs between those households that have moved home recently and those that have not. A particular advantage of this is that many of the determinants of the demand for durables (eg the official interest rate) will be common to both movers and non-movers. This makes it easier to isolate the impact of moving home on durables spending. However, one key determinant — income expectations — is unlikely to be common across movers and non-movers. So comparisons of durables spending between movers and stayers may also be picking up something like changes in income expectations. Examining microdata could still be useful in those circumstances, because it may be possible to restrict the comparison to a set of households that are less likely to be affected by changes in income expectations. For example, higher income expectations may be less important for those who move within the publicly rented sector. In the following sections we compare the spending behaviour of movers and non-movers, and then consider whether we obtain similar results among households whose decision to move is less likely to be affected by income expectations.

### Movers and non-movers

Table A provides some simple summary statistics from the BHPS data. It shows the percentage of households that have bought various durable goods and their average spending on each, comparing those who have recently moved home to those who have not. Unfortunately, the BHPS contains data on only those durables shown in the table so we have not been able to consider the range of household goods shown in Chart 5. Nevertheless, the following points can be made:

- Households that move home are much more likely to purchase a range of consumer durables.
- There is a particularly strong difference for white goods, with movers being two to three times more likely to purchase them.
- Movers' average total spend when they purchase goods is a little higher than stayers.

**Table A**
**Annual durables spending and moving home for owner-occupiers**

| Item | | Per cent purchasing a durable in past year | | Average amount spent, if bought (£) | |
|---|---|---|---|---|---|
| | | Moved | Stayed | Moved | Stayed |
| White goods | Freezer | 24.0 | 6.3 | 276 | 270 |
| | Washing machine | 19.4 | 6.7 | 308 | 319 |
| | Tumble dryer | 9.6 | 3.3 | 152 | 160 |
| | Dishwasher | 13.4 | 3.1 | 248 | 250 |
| | Microwave | 11.5 | 4.9 | 100 | 105 |
| Audio-visual | Colour TV | 15.4 | 9.7 | 400 | 391 |
| | VCR | 11.9 | 7.7 | 167 | 161 |
| | CD player | 10.9 | 7.9 | 197 | 177 |
| | Satellite dish | 10.1 | 3.3 | 58 | 59 |
| | Cable TV | 4.1 | 1.2 | n.a. | n.a. |
| Other | Home computer | 8.4 | 8.4 | 851 | 919 |
| | Telephone | 16.7 | 8.1 | 73 | 70 |
| | Home improvements | 59.4 | 53.3 | 3,548 | 1,581 |
| Summary | Any/all white goods | 46.7 | 19.4 | 434 | 292 |
| | Any/all audio-visual | 35.6 | 23.4 | 315 | 300 |
| | Any/all durables | 69.6 | 47.5 | 570 | 458 |

n.a. = not available.

Note: BHPS 1991–2002, although not all questions are asked in all years (for example amount spent questions were not asked between 1991 and 1996) so the number of observations varies by question. The sample size for freezer, for instance, is 1,529 movers and 33,778 stayers. An average of 4.3% of owner-occupiers moved to another owner-occupied house. See also Benito (2004).

This is the case whether we use nominal spending (shown in the table) or use real spending calculated with ONS price deflators.(1)

This suggests that housing transactions may have some direct impact on durables purchases, at least in the short term. That may reflect direct linkages with the purchase of durables that 'fit' the new home, as well as the cost savings that make moving home a good time to buy durables. However, the results may be indicative of moving home and durables expenditure being influenced by a common factor, such as improved income expectations.

### Income expectations

The difference in spending patterns identified above may not reflect a direct causal relationship between moving home and buying durables. Instead, both may reflect improved income expectations.(2) For example, if households have received a better-paid job offer they may be more likely to move home and to increase their spending on durables. But it would be the change in income expectations that would be driving both the house move and the increased durables spending. If this were the case, then the apparent link between housing transactions and durables spending would not be a causal one and a change in housing transactions, absent any change in expected

(1) Applying the ONS household appliance deflator to expenditure on white goods does not alter our results much because the appliances deflator fell by only around 11% between 1997 and 2002. The audio-visual deflator fell much more, by 38%. So average real audio-visual spending, over our sample period, would be substantially lower than nominal spending. But the differences between average spending by movers and stayers remain similar to those in the table.
(2) Strictly, income expectations would influence housing demand (and house prices) rather than transactions. But in the presence of a down-payment constraint this would feed through to transactions (Benito (2005)).

income, would not imply any change in durables spending.(1)

To attempt to hold income expectations constant we look at the spending behaviour of households renting public housing. Those households that move from one publicly rented home to another are probably less likely than owner-occupiers to be doing so in response to news about income prospects. Table B shows that purchases of durables by this group of households are affected by whether or not they have moved home. The differences in behaviour of movers and stayers are smaller than those shown in Table A, but they remain.

**Table B**
**Annual durables spending and moving home for public renters**

| Item | | Per cent purchased a durable in past year | | Average amount spent, if bought (£) | |
|---|---|---|---|---|---|
| | | Moved | Stayed | Moved | Stayed |
| White goods | Freezer | 13.9 | 6.2 | 200 | 230 |
| | Washing machine | 12.9 | 6.8 | 234 | 273 |
| | Tumble dryer | 6.0 | 2.9 | 117 | 139 |
| | Dishwasher | 1.1 | 0.8 | 83 | 212 |
| | Microwave | 9.2 | 5.1 | 83 | 85 |
| Audio-visual | Colour TV | 12.5 | 9.2 | 313 | 325 |
| | VCR | 9.3 | 6.6 | 133 | 142 |
| | CD player | 10.4 | 6.2 | 137 | 164 |
| | Satellite dish | 6.4 | 2.5 | 55 | 56 |
| | Cable TV | 2.5 | 1.0 | n.a. | n.a. |
| Other | Home computer | 6.2 | 4.3 | 594 | 723 |
| | Telephone | 16.8 | 7.6 | 66 | 58 |
| | Home improvements | 27.9 | 20.8 | 292 | 275 |
| Summary | Any/all white goods | 31.3 | 17.8 | 253 | 240 |
| | Any/all audio-visual | 30.6 | 20.8 | 251 | 255 |
| | Any/all durables | 56.6 | 40.0 | 366 | 345 |

n.a. = not available.

Note: Number of observations (freezers): Movers: 603; Stayers: 11,123.

This suggests that the earlier comparison of durables purchases by those who move and those who do not may exaggerate the effect of moving home on durables by failing to control for changes in income expectations. But the results for public renters may underestimate the effect. First, we noted above that moving home may be related to purchasing durables because it is a good time (ie less costly) to withdraw housing equity. This argument does not apply to those who rent their homes, so we would expect the differences in behaviour between those renters who move and those who do not move to be smaller than for owner-occupiers. Second, those who own their property have a stronger incentive to add value to their home (eg installing a new fitted kitchen). Some of those who have chosen to buy rather than rent may have done so because they attach more importance to the ability to alter their home as they please. So the behaviour of public renters is likely to provide a lower bound to our estimates of the effect of moving home on durables spending.

We interpret the data above as confirming that even in such circumstances where the direct effect of moving home on durables purchases is likely to be at its weakest, there is still probably some link. This suggests that moving home does directly stimulate durables spending.

## The impact on consumption of a change in housing transactions

In principle, the above analysis can be used to give an indication of the likely effect of a change in housing transactions on durables spending. We work with the results in Table A to provide an illustration of the possible link.

The BHPS data cover only a subset of all household goods. Within that subset, moving house tends to have a bigger impact on purchases of white goods than on others. So we have made a generous assumption that all household and audio-visual goods expenditure is affected to the same extent as white goods by moving home. That implies that a change in housing transactions of 100,000 could reduce annual spending on household and audio visual goods by 0.9%. That is equivalent to a change in durable and semi-durable spending of 0.2%, and to a change of 0.05% in annual consumption expenditure.

The size of this effect is moderate mainly because only a small proportion of households are changing their behaviour: the illustrative change in transactions is equivalent to just 0.3% of households. So this example suggests that changes in transactions of this amount are likely to have only a moderate impact on durables expenditure and consumption in aggregate, although the act of moving house does have a substantial effect on an individual households' expenditure on durables.

But this illustrative estimate is subject to considerable uncertainty. Using the figures in Table A, which do not control for changes in income expectations, would tend to lead to an overestimate of the effect. Our assumption that the impact on those white goods identified in the BHPS applies for all other household goods, including audio-visual, adds to the uncertainty of our estimates.

(1) Age of the household (younger people being more likely to form a new household) is another factor that might influence housing transactions and durables spending. But the differences shown in Table A apply to both relatively young and old households.

On the one hand, as noted above a number of the household goods, not covered by the BHPS, seem unlikely to be correlated with moving house eg major tools, glassware, and vacuum cleaners. On the other hand, some types of household goods, again not covered by the BHPS, such as carpets and curtains may be more likely to be purchased than white goods when moving home.

An additional uncertainty relates to the timing of the effect. The illustrative numbers above refer to an impact on annual consumption. But if the change in transactions and the impact on spending were concentrated in a shorter time period then it could be magnified. However, it seems unlikely that all the purchases of durable goods associated with the house move would be made in the same quarter.

The above assumptions could be varied in other ways to generate larger estimated effects. But the purpose of this discussion has been to highlight how an analysis, based on a study of the spending patterns of individual households, can be used to construct such an estimate.

## Conclusions

Spending on durable goods has played an important role in accounting for movements in consumer spending in the United Kingdom. Another recent feature of the UK economy has been a high level of housing activity relative to the early 1990s; more recently still that level of activity has fallen. In this article we have aimed to shed light on the strength of the link between housing transactions and durables spending.

We have shown that people are much more likely, around two to three times, to buy certain durables, especially white goods, when they move home. The effect is likely to be largely due to households bringing forward durables purchases to coincide with the house move. But the impact on aggregate consumption of a change in housing transactions is likely to be moderate. That is largely because plausible changes in the number of transactions from year to year are small relative to the total stock of households. However, the illustrative estimate is subject to considerable uncertainty.

The nature of the link between housing transactions and durables spending also needs to be made clear. People spend from their lifetime resources. Since moving home does not increase those resources, and in particular does not do so for the economy as a whole, then housing transactions can only provide a short-term stimulus to spending. This suggests that any pronounced change in the number of housing transactions could alter the short-term profile for spending, but not its profile in the medium term.

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# The inflation-targeting framework from an historical perspective

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*This article provides an historical perspective on the post-1992 inflation-targeting regime in the United Kingdom. It assesses nearly 400 years of UK economic history using three alternative gauges of stability: business-cycle fluctuations, the Phillips correlation between inflation and unemployment and the degree of inflation persistence. The first of these measures suggests that the inflation-targeting regime has been characterised by the most stable macroeconomic environment in recorded UK history. The second points to a significant improvement in the stability of the Phillips inflation-unemployment correlation during the post-1992 period. The third stability measure suggests that inflation persistence in the United Kingdom has been the exception, not the rule.*

## Introduction

On 8 October 1992, three weeks after sterling's departure from the Exchange Rate Mechanism of the European Monetary System, Norman Lamont, then Chancellor of the Exchequer, established a new framework for monetary policy based on a range of 1%–4% for annual RPIX inflation.(1) In 1997 this framework was further developed with the Bank of England being given operational independence and a symmetrical target of 2.5% for annual RPIX inflation, subsequently changed to 2% for CPI inflation. Throughout the inflation-targeting period, UK macroeconomic performance has been characterised by low and stable inflation, historically low nominal interest rates, and, as of 2005 Q1, 51 quarters of uninterrupted output growth.

In previous research(2) we used statistical methods to investigate changes in UK economic performance since the end of World War 2 (WWII). Empirical evidence clearly suggested that the inflation-targeting regime has been, in a very broad sense, significantly more stable than the previous monetary regimes/historical periods in the post-WWII era.

This article provides an historical perspective on the inflation-targeting regime, assessing its performance under three alternative gauges of stability: the amplitude of business-cycle fluctuations, the unemployment-inflation trade-off and inflation persistence (whereby the rate of inflation is positively correlated with its recent past).

The first of these stability measures — the size of business-cycle fluctuations — looks at the volatility of the main expenditure components of GDP, such as consumer spending and business investment, over the business cycle. The greater the degree of macroeconomic stability, the lower the volatility of these components. The second measure looks at the short-run Phillips trade-off between unemployment and inflation. The move to a low-inflation environment should be associated with a flattening of the trade-off: in other words, given fluctuations in output and unemployment are accompanied by smaller fluctuations in inflation.(3) The final measure looks at inflation persistence. Traditionally,(4) economists have assumed that inflation is highly persistent — ie positively correlated over time so if inflation is comparatively high in one period, it will also tend to be high in subsequent periods. As we show, this is no longer the case under the current monetary framework.

Our main results may be summarised as follows. First, the inflation-targeting regime has been characterised, to date, by the most stable macroeconomic environment in recorded UK history. The conclusion from our earlier study, namely that cyclical fluctuations in the economy post-1992 have on average been smaller than in the rest of the post-WWII era, can now be extended to cover any

(1) The government's objective was for inflation to be in the lower half of the 1%–4% range by the end of that Parliament.
(2) See Benati (2004).
(3) See for example Ball, Mankiw and Romer (1988).
(4) See for example Fuhrer and Moore (1995).

previous historical period since the metallic standards era. Second, since 1992 the Phillips correlation between unemployment and inflation has exhibited the greatest stability in recorded history. Third, inflation persistence appears to have been the exception, rather than the rule, with inflation having been highly persistent only during the period between the floating of the pound in June 1972 and the introduction of inflation targeting, in October 1992. Under inflation targeting post-October 1992, inflation is estimated to have been slightly negatively correlated with its lagged values, based on all the price indices we consider.

## Monetary regimes and macroeconomic performance

The remainder of this article assesses the following monetary regimes/historical periods against our three 'stability' measures:

- *De facto* (actual) silver standard, from the beginning of our sample in 1661 up until 1717.
- *De facto* gold standard, from 1718 up until the beginning of the suspension period associated with the wars with France of the late XVIII century, in February 1797.
- *De jure* (declared) gold standard, from May 1821 up to the beginning of the second suspension period, in August 1914.
- Inter-war period, from the constitution of the Irish Free State as a British dominion in December 1921,(1) to the United Kingdom's declaration of war on Germany, in September 1939.
- Bretton Woods regime: from December 1946 up to the floating of the pound against the US dollar, in June 1972.
- From July 1972 up to the introduction of inflation targeting, in October 1992.
- Inflation-targeting regime: from November 1992 to the present.

Although the period between the floating of the pound and the introduction of inflation targeting was characterised by a succession of different monetary arrangements and measures, we treat it as a single period for two reasons. First, the short length of several of the subperiods prevents us from deriving reasonably robust results (similarly, we treat the inter-war period as a unique 'regime', in spite of the several changes during those years). Second, breaking the 1972–92 period down into subperiods would be difficult to do with precision.

### Stability measure 1: the amplitude of business-cycle fluctuations

We start by looking at the size of business-cycle fluctuations. Table A reports the standard deviations of the business-cycle elements for the series in our data set(2) by monetary regime/historical period.

Several facts are readily apparent from the table. First, based on annual data, the volatilities of the business-cycle parts of real GDP and its main expenditure components have been systematically lower post-1992 than during any of the previous monetary regimes/historical periods, in several cases markedly so. For example, the volatility of the cyclical part of real GDP post-1992 has been around two thirds and one half of that under Bretton Woods and in the period 1972–92 respectively, and just one third of that between the wars (confirming the remarkable instability of the inter-war period). The volatility of the cyclical part of real GDP associated with the *de jure* gold standard regime was twice that of the inflation-targeting regime, but was the same as from 1972–92.(3)

In summary, there was a period of extreme turbulence in the inter-war years; one of remarkable stability under the current inflation-targeting regime; and three periods (namely 1821–1914, 1946–72 and 1972–92) that are 'in-between'. For example, the cyclical volatility of real GDP under the gold standard of 1821–1914 was essentially the same as 1972–92.

Based on quarterly data for the post-WWII period, the inflation-targeting regime appears, again, the most stable by far for both real GDP and all expenditure measures (with the single exception of government

(1) Several series in our data set include the Irish Republic up to 1921, and exclude it thereafter.
(2) Business-cycle analysis is based on the notion that (economic) time series can be divided into different frequency components: very slow-moving components, intuitively associated with the notion of a trend; fast-moving ones, associated with 'noise and seasonal' factors; and components 'in-between', traditionally associated with the notion of business-cycle fluctuations. On this, see eg Stock and Watson (1999) and Christiano and Fitzgerald (2003).
(3) An important point to stress is the high quality of UK 19th century real GDP data: the Feinstein (1972) 'compromise estimate' of real GDP we use is based on three alternative, independent estimates of real output, based on income, expenditure and production data.

## Table A
## Standard deviations of business-cycle components by monetary regime/historical period

| | *De facto* silver standard | *De facto* gold standard | *De jure* gold standard | Inter-war period | | Bretton Woods | | Bretton Woods to inflation targeting | | Inflation targeting | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | A | A | A | Q | A | Q | A | Q | A | Q |
| | | | *Logarithms of real national accounts components:* | | | | | | | | |
| GDP | | | 1.71 | 2.69 | — | 1.28 | 1.20 | 1.68 | 1.54 | 0.86 | 0.73 |
| Consumption | | | 1.32 | 1.03 | — | 1.31 | 1.26 | 1.90 | 1.80 | 0.95 | 0.72 |
| Government expenditure | | | 4.81 | 3.06 | — | 2.51 | 1.49 | 1.25 | 0.86 | 0.73 | 0.90 |
| Investment | | | 6.22 | 5.78 | — | 3.19 | 2.68 | 3.95 | 3.72 | 2.19 | 1.82 |
| Exports | | | 3.37 | 7.36 | — | 4.51 | 2.18 | 2.86 | 2.36 | 2.13 | 2.02 |
| Imports | | | 3.06 | 3.78 | — | 3.85 | 2.80 | 4.03 | 4.17 | 1.18 | 0.93 |
| | | | *Inflation rates based on:* | | | | | | | | |
| E Schumpeter price indices for: | | | | | | | | | | | |
| *consumer goods* | 9.28 | 7.41 | | | | | | | | | |
| *producer goods* | 7.17 | 7.20 | | | | | | | | | |
| GDP deflator | | | 3.81 | | 1.26 | 1.98 | 1.68 | 4.30 | 4.22 | 0.88 | 1.13 |
| CPI[(a)] | | 6.74 | 6.14 | 1.73 | — | 1.89 | — | 3.88 | 2.73 | 1.45 | 0.62 |
| Retail prices index | | | | — | 4.15 | — | 2.66 | — | 4.10 | — | 1.30 |

Note: A = Annual and Q = Quarterly.

(a) Annual data: composite price index from the ONS. For details on the construction of the index, see O'Donoghue, Goulding and Allen (2004).

expenditure, for which the lowest volatility arose under the Bretton Woods regime).

A very similar picture emerges for inflation. First, the inflation-targeting regime has had the lowest cyclical volatility of inflation on record, based on any of the measures of inflation for which comparisons are possible. Results based on quarterly RPI inflation, available from 1914 Q4, confirm the reduction in volatility during the latest period, with the standard deviation of the cyclical component of inflation under the current regime having been equal to less than half of that during the inter-war years, under Bretton Woods and from 1972–92.

Second, the difference in inflation volatility between the current regime and its predecessors is generally extremely marked. For example, based on annual GDP deflator inflation, volatility post-1992 has been under one half of that under Bretton Woods, one fifth of the 1972–92 period and one quarter of that under the gold standard. Intriguingly, the volatility of inflation fluctuations in the inter-war period was only slightly higher than in the current regime. Standard deviations of inflation fluctuations (based on the CPI inflation measure) for the inter-war period and the current regime are respectively 1.7 and 1.5. Comparable figures for the *de facto* gold standard and the *de facto* silver standard range from 6.7 to 9.3, indicating a remarkable amount of volatility of inflation under those regimes.

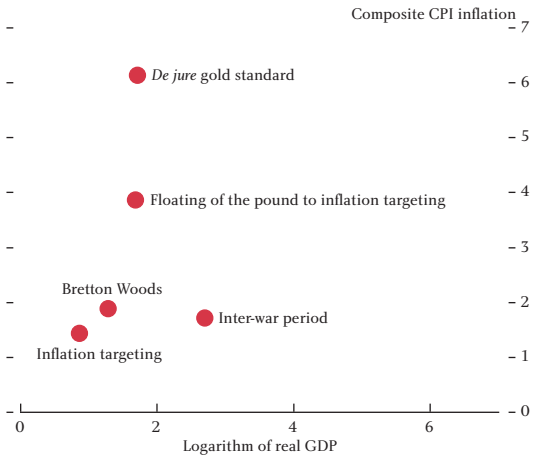
These figures, however, are likely to overstate the true reduction in volatility in the most recent era, for two reasons. First, the prices data were likely subject to sizable measurement error in the earlier periods. This exaggerates the true reduction in volatility in the most recent era. Second, the composition of overall output, and the average consumption basket in previous historical periods was markedly 'skewed' (compared with today) towards agricultural goods, whose prices are much more volatile than those of industrial goods. Again, this would exaggerate the true extent of volatility reduction over the most recent era.

Chart 1 shows scatter plots of the standard deviations of the business-cycle components of real GDP and two measures of inflation, namely the ONS's composite price index (annual data) and the RPI (quarterly data). Although based on an extremely limited number of observations, the correlation is clearly positive based on quarterly data. That is, when comparing different regimes, an increase in the volatility of inflation is associated with increased volatility of real GDP. Based on annual data, the correlation is positive if we exclude the inter-war era, which might be regarded as anomalous. By contrast, the vast majority of the macroeconomic models used in monetary policy analysis imply a trade-off (that is, a negative relationship) between inflation and output volatility: other things being equal, if monetary policy aims to reduce the volatility of inflation, an increase in the volatility of output necessarily results.

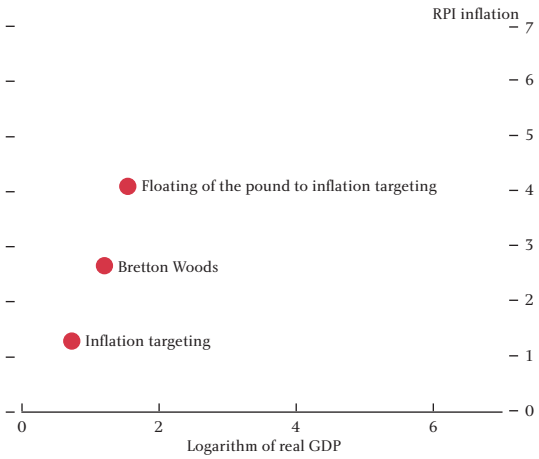
The positive correlations reported in Chart 1 have at least two possible interpretations. First, the greater volatility in both inflation and output during the pre-1992 regimes/period may have reflected sub-optimal monetary policy. A second possibility is that, while there may be a short-run trade-off between inflation and

## Chart 1
## Standard deviations of business-cycle components of log real GDP and inflation by monetary regime

**(a) Annual data**




**(b) Quarterly data**




output volatility within a given monetary regime, changes in the volatility of structural shocks to the economy have tended to account for most of the changes in the volatilities of inflation and output across regimes.

### Stability measure 2: the Phillips correlation

Since A W Phillips' 1958 seminal paper, the Phillips correlation(1) between unemployment and inflation has probably been the single most intensely investigated macroeconomic relationship, playing a key role in shaping macroeconomic thinking. Panels (a) to (e) of Chart 2 show scatter plots of business-cycle components of unemployment and inflation over different monetary regimes and historical periods. Panel (f) shows for each period a scatter plot of average inflation and the slope of the Phillips curve.(2)

Table B reports standard deviations of regression residuals by regime/period. The lower the standard deviation, the more stable is the unemployment-inflation trade-off. Several findings stand out:

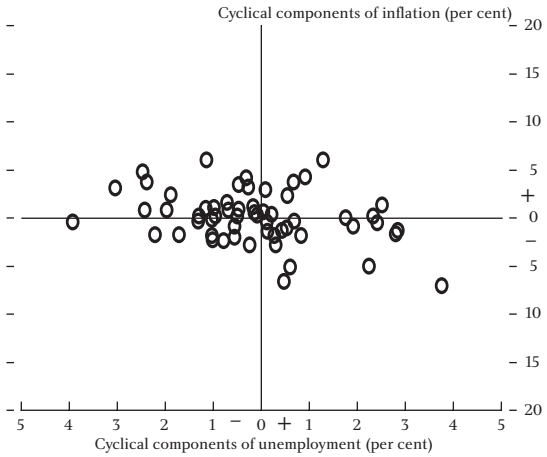
- the inflation-targeting regime has been characterised to date by the most stable (although not the flattest) unemployment-inflation trade-off in recorded history, with a standard deviation of regression residuals less than half of that under previous regimes/periods;
- in stark contrast with the current regime, the 1972–92 period had the steepest and most unstable trade-off in recorded history. The slope of the Phillips curve was equal to -2.3, so that a 1% reduction in inflation would typically be associated with an increase in unemployment of 2.3%. The standard deviation of regression residuals was up to four times that of other regimes/periods. So if policymakers in that period had tried to reduce unemployment, the consequences for inflation were particularly uncertain; and
- the gold standard had the flattest trade-off ever, indicating that a given change in inflation was associated with only relatively small changes in unemployment. Even so, unemployment was remarkably volatile in this period. A qualitatively similar result is found for the inter-war period.

Panel (f) of Chart 2 shows a scatter plot of average inflation and the slope of the Phillips curve across monetary regimes and historical periods. Although admittedly based on just five observations, the evidence clearly suggests a positive correlation between average inflation and the slope of the Phillips curve. Chart 3 presents analogous evidence, based on monthly data for rolling ten-year samples, for the inter-war era and the post-WWII period. Evidence of a positive correlation is clear for the latter period, much less so for the former.(3)

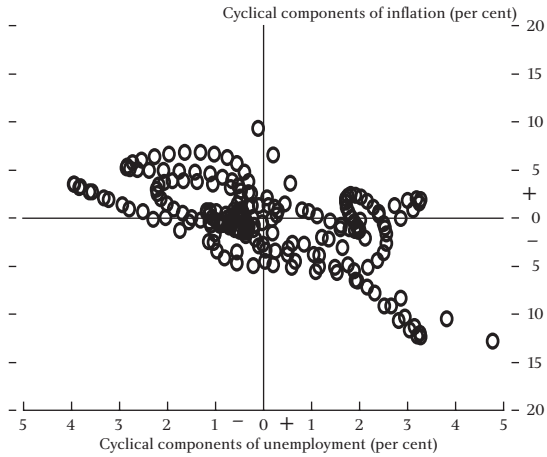
(1) It is important to stress that correlation by no means implies causation. In the present paragraph we interpret the Phillips correlation between unemployment and inflation as purely reduced form, without any structural and/or causal meaning.
(2) The Phillips curve is estimated using least-absolute deviations (LAD) in the regression of cyclical inflation on cyclical unemployment and a constant. The LAD estimator minimises the sum of absolute deviations from the regression line, instead of the sum of squared residuals as with the traditional ordinary least squares (OLS) estimator. Because of this, the former is generally regarded as the more robust methodology.
(3) As stressed by Ball, Mankiw and Romer (1988), such a stylised fact provides an important litmus test for discriminating between alternative theories/models of the Phillips trade-off, tending to falsify (eg) 'Lucas' islands'-type explanations of the trade-off, and favouring instead New Keynesian theories emphasising the link between mean inflation, the frequency of price/wage adjustments, and the steepness of the trade-off.

## Chart 2
## The UK Phillips correlation across monetary regimes, 1855–2004

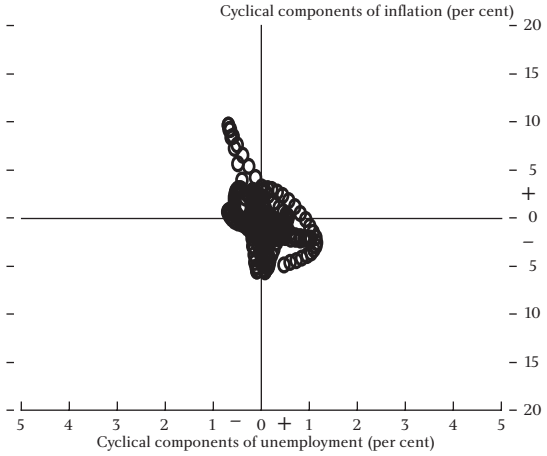
### (a) Gold standard (1855–1913)



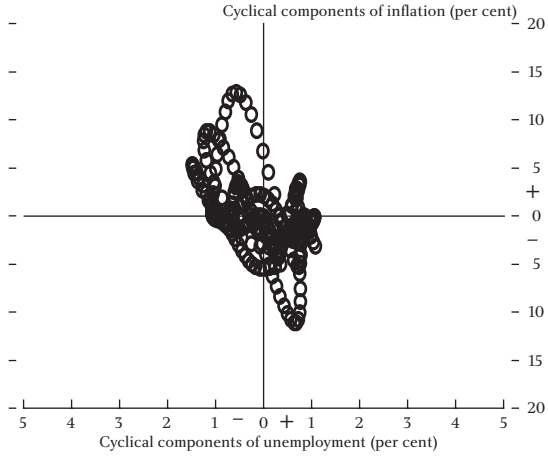

### (b) Inter-war period (January 1922–August 1939)



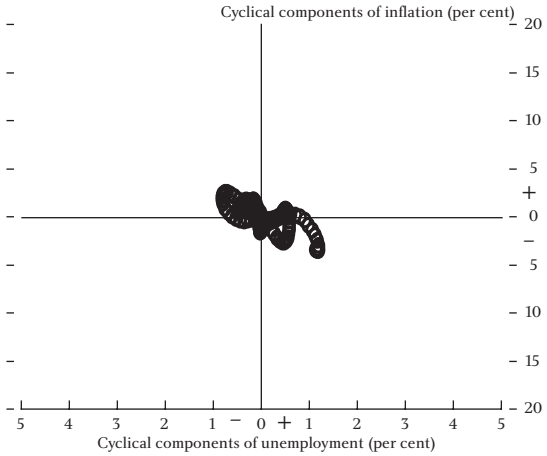

### (c) Bretton Woods (July 1948–May 1972)




### (d) June 1972–September 1992




### (e) Inflation targeting (October 1992–June 2004)




### (f) Average inflation and the slope of the Phillips curve

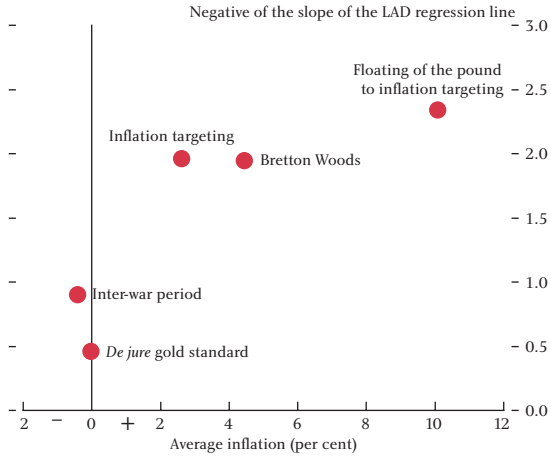


**Table B**
**The Phillips correlation: standard deviations of LAD regression residuals by regime/period**

| Gold standard (1855–1913) | Inter-war period (January 1922–August 1939) | Bretton Woods (July 1948–May 1972) | June 1972 to October 1992 | Inflation targeting (October 1992–June 2004) |
|---|---|---|---|---|
| 2.602 | 3.270 | 2.410 | 3.699 | 0.935 |

Note: From LAD regression of cyclical inflation on cyclical unemployment and a constant.

Providing an explanation of historical changes in the slope of the UK Phillips correlation is beyond the scope of this article. Nevertheless, the UK experience clearly points to a positive correlation — both across regimes and over time (especially over the post-WWII era) — between average inflation and the slope of the Phillips correlation.

## Stability measure 3: inflation persistence

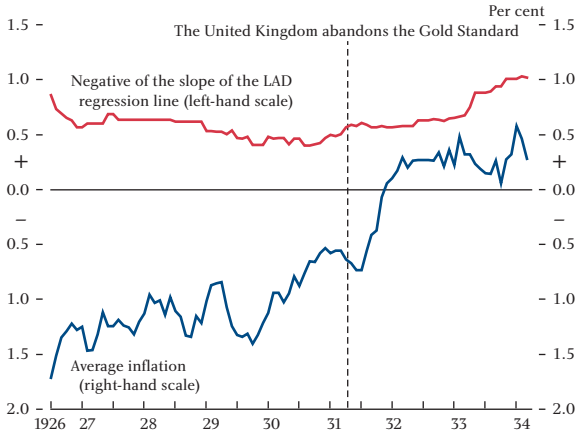
Inflation persistence — the tendency for inflation to be comparatively high (low) in one period, having been comparatively high (low) in previous periods — plays a crucial role in monetary policy. For example, it partly determines the speed at which inflation reverts to its equilibrium level following an unforeseen shock to the economy.

In the past, high inflation persistence has been regarded as a robust macroeconomic stylised fact. But in recent years several papers(1) have produced empirical evidence (mostly for the United States) suggesting that high persistence may have been 'chronologically concentrated' around the time of the Great Inflation of the 1970s.

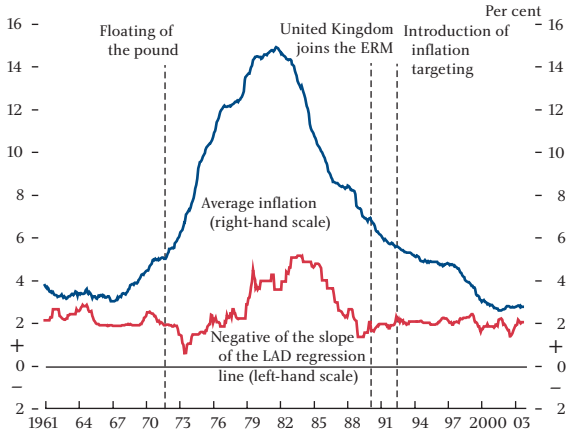
The notion that inflation may be intrinsically persistent should be regarded with suspicion: inflation trends can

**Chart 3**
**The UK Phillips correlation in the 20th century, rolling ten-year samples**

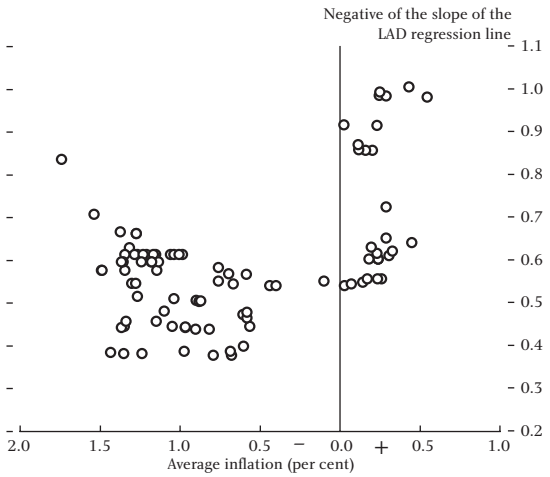
(a) Inter-war era



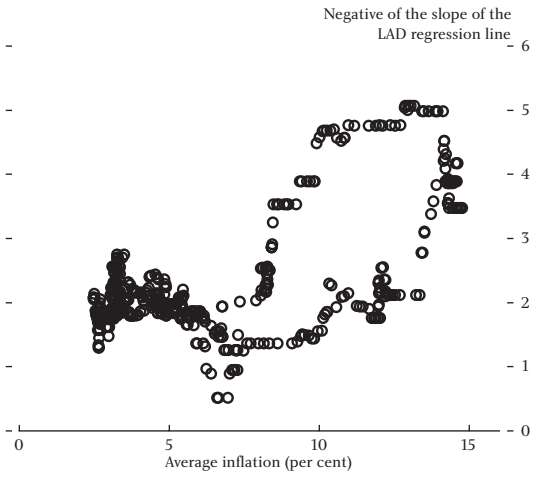

(b) Post-WWII period




(c) Inter-war era




(d) Post-WWII period




(1) See in particular Cogley and Sargent (2002, 2005).

not be viewed as being entirely independent of the underlying monetary regime. By stabilising the price level, for example, a successful price-level targeting regime would make its rate of change — ie, inflation — perfectly negatively serially correlated. In other words, an inflation rate of +1% in one period would be followed by one of -1% in the next. Similarly, it is hard to believe that inflation may be highly persistent under an inflation-targeting regime in which the central bank counters any prospective deviation of inflation from target.

For each inflation series, we estimate (using ordinary least squares (OLS)) a model in which inflation has a linear relationship with its past values — technically, an AR($\rho$) model. For each series, Table C reports our preferred measure of persistence, the sum of the coefficients ($\rho$) on lagged inflation, together with the 90%-coverage confidence interval in square brackets. Values of $\rho$ that are close to 1 indicate that inflation is persistent; values close to zero indicate almost no inflation persistence. (The special case where $\rho$ is equal to 1 is a useful yardstick, as in this case shocks to inflation are permanent.)

The table shows that high inflation persistence appears to have been the exception, rather than the rule. Inflation has only been very highly persistent during the period between the pound floating in June 1972 and the introduction of inflation targeting in October 1992. Specifically,

- the current inflation-targeting regime exhibits some mildly negative serial correlation for inflation based on either the RPI, the CPI or the GDP deflator. In all cases, the upper limit of the 90% confidence interval around $\rho$ is well below 1. So based on experience to date, it is likely that a shock to the rate of inflation during the current regime would not only be transitory but would also dissipate quickly;

- in stark contrast with the current regime, the 1972–92 period exhibits very high persistence for each inflation measure, with point estimates of $\rho$ only slightly less than 1 and upper limits of 90% confidence intervals exceeding 1 in all but one case;

- persistence is entirely absent under metallic standards, either *de facto* or *de jure*, and based on either gold or silver. The *de facto* gold standard in particular displays a mild, although not statistically significant, negative serial correlation based on all three inflation measures;

- intriguingly, the turbulent inter-war period only displays a mildly positive serial correlation for inflation; and

- Bretton Woods displays some evidence of serial correlation for inflation, but that is nowhere near as strong as for the 1972–92 period.

**Table C**
**Inflation persistence: estimates of $\rho$, and 90% confidence intervals**

| | *De facto* silver standard | *De facto* gold standard | *De jure* gold standard | Inter-war period | Bretton Woods | Bretton Woods to inflation targeting | Inflation targeting |
|---|---|---|---|---|---|---|---|
| | | | *Annual series:* | | | | |
| E Schumpeter price indices for: *consumer goods* | -0.31 [-0.71; 0.11] | -0.24 [-0.61; 0.14] | | | | | |
| *producer goods* | 0.19 [-0.04; 0.41] | -0.22 [-0.41; -0.03] | | | | | |
| GDP deflator | | | 0.05 [-0.13; 0.22] | | 0.51 [0.15; 0.93] | 0.79 [0.44; 1.04] | |
| ONS' composite CPI | | -0.17 [-0.62; 0.29] | -0.21 [-0.45; 0.02] | | 0.56 [0.19; 1.02] | 0.91 [0.53; 1.04] | |
| | | | *Quarterly series:* | | | | |
| Retail prices index | | | | 0.37 [-0.05; 0.80] | 0.56 [0.33; 0.83] | 0.91 [0.72; 1.03] | -0.05 [-0.57; 0.49] |
| Consumer prices index | | | | | | 0.93 [0.89; 0.98] | -0.12 [-0.51; 0.24] |
| GDP deflator | | | | | 0.44 [0.07; 0.83] | 0.88 [0.70; 1.04] | -0.19 [-0.70; 0.35] |

Note: 90% confidence intervals are in square brackets underneath the respective estimator of $\rho$, which is the sum of the coefficients of the lagged terms in the auto regressive equation for inflation. If identical circumstances were to prevail on 100 occasions, the estimate of $\rho$ would fall within the range indicated by the confidence interval on 90 of these occasions. When the upper end of the range is well below 1, we can be confident that a shock to inflation would not be permanent.

These results refute the notion that inflation is intrinsically persistent. Rather, they are compatible with the alternative notion that the degree of inflation persistence crucially depends on the monetary regime in place at the time. In particular, persistence appears to have been entirely absent under both metallic standards and the current inflation-targeting regime, both monetary policy arrangements providing strong nominal anchors. By contrast, inflation persistence was stronger during the 1972–92 period, when there were several changes to monetary arrangements and policy may not have been entirely credible.

## Conclusions

By historical standards, the performance of the UK economy under inflation targeting has been unique. The size of business-cycle frequency fluctuations has been to date the lowest in recorded history; the unemployment-inflation trade-off displays the greatest stability ever; and the high-inflation persistence typical of the period between 1972 and 1992 has entirely vanished.

These results can be regarded as especially robust for two reasons. First, they are very consistent across series. Second, they have been derived using relatively simple statistical techniques, which do not depend on possibly invalid underlying assumptions.

What has caused such remarkable and historically unprecedented stability since 1992? Although it may be unreasonable to explain the increase in macroeconomic stability only by the impact of the new monetary framework, it appears equally implausible to ascribe it solely to plain good luck. A more balanced interpretation of the evidence is probably that the introduction, and continued application, of inflation targeting from 1992 was one of the key factors behind what the Governor of the Bank of England recently labelled as the 'NICE decade' — 'Non-Inflationary Consistently Expansionary'.(1) Other important contributory factors may have been a substantial fiscal consolidation, which turned a deficit of 8% of GDP in 1993 into a sustainable position for the public finances; a continuing programme of supply-side reforms over a period of 25 years, which made it possible to reduce unemployment without generating higher inflation; and finally, some luck, whereby the economic effects of unexpected events tend to balance out over time, rather than cumulate in either an upward or downward spiral.

(1) See King (2003).

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# Monetary policy news and market reaction to the *Inflation Report* and MPC *Minutes*

**By James Bell of the Bank's Conjunctural Assessment and Projections Division and Robin Windle of the Bank's Sterling Markets Division.**

*This article describes the results of analysis carried out as background for the speech 'Inflation targeting in practice: models, forecasts and hunches', by Rachel Lomax, Deputy Governor for Monetary Policy, which is reproduced in this edition of the* Quarterly Bulletin.(1) *It examines the reactions of both economists and financial markets to different MPC announcements: the policy statement release immediately after the interest rate meeting; the* Minutes *of that meeting; and the* Inflation Report. *This article also examines whether the amount of perceived 'news' contained in interest rate decisions has changed since the MPC was established in 1997.*

## Introduction

Eight years ago the Bank of England was given operational independence. Since then, there has been a monthly meeting at which the Monetary Policy Committee (MPC) decides on the level of interest rates. Additionally, each quarter, following a forecasting process, the Committee agrees projections for future inflation and economic activity, which are published in the *Inflation Report*.

Interest rate decisions are usually announced on the first or second Thursday of each month, at the end of the MPC's two-day policy meeting. The *Minutes* of that meeting are then published 13 days later.(2) The *Inflation Report* — published in February, May, August and November — is usually released six days after the interest rate announcement, and a press conference is held on the same day.

These three public statements — the interest rate announcement, the *Minutes* and the *Inflation Report* — are important communication tools for the MPC. Reflecting this, economists and financial market participants closely examine them to understand better the reasons for the MPC's interest rate decisions, and to see what 'news' they might contain about interest rates in the future.

This article examines the reaction to these public statements. We look at whether interest rate decisions have become better anticipated since the inception of the MPC. We then assess the extent to which the three regular pieces of MPC communication influence expectations of how interest rates will evolve in the future.

A number of previous studies have examined market reactions to MPC communications, including Clare and Courtney (2001) using data up to mid-1999 and Lasaosa (2005), using data up to mid-2001. These studies found evidence that the apparent amount of 'news' contained in interest rate decisions had, on average, increased following Bank independence. But our analysis suggests that in more recent years, the average amount of 'news' may have declined. And the evidence is consistent with the quarterly production of the *Inflation Report*, including the MPC's updated macroeconomic projections, playing a more central role in the decision-making process.

## Assessing monetary policy 'news'

Economists and financial market participants seek to anticipate the monetary policy decisions of the MPC. We can measure expectations of future interest rate decisions either directly, from surveys of economists, or indirectly, by using information from the prices of money market instruments.

### (i) A survey-based measure of interest rate news

A few days prior to each monthly MPC decision, Reuters conducts a survey of economists (typically at major

(1) The results in this article update those represented in the Annex to Rachel Lomax's speech by including data up to and including the release of the April 2005 MPC *Minutes*.
(2) Before October 1998 the *Minutes* were published with a lag of six weeks.

investment banks). The economists are each asked to estimate the probabilities that the MPC will cut, raise or hold rates constant at the following meeting.(1) From these probabilities, we are able to calculate an average expectation. We can use the difference between that expectation and what the MPC actually decides a few days later as a proxy for the amount of news contained in the decision.

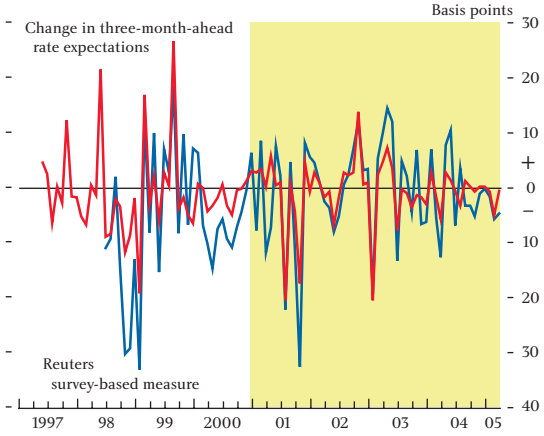
### (ii) A market-based measure of news in MPC interest rate announcements

Expectations of how official interest rates will evolve several years into the future can be estimated using information from the prices of financial instruments. These interest rate expectations are known as 'implied forward rates'. Indeed, the *Inflation Report* contains projections for output and inflation that are conditional on actual interest rates evolving in line with these market-based expectations three years into the future.(2)

If the MPC's decisions turned out to be exactly as market participants were anticipating, then we would not expect to see significant movements in implied forward rates following policy announcements — market participants would have received no new information, and so would have little reason to reassess the outlook for interest rates in future. But a large movement in implied forward rates immediately following a monetary policy announcement might suggest that the MPC's decision was not fully anticipated and that it provided extra news to market participants about the future path of interest rates. So calculating the size of the change in implied forward rates straight after a policy announcement gives us a metric of the amount of news contained in policy announcements. Here we consider the change in market expectations of interest rates three months into the future. But later in this article we will be considering expectations of interest rates further into the future.(3)

Chart 1 shows both the survey-based and the market-based measures of the news in monthly interest rate decisions. The blue line is calculated as the actual interest rate change announced by the MPC minus the rate change expected in advance by the economists polled by Reuters (expressed in basis points). The red line depicts the change immediately following a policy announcement in market participants' average view of what interest rate will be prevailing in three months' time. The two measures look similar.

**Chart 1**
**Market and survey-based measures of news in MPC interest rate announcements**




Notes: Excludes special MPC meeting following 11 September 2001.
The shaded area represents the period January 2001–April 2005.

Unlike the monthly Reuters' survey, data on financial prices are available continuously. This means that we can measure market interest rate expectations at any given point in time. Using these data we are able not only to examine market reactions to interest rate decisions, but also the reaction to any other event. In the following sections of this article we will also examine the market reaction to the monthly publication of the MPC meeting *Minutes* and the quarterly *Inflation Report*.

Table A lists the MPC statements (interest rate announcements, the *Inflation Report* and the publication of the MPC *Minutes*) that seem to have contained the most news since the inception of the MPC in 1997. Only those events that resulted in changes in three-month-ahead interest rate expectations of 10 basis points or more are included.(4) It suggests that unanticipated interest rate decisions have contained the largest amount of news for financial markets. Only three

(1) Reuters has been asking the economists to estimate the likelihood of a range of different possible rate decisions since July 1998. Prior to that, the survey asked respondents to specify only what they thought was the single most likely outcome.
(2) See the box 'The interest rate assumptions in the projections', on pages 42–43 of the August 2004 *Inflation Report*.
(3) Our measure of market expectations is derived from short sterling futures. Details of this data set can be found in Annex 2.
(4) In general, we look at the change in expectations between 11.30 am and 12.30 pm on the day of the announcement of the MPC decision, between 9.00 am and 10.30 am on the day of the MPC *Minutes* release and between 10.00 am and 11.30 am on the day of publication of the *Inflation Report*. In some instances the events took place at a slightly different time of day, so we have adjusted the calculation accordingly.

sets of MPC *Minutes* and one *Inflation Report* publication have resulted in a large change in implied rates.(1)

**Table A**
**Movements in sterling three-month implied forward rates greater than 10 basis points linked to MPC-related news (1997–2005)**

| Rank | News date | Change (basis points) | News item |
|---|---|---|---|
| 1 | 08 Sep. 1999 | 26.4 | MPC decision (+25 bps) |
| 2 | 04 June 1998 | 21.2 | MPC decision (+25 bps) |
| 3 | 06 Feb. 2003 | -20.8 | MPC decision (-25 bps) |
| 4 | 02 Aug. 2001 | -20.8 | MPC decision (-25 bps) |
| 5 | 04 Feb. 1999 | -19.5 | MPC decision (-50 bps) |
| 6 | 08 Nov. 2001 | -17.6 | MPC decision (-50 bps) |
| 7 | 03 Mar. 1999 | 16.7 | MPC decision (no change) |
| 8 | 07 Nov. 2002 | 13.5 | MPC decision (no change) |
| 9 | 15 July 1998 | 12.6 | MPC *Minutes* |
| 10 | 05 Nov. 1998 | -12.0 | MPC decision (-50 bps) |
| 11 | 06 Nov. 1997 | 12.0 | MPC decision (+25 bps) |
| 12 | 11 Nov. 1998 | 11.6 | *Inflation Report* |
| 13 | 22 Oct. 2003 | 11.5 | MPC *Minutes* |
| 14 | 14 Jan. 1998 | 11.4 | MPC *Minutes* |

The table also suggests that the amount of news in monetary policy announcements declined in the second half of the period: just five of these fourteen large moves in rate expectations have occurred since the beginning of 2001.

## Has policy announcement news been declining?

We can use statistical tests based on the two measures in Chart 1 to examine formally the proposition that there has been a reduction in the amount of news contained in interest rate announcements.

To do this, we divide the period of the MPC's existence into two subperiods, June 1997 to December 2000 and January 2001 to April 2005 (corresponding to the shaded area in Chart 1).(2)

Table B shows the average absolute values of both the Reuters' survey-based and market-based news measures in the two subperiods.

Both news measures are smaller in the later period than in the earlier one. In both cases, the average magnitude of the rate news in the second period is a little under two thirds of the corresponding value for the earlier period. Statistical tests suggest that this average decline in the amount of news is greater than could reasonably be accounted for by chance alone (ie the difference between the averages is statistically significant).

**Table B**
**Has policy announcement news been declining?**

| | Average magnitude of rate news measure (basis points) | Number of observations |
|---|---|---|
| *Reuters survey-based measure:* | | |
| 1998–2000 | 11.0 | 30 |
| 2001–present | 7.2 | 52 |
| *Difference* | *-3.8**** | |
| *Market-based measure:* | | |
| 1997–2000 | 5.4 | 43 |
| 2001–present | 3.6 | 52 |
| *Difference* | *-1.8** | |

Notes: Significance test based on t-test for difference between two means.
Significantly lower than zero at ***1%, **5% and *10% levels (one-sided).
Excludes the special MPC meeting following 11 September 2001.

This reduction in the degree of news may be linked to a decrease in the frequency of rate changes. In 1997–2000, just over one third of meetings resulted in a change in the interest rate, whereas in 2001–05 it was closer to one quarter. The number of changes of 50 basis points has also fallen: there were three such changes to the repo rate in the earlier period but only one in the later one (all other changes have been of 25 basis points).

What might explain the apparent reduction in the size of news and the lower frequency of interest rate changes? One potential explanation is that continued experience of the current inflation-targeting regime has over time brought about a greater understanding of the interest rate-setting process, and how the MPC is likely to react to the economic shocks that come along. This might be expected to lead to fewer and smaller monetary policy surprises over time as interest rates become more predictable.

It may also mean that fewer changes to the policy rate become necessary. Expectations of where interest rates will go in the future are a key influence on economic activity and inflation today. With a greater experience and understanding of the policy framework, expectations of interest rates in the medium term may adjust more quickly to a level consistent with hitting the inflation target. In turn, this may necessitate fewer changes to the short-term interest rate controlled by the MPC. As

(1) It should be noted that we make no attempt to control for other events that occur in the time interval. In general no other economic releases coincide with MPC-related events, with the exception of the release of UK labour market statistics, which sometimes coincides with publication of either the *Inflation Report* or the MPC *Minutes*.
(2) Given the relatively small sample period, it is difficult to test for structural breaks. Our choice of the two periods enables us to examine timeframes of (approximately) the same size; our results are, in general, invariant to changes of one year either side of this breakpoint.

noted by the Governor (2005), it may be that *'monetary policy was able to respond by less than would otherwise have been necessary because it affected expectations'*.(1)

But there are other possible explanations. One alternative is that the magnitude of shocks hitting the economy was greater in the first half of the sample (for instance, the Asian economic crisis). If some of the uncertainty about future changes in interest rates derives from uncertainty about the MPC's reaction to these shocks, then the occurrence of fewer large economic shocks would be likely to lead to an increase in the ability of individuals to predict interest rate changes.(2) That said, one can point to a number of significant shocks to the economy over the period 2001–05, including the impact of 11 September and the US recession, the rapid rise in UK house prices, and recent sharp rises in oil prices.

It is also possible that in 1997, following independence, the Committee perceived rates to be below the level consistent with the inflation target. If there was a desire to change interest rates in small steps (to 'smooth' interest rates) then several rate changes may have been necessary to get to the required level. Once there, we might expect the frequency of rate changes to fall. Even excluding 1997, though, the proportion of meetings in the earlier period resulting in a rate change remains at around a third — higher than in the more recent period.

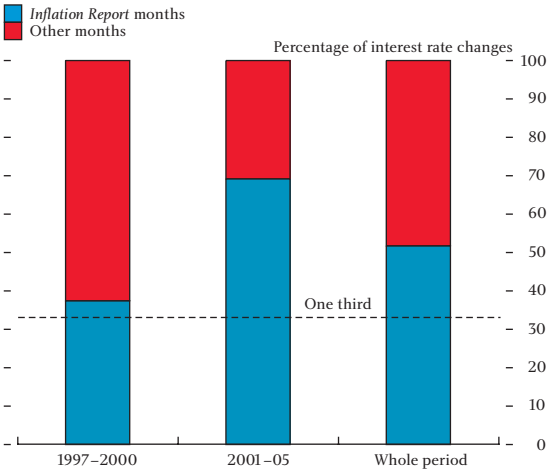
## Monetary policy decisions and the *Inflation Report*

In four months of the year, the MPC's interest rate decision is followed six days later by the publication of an *Inflation Report*. During the production stages of the *Report*, the MPC undertakes a thorough re-assessment of its three-year projections for output and inflation. It makes its interest rate decision in the light of that re-assessment and the detailed analysis that supports it.

Although the frequency of interest rate changes has fallen in recent years, the changes that have occurred have happened more often in *Inflation Report* months. Chart 2 depicts this graphically, while Table C presents the raw data.

Since the beginning of 2001, around two thirds of interest rate changes have happened in *Inflation Report* months — a greater proportion than the one third that we would expect if rate changes were evenly spread over the months of the year. However, this was not the case in the earlier subperiod.

### Chart 2
### Proportion of interest rate changes in *Inflation Report* months




Note: Excludes special MPC meeting following 11 September 2001.

We can again use a more formal statistical test to examine the significance of these results. For the most recent sample period, our tests suggest that the apparent concentration of rate changes in *Inflation Report* months is indeed higher than we would expect just by chance, or random variation. By contrast, before 2001, no such pattern seemed to exist.

### Table C
### Are rate changes evenly spread over the months of the year?

| | Rate changes | | $\chi^2$ test statistic |
|---|---|---|---|
| | *Inflation Report* months | Other months | |
| Whole period | 15 | 14 | 4.41** |
| 1997–2000 | 6 | 10 | 0.13 |
| 2001–present | 9 | 4 | 7.54*** |

Notes: Test statistic for whether rate changes are distributed one third in *Inflation Report* months and two thirds in other months.
Significantly different to zero at ***1%, **5% and *10% levels. Monte Carlo simulations were used to uncover the critical values.
Excludes the special MPC meeting following 11 September 2001.

This apparent shift in behaviour is consistent with the quarterly *Inflation Report* and accompanying forecast having become more central to the policymaking process. Given its thorough re-evaluation of the medium-term prospects for inflation in these months, the MPC may be more likely to re-assess its view of the

(1) The Governor's 2005 Mais Lecture (which is also published in this edition of the *Quarterly Bulletin*) discusses the importance of interest rate expectations in more detail.
(2) Perhaps consistent with this, the average surprise that relates specifically to official interest rate changes has fallen between the two periods; the fall in the survey-based measure is particularly large.

appropriate level of interest rates to meet the inflation target.(1)

The result may also in part be linked to the previous finding that rate changes are less frequent in the second period. For the reasons noted above, fewer rate changes may have been necessary recently, and so the Committee may have been more willing to wait until a full assessment of the prospects for inflation could be carried out before adjusting the policy rate. The preparation of the inflation forecast associated with the publication of the *Inflation Report* provides such an opportunity for an in-depth analysis of the key issues affecting the risks to inflation.

Moreover, there is evidence that economists and others outside the Bank recognise the significance of the *Inflation Report*. Survey data suggest that, since 1997, economists have thought that a rate change was the most likely outcome on 22 occasions, of which almost two thirds were in *Inflation Report* months. That result is especially marked since 2001, as shown in Table D.

**Table D**
**Are rate changes expected to be evenly spread over the months of the year?**

| | Expected rate changes | | $\chi^2$ test statistic |
|---|---|---|---|
| | *Inflation Report* months | Other months | |
| Whole period | 14 | 8 | 9.09*** |
| 1997–2000 | 6 | 5 | 2.23 |
| 2001–present | 8 | 3 | 7.68*** |

Notes: These expectations relate to the single most likely outcome envisaged by the economists polled by Reuters, ie the modal outcome rather than the mean described above. These data are available for the whole period spanned by the MPC.
Test statistic for whether rate changes are distributed one third in *Inflation Report* months and two thirds in other months.
Significantly different to zero at ***1%, **5% and *10% levels. Monte Carlo simulations were used to uncover the critical values.
Excludes the special MPC meeting following 11 September 2001.

There is also evidence that the amount of news tends to be larger for a policy decision in *Inflation Report* months than in others. As shown in Table A, of the eleven MPC decisions associated with a market reaction of greater than 10 basis points, seven were in *Inflation Report* months.

Table E demonstrates this formally. Since 2001, the Reuters survey-based news measure associated with an interest rate decision in *Inflation Report* months is around one and a half times the news measure in other months. On the market-based measure, the result is even more persuasive: almost three times as large, and the result is strongly statistically significant.

**Table E**
**Is there more news in policy announcements in *Inflation Report* months?**

| | Average of news variable (basis points) | | |
|---|---|---|---|
| | *Inflation Report* months | Other months | *Difference* |
| *Reuters survey-based measure:* | | | |
| Whole period | 10.6 | 7.6 | +3.0* |
| 1998–2000 | 12.6 | 10.0 | +2.6 |
| 2001–present | 9.5 | 6.1 | +3.4* |
| *Market-based measure:* | | | |
| Whole period | 5.9 | 3.6 | +2.3** |
| 1997–2000 | 5.5 | 5.3 | +0.2 |
| 2001–present | 6.3 | 2.3 | +4.0** |

Notes: Significance test based on t-test for difference between two means.
Significantly lower than zero at ***1%, **5% and *10% levels (one-sided).
Excludes the special MPC meeting following 11 September 2001.

Not only are three-month-ahead market interest rate expectations more influenced by interest rate decisions in *Inflation Report* months, but so are expectations of rates further into the future (Table A1 in Annex 1). This seems to suggest that the market perceives interest rate decisions in *Inflation Report* months as containing extra information about the future.

The following section considers how interest rate expectations are influenced by the publication of the *Inflation Report* itself, and the subsequent release of the MPC meeting *Minutes*.

## Market reactions to the publication of the *Inflation Report* and MPC *Minutes*

The MPC releases three key monetary policy statements in an *Inflation Report* month: the interest rate decision, the *Inflation Report* itself and the *Minutes* of the MPC meeting. Chart 3 demonstrates the average effect that these statements have had on market interest rate expectations since 1997. In particular, it shows the average absolute change in expectations for interest rates at different points in the future: three months, six months and twelve months ahead.

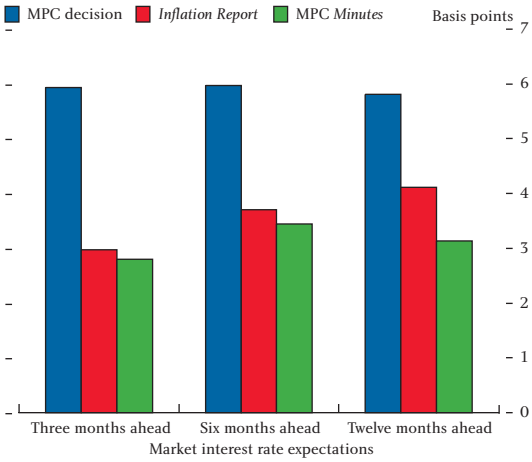
As Chart 3 shows, market interest rate expectations are more likely to react to the rate decision itself than to either the subsequent publication of the *Inflation Report* or the MPC *Minutes*.(2) Why might that be the case?

As previously noted, a week before the publication of the *Inflation Report*, the MPC makes its interest rate decision with the knowledge of the forthcoming inflation projection. The decision may, therefore, convey the

(1) Similar arguments are made by MPC member Richard Lambert in 'Inside the MPC' in the Spring 2005 *Quarterly Bulletin*, by Deputy Governor Rachel Lomax in her speech 'Inflation targeting in practice: models, forecasts and hunches' in this edition of the *Quarterly Bulletin*, and by Chief Economist Charles Bean in 'The formulation of monetary policy at the Bank of England' (with Nigel Jenkinson), in the Winter 2001 *Quarterly Bulletin*.
(2) Details of the statistical tests confirming this result can be found in Table A2 in Annex 1.

majority of the information about the Committee's analysis, such that the actual publication of the economic projections in the *Inflation Report* itself contains less incremental news.

**Chart 3**
**Average absolute change in interest rate expectations following MPC announcements and publications in an *Inflation Report* month**

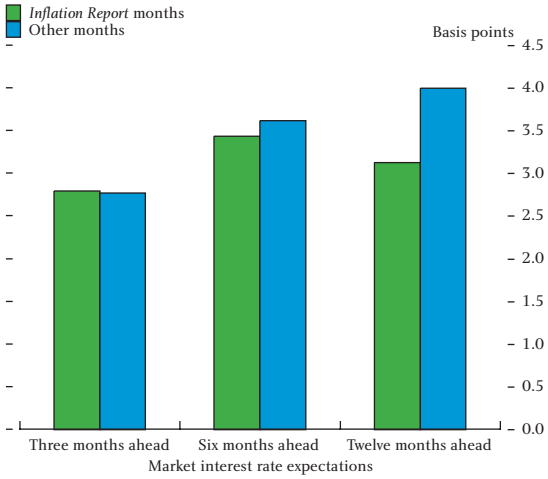



However, the *Inflation Report* and the MPC meeting *Minutes* provide a considerable amount of detailed information about the MPC's judgement on the economic outlook over the medium term. As a consequence these publications might be expected to have a greater influence on expectations of interest rates further into the future. There is some evidence that this is indeed the case (Chart 3); the average impact of an *Inflation Report* release is larger on rate expectations twelve months into the future than on those at a shorter horizon.

Chart 3 suggests that the impact on rate expectations of the release of the MPC *Minutes* is only very slightly larger at longer horizons. But the effect is more noticeable in months in which an *Inflation Report* is not published, as Chart 4 shows. This is perhaps because, in those months, the MPC *Minutes* are the sole detailed description of the MPC's view of medium-term prospects.

The MPC *Minutes* also contain information on how individual Committee members voted at the monthly interest rate-setting meeting. It reveals whether the interest rate decision was arrived at unanimously or by a split vote. However, we found little compelling evidence that interest rate expectations react, on average, differently to *Minutes* that reveal a split vote to those that reveal a unanimous one. If anything, the reaction to a unanimous vote tends to be slightly larger — perhaps because it is perceived that unanimity provides a more powerful statement about the likely future path of interest rates. But it is not at all obvious why this should be the case. And the difference in reactions found here is not large enough to make the argument especially persuasive.(1)

**Chart 4**
**Average size of reaction to MPC *Minutes* releases**




Note: Excludes special MPC meeting following 11 September 2001.

Nonetheless, the impact of the policy announcement itself on expectations does seem to be significantly larger when the rate decision was agreed by a split vote — even though market participants would not at that time know whether the decision was split or not. One potential explanation is that split votes might occur when the outlook for inflation — and thus interest rates — is most uncertain. Under those circumstances, it may be that the policy announcement has a larger impact on market expectations than otherwise because it resolves some of the uncertainty about the interest rate outlook.(2)

## Conclusion

In this article we have examined the degree of 'news' in interest rate decisions and the impact of the publication of the *Inflation Report* and MPC *Minutes* on expectations of what interest rates will be in the future.

We have found evidence from both survey and market-based measures that recent interest rate

(1) Gerlach-Kristen (2004) finds that the direction of Committee members' dissent in the monthly vote provides information about future rate changes over and above that already embodied in market expectations.
(2) More detail on the reaction of market interest rate expectations to unanimous and split vote policy announcements and MPC *Minutes* can be found in Table A3 in Annex 1.

decisions have appeared to contain less news than in the first half of the MPC's existence.

The number of interest rate changes has fallen in recent years compared with the earlier years of the MPC. At the same time, the proportion of interest rate changes that occur in an *Inflation Report* month has risen, perhaps reflecting the increasing role of the quarterly forecast process in policymaking. The economists surveyed by Reuters have expected interest rates to change more often in *Inflation Report* months, and there is some evidence that market participants believe that rate decisions in those months contain more information about the future than decisions in other months.

On average, the interest rate decision itself tends to affect expectations of rates in the future by more than the publication of the *Inflation Report* or the MPC meeting *Minutes*. This is particularly true for expectations of rates in the near term. But there is some evidence that the publication of the *Minutes* and *Inflation Report* have a greater impact on expectations of interest rates further into the future.

# Annex 1: Test results

## Table A1
## Change in market rate expectations following an interest rate announcement

| | Average of news variable (basis points) | | |
|---|---|---|---|
| | *Inflation Report* months | Other months | *Difference* |
| *Three-months ahead:* | | | |
| Whole period | 5.9 | 3.6 | *+2.3*** |
| 1997–2000 | 5.5 | 5.3 | *+0.2* |
| 2001–present | 6.3 | 2.3 | *+4.0*** |
| *Six-months ahead:* | | | |
| Whole period | 6.0 | 3.5 | *+2.5*** |
| 1997–2000 | 5.3 | 5.3 | *0.0* |
| 2001–present | 6.3 | 1.9 | *+4.6*** |
| *Twelve-months ahead:* | | | |
| Whole period | 5.8 | 3.0 | *+2.8*** |
| 1997–2000 | 5.0 | 4.6 | *+0.4* |
| 2001–present | 6.5 | 1.7 | *+4.9**** |

Notes: Significance test based on t-test for difference between two means.
Significantly higher than zero at ***1%, **5% and *10% levels (one-sided).
Excludes the special MPC meeting following 11 September 2001.

## Table A2
## Market reactions in *Inflation Report* months

| | Average absolute change in three-month-ahead interest rate expectations (basis points) | | | *Difference between reaction to policy decision and* Inflation Report *publication* | *Difference between reaction to policy decision and MPC* Minutes *publication* | Observations |
|---|---|---|---|---|---|---|
| | Policy decision | *Inflation Report* publication | MPC *Minutes* publication | | | |
| Whole period | 5.9 | 3.0 | 2.8 | *+3.0*** | *+3.1*** | 31 |
| 1997–2000 | 5.5 | 3.4 | 2.4 | *+2.1* | *+3.1*** | 14 |
| 2001–present | 6.3 | 2.7 | 3.1 | *+3.6*** | *+3.2*** | 17 |
| *Difference* | *0.7* | *-0.7* | *+0.6* | | | |

Notes: Significance test based on t-test for difference between two means.
Significantly higher than zero at ***1%, **5% and *10% levels (one-sided).
Excludes the special MPC meeting following 11 September 2001.

## Table A3
## Does the market react differently to split votes?

| | Reaction to policy announcement (basis points) | | | Reaction to *Minutes* (basis points) | | |
|---|---|---|---|---|---|---|
| | Split vote | Unanimous | *Difference* | Split vote | Unanimous | *Difference* |
| *Three-month-ahead rate expectations:* | | | | | | |
| 1997–2000 | 6.7 | 3.2 | *+3.5*** | 2.8 | 3.3 | *-0.5* |
| 2001–present | 4.9 | 1.4 | *+3.5**** | 2.5 | 2.8 | *-0.2* |
| Total | 5.7 | 2.3 | *+3.5**** | 2.7 | 3.0 | *-0.3* |
| *Six-month-ahead rate expectations:* | | | | | | |
| 1997–2000 | 6.4 | 3.5 | *+2.9*** | 3.5 | 4.0 | *-0.5* |
| 2001–present | 4.6 | 1.5 | *+3.1**** | 3.1 | 4.0 | *-0.9* |
| Total | 5.4 | 2.4 | *+3.1**** | 3.3 | 4.0 | *-0.7* |
| *Twelve-month-ahead rate expectations:* | | | | | | |
| 1997–2000 | 5.2 | 3.7 | *+1.5* | 3.5 | 4.5 | *-1.0* |
| 2001–present | 4.2 | 1.7 | *+2.5*** | 3.2 | 4.2 | *-1.0* |
| Total | 4.7 | 2.6 | *+2.1*** | 3.4 | 4.3 | *-1.0** |

Notes: Significance test based on t-test for difference between two means.
Significantly higher than zero at ***1%, **5% and *10% levels (one-sided).
Excludes the special MPC meeting following 11 September 2001.

## Annex 2: Data set

Short sterling contracts settle on three-month Libor rates on the third Wednesday of the delivery month. So, for example, the March 2006 short sterling futures contract provides an implied three-month Libor rate on the third Wednesday of March 2006.

The short sterling intraday data are provided by Euronext.liffe. This consists of data giving the price of every trade for a given contract. The data were filtered to give trade price data at five-minute intervals, with the price at each interval equal to the last traded price.

To derive a constant maturity forward rate we linearly interpolate between adjacent contracts. So, for example, in February 2005, three months forward was in May 2005. So to derive a three-month constant maturity forward rate we linearly interpolate between the rate implied by the March and June 2005 contracts.

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# Learning the rules of the new game? Comparing the reactions in financial markets to announcements before and after the Bank of England's operational independence

***Working Paper no. 255***

Ana Lasaosa

Increased transparency is a stated aim of the new operational framework for UK monetary policy introduced in 1997. Several features of the new framework are designed to increase the accountability and transparency of the monetary policy process. Four Monetary Policy Committee (MPC) members are external to the Bank, and the individual votes are published in the *Minutes*. The nine members of the MPC give speeches laying down their views on particular economic issues. On top of this, the contents of the *Inflation Report* have changed since Bank independence. The *Inflation Report* — introduced shortly after the change to inflation targeting in 1992 — has increased its average number of pages from around 45 to 50, including a new section on 'Monetary policy since the previous *Inflation Report*'. It has occasionally featured a table with alternative scenarios for the inflation forecast. The *Minutes* now include a discussion of alternatives that the MPC considered but did not adopt, plus the reasoning behind its stance. The MPC members have a clear mandate and operational independence without political interference.

This paper uses high frequency data to analyse how the Bank of England's operational independence has changed the way in which markets react immediately after economic releases. Other things being equal, the increase in transparency embedded in the new framework will make monetary policy more predictable once the latest macroeconomic data are known. On this view, the market will be less sensitive to interest rate decisions and more sensitive to macroeconomic data releases.

Previous research on the subject showed a more muted immediate reaction to macroeconomic releases in the United Kingdom after 1997; this suggested that markets were still learning the rules of the new monetary framework. Using two more years of data, this paper finds that that is still the case. Macroeconomic releases continue to move the markets less in the extended post-independence period, and interest rate changes the same or more. The significance of the difference has in fact increased with two years of data in the case of macroeconomic announcements, and it is robust to the measure of central tendency — the mean or the median — used.

This paper complements the study of price variation with an analysis of trading activity (trades and number of contracts). We find that the differences in trading activity between the two periods tend to mirror the differences in price variation. A separate analysis of unexpected announcements and the surprise component of each announcement reveals a similar pattern. Nor is the possible greater impact of international announcements — another candidate explanation — borne out by the data. Finally, a comparison of the two halves of the post-independence period shows that the reactions to macroeconomic announcements are indeed stronger in the second half. There are tentative signs of a more muted reaction to interest changes, but they lack statistical significance.

An increase in transparency was not the only change brought about by operational independence. The decision-making body is now a committee with nine members. This collective nature may make their decisions harder to anticipate, thus decreasing the response to macroeconomic releases and increasing the reaction to monetary policy decisions. If the interest rate process, though transparent, cannot be observed in real time and is the outcome of a discussion in which new information may result, then the interest rate decision could still be the important price-mover despite the increase in transparency. It is also plausible to argue that the new framework shifted the reaction function of the monetary authority towards a more implicit instrument (or targeting) rule, which involves less reaction to macroeconomic announcements than explicit rules.

# Comovements in the prices of securities issued by large complex financial institutions

***Working Paper no. 256***

Christian Hawkesby, Ian W Marsh and Ibrahim Stevens

In recent years, mergers, acquisitions and organic growth have meant that some of the largest and most complex financial groups have come to transcend national boundaries and traditionally defined business lines. As a result, they have become a potential channel for the cross-border and cross-market transmission of financial shocks, which is especially relevant for analysis of financial stability in an international financial centre such as London.

To identify the degree to which large complex financial institutions (LCFIs) have exposures to common factors, this paper analyses the degree of comovement in the prices of securities issued by a selected group of LCFIs — more specifically, their share price returns and movements in their credit default swaps (CDSs). A number of techniques are employed to analyse information from the correlation or covariance matrices of these asset prices, including heat maps of correlations, cluster analysis, minimum spanning trees, principal component analysis and factor modelling.

Such an analysis of comovement in market prices captures both market perceptions of direct exposures between LCFIs and exposures to similar external factors. Knowledge of these common factors could help to identify potential channels for financial stability threats, such as through interlinkages between LCFIs or common vulnerabilities. The approach used does not, however, attempt to capture the degree of contagion that may occur during periods of financial stress, as the empirical estimation does not focus exclusively on such periods.

The various techniques applied to analyse comovement provide corroborating results for our peer group of LCFIs. Across the techniques employed, we find a relatively high degree of commonality in the asset price movements of LCFIs (compared with a control group of size/country-matched non-financials). This emphasises the relevance for financial stability of monitoring LCFIs as a special class of financial institutions.

However, there is also clear evidence that a divide still exists between US and European institutions within the LCFI group. Some segmentation is also evident along national lines within Europe and between pure brokerage houses and the banking-oriented institutions. Despite the liberal inclusion of unobserved factors to explain movements in the securities prices of LCFIs, around a quarter of equity returns' variance and a quarter of the variance of CDS price changes has to be allocated to unexplained or idiosyncratic factors on average. So despite recent mergers and acquisitions, LCFIs do not yet form a purely homogeneous group affected equally by common factors.

# The role of ICT in the global investment cycle

***Working Paper no. 257***

Michael McMahon, Gabriel Sterne and Jamie Thompson

Most macroeconomic forecasters underestimated the volume of global investment during the late 1990s. One potential reason was that the models they were using were insufficiently disaggregated.

We extend previous international empirical models of investment in a number of ways. Following approaches for the United Kingdom and the United States that have demonstrated the benefits from estimating disaggregated investment equations, we use a data set that enables us to disaggregate non-residential investment into information, communications and technology (ICT) and non-ICT assets for all G7 countries and Australia. Furthermore, we calculate for each country a measure of the real user cost of capital that is more richly specified than has generally been the case in cross-country studies. We employ a Hall-Jorgenson real user cost of capital measure that specifies roles (among others) for the price of investment goods relative to that of other goods in the economy; the real interest rate faced by firms (including corporate spreads); and the cost of equity finance.

The various innovations in our approach and the use of more disaggregated data result in improved econometric performance. Our estimated disaggregated system of investment equations yields out-of-sample forecasts that largely explain the global investment boom in the late 1990s. They suggest very strong relative price effects on ICT investment for all countries in our sample, and it is this sensitivity that accounts for the much improved forecasting performance of our model relative to previous approaches.

# Estimating UK capital adjustment costs

***Working Paper no. 258***

Charlotta Groth

The aim of monetary policy is to keep inflation low and stable, in accordance with the target set by the Chancellor. A key influence on inflationary pressure is the balance between the demand for, and the economy's capacity to supply, goods and services. This capacity depends both on the quantities and qualities of the primary inputs into the production process — capital and labour — but also on the efficiency with which they are combined. The latter concept is often referred to as total factor productivity (TFP). A good knowledge of current and past productivity growth is therefore important for understanding aggregate supply activity, and so is relevant for the conduct of monetary policy.

To obtain a good measure of TFP growth, it is important to measure output and factor inputs correctly. There are a number of issues that need to be addressed. For example, the composition of aggregate inputs changes over time, and it is important to recognise and adjust for this. Also, the level of utilisation of the inputs may vary over the business cycle, which needs to be taken into account. It may also be costly to change the level of factor inputs, and adjusting for these costs may be important to better understand fluctuations in measured TFP growth.

The purpose of this paper is to get a better understanding of the costs associated with changing the level of capital; capital adjustment costs. The motivation for considering these types of costs is that when firms are investing in capital, they may need to divert resources to installing new capital rather than producing marketable output. This means that in periods of rapid investment growth, firms could be producing two types of products: the final product sold in the market and the services used within the firm to install capital. Marketable output may therefore be lower in periods of high investment growth, and this would cause a downward bias in estimates of measured productivity growth.

Simple plots of the standard measure of TFP growth (the Solow residual) and investment growth suggest a negative relationship between these series: TFP growth has fallen in periods of high investment growth, such as the late 1980s and the second half of the 1990s.

There are a number of studies that estimate capital adjustment costs for US data, but little is known about the importance of these costs for the United Kingdom. The main purpose of this paper is therefore to provide estimates of UK capital adjustment costs, using a newly constructed industry data set for 34 UK manufacturing and services industries, for the period 1970–2000.

The results are applied to an analysis of the second half of the 1990s: a period when TFP growth fell relative to the first half of the 1990s in the United Kingdom, while rising sharply in the United States. This period exhibits high growth in investment in information and communications technology (ICT). Separate estimates of adjustment costs are therefore provided for ICT and non-ICT capital. The results suggest that there exist significant adjustment costs for traditional non-ICT assets (plant and machinery, buildings, vehicle and intangibles). By contrast, there is less support for costly adjustment of ICT capital (computers, software, telecommunications equipment). We find some evidence that UK adjustment costs for non-ICT capital are larger than comparable estimates for the United States, while the cost of installing new ICT equipment appears to have been lower than those facing US firms.

The data set includes data for services industries, such as finance and business services. The output share of these industries has grown rapidly over time, and services industries also exhibited strong investment growth during the 1990s. Sectoral results suggest that it may be more costly to install capital in fast-growing services industries, than in more traditional manufacturing industries.

Finally, we find that capital adjustment costs accounted for around two thirds of the observed slowdown in UK TFP growth in the second half of the 1990s. However, the adjustment is not large enough to reverse the finding that UK TFP growth declined in the second half of the 1990s, unlike the US experience of rising TFP growth.

# Productivity growth in UK industries, 1970–2000: structural change and the role of ICT

## *Working Paper no. 259*

Nicholas Oulton and Sylaja Srinivasan

The aim of this paper is to quantify the importance of structural change and of investment in information and communication technology (ICT) in accounting for the growth of productivity in the United Kingdom.

The context is a puzzle about UK productivity in the 1990s. Though in other respects — inflation, unemployment, and job creation — the economy has done well since emerging from the 1990–92 recession, and though productivity growth has been quite rapid, it slowed down after 1995. This was in contrast to the United States which experienced a rise in productivity growth in 1995–2000, widely believed to be associated with the ICT investment boom. Why did nothing comparable happen in the United Kingdom?

*The Bank of England industry dataset (BEID)*
We use a new industry dataset, containing annual data for 34 industries spanning the whole UK economy (of which 31 industries are in the market sector), running from 1970 to 2000. The dataset satisfies two important principles. First, it is consistent with the national accounts in both nominal and real terms. Second, industry output is measured gross, so that proper account can be taken of the contribution of intermediate input to productivity growth.

*Structural change*
We considered several different forms of structural change including:

(1) A change in the degree of inter-relatedness of domestic industries, ie a change in the proportion of each industry's total costs accounted for by buying from other industries. We found that inter-relatedness has risen fairly steadily since 1970 (apart from a dip in the early 1980s). According to growth accounting theory, this means that, even if the growth rates of total factor productivity (TFP) had been constant in individual industries, the aggregate TFP growth rate would still have risen.

(2) A shift in the composition of output towards industries with a high or low level of labour productivity, tending either to raise or lower the aggregate labour productivity growth rate. We found however that aggregate labour productivity growth was predominantly due to labour productivity growth in individual industries, not compositional changes.

*Productivity growth in the market sector: a growth accounting analysis*
Since 1979, input growth (capital deepening plus labour quality growth) has accounted for three quarters of labour productivity growth in the market sector (ie the whole economy excluding the government sector), while capital deepening alone has accounted for more than half. TFP growth accounted for 28% of labour productivity growth in 1979–90 and for 35% in 1990–2000; reallocation effects accounted for the remainder.

Over the three decades, ICT capital services per hour have grown at a remarkable 22.0% per year, while non-ICT services per hour grew at only 3.3% per year. Interestingly, ICT capital services were growing more rapidly in the 1970s than in the 1990s. But their contribution to overall deepening was lower. This was because in the 1970s the share of ICT capital in income (ie profit attributable to ICT assets as a proportion of GDP) was less than 2%, while by the 1990s it had tripled to more than 5%. The share of ICT capital in income is now about the same as in the United States but ICT capital stocks per capita are still significantly lower in the United Kingdom.

We find that ICT capital accounted for 13% of growth in the market sector in 1970–79 (ie 0.47 percentage points out of 3.62% per annum growth of GDP per hour), 26% in 1979–90, and 28% in 1990–2000. In 1995–2000 the proportion rises to 47%. ICT capital, despite only being a small fraction of the total capital stock, contributed as much to growth as non-ICT capital in 1990–2000 and getting on for twice as much in 1995–2000.

*Testing the growth accounting assumptions*
The growth accounting analysis makes a number of strong assumptions. So we test these assumptions econometrically by panel regression analysis. We find that the growth rate of labour productivity is more strongly associated with the growth of ICT than with that of non-ICT capital. But the association between productivity and ICT capital gets stronger and more significant statistically as the period over which growth is measured gets longer: over one year the association is low and statistically insignificant, but over five years it is large and highly significant.

*Complementary investment and capital*
It is often argued that successful implementation of an ICT project requires costly reorganisation of the firm around the new technology. By incurring current costs, the firm acquires a capability that helps it to absorb new technology in the future. In other words, the investment in reorganisation creates a stock that yields future benefits. The empirical difficulty is that this type of 'complementary' investment is not measured as such in the national accounts.

The effect on the estimation of TFP is quite complex. Omitting the contribution of growth in the stock of complementary capital biases the estimate of TFP growth upwards, while omitting the contribution of the growth in complementary investment biases it downwards. In a boom investment tends to grow more rapidly than capital, leading to a net downward bias. Simulation shows that the bias can be quite large. We also estimate the bias econometrically on our panel of industries, using ICT capital as a proxy for complementary capital. We find, in accordance with the theory, that ICT capital significantly increases TFP growth, while ICT investment significantly reduces it. So a surge in complementary investment accompanying the surge in ICT investment in the second half of the 1990s may explain some at least of the observed slowdown in TFP growth.

# Financial constraints and capacity adjustment in the United Kingdom: evidence from a large panel of survey data

***Working Paper no. 260***

Ulf von Kalckreuth and Emma Murphy

Recent research has shown that the causes and effects of financial constraints for firms in the private sector is of key importance for a variety of policy issues relevant to central banks. First, the quantitative and qualitative features of monetary transmission depend on whether or not borrowing and other financial constraints have important effects on the real economy. Second, the real consequences of shocks to the financial system depend on the way in which firms cope with their financial constraints. Due to the interrelationships between firms, financial constraints also may form part of a propagation mechanism creating systemic risk. Third, financial constraints might be especially relevant for investment activities that are difficult to raise finance for but quite important for economic growth, such as research and development, or the introduction of innovative products and processes.

Survey data have a decisive advantage over other micro data sources: firm managers can be directly asked for the main constraints to their activities. Unlike balance sheet information, these data are available in a timely manner. Potentially this makes them a valuable direct tool in policy analysis compared to indirect methods of detecting financial constraints that rely on ambiguous cash-flow sensitivities. However, it is necessary to make sure that managers' statements are compatible with how economists use the concept of financial constraints: their survey responses need to correspond to what theoretically might be expected in a financially constricted environment.

We are able to use the *CBI Industrial Trends Survey* (*ITS*), which is an important survey for business cycle analysis in the United Kingdom. For the eleven years between January 1989 and October 1999, the cleaned, unbalanced panel contains 49,244 quarterly observations on 5,196 firms. According to the CBI, the *ITS* represents around 33% of total UK manufacturing employment. The data set covers all size ranges, including small firms for which very little information is available from other micro data sets. More than 63% of the *ITS* observations cover firms with less than 200 employees. On average, around 21% of respondents state that they are constrained by inadequate amounts of finance, and that these constraints have an influence on their investment plans.

First, we describe the financing environment for small firms in the United Kingdom during the 1990s. We then present our data set by means of descriptives statistics. At this stage, the differences between large and small firms appear modest. We proceed to examine the usefulness of our data on financial constraints. Our focus is on capacity adjustment as the *ITS* data on capacity restrictions, planned expansion and rates of capacity utilisation are especially rich. Firms report whether their capacity is insufficient with respect to demand. Those firms which indicate financial constraints should have insufficient capacity often and take longer to get rid of their capacity restriction, either because they are less able to finance their investments or else because the capacity shortfall is larger.

To test this prediction, we first look at the statistical association between two types of constraints: capacity restrictions and financial constraints. We test whether those two types of constraints tend to occur jointly. Then we analyse the duration of capacity gaps with respect to spells of capacity restrictions. To the best of our knowledge, the duration of capacity constraints has never been investigated before on a microeconometric level.

For both size classes, we find a clear contemporaneous association between the two types of constraints. This association stays intact when we look at whether capacity constraints were present in the previous period. With respect to duration, financially constrained firms take longer to end a period of insufficient capacity. On average, the actions taken by a firm to close its capacity gap will leave it with a level of capacity that is about 20% lower if it is financially constrained, compared to a firm that does not report financial constraints. This is entirely consistent with the results we obtain from association analysis.

We conclude that the survey data contain useful information on financial constraints.

Splitting the sample shows that the relationship between financial constraints and the duration of capacity restrictions is weaker for larger firms, indicating that financial constraints might be of less relevance to their activity. On the other hand, small firms appear able to overcome their capacity shortfalls faster than larger firms. This might indicate that small firms, due to flat hierarchies and low co-ordination costs, are more flexible in coping with the demand shocks typical for their size.

# Default probabilities and expected recovery: an analysis of emerging market sovereign bonds

***Working Paper no. 261***

Liz Dixon-Smith, Roman Goossens and Simon Hayes

In this paper information contained in bond prices is backed out to assess credit risk in emerging market economies (EMEs). As a first step a model is set out which is used to decompose bond prices into its constituent parts — in particular default probabilities and expected recovery rates. The model is then applied to a group of EME sovereign bonds. This enables a judgement to be made among other things, on whether the model is useful to gain some insight into recent emerging market crises.

Yield spreads on EME sovereign bonds reflect, in part, market perceptions of the risk of default and expected recovery in the event of default. Typically, indices of average bond yield spreads are used to evaluate how the market's perception of credit risk evolves over time. However, backing out 'fundamental' determinants such as default probabilities and recovery rates is not straightforward. Moreover, there is information in the term structure on the probabilities of default in the near term that cannot be inferred from simple indices of average spreads.

There are a number of ways to extract this information but two types of models that are commonly used are structural and reduced-form (intensity-based) ones. A simple 'reduced-form' approach is followed in this paper. The model is augmented to incorporate information from the yield curve by introducing a more realistic distributional assumption for the risk-neutral probability density function. A Weibull distribution is assumed which allows the level and the slope of the probability of default structure to be derived. It also enables useful summary statistics (such as the median time to default) to be calculated which gives a greater insight into the development of credit perceptions. The model also allows time-varying recovery rates to be estimated simultaneously with the probability of default.

The model is applied to six EMEs: Argentina, Brazil, Colombia, Mexico, Russia and Turkey over the January 2000–July 2002 period. For all countries, investors' perception of the (risk-neutral) probabilities of default at different maturities and the expected half-life to default are backed out. Long-term probabilities of default are found to be highly correlated with the spread. However, short-term probabilities behave quite differently indicating that there are periods of high volatilities that seem to coincide with market-wide uncertainty. Time-varying recovery rates are assumed for countries facing financial difficulties in the short term — such as Argentina and Brazil — and the empirical results are consistent with this assumption. In other words, investors seem to perceive that recovery rates fall significantly when default seems imminent. Finally, movements in the median time to default generally appear plausible — falling when credit conditions deteriorate and rising when they improve — both across time and country.

Notwithstanding problems with the paucity of data for some EMEs, the findings of this paper shed light on recent sovereign crises.

# The impact of unsecured debt on financial distress among British households

***Working Paper no. 262***

Ana Del-Río and Garry Young

Unsecured borrowing by British households, mainly in the form of personal loans, overdrafts and credit cards, has grown rapidly over the past decade or so. This has led to widespread concerns that many households have taken on more debt than they can easily afford, with possible future consequences for macroeconomic and financial stability.

This paper examines survey evidence on the extent to which households consider unsecured debt to be a burden, using this as an indicator of financial distress. Its aim is to quantify the level at which unsecured debt becomes a problem for the typical household and what other factors affect this outcome. The paper uses evidence for 1995 and 2000 from the British Household Panel Survey (BHPS), which since 1995 has questioned households about their attitudes to unsecured debt.

We examine how attitudes to debt are related to survey measures of the amount of debt that people have and its affordability. We find that, in general, there is a clear link between the subjective measure of financial distress and indicators of the affordability of debt. Our estimates suggest that the main determinant of debt problems is the unsecured debt to income ratio. There is no clear point at which debt becomes a problem, but our analysis suggests, for example, that having an unsecured debt-income ratio above 12% (the 70th percentile of households with any debt) adds at least 17 percentage points to the probability of unsecured debt being somewhat of a burden and 4 percentage points to the probability of it being a heavy burden, compared to households without any debt. Nevertheless, our estimates also show a general softening in attitudes towards debt, since the higher debt to income ratios observed in 2000 did not lead to an increasing likelihood of reporting debt to be somewhat or a heavy burden. We attribute this to the greater affordability of debt in 2000.

Other than the unsecured debt to income ratio, the most important factors affecting the likelihood of a household reporting debt to be somewhat of a burden in 2000 were the level of mortgage income gearing, the level of financial wealth of the household, their health, ethnicity and marital status. Having mortgage income gearing above 20% of income added about 9 percentage points to the probability of reporting debt to be somewhat of a burden. Being unemployed was also associated with a higher probability of reporting debt problems.

While the proportion of households reporting debt problems did not change between 1995 and 2000, there were important shifts among different groups. In particular, more households in the youngest age group reported debt repayments were a heavy burden in 2000, while the opposite applies to the oldest age group where a smaller proportion of households than in 1995 reported debt was a heavy burden. By income group, the main change was a sharp fall in 2000 in the proportion of very low income households who reported that debt was a heavy burden.

The paper shows that these changes can largely be accounted for by the changing economic circumstances of different groups rather than an unrelated shift in attitudes. The increase in the median debt to income ratio of the young from just under 8% in 1995 to a level between 10% and 14% in 2000 was the main factor accounting for their greater tendency to report debt problems.

While any given level of indebtedness was less problematic in 2000 than 1995, the increased quantity of unsecured debt taken on by these groups meant that they were more likely to face problems and be vulnerable to potential shocks in their income and interest rates. Moreover, the evidence suggests that the likelihood of reporting debt to be a burden increased for households with high debt to income ratios who also experienced an adverse financial shock. This suggests that, while the greater indebtedness of British households in 2000 had not raised the perceived burden of debt, some would be more vulnerable to adverse economic shocks should these occur in the future.

# The determinants of unsecured borrowing: evidence from the British Household Panel Survey

***Working Paper no. 263***

Ana Del-Río and Garry Young

Unsecured borrowing by households, mainly in the form of personal loans, overdrafts and credit cards, has grown rapidly over the past ten years or so. This has raised concerns that it could cause widespread financial difficulties and default among households who might struggle to keep up with their debt repayments. The validity of such concerns will depend to a large extent on the type of people who have increased their indebtedness and whether they are borrowing more because their economic circumstances have changed and they feel more confident about taking on additional financial commitments. Borrowing for these reasons is unlikely to be as risky as increased borrowing without a change in underlying economic conditions.

This paper examines survey evidence on the determinants and distribution of unsecured debt using waves 5 and 10 for 1995 and 2000 of the British Household Panel Survey (BHPS). Previous work in the Bank has used the BHPS to analyse the overall financial position of households, including the distribution of unsecured debt across different income and age groups. This paper looks in more detail at the determinants of the cross-sectional distribution of unsecured debt and whether this distribution has changed over time. That makes it possible to assess whether unsecured debt has increased because the factors determining its use have changed or whether more debt is held for given circumstances.

One of the key risks associated with unsecured debt is that it is increasingly used by high risk borrowers. Despite the increased prevalence of credit cards, there is no evidence from the BHPS that participation in the unsecured debt market rose between 1995 and 2000. In both years, around 39% of people claimed to have some debt in this form. These may not be the same people, as the BHPS suggests that 35% of the most indebted quartile in 1995 had no unsecured debt in 2000. But the evidence suggests that there has been no substantial change in the factors that determine whether an individual is likely to have unsecured debt or not.

In line with standard life-cycle considerations, econometric analysis indicates that the main determinant of the participation decision is the age of the borrower, with 20 to 30-year olds most likely to borrow unsecured. Other statistically significant factors are income, economic prospects, qualifications, job status, housing status and the extent of mortgage borrowing.

While there is no clear statistical evidence of a change in the determinants of participation in the unsecured credit market between 1995 and 2000, there was, though, a striking increase in the amount of debt held by borrowers between these two years. According to econometric estimates, the main determinant of the level of unsecured borrowing of borrowers is the level of individual income. Age seems to be less important in determining the amount of unsecured borrowing than the decision to participate in the unsecured market. The other statistically significant determinants of the amount of borrowing are economic prospects, qualifications, job status, housing status and the extent of mortgage borrowing. But, as with the participation decision, there is little evidence of a major change in the importance of these determinants between 1995 and 2000, although there does appear to have been a slight increase in the relative borrowing of those with high incomes. Instead, the main change between these years has been an increase in the amount borrowed throughout the distribution. This suggests that factors affecting all current and potential borrowers, regardless of their personal characteristics, were most important in explaining the rise in unsecured debt between 1995 and 2000.

Thus the rise in unsecured borrowing appears not to have been concentrated within poor risk groups, but to have been a general phenomenon affecting those likely to be borrowers to a similar extent. While it is not possible, on the basis of the information available, to explain the cause of this shift, it is consistent with lower rates of interest on unsecured debt. According to the theory outlined in this paper, lower rates on unsecured debt would raise both the unsecured and secured borrowing of those unable to borrow as much as they would like at secured interest rates, without encouraging further borrowing by those who are unlikely to participate in the unsecured market. This would improve the welfare of those who had been constrained by enabling them to spread their spending more smoothly over time.

Of course, more unsecured debt involves greater risks even if debt is not concentrated among high risk groups. Some individuals do have very high levels of debt in relation to their income and that exposes them to the risk that they will not be able to repay. But there is no evidence that this situation worsened between 1995 and 2000.

# Liquidity risk and contagion

***Working Paper no. 264***

Rodrigo Cifuentes, Gianluigi Ferrucci and Hyun Song Shin

Prudential regulations in the form of liquidity or capital requirements are designed to enhance the resilience of financial systems under a broad range of market conditions. However, at times of market turbulence the remedial actions prescribed by these regulations may have perverse effects on systemic stability. Forced sales of assets may feed back on market volatility and produce a downward spiral in asset prices, which in turn may affect adversely other financial institutions.

Regulators are familiar with the potentially destabilising effects of solvency constraints in distressed markets. For example, in the wake of the September 11th attacks in the United States, global financial markets were buffeted by unprecedented turbulence, which prompted the authorities to suspend various solvency tests applied to large financial institutions. In the United Kingdom, for instance, the 'resilience test' applied to life insurers (in which firms have to demonstrate solvency in the face of a 25% market decline) was suspended for several weeks. Also, following the decline in the European stock markets in the summer of 2002, the Financial Services Authority — the UK regulator — diluted the resilience test so as to preempt the destabilising forced sales of stocks by the major market players. The crisis of the Long-Term Capital Management (LTCM) hedge fund in 1998 is another instance where credit links and asset prices acted in concert to propagate market distress.

This paper looks at these issues. It combines liquidity risk with externally imposed regulatory solvency requirements, when mark-to-market accounting rules of firms' assets are in place. The model incorporates two channels of contagion — direct balance sheet interconnections among financial institutions and contagion via changes in asset prices. Changes in asset prices may interact with externally imposed solvency requirements or the internal risk controls of financial institutions to generate amplified endogenous responses that are disproportionately large relative to any initial shock. A shock that reduces the market value of a firm's balance sheet elicits the disposal of assets or of trading positions. If the market's demand is less than perfectly elastic, such disposals result in a short run change in market prices. When assets are marked to market at the new prices, the externally imposed solvency constraints, or the internally imposed risk controls may dictate further disposals. In turn, such disposals will have a further impact on market prices. In this way, the combination of mark-to-market accounting and solvency constraints has the potential to induce an endogenous response that far outweighs the initial shock.

Many papers examine balance sheet interlinkages as a possible source of systemic risk. However, they assume that asset prices do not change and therefore invariably find that systemic contagion is never significant in practice, even in the presence of large shocks. In the absence of price effects, this is hardly surprising as direct credit connections among financial institutions represent only a limited fraction of their balance sheets. Conventional wisdom is also that collateralisation — ie the practice of requiring borrowers to provide assets to secure a loan — may have mitigated these risks further. This paper suggests that systemic risk may be larger than thought, even in the presence of collateralisation. The reason is that the risk that materialises is not a credit risk but a combination of credit and market risks, exacerbated by counterparty risk.

Liquidity requirements can mitigate contagion, and can play a similar role to capital buffers in curtailing systemic failure. In some cases, liquidity may be more effective than capital buffers in forestalling systemic effects. When asset prices are extremely volatile, for example during periods of major financial distress, even a large capital buffer may be insufficient to prevent contagion, since the price impact of selling into a falling market would be very high. Liquidity requirements can mitigate the spillover to other market participants generated by the price impact of selling into a falling market. Moreover, because financial institutions do not recognise the indirect benefits of adequate liquidity holdings on other network members (and more generally on system resilience), their liquidity choices will be suboptimal. As a result, liquidity and capital requirements need to be imposed externally, in relation to a bank's contribution to systemic risk.

# Asset pricing, asymmetric information and rating announcements: does benchmarking on ratings matter?

***Working Paper no. 265***

Spyros Pagratis

This paper discusses an intertemporal model of asset pricing under asymmetric information, demonstrating how noisy public ratings about the quality of a risky asset could enhance information efficiency, albeit at a cost of higher asset price volatility. The analysis also draws implications for the use of ratings for benchmarking purposes, with most notable example the dichotomy between investment and subinvestment grade credits. In particular, we consider a stylised version of benchmarking investment decisions to ratings, whereby a residual class of (noise) traders link their net supply of a rated asset to some measure of the probability that the rating next period will fall below a given threshold. Thus, benchmarking to ratings can be rationalised as the result of forced sales by a class of regulated investors (eg pension funds) that are restricted to hold securities whose ratings are above a prespecified threshold, and unload their holdings to the market proportionally to the probability such downgrading will take place.

The main conclusion from the analysis is that, with benchmarking, price efficiency drops while volatility increases. That is because, perceived changes in fundamentals feed into prices not only through changes in perceptions about future income from holding the asset, but also through beliefs about capital gains that depend on the net supply of the asset. Given that benchmarking renders the net supply of traded assets partly forecastable, informed traders are inclined to trade more aggressively on any item of news that could imply a change in fundamentals in order to exploit perceived mispricings. Thus, informed traders become more prone to misinterpret any item of news as information about fundamentals leading to less informative and more volatile prices.

# Addendum to *Report on modelling and forecasting at the Bank of England*

*The Spring 2003* Quarterly Bulletin[1] *contained a report on modelling and forecasting at the Bank of England by Adrian Pagan.*[2] *This article is a postscript to Professor Pagan's original report, and covers the introduction of the Bank's new macroeconomic model (the Bank of England Quarterly Model, or BEQM). The overall assessment is broadly positive, and the Bank would again like to thank Professor Pagan for the valuable insights that his report has provided.*

## Introduction

As described in my previous report,[1] a modelling and forecasting system within a central bank generally incorporates a number of models — a major model that is used for the central tasks of analysis and forecasting, and a number of auxiliary ones that are used to support this process and to examine some special features and events that arise from time to time. At the time of my previous report the main model in use at the Bank of England was what has been labelled the Medium Term Macro Model (MTMM) but a new model was being developed, which I referred to as the New Macro Model (NMM). This model has since been given the name of the Bank of England Quarterly Model (BEQM). In this addendum to my report I look at that model in more detail than was possible before and consider it broadly under the terms of reference of the previous report.

It is useful to think of the task of building a model for policy use in three stages. Indeed it is often useful to think of these as separate models, even though they are mostly a single one. The three 'models' could be referred to as:

- The conceptual model (CM)
- The data-adjusted model (DAM)
- The operational model (OM)

The conceptual model attempts to set out an overall framework for macroeconomic analysis that incorporates some of the institutional features and constraints upon policy formulation. As such it needs to provide a clear explanation of some of the principal features of the economy under investigation eg that shocks to the macroeconomic system are often not dissipated instantaneously but instead persist for substantial periods of time. The model also seeks to incorporate many accounting identities that exist within and between the stocks and flows of the macroeconomic system. At a crude level one could think of the CM as the economic-theoretical structure of the main model. It is informed by data but only in a general way. Within BEQM the CM is what is referred to as the core model and I will refer to that in what follows as BEQM-core.

The data-adjusted model stems from a process whereby the CM is augmented by extra variables to provide a reasonably close fit to the data. In the words of Harrison *et al* (2005, page 61) this augmentation process stems from the '…choice not to include in the core model some features of the economy, such as credit market imperfections, which would risk making the core model too large and complex to be tractable', and the fact that '…the theoretical underpinnings of some aspects of these correlations, for example the degree of persistence of nominal variables, are not yet well understood'. There are many examples of variables that can usefully augment a CM eg housing price inflation may be added, based on the perception that rises in such asset prices have contributed a good deal more to consumption expenditures than would be expected from most models that rely upon consumers smoothing their consumption over time.

Finally, the operational model is the model that is used in the forecasting rounds. This may just be the DAM

(1) 'Report on modelling and forecasting at the Bank of England' (2003), *Bank of England Quarterly Bulletin*, Spring, pages 60–88.
(2) Professor of Economics, Australian National University and Senior Research Fellow, Nuffield College, Oxford. Email: adrian.pagan@anu.edu.au.

but, since the forecast relates to future rather than past outcomes, the operational model often makes extensive use of information pertaining to the future. Examples would be the utilisation of information supplied by the Agents, measures of confidence of consumers and investors, analysts' forecasts of equity returns, information contained in such items as stock options and oil price futures etc. Not all of this information is used at every round and it is generally not used to reconcile the conceptual model with the past data sets.

It is useful to look at BEQM under these headings from the perspective of the original terms of reference. However, I will also deal a little with the question of documentation and communication. I think it is important that the structure of models be well documented and that the properties be effectively communicated. The Bank of England has a commendable reputation for its past endeavours in this area providing a clear account of the nature of the MTMM as well as detailing a range of models that have been used in the policy process. In commenting on the documentation of BEQM I am referring to Harrison *et al* (2005), *The Bank of England Quarterly Model*.

## The conceptual model (BEQM-core)

In the description of BEQM a repeated theme is that BEQM is evolutionary rather than revolutionary ie it re-works many of the economic themes of the previous model MTMM into a consistent pattern rather than being something that overturns them. Such continuity is important in facilitating the movement from one model to another. Indeed, it would be surprising if this were not true. By their very nature central bank models are unlikely to incorporate radically new perspectives, unless there have been some severe changes in an economy. Concepts that have a proven value, rather than those that are speculative, will inevitably form the basis of the chosen CM. Moreover, the econometric techniques used to transform the CM to a DAM and OM will also be expected to be reasonably conventional. This is not to say that a model like BEQM cannot be innovative. Because it was built some time after MTMM, it is often possible to incorporate a wider range of features then before, and the range of methods that have proven to be useful has almost certainly expanded since MTMM was built.

In building their CM the modellers stated the following objective (page 11): 'To incorporate theory that is rich enough to be able to handle a wide range of economic analysis and investigation, while remaining tractable, internally consistent, coherent and easily understood.' My feeling is that this objective has been achieved. BEQM-core incorporates an impressive number of features that are widely regarded as being important in capturing movements in the economy. It is also my belief that BEQM is sufficiently innovative that it will be a reference point for many central banks when they come to design the CM that is to gird their macroeconomic analysis.

Taking a broad view, one of the innovative aspects of BEQM-core is the degree of integration in the modelling of decisions by agents in an economy. Many policy models in the past have had a CM which simply determined a set of interrelationships between variables. These might be considered as capturing the relative patterns of behaviour of the variables entering them when looked at over reasonable periods of time and are often referred to as 'long-run' equilibrium relations. Once there is a departure from such relations in a particular historical period one expects forces to trigger a set of adjustments to restore them. The speed of such adjustments is generally determined by considering how quickly the relations were restored when the economy was subject to some shocks in history. Effectively this was a major step in the chosen CM becoming a DAM. Technically, it was done by specifying some parametric class of adjustment schemes, with the data being used to estimate these parameters. Perhaps the most prominent example of this scheme today is the Federal Reserve model of the US economy (FRB-US). In BEQM-core the relations between variables involved in decisions, and the adjustments needed to restore such relationships, are determined simultaneously.

There are always features of a CM that may not appeal to outside observers. Examples in terms of BEQM-core might be the way in which inertia is introduced into inflation rates, how persistence is imposed upon consumption decisions, the way in which wage determination is modelled, and the values assigned to some of the parameters of the model. Such dissent can be a very healthy response if it encourages those observers to show how their alternate vision would produce a better CM. However, listing a complete set of the items that might be deemed controversial seems inappropriate in this report. The decisions taken by builders of CMs have to be rooted in what is tractable and what is familiar to policymakers, and one needs to recognise these constraints when making criticisms of the particular choices made.

Documentation of BEQM-core is very good. Indeed I felt that this could easily be used as a text on how one builds CMs. It explains many of the choices made in simple terms and is a good guide to much modern macroeconomic theory. It also provides a very good feel for the 'art' of quantifying the parameters of the core model ie how data informs the choices of parameter values for the CM. Because of the size and complexity of BEQM the number of parameters that have to be quantified is far larger than is typically discussed in academic research and teaching and so the analysis provided in the document should be of interest to those engaged in macroeconomic research more generally.

## The data-adjusted model (BEQM/non-core)

In building the DAM the project had the following objective (page 11): 'to make this theoretically tight model match the data as well as the previous model.' To do this BEQM adopts a novel approach of utilising the output of the CM (BEQM-core) as the reference point and then proposing a list of variables that are to augment the CM so as to narrow the gap between the CM model output and the data. These are non-core variables and the DAM is described in the BEQM documentation as being part of the non-core model. The error between the CM and the data is therefore partially explained by these augmenting variables. Such an error correction approach has been used for many years in macroeconomic modelling, but not quite in the way that it is adopted in BEQM. The procedure developed by the modelling team is a very useful way of moving between the CM and the DAM and I expect it to influence many future modellers.

How does one judge a DAM? At a minimum one would like information on three ways of describing the performance of the model. These are:

- the operating characteristics of the model in response to particular shocks;
- the extent to which the modifications made in producing the DAM infringe upon the desirable features of the CM; and
- the tracking ability of the model over an historical data period.

In the BEQM documentation the impact of a number of shocks upon variables in the full model is described. Clear explanations are provided on the economic rationale for the particular responses observed. There is also good reference to what previous literature would lead one to expect about them. However, I must confess to a desire to see the separate responses from both BEQM-core and BEQM in order to gain some appreciation of the contribution of the non-core components to these responses, although it has to be recognised that it is the complete model response that should influence any judgement about the 'quality' of BEQM.

Much thought was given to ensuring that the constraints enforced in BEQM-core also held in BEQM. An exception was that, while output in BEQM-core must lie on a production function ie it is produced using the quantity of factors and utilisation rates which are the product of optimal decisions, this is not true for BEQM, at least in the short run. The existence of a mystery factor of production (or unexplained rises in factor utilisation) was often criticised in the macroeconometric models of the 1970s, and I found it a little unsettling that a similar feature also appears in BEQM. What significance should be attached to this depends on how large the variation in factors or their utilisation rates needs to be to produce observed output, and some analysis of this would have been welcome.

Some information was provided concerning the tracking performance of BEQM, in the form of prediction errors. These suggest that BEQM does track the data more closely than MTMM, thus satisfying the objective set out above. In older models it was often the case that a dynamic simulation was performed to evaluate the utility of the model. Although no comparison is given here that is exactly of this type, the 13 quarter-ahead forecast is probably a reasonable substitute, and it shows a very strong preference for BEQM over MTMM in the tracking of inflation, although slightly weaker in terms of GDP. Also provided is a comparison of BEQM-core tracking performance relative to MTMM which shows quite dramatically how much the adjustments made in moving to the DAM improve the tracking performance in the longer term as well as a single quarter ahead. Such a result reinforced my desire, expressed above, to see a decomposition of any BEQM comparisons into the relative contributions made from the core and non-core parts of the model.

Documentation of the DAM is quite good, although I think it to be less complete than for the CM. The equations used to transform BEQM-core to BEQM-DAM are well set out, and each one provides concrete and

useful information on how this task is performed. I was less happy with the information provided concerning how the predicted paths of variables from the core model were constructed. Any CM model has within it a range of shocks, some of them being observable and some unobservable. Productivity shocks are generally unobservable whereas items like world demand are observable. There is a general description in the documentation of how observable shocks were constructed over an historical period, but not of unobservable ones. It seems that no unobservable shocks were present in the experiment to measure tracking performance, which might be regarded as surprising given the productivity movements over a period like the 1990s.

A further qualm I had about the information provided on tracking performance was that it was mainly of a summary nature ie it represents an average over history. Although valuable, it might well be supplemented with information relating to particular episodes. Thus the tracking performance in the period after 1997, when there was a strong exchange rate, is of interest.

## The operational model

In building the OM the project had the following objective (page 11): 'To make the model reliable and efficient under different forecasting assumptions, and amenable to the imposition of judgemental adjustments and conditioning paths.'

It is difficult for a reviewer to comment on the extent to which this objective has been achieved. The opinions of the ultimate users of the model — policy advisors and the MPC — constitute the source material for providing an answer. I interviewed a small number of people from each group, seeking their opinions about whether BEQM was a useful model in their deliberations. It would seem that the advisors found it to be a useful tool and felt that the extra flexibility of BEQM (compared to MTMM) enabled scenarios to be constructed that could be given a sounder economic rationale. Moreover, the non-core additions were a useful technique for enabling the MPC to impose their opinions about economic developments which would have been hard to explain within the core model.

The model has also proven to be stable and to solve quickly. In general the presence of a strong CM in the form of BEQM-core meant that more attention was being paid to the economic issues and a little less to how adjustments should be made to capture known deficiencies in a model like MTMM. This seemed to be an opinion shared by the MPC members I spoke to, although it was clearly difficult for them to move away from an older model, whose deficiencies were well known, to one where there had been only a short period of operational use, and so its idiosyncrasies were not fully understood. On balance however I would conclude that the objective has been achieved.

## Summary

From the comments I have made above I would conclude that the construction of BEQM has been a success. It seems to provide a more satisfactory vehicle than MTMM for the discussion of outcomes and the policy responses that should be made to them, as well as producing superior forecasting performance over the medium term. Building a model such as this is not a trivial task and there was no guarantee of success. One of the reasons for the project being so fruitful was the careful attention paid to the process of model construction: this involved selecting a talented group of researchers with a mixture of theoretical and quantitative skills, the provision of an intranet site that thoroughly documented developments in the model at all stages, a regular briefing of staff in the Monetary Analysis divisions of the Bank about progress, and an involvement of some representatives of the MPC in the formulation of the CM. All of these were crucial elements in eventually producing a successful product. Although this process is not detailed in the documentation of BEQM it is very important and should be regarded as an essential part of constructing future macroeconomic models of this type. In conclusion I would like to congratulate all those who participated in some way in the construction of BEQM and to thank the people who spent many hours discussing with me the details of the model and their experiences with it.

## References

**Harrison, R, Nikolov, K, Quinn, M, Ramsay, G, Scott, A and Thomas, R (2005)**, *The Bank of England Quarterly Model*, Bank of England.

# Public attitudes to inflation

**By Colin Ellis of the Bank's Inflation Report and Bulletin Division.**

*Over the past five and a half years, NOP has carried out surveys of public attitudes to inflation on behalf of the Bank of England. As part of an annual series, this article analyses the results of the surveys from May 2004 to February 2005. Public opinion on most issues has changed little over the past year. One in five people — the largest group — thought inflation had been between 2% and 3%, and a similar proportion expected price increases in that range over the next twelve months. In February a majority of respondents expected interest rates to rise over the next year, but that was a smaller proportion than a year ago. Around 40% of people thought the economy would fare best if interest rates remained unchanged, and over half of the sample was satisfied with the way the Bank is setting rates. But there remained a lack of understanding about monetary policy in some demographic groups.*

## Introduction

The new monetary policy framework established in May 1997 gave the Bank of England operational responsibility for setting interest rates to meet the Government's inflation target. The Bank believes that monetary policy will be most effective if the public understand and support the goal of price stability, as well as the means of achieving it.

Interest rates are set by the Monetary Policy Committee (MPC), which has nine members. MPC members use a variety of methods to explain their interest rate decisions. These include the publication of minutes of their monthly meetings, the quarterly *Inflation Report*, and research papers. MPC members give speeches and lectures, appear before parliamentary committees, conduct interviews with the media, and visit the regions of the United Kingdom. Bank staff, particularly the twelve regional Agents, also spend a considerable amount of time explaining monetary policy to a wide audience. And the Bank has an education programme, including the 'Target Two Point Zero' competition for schools, that is designed to promote understanding of, and support for, price stability.

Public support for price stability is hard to gauge. The Bank decided that one way to measure it was to carry out quarterly surveys of public opinion and awareness. After early trials, the survey has been in use since February 2001. The first annual article on the survey results was published in the Summer 2001 edition of the *Quarterly Bulletin*: this article describes the results from May 2004 to February 2005.

The survey covers a total of 14 questions.(1) But the trials showed that the results of five of them varied little over three-month periods, and so these questions are asked just once a year each February. The nine other questions are asked every quarter, after the publication of the *Inflation Report* in February, May, August and November. The sample size for the quarterly surveys is around 2,000 people, roughly half the size of the annual February survey.

The February 2005 survey was carried out between 17 February and 8 March. NOP interviewed 3,842 people aged 15 and over in 350 randomly selected districts throughout Great Britain. The raw data were weighted to match the demographic profile of Great Britain as a whole.(2)

The five annual questions (numbers 9–13) ask about the relationship between interest rates and inflation, and who actually sets interest rates. The nine quarterly questions, which are also asked in the annual survey,

(1) Since February 2004, the annual survey has included two extra parts to Question 3, asking respondents about the change in the inflation target made by the Chancellor of the Exchequer in December 2003.
(2) The quarterly results of the May survey have been published as a separate News Release at the same time as this *Bulletin* article. The quarterly survey results for February were published in March, whereas the answers to the five annual questions for February are published here for the first time.

cover views of past and future interest rates and inflation, the impact of inflation and interest rates on the economy and individuals, and how satisfied people are with the way the Bank of England is doing its job of setting interest rates to meet the inflation target.(1)

The questions are asked by the market research agency NOP in its regular Omnibus surveys. It uses a random location sample designed to be representative of all adults in Great Britain, and interviewing is carried out face-to-face in homes.

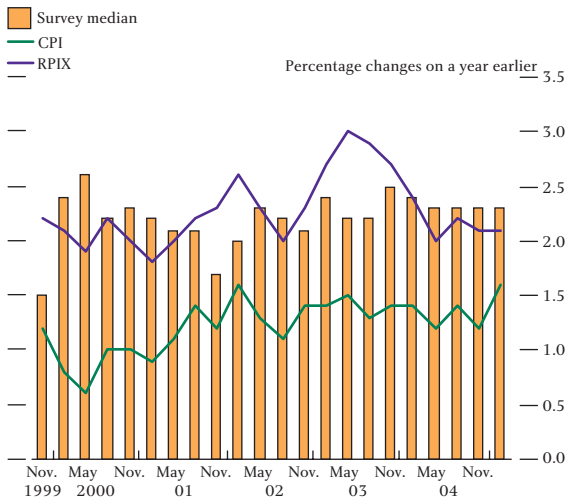
The following sections look at the survey responses in a demographic and historic context, and compare answers across questions.

## Knowledge and predictions

### Inflation outturns (*Question 1*)

*Question 1* asks about people's perceptions of the current annual inflation rate and offers a range of responses, from falling prices to inflation of 5% or more. The median(2) view of the current annual rate of inflation was 2.3% in February 2005, similar to that a year earlier. The survey question does not ask about the rate of inflation according to a particular measure. At the time of the February survey, the latest published estimate of annual CPI inflation — the MPC's target measure — was 1.6%, and for RPI inflation it was 3.2%. Annual RPIX inflation was closer to the survey response at 2.1%. During the past year the survey responses have been broadly stable, despite some variation in published inflation rates (Chart 1). Furthermore, the median responses have been a little higher than the levels of actual RPIX inflation (and CPI inflation) recorded in the months before the surveys.(3) This gap persisted throughout the year. This suggests that the change in the inflation target in December 2003, from 2.5% for annual RPIX inflation to 2.0% for annual CPI inflation, may not have affected respondents' interpretation of the first question. If it had, perhaps the survey measure of inflation would have been notably lower, given that CPI inflation has been below RPIX inflation.

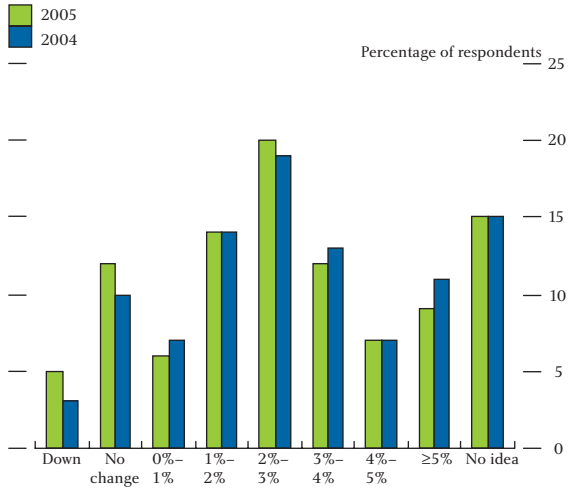
**Chart 1**
**Median survey and official estimates(a) of inflation**




(a) Official estimates in the months before surveys.

As noted in last year's *Bulletin*, the distribution of responses to *Question 1* across different inflation ranges has changed little since February 2003. For the past two years, around one in five people have thought that annual retail price inflation was between 2% and 3% (Chart 2). Over the same period, annual RPIX inflation ranged between 1.9% and 3.0%.

**Chart 2**
**The distribution of responses about price changes over the past twelve months**



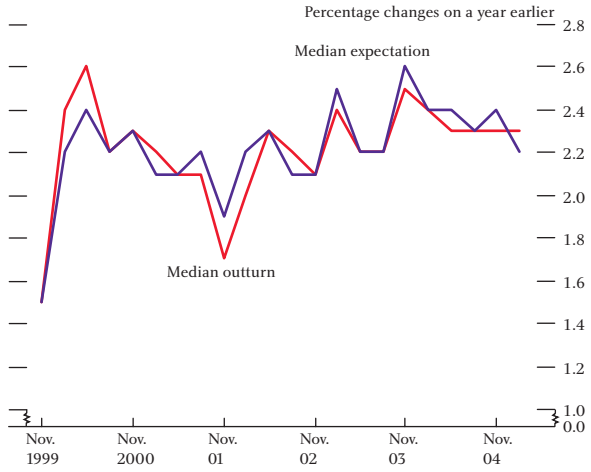

(1) The precise wording of all of the questions and the full results since the start of the survey are shown in the annex to this article.
(2) To calculate the median (a type of average), responses are assumed to be evenly distributed within bands.
(3) The MPC targeted RPIX inflation until December 2003, so it is possible that respondents may be thinking of this measure when answering the question. Although individuals' consumption patterns may differ from that underlying the RPIX, such differences have no significant effect on responses to the questions about past (and expected) price changes (see Lombardelli, C and Saleheen, J (2003), 'Public expectations of UK inflation', *Bank of England Quarterly Bulletin*, Autumn, pages 281–90). This may suggest that respondents do not report their own inflation experience over the past year, but instead correctly interpret Question 1 as being about inflation in the economy. Inflation expectations (Question 2) are, however, significantly affected by individuals' lifetime inflation experiences and are therefore not necessarily related to expected changes in any measure of inflation.

As in the February 2004 survey, the distribution of responses was similar across most demographic groups, with the largest concentration of answers generally in the 2%–3% range. But again, as in the previous annual survey, in some groups the largest proportion of people had 'no idea' about inflation. These included 15–24 year olds, semi and unskilled workers and those living on benefits (categorised as 'DE' respondents), and those renting council accommodation.

## Inflation expectations (*Question 2*)

The median expectation of inflation over the next twelve months edged down slightly, from 2.4% in the February 2004 survey to 2.2% in the February survey this year. Since the survey began, median inflation expectations have moved in line with respondents' perceptions about inflation over the previous year (Chart 3).

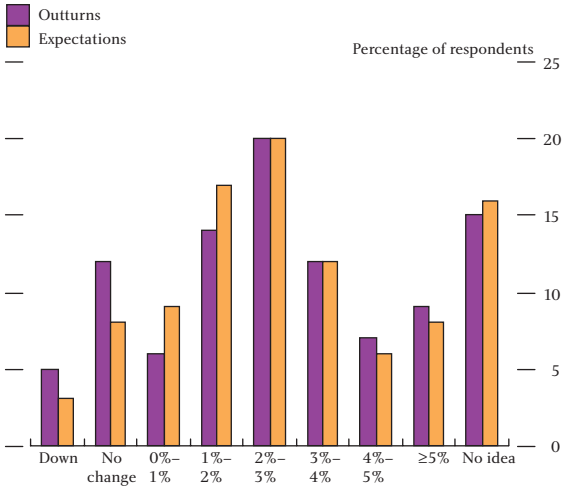
### Chart 3
### Median outturns and expectations of inflation




The distributions of responses to *Questions 1* and *2* were also very similar in February (Chart 4): again, that chimes with results from previous surveys. At the individual level, responses to *Questions 1* and *2* were less closely related than at the median level, though the correlation — a measure of how close the responses were — was still significant at 0.64. However, the bands respondents can choose from are fairly broad, so they could mask more precise differences between outturns and expectations.

Once again, the distribution of responses to *Question 2* was similar across demographic groups, with the highest concentration generally in the 2%–3% and 1%–2%

### Chart 4
### The distribution of responses about price changes over the past and next twelve months(a)



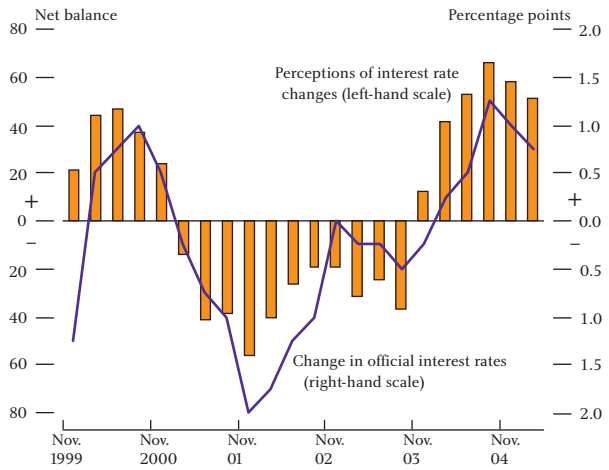

(a) From the February 2005 survey.

bands. However, around a fifth of DE respondents, together with individuals who left school before 16, the non-employed, and people renting council homes, had no idea what inflation would be over the next twelve months.

## Interest rate outturns (*Question 5*)

In the February 2005 survey, 58% of respondents correctly believed that interest rates had risen over the past twelve months: the official interest rate was 4.75% in February 2005, compared with 4% a year earlier. Only 7% of people thought interest rates had fallen.(1) Since the start of the survey, there has been a reasonable relationship between the net balance of respondents citing a change in rates over the past year, and actual changes in official rates (Chart 5).

### Chart 5
### Perceptions of interest rates and actual changes in official rates




(1) Respondents' views may also reflect their personal experience over the past year with interest rates on savings accounts, mortgages and bank loans. These rates do not all move in line with official interest rates.

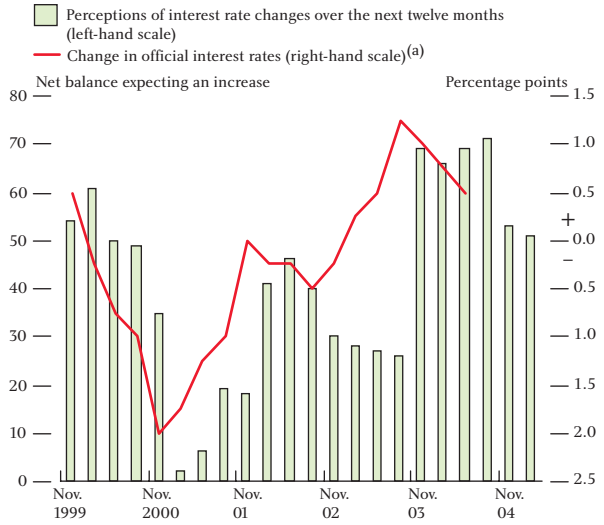
Across most demographic groups, the highest proportion of people thought that rates had 'risen a little' over the past twelve months. The exceptions were 15–24 year olds, 33% of whom had 'no idea' what had happened to rates, and individuals renting council accommodation — 31% had no idea how rates had behaved, the same proportion as thought they had risen a little.

### Expectations of interest rates (*Question 6*)

In the February 2005 survey, 56% of respondents expected interest rates to rise over the next year. That was lower than February 2004 (69%). The percentage of people expecting rates to stay about the same rose from 12% in February 2004 to 23% this year — the highest since August 2003.

Respondents' views on future interest rates appear to be biased. In every survey so far, a net balance of respondents has expected interest rates to rise over the next twelve months, even when official rates have subsequently fallen. But nonetheless, there appears to be a relationship between expectations and outturns (Chart 6).

**Chart 6**
**Perceptions of future changes in interest rates and outturns**




(a) Lagged by a year, to correspond to the survey question.

At the individual level, respondents' expectations for interest rates over the next twelve months in the February survey were positively related to their view of changes in rates over the past year: the correlation coefficient was +0.64. This could be consistent with individuals forming expectations on the basis of their recent experience. Alternatively, respondents may expect interest rates to move in the same direction for some time.

### The Bank of England (*Questions 11–13*)

Understanding of the monetary policy process appears to have changed little over the past year. When asked, without prompting, who sets 'Britain's basic interest rate level' (*Question 11*), 38% replied the Bank of England, and a further 4% the Monetary Policy Committee. This was a little higher than a year earlier, when 36% of individuals identified the Bank, and 4% the MPC. The percentage of people replying 'don't know' fell to 50% in February 2005, the lowest since the November 1999 survey. When respondents were given five options (*Question 12*), 70% chose the Bank, the highest proportion on record, 12% answered 'government ministers', and 12% had no idea. But overall, awareness has changed little since the 2004 survey, both within and across demographic groups.

Knowledge of how the MPC is appointed was a little lower than a year earlier; 36% answered that it is an independent body, partly appointed by the government (*Question 13*), compared with 38% in February 2004. A quarter of respondents thought the MPC is completely independent, and 18% had no idea. 7% thought the MPC was a quango, wholly appointed by the government.

## Attitudes

### Inflation (*Questions 3* and *4*)

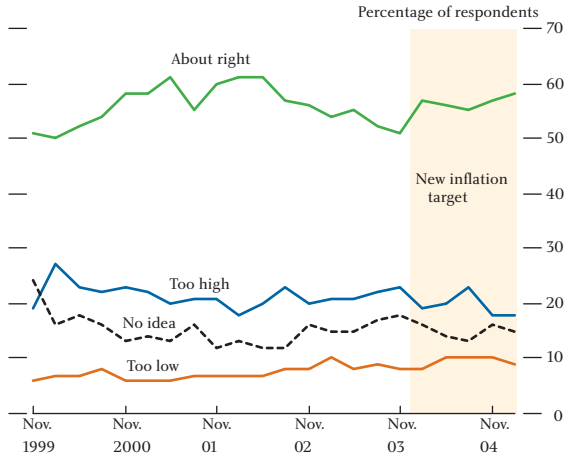
Inflation is thought to have a negative impact on the strength of the economy. The proportion of people who were aware of this relationship (*Question 3A*) stayed at just under a half over the past year (48% in February this year, compared with 49% a year earlier). Just 8% of people thought that higher inflation would benefit the economy, down from 10% a year earlier. But 27% of respondents thought that higher inflation would make little difference, up from 22% in February 2004. Across all demographic groups, the highest proportion of respondents answered that higher inflation would make the economy weaker.

Two extra parts to *Question 3* (*Questions 3B* and *3C*) were introduced in the February 2004 survey following the introduction of the new inflation target, to monitor public awareness of this change. In this February's survey, 23% of people identified that the target was between 1.5% and 2.5%, and 30% of respondents

correctly asserted that the target was the same as a year ago: in both cases the highest proportions of those people specifying an answer. However, 41% of respondents had no idea what the targeted inflation rate was, and 33% did not know if it had changed over the past twelve months.

Since the survey started, at least half of the sample population have thought that the actual inflation target at the time of questioning was 'about right' (*Question 4*). This proportion was 58% in February this year, broadly unchanged from a year earlier. Fewer than one in ten saw the current target as too low and fewer than one in five thought it was too high. The inflation target was changed from 2.5% for annual RPIX inflation to 2.0% for annual CPI inflation in December 2003. Even so, changes in the distribution of responses have been small, both within and across demographic groups.

**Chart 7**
**Views on the level of the inflation target**




## Interest rates (*Questions 7* and *8*)

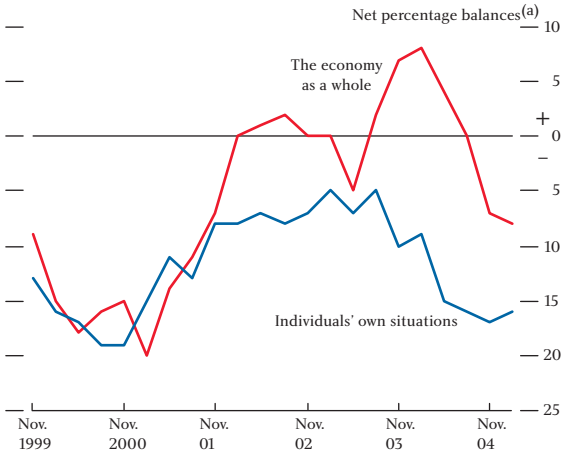
The survey asks respondents what they think should happen to interest rates. In previous surveys, the largest group of respondents have tended to think that the best option for the British economy would be for interest rates to remain unchanged. That pattern was repeated this February, with 41% of individuals thinking rates should stay put. The proportion arguing that rates should fall (21%) was larger than the proportion who thought rates should increase (13%): this was a reversal from February 2004, when 15% thought that rates should fall compared with 23% arguing for a rise. And those two proportions were balanced in the August 2004 survey, before the 'falls' overtook the 'rises'. That is around the same time that the MPC stopped raising interest rates: the official rate has now been unchanged since August last year. The proportion of people who thought that interest rates did not matter for the economy remained low, at 8%.

Asked about the relationship between interest rates and their personal situation (*Question 8*), 35% of the February survey participants would like lower interest rates, and 19% preferred higher rates. In the past, responses to this question have tended to vary only a little. But in August 2004 the proportion of people preferring a cut in rates reached 37%, the highest so far. However, that proportion fell back in the November survey, despite official rates remaining unchanged in the intervening months.

For most demographic groups, the highest proportion of people preferred a cut in rates. Unsurprisingly, 51% of those with a mortgage would like a cut in rates, but 40% of outright homeowners preferred a rise, probably because they would benefit from a higher return on their savings. This pattern was also reflected across age groups, with younger respondents generally preferring a cut in rates, and older people leaning more towards higher rates.

Responses to what would be best for the economy and what would benefit respondents personally were very similar when the survey started. But a divergence has become apparent in recent years (Chart 8). This could suggest that people have become more aware that what they would personally like may not be appropriate for the economy as a whole.

**Chart 8**
**Respondents' views on what would be best for rates**




(a) Percentage citing an increase in rates minus that citing a fall.

## Inflation versus interest rates (*Questions 9* and *10*)

In light of this distinction between the whole economy and the individual, does the general public understand

how monetary policy works? As in previous surveys, the biggest proportion of respondents thought that a rise in interest rates would make high street prices rise more slowly (*Question 9*), both over a month or two (36%) and over a year or two (40%). This suggests that respondents are still not fully aware of the timing delay between a change in rates and its impact on inflation: inflation would probably be unaffected by a rise in rates after a month or two, but would be weaker in a year to two.

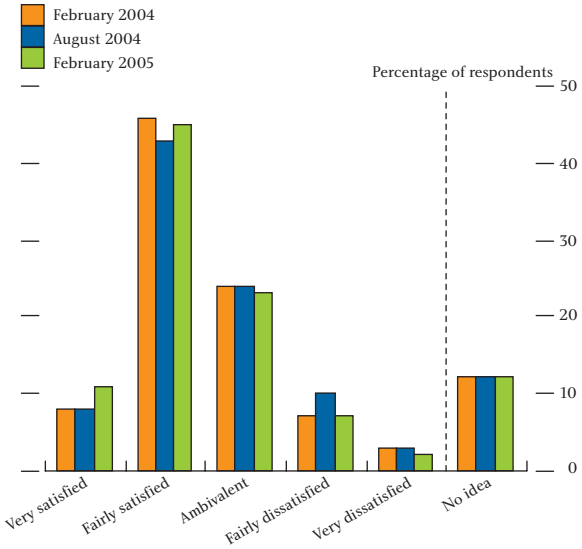
Asked to choose between higher interest rates to keep inflation under control or lower rates and faster increases in shop prices (*Question 10*), 55% of people preferred the former, down slightly from 57% in February 2004. 20% of respondents preferred faster rises in prices, the highest proportion since the survey began.

### The Bank of England (*Question 14*)

Finally, survey participants were asked for their degree of satisfaction with the way the Bank of England is doing its job of setting interest rates to control inflation. Over the past five years, a majority of respondents has generally been satisfied with the Bank's performance. The proportion of satisfied responses fell to 51% in August 2004. That could be consistent with the rise in the net balance of individuals preferring a cut in rates, when one did not materialise (*Question 8*). However, the proportion of satisfied respondents picked up in the next two surveys, reaching 56% in February 2005, leaving the distribution of responses little changed from a year earlier (Chart 9).

Across most demographic groups, the highest proportion of respondents was fairly satisfied with the Bank's

**Chart 9**
**Public satisfaction with the Bank of England**




performance; but in some instances (15–24 year olds and council tenants) the proportion that was neither satisfied nor dissatisfied was at least as high. In part, this could reflect a lack of understanding about the role and aim of monetary policy, consistent with responses to earlier questions on these topics.

## Conclusion

Overall, the NOP survey of public perceptions suggests that individuals' views on past and expected inflation remained stable. A majority of people always think that interest rates will rise in the future, though the proportion has fallen back in recent quarters. Two fifths of respondents think unchanged rates would be best for the economy. There is a common understanding that higher inflation is bad for the economy. But in some demographic groups there is still limited awareness of inflation and monetary policy.

# Annex
# Survey results

Per cent

| | 1999 | 2000 | | | | 2001 | | | | 2002 | | | | 2003 | | | | 2004 | | | | 2005 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Nov. | Feb. | May | Aug. | Nov. | Feb. | May | Aug. | Nov. | Feb. | May | Aug. | Nov. | Feb. | May | Aug. | Nov. | Feb. | May | Aug. | Nov. | Feb. |
| **Q.1 Which of these options best describes how prices have changed over the last 12 months?** | | | | | | | | | | | | | | | | | | | | | | |
| Gone down | 11 | 7 | 5 | 8 | 6 | 7 | 7 | 5 | 8 | 7 | 5 | 6 | 7 | 6 | 5 | 8 | 4 | 3 | 3 | 3 | 4 | 5 |
| Not changed | 18 | 12 | 10 | 12 | 14 | 15 | 15 | 16 | 18 | 16 | 14 | 13 | 14 | 11 | 14 | 13 | 12 | 10 | 11 | 11 | 13 | 12 |
| Up by 1% or less | 7 | 5 | 4 | 7 | 5 | 6 | 6 | 6 | 7 | 7 | 6 | 7 | 6 | 6 | 7 | 7 | 6 | 7 | 7 | 6 | 6 | 6 |
| Up by 1% but less than 2% | 12 | 11 | 12 | 12 | 13 | 12 | 13 | 13 | 14 | 14 | 12 | 15 | 14 | 12 | 13 | 10 | 10 | 14 | 15 | 16 | 13 | 14 |
| Up by 2% but less than 3% | 16 | 17 | 18 | 20 | 18 | 20 | 19 | 18 | 17 | 19 | 20 | 20 | 17 | 20 | 20 | 19 | 20 | 19 | 21 | 20 | 20 | 20 |
| Up by 3% but less than 4% | 7 | 11 | 13 | 13 | 13 | 11 | 11 | 11 | 9 | 10 | 12 | 12 | 10 | 13 | 11 | 13 | 13 | 13 | 13 | 12 | 12 | 12 |
| Up by 4% but less than 5% | 4 | 8 | 7 | 5 | 6 | 6 | 6 | 6 | 5 | 7 | 8 | 7 | 6 | 7 | 7 | 5 | 6 | 7 | 6 | 8 | 7 | 7 |
| Up by 5% or more | 9 | 12 | 13 | 10 | 11 | 12 | 10 | 9 | 7 | 9 | 10 | 11 | 11 | 10 | 9 | 11 | 12 | 11 | 10 | 9 | 11 | 9 |
| No idea | 17 | 17 | 17 | 12 | 13 | 13 | 12 | 15 | 15 | 11 | 13 | 10 | 15 | 14 | 14 | 13 | 18 | 15 | 15 | 15 | 13 | 15 |
| Median | 1.5 | 2.4 | 2.6 | 2.2 | 2.3 | 2.2 | 2.1 | 2.1 | 1.7 | 2.0 | 2.3 | 2.2 | 2.1 | 2.4 | 2.2 | 2.2 | 2.5 | 2.4 | 2.3 | 2.3 | 2.3 | 2.3 |
| **Q.2 How much would you expect prices in the shops generally to change over the next 12 months?** | | | | | | | | | | | | | | | | | | | | | | |
| Go down | 10 | 7 | 4 | 6 | 4 | 5 | 5 | 4 | 5 | 3 | 2 | 4 | 4 | 3 | 3 | 4 | 2 | 2 | 2 | 2 | 2 | 3 |
| Not change | 14 | 8 | 9 | 9 | 9 | 11 | 11 | 9 | 13 | 9 | 9 | 9 | 10 | 7 | 10 | 11 | 5 | 7 | 6 | 8 | 8 | 8 |
| Up by 1% or less | 10 | 7 | 7 | 10 | 8 | 9 | 9 | 10 | 10 | 10 | 10 | 10 | 8 | 7 | 8 | 9 | 8 | 8 | 9 | 9 | 9 | 9 |
| Up by 1% but less than 2% | 16 | 15 | 14 | 15 | 16 | 16 | 17 | 16 | 18 | 17 | 16 | 20 | 17 | 15 | 18 | 15 | 16 | 17 | 17 | 18 | 18 | 17 |
| Up by 2% but less than 3% | 17 | 21 | 21 | 19 | 21 | 20 | 20 | 21 | 20 | 22 | 22 | 22 | 20 | 20 | 21 | 20 | 20 | 22 | 21 | 23 | 22 | 20 |
| Up by 3% but less than 4% | 6 | 12 | 10 | 12 | 12 | 11 | 9 | 11 | 9 | 11 | 11 | 11 | 10 | 12 | 11 | 11 | 15 | 11 | 12 | 12 | 10 | 12 |
| Up by 4% but less than 5% | 3 | 7 | 7 | 6 | 6 | 5 | 7 | 6 | 5 | 6 | 8 | 6 | 5 | 8 | 6 | 6 | 7 | 7 | 6 | 7 | 7 | 6 |
| Up by 5% or more | 8 | 10 | 11 | 9 | 11 | 10 | 9 | 9 | 7 | 9 | 9 | 9 | 10 | 13 | 8 | 9 | 11 | 11 | 12 | 8 | 11 | 8 |
| No idea | 16 | 13 | 16 | 13 | 12 | 13 | 13 | 13 | 13 | 12 | 13 | 10 | 16 | 15 | 15 | 14 | 17 | 14 | 14 | 12 | 14 | 16 |
| Median | 1.5 | 2.2 | 2.4 | 2.2 | 2.3 | 2.1 | 2.1 | 2.2 | 1.9 | 2.2 | 2.3 | 2.1 | 2.1 | 2.5 | 2.2 | 2.2 | 2.6 | 2.4 | 2.4 | 2.3 | 2.4 | 2.2 |
| **Q.3A If prices started to rise faster than they do now, do you think Britain's economy would…** | | | | | | | | | | | | | | | | | | | | | | |
| End up stronger | 8 | 8 | 8 | 6 | 8 | 7 | 8 | 9 | 8 | 8 | 9 | 7 | 8 | 7 | 7 | 7 | 8 | 10 | 8 | 9 | 7 | 8 |
| Or make little difference | 28 | 23 | 22 | 23 | 25 | 26 | 27 | 23 | 28 | 27 | 29 | 26 | 25 | 22 | 26 | 24 | 24 | 22 | 28 | 27 | 27 | 27 |
| Or weaker | 44 | 48 | 47 | 50 | 49 | 47 | 47 | 48 | 48 | 48 | 44 | 50 | 48 | 53 | 47 | 48 | 48 | 49 | 45 | 47 | 49 | 48 |
| Don't know | 20 | 21 | 23 | 21 | 18 | 20 | 18 | 20 | 15 | 17 | 18 | 16 | 20 | 18 | 19 | 21 | 20 | 19 | 19 | 16 | 17 | 18 |
| **Q.3B The Government sets a target each year for what it thinks inflation should be. What do you think that the target is for this year?** | | | | | | | | | | | | | | | | | | | | | | |
| Up by less than 0.5% | | | | | | | | | | | | | | | | | | 1 | | | | 2 |
| Up by 0.5% but less than 1.5% | | | | | | | | | | | | | | | | | | 5 | | | | 6 |
| Up by 1.5% but less than 2.5% | | | | | | | | | | | | | | | | | | 23 | | | | 23 |
| Up by 2.5% but less than 3.5% | | | | | | | | | | | | | | | | | | 18 | | | | 18 |
| Up by 3.5% but less than 4.5% | | | | | | | | | | | | | | | | | | 5 | | | | 6 |
| Up by 4.5% or more | | | | | | | | | | | | | | | | | | 5 | | | | 4 |
| Don't know | | | | | | | | | | | | | | | | | | 44 | | | | 41 |
| **Q.3C Do you think the figure the Government has given for the current target is higher, lower or the same as last year's figure?** | | | | | | | | | | | | | | | | | | | | | | |
| Higher | | | | | | | | | | | | | | | | | | 36 | | | | 25 |
| Lower | | | | | | | | | | | | | | | | | | 12 | | | | 11 |
| The same | | | | | | | | | | | | | | | | | | 27 | | | | 30 |
| Don't know | | | | | | | | | | | | | | | | | | 26 | | | | 33 |
| **Q.4 The Government has set an inflation target of 2.0%.[a] Do you think this target…** | | | | | | | | | | | | | | | | | | | | | | |
| Is too high | 19 | 27 | 23 | 22 | 23 | 22 | 20 | 21 | 21 | 18 | 20 | 23 | 20 | 21 | 21 | 22 | 23 | 19 | 20 | 23 | 18 | 18 |
| Or too low | 6 | 7 | 7 | 8 | 6 | 6 | 6 | 7 | 7 | 7 | 7 | 8 | 8 | 10 | 8 | 9 | 8 | 8 | 10 | 10 | 10 | 9 |
| Or about right | 51 | 50 | 52 | 54 | 58 | 58 | 61 | 55 | 60 | 61 | 61 | 57 | 56 | 54 | 55 | 52 | 51 | 57 | 56 | 55 | 57 | 58 |
| No idea | 24 | 16 | 18 | 16 | 13 | 14 | 13 | 16 | 12 | 13 | 12 | 12 | 16 | 15 | 15 | 17 | 18 | 16 | 14 | 13 | 16 | 15 |
| **Q.5 How would you say interest rates on things such as mortgages, bank loans and savings have changed over the last 12 months?** | | | | | | | | | | | | | | | | | | | | | | |
| Risen a lot | 7 | 18 | 19 | 13 | 10 | 6 | 4 | 5 | 2 | 4 | 5 | 5 | 6 | 5 | 6 | 4 | 7 | 8 | 13 | 25 | 19 | 15 |
| Risen a little | 35 | 37 | 37 | 36 | 29 | 16 | 10 | 10 | 8 | 11 | 13 | 14 | 12 | 12 | 12 | 11 | 28 | 46 | 47 | 45 | 45 | 43 |
| Stayed about the same | 18 | 12 | 13 | 20 | 26 | 20 | 12 | 12 | 7 | 13 | 20 | 25 | 24 | 14 | 20 | 13 | 23 | 16 | 14 | 9 | 11 | 16 |
| Fallen a little | 17 | 8 | 7 | 10 | 12 | 33 | 39 | 37 | 29 | 32 | 28 | 26 | 24 | 34 | 31 | 35 | 18 | 10 | 5 | 3 | 5 | 6 |
| Fallen a lot | 4 | 3 | 2 | 2 | 3 | 3 | 16 | 17 | 37 | 23 | 16 | 12 | 13 | 15 | 12 | 17 | 5 | 3 | 2 | 1 | 1 | 1 |
| No idea | 19 | 21 | 22 | 19 | 21 | 21 | 19 | 20 | 17 | 16 | 19 | 18 | 21 | 19 | 19 | 20 | 18 | 17 | 19 | 16 | 19 | 19 |
| All saying 'risen' | 42 | 55 | 56 | 49 | 39 | 22 | 14 | 15 | 10 | 15 | 18 | 19 | 18 | 17 | 18 | 15 | 35 | 54 | 60 | 70 | 64 | 58 |
| All saying 'fallen' | 21 | 11 | 9 | 12 | 15 | 36 | 55 | 54 | 66 | 55 | 44 | 38 | 37 | 49 | 43 | 52 | 23 | 13 | 7 | 4 | 6 | 7 |
| Net risen | 21 | 44 | 47 | 37 | 24 | -14 | -41 | -39 | -56 | -40 | -26 | -19 | -19 | -32 | -25 | -37 | 12 | 41 | 53 | 66 | 58 | 51 |
| **Q.6 How would you expect interest rates to change over the next 12 months?** | | | | | | | | | | | | | | | | | | | | | | |
| Rise a lot | 7 | 16 | 10 | 8 | 6 | 4 | 4 | 6 | 5 | 6 | 6 | 6 | 6 | 8 | 5 | 4 | 15 | 12 | 17 | 19 | 10 | 9 |
| Rise a little | 52 | 50 | 46 | 47 | 39 | 24 | 24 | 30 | 31 | 43 | 46 | 43 | 34 | 33 | 33 | 32 | 56 | 57 | 54 | 54 | 47 | 47 |
| Stay about the same | 19 | 12 | 19 | 23 | 27 | 26 | 30 | 28 | 30 | 27 | 26 | 27 | 28 | 28 | 33 | 33 | 11 | 12 | 11 | 11 | 20 | 23 |
| Fall a little | 4 | 4 | 5 | 6 | 10 | 25 | 21 | 16 | 16 | 7 | 5 | 8 | 9 | 11 | 10 | 9 | 2 | 3 | 2 | 2 | 4 | 5 |
| Fall a lot | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | * | * | * | * | * | * |
| No idea | 18 | 17 | 20 | 16 | 17 | 20 | 20 | 19 | 17 | 16 | 17 | 16 | 22 | 18 | 18 | 20 | 16 | 16 | 16 | 13 | 17 | 17 |
| All saying 'rise' | 59 | 66 | 56 | 55 | 45 | 28 | 28 | 36 | 36 | 49 | 52 | 49 | 40 | 41 | 38 | 36 | 71 | 69 | 71 | 73 | 57 | 56 |
| All saying 'fall' | 5 | 5 | 6 | 6 | 10 | 26 | 22 | 17 | 18 | 8 | 6 | 9 | 10 | 13 | 11 | 10 | 2[b] | 3 | 2 | 2 | 4 | 5 |
| Net rise | 54 | 61 | 50 | 49 | 35 | 2 | 6 | 19 | 18 | 41 | 46 | 40 | 30 | 28 | 27 | 26 | 69 | 66 | 69 | 71 | 53 | 51 |
| **Q.7 What do you think would be best for the British economy — for interest rates to go up over the next few months, or to go down, or to stay where they are now, or would it make no difference either way?** | | | | | | | | | | | | | | | | | | | | | | |
| Go up | 12 | 12 | 11 | 11 | 9 | 8 | 10 | 13 | 14 | 16 | 17 | 19 | 17 | 17 | 14 | 17 | 22 | 23 | 21 | 20 | 14 | 13 |
| Go down | 21 | 27 | 29 | 27 | 24 | 28 | 24 | 24 | 21 | 16 | 16 | 17 | 17 | 17 | 19 | 15 | 15 | 15 | 17 | 20 | 21 | 21 |
| Stay where they are | 40 | 33 | 28 | 35 | 42 | 34 | 40 | 37 | 40 | 40 | 41 | 40 | 39 | 36 | 40 | 38 | 37 | 36 | 36 | 38 | 39 | 41 |
| Make no difference | 7 | 10 | 10 | 9 | 11 | 10 | 10 | 10 | 10 | 10 | 10 | 9 | 9 | 11 | 8 | 10 | 8 | 8 | 9 | 8 | 9 | 8 |
| No idea | 20 | 18 | 23 | 17 | 15 | 19 | 16 | 17 | 14 | 17 | 17 | 15 | 19 | 19 | 19 | 20 | 19 | 18 | 17 | 13 | 16 | 17 |
| Net balance down | 9 | 15 | 18 | 16 | 15 | 20 | 14 | 11 | 7 | 0 | -1 | -2 | 0 | 0 | 5 | -2 | -7 | -8 | -4 | 0 | 7 | 8 |

## Survey results (continued)

Per cent

| | 1999 | 2000 | | | | 2001 | | | | 2002 | | | | 2003 | | | | 2004 | | | | 2005 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Nov. | Feb. | May | Aug. | Nov. | Feb. | May | Aug. | Nov. | Feb. | May | Aug. | Nov. | Feb. | May | Aug. | Nov. | Feb. | May | Aug. | Nov. | Feb. |
| **Q.8 And which would be best for you personally, for interest rates to...** | | | | | | | | | | | | | | | | | | | | | | |
| Go up | 17 | 19 | 16 | 17 | 17 | 18 | 22 | 20 | 24 | 22 | 22 | 22 | 22 | 24 | 22 | 23 | 20 | 22 | 19 | 21 | 18 | 19 |
| Go down | 30 | 35 | 33 | 36 | 36 | 33 | 33 | 33 | 32 | 30 | 29 | 30 | 29 | 29 | 29 | 28 | 30 | 31 | 34 | 37 | 35 | 35 |
| Stay where they are | 22 | 15 | 16 | 18 | 19 | 17 | 18 | 16 | 18 | 20 | 21 | 23 | 22 | 20 | 22 | 20 | 21 | 20 | 20 | 19 | 18 | 20 |
| Make no difference | 17 | 22 | 22 | 19 | 20 | 22 | 20 | 22 | 21 | 20 | 21 | 19 | 18 | 18 | 19 | 18 | 19 | 19 | 19 | 16 | 21 | 17 |
| No idea | 14 | 10 | 13 | 10 | 8 | 10 | 20 | 8 | 6 | 8 | 7 | 6 | 9 | 10 | 9 | 10 | 10 | 9 | 8 | 7 | 8 | 10 |
| Net balance down | 13 | 16 | 17 | 19 | 19 | 15 | 11 | 13 | 8 | 8 | 7 | 8 | 7 | 5 | 7 | 5 | 10 | 9 | 15 | 16 | 17 | 16 |
| **Q.9 How strongly do you agree with the following statements?** | | | | | | | | | | | | | | | | | | | | | | |
| **(A) A rise in interest rates would make prices in the high street rise more slowly in the short term — say a month or two** | | | | | | | | | | | | | | | | | | | | | | |
| Agree strongly | | 2 | 2 | n.a. | n.a. | n.a. | 1 | n.a. | n.a. | n.a. | 2 | n.a. | n.a. | n.a. | 1 | n.a. | n.a. | n.a. | 3 |
| Agree | | 35 | 32 | n.a. | n.a. | n.a. | 34 | n.a. | n.a. | n.a. | 35 | n.a. | n.a. | n.a. | 35 | n.a. | n.a. | n.a. | 33 |
| Neither agree nor disagree | | 16 | 19 | n.a. | n.a. | n.a. | 19 | n.a. | n.a. | n.a. | 18 | n.a. | n.a. | n.a. | 19 | n.a. | n.a. | n.a. | 17 |
| Disagree | | 25 | 20 | n.a. | n.a. | n.a. | 20 | n.a. | n.a. | n.a. | 19 | n.a. | n.a. | n.a. | 20 | n.a. | n.a. | n.a. | 22 |
| Disagree strongly | | 2 | 2 | n.a. | n.a. | n.a. | 1 | n.a. | n.a. | n.a. | 2 | n.a. | n.a. | n.a. | 1 | n.a. | n.a. | n.a. | 3 |
| Don't know | | 21 | 25 | n.a. | n.a. | n.a. | 25 | n.a. | n.a. | n.a. | 24 | n.a. | n.a. | n.a. | 23 | n.a. | n.a. | n.a. | 21 |
| All agree | | 37 | 34 | n.a. | n.a. | n.a. | 35 | n.a. | n.a. | n.a. | 37 | n.a. | n.a. | n.a. | 36 | n.a. | n.a. | n.a. | 36 |
| All disagree | | 27 | 22 | n.a. | n.a. | n.a. | 21 | n.a. | n.a. | n.a. | 21 | n.a. | n.a. | n.a. | 21 | n.a. | n.a. | n.a. | 25 |
| Net agree | | 10 | 12 | n.a. | n.a. | n.a. | 14 | n.a. | n.a. | n.a. | 16 | n.a. | n.a. | n.a. | 15 | n.a. | n.a. | n.a. | 11 |
| **(B) A rise in interest rates would make prices in the high street rise more slowly in the medium term — say a year or two** | | | | | | | | | | | | | | | | | | | | | | |
| Agree strongly | | 2 | 2 | n.a. | n.a. | n.a. | 1 | n.a. | n.a. | n.a. | 1 | n.a. | n.a. | n.a. | 2 | n.a. | n.a. | n.a. | 3 |
| Agree | | 39 | 35 | n.a. | n.a. | n.a. | 38 | n.a. | n.a. | n.a. | 38 | n.a. | n.a. | n.a. | 37 | n.a. | n.a. | n.a. | 37 |
| Neither agree nor disagree | | 16 | 19 | n.a. | n.a. | n.a. | 18 | n.a. | n.a. | n.a. | 18 | n.a. | n.a. | n.a. | 19 | n.a. | n.a. | n.a. | 17 |
| Disagree | | 21 | 16 | n.a. | n.a. | n.a. | 15 | n.a. | n.a. | n.a. | 16 | n.a. | n.a. | n.a. | 16 | n.a. | n.a. | n.a. | 17 |
| Disagree strongly | | 1 | 1 | n.a. | n.a. | n.a. | 1 | n.a. | n.a. | n.a. | 1 | n.a. | n.a. | n.a. | 1 | n.a. | n.a. | n.a. | 2 |
| Don't know | | 22 | 27 | n.a. | n.a. | n.a. | 26 | n.a. | n.a. | n.a. | 25 | n.a. | n.a. | n.a. | 25 | n.a. | n.a. | n.a. | 24 |
| All agree | | 41 | 37 | n.a. | n.a. | n.a. | 39 | n.a. | n.a. | n.a. | 39 | n.a. | n.a. | n.a. | 39 | n.a. | n.a. | n.a. | 40 |
| All disagree | | 22 | 17 | n.a. | n.a. | n.a. | 16 | n.a. | n.a. | n.a. | 17 | n.a. | n.a. | n.a. | 17 | n.a. | n.a. | n.a. | 19 |
| Net agree | | 19 | 20 | n.a. | n.a. | n.a. | 23 | n.a. | n.a. | n.a. | 22 | n.a. | n.a. | n.a. | 22 | n.a. | n.a. | n.a. | 21 |
| **Q.10 If a choice had to be made, either to raise interest rates to try to keep inflation down; or keep interest rates down and allow prices in the shops to rise faster, which would you prefer:** | | | | | | | | | | | | | | | | | | | | | | |
| Interest rates to rise | 51 | 58 | 52 | 57 | 63 | 62 | n.a. | n.a. | n.a. | 63 | n.a. | n.a. | n.a. | 62 | n.a. | n.a. | n.a. | 57 | n.a. | n.a. | n.a. | 55 |
| Prices to rise faster | 17 | 19 | 16 | 15 | 19 | 16 | n.a. | n.a. | n.a. | 16 | n.a. | n.a. | n.a. | 16 | n.a. | n.a. | n.a. | 19 | n.a. | n.a. | n.a. | 20 |
| No idea | 31 | 24 | 31 | 28 | 18 | 22 | n.a. | n.a. | n.a. | 21 | n.a. | n.a. | n.a. | 23 | n.a. | n.a. | n.a. | 24 | n.a. | n.a. | n.a. | 25 |
| **Q.11 Each month, a group of people meets to set Britain's basic interest rate level. Do you know what this group is?** | | | | | | | | | | | | | | | | | | | | | | |
| Monetary Policy Committee | 7 | 4 | 5 | 6 | 5 | 5 | n.a. | n.a. | n.a. | 4 | n.a. | n.a. | n.a. | 4 | n.a. | n.a. | n.a. | 4 | n.a. | n.a. | n.a. | 4 |
| Bank of England | 39 | 29 | 33 | 38 | 29 | 32 | n.a. | n.a. | n.a. | 35 | n.a. | n.a. | n.a. | 35 | n.a. | n.a. | n.a. | 36 | n.a. | n.a. | n.a. | 38 |
| The Government | 4 | 2 | 3 | 2 | 3 | 3 | n.a. | n.a. | n.a. | 4 | n.a. | n.a. | n.a. | 3 | n.a. | n.a. | n.a. | 4 | n.a. | n.a. | n.a. | 3 |
| The Treasury | 1 | 1 | 1 | 1 | 1 | 1 | n.a. | n.a. | n.a. | 1 | n.a. | n.a. | n.a. | 1 | n.a. | n.a. | n.a. | 1 | n.a. | n.a. | n.a. | 2 |
| Parliament | 1 | * | * | * | 1 | * | n.a. | n.a. | n.a. | * | n.a. | n.a. | n.a. | * | n.a. | n.a. | n.a. | * | n.a. | n.a. | n.a. | * |
| Other | 1 | 2 | 1 | 2 | 1 | 2 | n.a. | n.a. | n.a. | 2 | n.a. | n.a. | n.a. | 1 | n.a. | n.a. | n.a. | 2 | n.a. | n.a. | n.a. | 2 |
| Don't know | 47 | 62 | 57 | 51 | 60 | 57 | n.a. | n.a. | n.a. | 54 | n.a. | n.a. | n.a. | 56 | n.a. | n.a. | n.a. | 54 | n.a. | n.a. | n.a. | 50 |
| **Q.12 Which of these groups do you think sets the interest rates?** | | | | | | | | | | | | | | | | | | | | | | |
| Government ministers | 14 | 15 | 12 | 13 | 16 | 15 | n.a. | n.a. | n.a. | 13 | n.a. | n.a. | n.a. | 12 | n.a. | n.a. | n.a. | 13 | n.a. | n.a. | n.a. | 12 |
| Civil servants | * | * | * | * | * | 1 | n.a. | n.a. | n.a. | 1 | n.a. | n.a. | n.a. | * | n.a. | n.a. | n.a. | 1 | n.a. | n.a. | n.a. | 2 |
| Bank of England | 67 | 63 | 63 | 69 | 65 | 66 | n.a. | n.a. | n.a. | 67 | n.a. | n.a. | n.a. | 69 | n.a. | n.a. | n.a. | 69 | n.a. | n.a. | n.a. | 70 |
| High street banks | 3 | 4 | 3 | 2 | 4 | 3 | n.a. | n.a. | n.a. | 3 | n.a. | n.a. | n.a. | 3 | n.a. | n.a. | n.a. | 2 | n.a. | n.a. | n.a. | 3 |
| European Central Bank | 2 | 3 | 3 | 3 | 3 | 3 | n.a. | n.a. | n.a. | 4 | n.a. | n.a. | n.a. | 2 | n.a. | n.a. | n.a. | 3 | n.a. | n.a. | n.a. | 2 |
| No idea | 13 | 14 | 18 | 12 | 12 | 13 | n.a. | n.a. | n.a. | 13 | n.a. | n.a. | n.a. | 13 | n.a. | n.a. | n.a. | 12 | n.a. | n.a. | n.a. | 12 |
| **Q.13 In fact, the decisions are taken by the Monetary Policy Committee of the Bank of England. Which of these do you think best describes the Monetary Policy Committee?** | | | | | | | | | | | | | | | | | | | | | | |
| Part of the Government | 11 | 11 | 9 | 10 | 12 | 11 | n.a. | n.a. | n.a. | 11 | n.a. | n.a. | n.a. | 13 | n.a. | n.a. | n.a. | 13 | n.a. | n.a. | n.a. | 13 |
| A quango, wholly appointed by the Government | 8 | 8 | 8 | 8 | 9 | 8 | n.a. | n.a. | n.a. | 7 | n.a. | n.a. | n.a. | 7 | n.a. | n.a. | n.a. | 8 | n.a. | n.a. | n.a. | 7 |
| An independent body, partly appointed by the Government | 38 | 39 | 37 | 42 | 37 | 38 | n.a. | n.a. | n.a. | 39 | n.a. | n.a. | n.a. | 36 | n.a. | n.a. | n.a. | 38 | n.a. | n.a. | n.a. | 36 |
| A completely independent body | 23 | 20 | 22 | 20 | 24 | 24 | n.a. | n.a. | n.a. | 23 | n.a. | n.a. | n.a. | 24 | n.a. | n.a. | n.a. | 23 | n.a. | n.a. | n.a. | 25 |
| No idea | 20 | 21 | 24 | 20 | 17 | 19 | n.a. | n.a. | n.a. | 19 | n.a. | n.a. | n.a. | 19 | n.a. | n.a. | n.a. | 18 | n.a. | n.a. | n.a. | 18 |
| **Q.14 Overall, how satisfied or dissatisfied are you with the way the Bank of England is doing its job to set interest rates in order to control inflation?** | | | | | | | | | | | | | | | | | | | | | | |
| Very satisfied | 7 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 11 | 10 | 11 | 11 | 8 | 9 | 12 | 10 | 8 | 9 | 8 | 8 | 11 |
| Fairly satisfied | 41 | 37 | 38 | 45 | 48 | 47 | 49 | 45 | 51 | 50 | 49 | 46 | 42 | 47 | 46 | 40 | 45 | 46 | 43 | 43 | 44 | 45 |
| Neither satisfied nor dissatisfied | 26 | 28 | 27 | 25 | 26 | 25 | 23 | 23 | 19 | 20 | 23 | 22 | 23 | 24 | 22 | 22 | 22 | 24 | 23 | 24 | 21 | 23 |
| Fairly dissatisfied | 7 | 12 | 9 | 9 | 8 | 7 | 6 | 6 | 6 | 6 | 6 | 7 | 7 | 7 | 7 | 6 | 6 | 7 | 9 | 10 | 7 | 7 |
| Very dissatisfied | 4 | 5 | 4 | 4 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 3 | 3 | 2 |
| No idea | 16 | 14 | 17 | 12 | 9 | 11 | 12 | 14 | 11 | 11 | 11 | 11 | 14 | 11 | 14 | 17 | 15 | 12 | 14 | 12 | 17 | 12 |
| Total satisfied | 48 | 41 | 43 | 51 | 55 | 55 | 58 | 55 | 62 | 61 | 59 | 57 | 53 | 55 | 55 | 52 | 55 | 54 | 52 | 51 | 52 | 56 |
| Total dissatisfied | 11 | 17 | 13 | 13 | 11 | 10 | 8 | 8 | 8 | 8 | 8 | 10 | 10 | 10 | 9 | 8 | 8 | 10 | 11 | 13 | 10 | 9 |
| Net satisfied | 37 | 24 | 30 | 38 | 44 | 45 | 50 | 47 | 54 | 53 | 51 | 47 | 43 | 45 | 46 | 44 | 47 | 44 | 41 | 38 | 42 | 47 |

n.a. = not available.

Note: * indicates less than 0.5%. Figures may not add to 100 due to rounding. Sampling error depends on the percentage response and the sample size. For example, given the sample size of 3,842 in the February 2005 survey, the sampling error on a 20% response is 0.65.

(a) Figures up to and including November 2003 are based on a target of 2.5%.
(b) The November 2003 release incorrectly stated that the November 2003 figure for all saying 'fall' was 5%.

# Chief Economist Workshop April 2005: exchange rate regimes and capital flows

**By Gill Hammond of the Bank's Centre for Central Banking Studies and Ole Rummel of the Bank's Monetary Instruments and Markets Division.**

*The second annual Chief Economist Workshop, organised by the Bank of England's Centre for Central Banking Studies (CCBS), brought together economists from more than 30 central banks. It was part of CCBS's programme of events to provide a forum for central bankers and academics to exchange views on central bank policies and to share specialist technical knowledge. The topic for this meeting was exchange rate regimes and capital flows, with a special emphasis on the choice of an appropriate exchange rate regime within the domestic monetary, fiscal and financial framework.*

## Introduction

In April 2005 the second Chief Economist Workshop(1) was held at the Bank of England, attended by more than 30 chief economists from central banks around the world. The topic this year was 'Exchange rate regimes and capital flows' and the Workshop featured academic papers(2) as well as empirical and country case studies. This article reports on the main themes of the Workshop.(3)

The choice of exchange rate regime is of vital importance for monetary policy, the main responsibility of central banks. Yet, despite much debate on this subject over a number of decades, there remain many unresolved issues. Indeed, it seems that no sooner has a conventional wisdom on exchange rates been established than new thinking emerges to challenge it. The topic therefore provoked much discussion among participants and, while there was no universally accepted proposal for exchange rate regimes, some broad conclusions were reached. Workshop participants concurred with the proposition that there was no 'one size fits all' exchange rate regime that was suitable for all countries at all times. Equally, there was agreement that history appeared to play a large part in the choice of exchange rate regime. When considering how to respond to exchange rate shocks, the source and propagation of shocks was of crucial importance. And there were some complex issues related to the potential conflict faced by central banks that operate both a fixed exchange rate and an inflation-targeting monetary regime. Participants also discussed the importance of the national institutional framework, the growing degree of international financial integration and the associated effect of greater capital flows — both sudden (mainly speculative) inflows as well as particularly sharp and abrupt reversals — on exchange rate regimes. Finally, the discussion touched upon the challenges of exiting a fixed exchange rate system to attain greater exchange rate flexibility.

## Exchange rate regimes: how should they be classified?

One reason for the lack of consensus on the appropriate exchange rate regime was that, while economic theory implied that the choice of regime was important for economic outturns, empirical evidence seemed to suggest there was no broad difference in economic performance between countries with fixed or floating rates. Workshop participants noted that empirical results varied quite considerably depending on the way that exchange rate regimes were classified and in particular whether the traditional, *de jure* (declared) or the newer, *de facto* (actual) classification schemes were used.

Traditionally, empirical investigations were based on the exchange rate arrangements reported by individual

(1) The inaugural Chief Economist Workshop at the CCBS was held in February 2004 on the topic of the relationship between monetary and financial stability. More information is provided in Fisher and Lund (2004).
(2) Presentations were given by Kenneth Rogoff (Harvard University), Christopher Meissner (University of Cambridge) and Morris Goldstein (Institute for International Economics).
(3) All discussions were conducted under Chatham House Rules whereby comments can be recorded but not attributed to individuals.

countries to the IMF and published in the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions* until 1999 (the *de jure* classification). Using this *de jure* classification of exchange rates, Ghosh *et al* (2002) found that inflation was lower and growth higher in countries with fixed exchange rates. More recently, however, economists have argued that the *de jure* classification was flawed. The currencies of some countries that were officially classified as flexible in practice exhibited what Calvo and Reinhart (2002) termed a 'fear of floating', with interest rate changes and changes in reserves used to limit movements in the exchange rate. Equally, some *de jure* fixed exchange rates in practice moved quite considerably as a result of either frequent devaluations or the existence of dual or parallel markets.

In response to this, a number of researchers have presented alternative, *de facto* classification schemes, eg IMF (1999), Bubula and Ötker-Robe (2002), Ghosh *et al* (2002), Bailliu *et al* (2003) and Levy-Yeyati and Sturzenegger (2003). Employing market-determined parallel exchange rates, Reinhart and Rogoff (2004) devised yet a third variant, which they referred to as the 'natural' classification scheme. A comparison of regime classifications across the *de jure* and the natural classification showed that only about half of the observations were classified the same way by both the IMF and Reinhart and Rogoff (2004). Participants noted that among the IMF's *de jure* 'free floats', only 20% operated as true floating regimes. Moreover, unofficial pegs were better characterised as managed or freely floating arrangements, or limited flexibility, about 45% of the time. Finally, of countries that were listed in the standard *de jure* classification as managed floating, about half turned out to have *de facto* pegs, crawls or narrow bands with some anchor currency.

Participants looked at the reasons for the discrepancies between *de facto* and *de jure* classification for individual countries. In some cases, eg Norway (1982–91) and Sweden (1993), countries had reported a fixed exchange rate regime but, because of exchange rate devaluations, were classified as non-fixed in *de facto* studies. In other cases, eg Switzerland (1982–98) and Canada (1974–89), the countries declared a floating-rate regime, but the currencies did not fluctuate much in practice.

It was suggested that the two sets of cases were quite different. While failure to maintain a *de jure* fixed rate could be seen as a 'broken commitment', lack of volatility in a *de jure* floating rate might have reflected a number of factors. One possibility is that exchange rate stability is a consequence of monetary policy strategy and macroeconomic stability. Or it could be that a country wants to have exchange rate stability, but keep the option of flexibility to respond to shocks. Finally, a country may wish to pursue exchange rate stability but not advertise a fixed exchange rate for fear of a speculative attack.

Four factors might explain 'fear of floating' in emerging market countries. First, the authorities may be concerned about the high degree of pass-through from exchange rate changes to domestic inflation. Second, they may be concerned about financial vulnerabilities arising from highly dollarised liabilities on domestic balance sheets. Third, the authorities may worry about a potential loss of competitiveness and, finally, they may have concerns about losing the transparent nominal anchor of the exchange rate target to guide domestic inflationary expectations.

But the 'fear of floating' phenomenon was perhaps not as widespread as suggested. Emerging markets in Central and Latin America provided a good counterexample. In the mid-1990s, the majority of countries in the region had either adjustable pegs or exchange rate bands with an exchange rate target but by 2004, most were following managed or free floats with an inflation target.

The new *de facto* classification seemed to challenge the conclusions about exchange rate regimes and economic performance that were derived from analysis of *de jure* regimes. But there was considerable variety in the conclusions reached in the different studies, in part reflecting different countries in the samples, different time periods, and varying levels of aggregation. Some common threads emerged. One result of particular interest to the chief economists was that what matters for growth was a strong monetary framework — such as inflation targeting — rather than the exchange rate regime.

At the same time, it was noted that such an overly quantitative approach represented only one side of the coin. Some participants argued that it was still important to consider what countries said they were doing, as well as to observe exchange rate movements in practice. Not only was communication an important part of a country's strategic exchange rate policy, but economic outcomes depended both on what countries

did, and what they said they were doing. In addition, foreign exchange interventions could be regarded as a revealing aspect of what exchange rate regime a country was in.

## What determines the choice of exchange rate regime?

This proved a fascinating question, though there were no clear answers. The classical view was that the choice of an exchange rate regime primarily depended on the nature of the shocks hitting the economy. If real shocks (ie shocks emanating from the terms of trade) dominated as, for example, would be the case for commodity exporters, a flexible exchange rate system was preferable. On the other hand, if nominal shocks (ie shocks arising from the demand side or the money supply) dominated, a fixed exchange rate regime was preferable.(1)

As described above, analysis of the choice of exchange rate regime is inextricably linked to the question of how regimes are classified. Studies based on *de jure* regimes had led to a conventional wisdom of a 'hollowing out' or 'bi-polarisation' over the past 15 years, with countries moving to either ends of the fixed to floating spectrum of exchange rate arrangements — to hard pegs or currency unions on the one hand or freely floating on the other — and away from intermediate regimes such as pegs. But studies based on the *de facto* classification of exchange rates seemed to refute the 'bi-polar' view of exchange rates.(2)

What is less contentious is that there has been a fall in the number of currencies used as an anchor, with the US dollar and the euro the predominant currency pegs today. Meissner and Oomes (2005) looked at the factors that determined the choice of anchor currency, noting that the currency denomination of debt as well as trade network externalities (ie the importance of trade partners' anchor currency choices), were key determinants of the choice of peg. In other words, countries adopt a particular currency peg because there are benefits in using the same anchor as their trading partners. And the greater the flows of imports and exports between a country and its trading partners, the larger are the potential benefits from adopting the same anchor currency. The network effects can also give rise to co-ordination failures. This is illustrated by the fact that a number of transition economies in Europe chose a peg to the US dollar, rather than the euro, even though it may have been preferable for them to peg to the euro.

Participants also noted that, while there were theoretical arguments in favour of pegging to a basket of currencies, particularly for countries with a diverse trading pattern, the empirical evidence showed that most countries chose a single currency peg. There were a number of possible explanations. Single currency pegs were more transparent, and possibly more credible. Some countries might peg to the single currency of a monetary union (the euro, for example) with a view to joining that union at some point in the future. Moreover the operational aspects of basket pegs could be more complex. (Should the weights be disclosed? Should there be a fluctuation band around the target and if so should that be announced? How frequently should the weights be revised to reflect changing trade patterns?)

Several participants noted the persistence of exchange rate regimes, which was mirrored in the academic literature. For example, Reinhart and Rogoff (2004) found that regime changes were rare. On average, only about 7% of countries changed their *de facto* regime in any one year.

The key conclusion reached by participants was that the choice of exchange rate regime did matter for economic performance. There was no one size fits all, and while the evidence was mixed, the strongest result seemed to be that, as countries became more developed with stronger institutions, a more flexible exchange rate system was better.

## Financial integration and its effects on the domestic economy

The two key questions discussed here were whether financial integration led to more rapid growth in developing countries, and whether it caused more macroeconomic volatility. In theory, financial integration should increase growth in developing countries both directly (augmenting domestic savings, lowering the cost of capital and technology transfer) and indirectly (promotion of specialisation and better macroeconomic policies). Empirically, however, it was hard to find evidence of the gains from financial integration, possibly because factors such as differences

(1) It was also imperative to try and identify whether the shock hitting the economy was temporary or permanent.
(2) Reinhart and Rogoff (2004) suggested that intermediate regimes such as pegs have consistently accounted for about 50% of all regimes from 1970 to 2000.

in institutions and human capital were more important than differences in physical capital. In addition, it was not easy to measure financial integration. As with exchange rates there existed considerable differences between *de jure* integration (measured by official restrictions on capital flows) and *de facto* integration (measured by actual capital flows).

Participants commented on both the potentials and pitfalls of increased capital market integration. Increasing deregulation had in some countries led to ongoing imbalances between savings and investment, coupled with a dependence on capital inflows. These in turn resulted in persistent current account deficits, which left the country more exposed to shifts in global investment preferences.

## Capital flows and exchange rate regimes

A key theme of the Workshop was the linkages between international capital market integration and exchange rate regimes and whether these were different for developing and emerging economies compared with advanced economies. The theory and empirical evidence on international capital market integration appeared to point to unambiguous benefits for advanced countries. For developing countries, the evidence was more mixed. There were benefits from capital integration, but also problems associated with inflexible exchange rate regimes, high levels of public and external debt, weaker governance and financial market regulation and less stable macroeconomic policies. These factors left developing countries more vulnerable to shocks.

While there was no robust empirical relationship between economic performance and exchange rate regime for emerging market countries, it appeared that emerging market countries with exposure to capital markets faced a greater risk of banking or exchange rate crises under a fixed or inflexible regime than other developing countries. For poorer developing countries, fixed regimes were associated with lower inflation and high durability. One possible explanation for the discrepancy between developing and emerging countries was that other factors, for example the quality of financial regulation, the quality of institutions such as the central bank and a sustainable fiscal position were more important.(1)

For most emerging market economies, the magnitude and gyrations of capital flows, rather than the trade deficit and economic growth, were becoming the primary determinants of short-term exchange rate movements. Indeed, some participants noted that increased capital mobility in recent years has played the most prominent role in determining the exchange rate regime and its durability in these economies.

Based on their experiences, participants offered some recommendations on how to manage capital flows (particularly reversals) in fixed and managed regimes. For a start, countries had to maintain adequate foreign exchange reserves to smooth the impact of capital reversals and sterilise the reserves inflow through open market operations in domestic securities. Another suggested measure was to raise the statutory reserve requirement on domestic/foreign deposits (on a remunerated/non-remunerated basis). Further ideas included limits on open foreign currency positions, the use of forward exchange swaps by the central bank, and widening the exchange rate bands to allow some exchange rate appreciation. In addition, it was recommended there should be a clear hierarchy in the nature of capital flows, with equity flows being preferred to short-term debt flows. The use of capital controls to deal with (unwanted) capital inflows was debated. The consensus was that while they induced a change in the composition of the inflows, they were not useful in avoiding a real exchange rate appreciation. In fact, they may end up reducing foreign direct investment.

## The role of the real exchange rate

In his classic study Mussa (1986) showed that real exchange rates were more volatile when exchange rates were floating than when they were fixed. In emerging economies, the real exchange rate may trigger a wide variety of problems, most of them related to the solvency of financial and fiscal institutions. Far from being exogenous to the economy, the real exchange rate was better regarded, at least in the short and medium term, as a mechanism of transmission between the current and the capital accounts of the balance of payments. Real exchange rate fluctuations were mostly explained by short-term shifts in capital movements. As such, every change in capital not sterilised by a similar change in international reserves generated a real exchange rate

(1) See Reinhart *et al* (2003) who argued that, for emerging markets, excessive government borrowing was at the root of most exchange rate crises.

adjustment. In particular, the sudden stops in capital flows identified by Calvo and Reinhart (1999) were usually related to episodes of sharp devaluations.

Participants agreed that targeting the real exchange rate would not be beneficial. On the contrary, such a policy entailed only transitory effects, induced policy mistakes, distorted investment decisions and, in the long term, generated inflationary pressure and reduced the credibility of the monetary authorities.

## Fixed exchange rates and interventions

Participants debated the efficiency and efficacy of foreign exchange interventions as a tool of exchange rate management and the optimum level of foreign exchange reserves. The general conclusion was that foreign exchange interventions were not very effective. In general, foreign exchange reserves were dwarfed by the size of portfolio flows and the daily turnover in the world's foreign exchange markets. Some felt that foreign exchange reserves should at least be sufficient to cover likely variations in capital flows or the 'liquidity at risk'. Others were of the view that some foreign exchange reserves were still needed for periodic interventions in view of large exchange rate misalignments. Many countries also recognised the need for more active management of the central bank's asset portfolio and more innovative measures for the deployment of these reserves. But there was also a suggestion that countries with floating exchange rates did not need a large amount of foreign exchange reserves.

## Institutional framework

The Workshop discussed the important role played by the institutional framework. There were a number of elements to this. Monetary stability required a strong commitment to long-run price stability by both the general public and the monetary authority, as well as central bank (instrument) independence.(1) Financial stability required robust prudential and supervisory arrangements. And fiscal stability was best ensured by sustainable debt levels and incentive-compatible revenue sharing systems.

Participants noted that the standard theory of optimum currency areas (originating with Mundell (1961)) often failed to consider monetary, financial and fiscal institutions, which were frequently weak and themselves a source of problems in emerging countries. Indeed, the nature of these institutions could affect the types of shocks a country experiences. Calvo and Mishkin (2003) concluded that the choice of exchange rate regime was likely to be of second order importance to the development of good fiscal, financial and monetary institutions in producing favourable macroeconomic outcomes in emerging market countries. In fact, their paper posed a paradox, in the sense that 'A floating exchange rate is clearly the wrong prescription….But…it is not clear that a fixed exchange rate is sustainable, either' (page 13).

With a weak monetary authority, inflation is more likely to ratchet up and become unpredictable. Rules may then tend to be replaced by discretion, thereby aggravating the time inconsistency problem. Taken to extremes, this can lead to the domestic currency being replaced by a foreign one (currency substitution), and asset and liability dollarisation extending to the rest of the financial markets. A resulting perception of worsening solvency ratios reinforces potential runs on banks and capital flight. The latter is a frequent outcome in such a situation, putting pressure on the sustainability of a fixed exchange rate system. Weak fiscal institutions in turn can cause governments in emerging countries to issue foreign currency debt (a process referred to as original sin), occasionally even in domestic markets (known as original super sin). In that case government solvency becomes vulnerable to adverse fluctuations in the real exchange rate. The effects of the real exchange rate tend to increase when the economy is in a recession, at the same time that tax collection is lower. Consequently, the interest burden also increases with the real exchange rate. The end effect is a deterioration of the fiscal account with little or no room for countercyclical policy.

Many participants warned that market incompleteness may present problems, leading to high exposure to sudden stops in capital flows and the potential for currency substitution and liability dollarisation. There was a view that one way for central banks to counteract this was to encourage the development of capital markets, including deep and liquid foreign exchange markets, which would allow market participants to hedge exchange rate movements. It was noted that attempts by central banks to prevent excessive exchange rate volatility, for example by using exchange rate bands, could inhibit market developments of exchange rate derivatives and hedges.

(1) Instrument independence is described in more detail in Debelle and Fischer (1994), and refers to the central bank's unimpeded choice about the use of monetary policy instrument(s) to meet the monetary policy objective.

## The interplay between the exchange rate and the inflation-targeting regime

Several countries represented at the Workshop had adopted an inflation-targeting framework while maintaining a fixed exchange rate regime.(1) Under inflation targeting, the attainment of the inflation target is the primary objective of monetary policy.(2) But the need to support the additional exchange rate target means that one policy instrument (the policy interest rate) has to support two policy goals. Conflicts can arise if high interest rates required to attain the inflation target cause capital inflows that put appreciation pressure on the exchange rate band. But lowering interest rates to relieve this pressure threatens the inflation target. Exchange rate bands can also weaken the monetary policy transmission mechanisms by limiting the operation of the exchange rate channel. Hence several countries have complemented monetary policy by implementing intra-marginal sterilised interventions — often with limited effectiveness and high quasi-fiscal costs. The end result has been that the frequent policy conflicts have undermined the credibility of both targets.

Participants concurred with the proposition that while exchange rate stability was a prior for price stability, monetary policy should focus on the latter. But a shift to greater exchange rate flexibility did not mean that inflation-targeting central banks could ignore the exchange rate: on the contrary, exchange rate shocks and the associated exchange rate volatility were important in all inflation-targeting countries. This is because the exchange rate channel may be the most powerful and fastest transmission channel to influence domestic prices in open economies, operating directly and indirectly through three channels. A direct channel works from the exchange rate to imported goods prices and thence to the consumer prices index (CPI). In the first of two indirect channels, the exchange rate has an effect on income and wealth, which shifts the demand for goods and therefore affects the CPI. In the second indirect channel, the exchange rate has an effect on balance sheets, and the credit channel ensures that there is an effect on the CPI.

## Exiting to greater exchange rate flexibility

There was some agreement that as countries develop economically and institutionally, there appeared to be considerable benefits in adopting a more flexible exchange rate system. The benefits of such a move occurring voluntarily, and not as the result of an exchange rate crisis, were illustrated in the IMF's September 2004 *World Economic Outlook*, which showed that countries switching voluntarily to floating exchange rates performed better on inflation and experienced little growth volatility. The Workshop touched upon the issue of best practice in switching to greater exchange rate flexibility. Four operational issues were identified in moving (voluntarily) to a fully flexible exchange rate system. For a start, there was the need to establish a new nominal anchor and/or monetary policy framework. On top of this came the development of an efficient and liquid foreign exchange market, coupled with the capacity to manage and regulate exchange rate risks. Finally, credible foreign exchange intervention policies needed to be formulated.(3)

## International monetary system, and the growing role of Asia

There was considerable interest in the question of how the mix of current exchange rate regimes is linked to global current account imbalances, and the implications of this for the future evolution of the international monetary system. Several participants noted the increasing importance of Asia in the international monetary system, as reflected in the growing share of real reserves held by Asian central banks. Their choices of reserve currency and exchange rate arrangements have potentially important consequences for the global monetary system.

Discussion focused on the potential interplay of two stylised features of the Asian monetary system: the attainment of regional exchange rate stability by *de facto* pegging to the US dollar and the collective reliance on exports outside the region for growth.(4) Some outside commentators have suggested that Asian central banks are pursuing exchange rate stability as insurance against private sector balance sheet exposure to exchange rate

(1) Eventually, though, most dual-target countries either widened the exchange rate band sufficiently to limit the likelihood of policy conflicts or abandoned the exchange rate target altogether by floating. In fact, most of today's inflation targeters having floating exchange rates.
(2) Other objectives are subordinated to achieving and maintaining low inflation (except under exceptional circumstances).
(3) But Brazil (1999) and Turkey (2001) have demonstrated that exits can be successful without taking account of these four operational issues.
(4) Formally, of course, there is a range of exchange rate regimes in Asia.

appreciation.(1) Others that exchange rates are undervalued to support export volumes and hence growth.(2) Various authors believe, for different reasons, that the current pattern of global current account imbalances could persist for some time. Others, though, question the sustainability of the current arrangements because both these theories imply substantial market distortions (public sector insurance of private sector risk in the first case and mispricing of exports and a global misallocation of resources in the second). Either way, there was agreement that even if the risks of a rapid unwinding of current global imbalances or a sea-change in the position of the dollar as reserve currency may be remote, the consequences could be huge.

The implications for short-run global demand dynamics have been analysed by the Bank's International Finance Division using a simple three currency bloc Mundell-Fleming model. In this model the euro floated against the US dollar while an Asian currency bloc could be switched from a fixed exchange rate against the US dollar to floating to explore some of these scenarios. The most striking feature of their analysis was that under the current hybrid floating and fixed system, the burden of adjustment to a demand shock fell disproportionately on one of the three blocs — precisely which one depended on the nature of the shock — relative to a system in which everyone floats. This increased the volatility of this particular international monetary system compared with a more uniform system. Given the presence of domestic adjustment frictions, this raised the issue of whether there is a greater need for international policy co-ordination. The latest literature in this area suggests that national policymakers setting policy to optimise on domestic goals can, unintentionally, still achieve close to the best outcome so policy co-ordination would not be needed. But the assumptions required to reach this result may be overly restrictive and there may be a need for co-ordination, as a second-best solution. If so, how could this be achieved? Should the IMF be given more powers, for example?

The question of a possible exchange rate realignment in the area was also discussed. If this were necessary, is it better done individually or collectively? What would be the effect of exchange rate realignments on Asian countries' balance sheets and trade positions? It was agreed that these were complex issues that warranted further research.

## Conclusion

Participants at the second Chief Economist Workshop discussed the interplay between exchange rates and capital flows in an environment of increasing capital market integration and potentially abrupt reversals in investment and capital. Frequently, exchange rate regimes were the outcome of a country's history rather than careful design and lengthy negotiation. Moreover, no exchange rate system could fit all the countries all of the time. Specifically, the source of the shocks facing an economy would have to be reflected in the choice of an exchange rate regime, but the regime was most likely going to change over the course of a country's economic development. The co-existence of a fixed exchange rate system with an inflation target was thought to represent a particular challenge to the domestic monetary authorities. Participants concluded that the choice of exchange rate regime depended on a number of factors, not all of which were exogenous and represented a dynamic process. Finally, the design of domestic monetary, fiscal and financial institutions was of paramount importance, especially in order to create institutions that were robust both to a range of economic shocks as well as to abrupt reversals in capital flows.

(1) See McKinnon and Schnabl (2004).
(2) See Dooley *et al* (2003, 2004).

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# Implementing monetary policy: reforms to the Bank of England's operations in the money market

**By Roger Clews of the Bank's Markets Area.**

*In its money market operations, the Bank of England implements the interest rate decisions of its Monetary Policy Committee while meeting the liquidity needs of the banking system and thus contributing to its stability. The Bank has decided that it needs to upgrade the way in which it carries out these operations and has announced wide-ranging reforms to bring that about. This article describes the new system.*

The Bank will adopt new ways of operating in the sterling money markets in the first half of 2006.(1) In its money market operations, the Bank implements the Monetary Policy Committee's interest rate decisions. But the particular way in which a central bank operates can affect the degree of control that it exercises over market interest rates. The up-coming reforms are intended to give the Bank much greater control. The instruments to be used in the new system will also provide more channels through which liquidity can pass between the banking system and the Bank. This should make for better liquidity management both in normal times and in stressed conditions. And it should foster more stable and fairer money markets. This article describes the new operational framework, focusing in particular on what it means for monetary policy implementation.

Each month the Bank's Monetary Policy Committee (MPC) meets to decide the level of the Bank's official interest rate. The MPC's decisions affect interest rates in money markets, on bank loans and retail deposits, as well as financial asset prices including the exchange rate. These changes in financial markets, together with the associated impact on expectations, in turn affect spending decisions and inflationary pressure in the economy. Monetary policy implementation focuses on the first step in this 'transmission mechanism' of monetary policy.(2) The new system is designed to provide a tighter link between the Bank's official rate and related market interest rates, out to the horizon of the next MPC rate announcement.

## Central bank money: demand and supply

Central banks can implement monetary policy because they are the sole issuers of 'central bank money'. The most familiar form of central bank money is banknotes. Only the Bank of England is allowed to issue banknotes in England and Wales.(3) But Bank of England notes are simply supplied on demand.(4) The second form of central bank money consists of balances (current accounts or deposits) held by, in particular, commercial banks at the central bank. These balances are crucial both to the liquidity of the banking system and to the implementation of monetary policy. The central element in the Bank's reform of monetary policy implementation concerns the terms on which banks (and building societies) can manage their accounts at the Bank.

Commercial banks (and, in the United Kingdom, building societies) are themselves issuers of money, in the form of deposits. These can be transferred to make payments, for example using debit cards or cheques, and they can also be converted into central bank money, for example through ATMs. In the United Kingdom, as in most developed economies, such 'commercial bank money' greatly exceeds the central bank note issue. Commercial banks need to manage their own liquidity to ensure that they can make payments on their customers'

(1) Details of the new arrangements were published in April in 'Reform of the Bank of England's Operations in the Sterling Money Markets', see www.bankofengland.co.uk/markets/money/smmreform050404.pdf. For analysis of problems with the current system and reasons for change see Paul Tucker 'Managing the central bank's balance sheet: where monetary policy meets financial stability', *Bank of England Quarterly Bulletin*, Autumn 2004, pages 359–82.
(2) The MPC's view of the transmission mechanism as a whole was set out in a booklet published in 1999 and available at www.bankofengland.co.uk/publications/other/monetary/montrans.pdf.
(3) For Scotland and Northern Ireland see footnote 2 on page 214.
(4) Demand for banknotes may however contain information relevant to monetary policy, eg on household spending.

behalf or can convert deposits into central bank notes as required. In part banks can do this by holding accounts with other banks, on which they can draw when necessary. And they can go into the interbank market to manage their liquidity, borrowing from or placing funds with other banks. But there are limits to banks' willingness to accept credit risk by lending to each other, particularly where credit exposures might be large. Major banks have therefore long since adopted the practice of settling debts between themselves in central bank money. So transactions passing through the payments system are ultimately settled by transfers from the account of one commercial bank at the central bank to that of another commercial bank. And when commercial banks buy notes from the central bank they pay for them by running down these same accounts at the central bank. These are the reasons why commercial banks have a demand for central bank balances.

The terms on which banks and building societies(1) will be able to manage their accounts at the Bank of England are described in some detail below. But there will be three main elements to the new arrangements.

(a) Within limits, banks will be able to hold balances ('reserves') at the Bank remunerated at the Bank's official interest rate. So long as they stay within those limits, banks will be able both to place funds at the official rate by increasing their reserve balances, and to obtain funds at the official rate by running down their balances. This will influence the interest rates at which banks are willing to place or borrow funds in the wider money market.

(b) Outside those limits, banks will be able to make use of two standing facilities at the Bank, in which they can borrow (against security) or place funds. On the days when they are most constrained by the limits in the reserves scheme, banks will be able to borrow and place funds in the two standing facilities at rates just 25 basis points (1/4%) above and below the official rate. This too should influence the rates at which they are willing to deal in the money market.

(c) Finally, the Bank will use its open market operations (OMOs) to ensure that (i) banks are unlikely to have to use the standing facilities at all, but that (ii) there is an equal (small) chance of using either facility. This too is intended to keep market rates close to the official rate (midway between the rates on the two facilities).

## The instruments in the new framework

The three main instruments in the new scheme are now described in greater detail.

*Remunerated reserves*. Banks will be able to hold balances at the Bank of England (reserves) remunerated at the official rate of interest. There will be no compulsion in this; they will each be able, within limits, to choose their own target level for these reserves. They will not be expected to hold reserves at this target level every day, but only on average during a 'maintenance period' running from one regular MPC decision day to the next. (Maintenance periods will thus normally be of four or five weeks in length.) Even over the maintenance period as a whole, reserve-holders will not be expected to hit their targets exactly. If actual reserves on average over a maintenance period are within ±1% of the target, they will be remunerated at the Bank's official rate. Banks would be expected, if necessary, to make use of the Bank's standing facilities (described in more detail below) to ensure that their reserve balance did fall within the target range of ±1%. If they failed to do so they would be penalised. An institution with average reserve balances above 101% of its target would receive interest at the official rate on 101% of the target but no interest on the excess. An institution with average holdings below 99% of its target would receive net interest equal to the official interest rate on 99% of the target less twice the official interest rate on the shortfall below 99%.(2) Reserve-holders would also be charged twice the official interest rate on any overdraft on their reserve account on any day.

Banks' ability to vary their reserve holdings from day to day during the maintenance period will help them to manage their liquidity, providing a buffer to absorb unexpected payment inflows or outflows. Individual banks will also be able to choose to run their reserve balances at the Bank up or down if the official rate on these balances compares favourably with rates in the money market. If rates in the money market are high, a bank may choose to run down its reserve balance instead of borrowing in the market. Equally if money

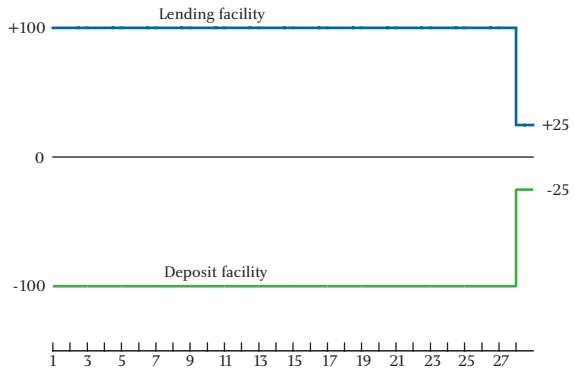
(1) In the rest of this article the term 'banks' will generally be used to cover both banks and building societies.
(2) The penalties can be described in an alternative but entirely equivalent way. Institutions will be paid the official rate on their actual reserve balances, but will be charged (one times) the official interest rate on any excess or shortfall above or below the target range.

market rates are low, a bank may choose to increase its reserve balance rather than to place funds in the market. The ability of banks to arbitrage in this way between balances at the Bank and positions in the money market should limit deviations between market rates and the official rate, within each maintenance period. Banks' freedom to vary their reserve balances will become more constrained as the end of the maintenance period approaches, since they will need to bring their average balances within the target range. But even on the final day of the period, the range itself may give them significant room for manoeuvre. Consider a bank with a target for its average reserve balances of £100 million. In a four-week (28 day) maintenance period that is equivalent to a target of £2,800 million for its cumulative reserve balances over the period. Suppose that on the last-but-one day of the period its cumulative reserves amount to £2,700 million (£100 million per day). Then reserve holdings on the final day within a range from £72 million to £128 million will ensure that the average for the period as a whole is within the ±1% range.

Reserve balances are expected to be attractive assets for many institutions. They will be a valuable tool for liquidity management and highly-rated by regulatory authorities. And they will not be costly; the Bank will pay the same rate of interest on these balances as on the short-term open market operations that institutions could use to finance the balances. (Open market operations are described further below.) Given these attractions there will be upper limits on the amount that any bank may target (the larger of £1 billion or 2% of eligible liabilities).(1) Within those limits banks will be free to vary their targets from maintenance period to maintenance period. But, after a possible learning period, it is not expected that reserve-holders will want to make large changes in normal circumstances.

*Standing facilities.* Banks will also be able to make use of overnight standing facilities. They will be able to place money with the Bank overnight, and they will be able to borrow funds by repoing eligible assets to the Bank overnight.(2) Particularly on the last day of the maintenance period, these standing facilities will have a role in controlling rates in the market as a whole (as explained below). On that day, the interest rate paid on the deposit facility will be just 25 basis points below the Bank's official rate; the rate charged for use of the borrowing facility will be 25 basis points above the official rate. On other days of the maintenance period, the facilities' main role will be to provide liquidity backup for individual institutions. On those days the rates will be less advantageous to the banks making use of the facilities, at 100 basis points below or above the official rate.

**Chart 1**
**Rates on standing facilities through a four-week maintenance period, relative to the official repo rate, in basis points**




*Open market operations.* Open market operations (OMOs) are another channel through which central banks lend money and sometimes borrow. But, unlike the use of standing facilities, OMOs are undertaken at the initiative of the central bank. As explained briefly above, the Bank will be using OMOs as its main instrument for ensuring that reserve-holders collectively are able to meet, on average over a maintenance period, the reserve targets they have set themselves. For example, if the average level of notes in circulation were to increase from one reserve maintenance period to the next, then other things being equal, reserve balances would fall, because the notes would have to be paid for. Although individual banks might change their reserve holdings by trading in the money market, their collective holdings would necessarily be lower on average in the second maintenance period. But the Bank would act to ensure that this did not actually happen. In this case the Bank would lend more in its open market operations (OMOs)

(1) Eligible liabilities are a measure of banks' sterling deposit liabilities (net of interbank deposits). They are calculated as the basis on which banks may be obliged to hold non-interest-bearing Cash Ratio Deposits at the Bank (see footnote 1 on page 215). In future they will also be used in the calculation of the maximum targets that institutions will be allowed to set for their holdings of voluntary interest-bearing reserve balances at the Bank.

(2) Repos are, in their economic effect, secured loans. In the standing facility the Bank will buy eligible assets from a bank, while simultaneously agreeing to sell them back the following day. The rate of interest will be expressed in the difference between the prices at which the assets are bought and then sold. Where, as here, the Bank is lending money, the transaction is strictly speaking a reverse repo from its point of view and a repo from the point of view of the borrower.

so that the increase in its note liabilities between maintenance periods was matched by an increase in its money market assets and not by a fall in its reserve balance liabilities. Equally, if banks were to raise or lower their reserve targets between one maintenance period and the next, the Bank would adjust its OMOs to ensure that banks could meet their new targets.

In this way the Bank will enable reserve-holders collectively to meet their reserve targets. But it will be for individual reserve-holders to ensure that they meet their individual targets. They may each seek to do so by taking part in the Bank's OMOs, but they are equally free to finance their reserve holdings in the market, if that is what they prefer. This is why individual reserve-holders will be eligible to take part in the OMOs, but so too will other banks, building societies or securities dealers that are, among other things, active in the money market.

The Bank will undertake one-week OMOs each week, normally on a Thursday (including MPC decision days). It will also undertake an overnight OMO (that is, with a maturity of just one day) on the final day of every maintenance period (normally a Wednesday). It will continue to undertake OMOs in the form of repos of eligible assets(1) and will continue to do so at the MPC's official rate — the Bank of England repo rate. To decide on the required scale of its OMOs, the Bank will make forecasts of factors that would otherwise affect aggregate reserve balances over the remainder of each maintenance period. The most important of these factors will normally be changes in the note circulation, but changes elsewhere in the Bank's balance sheet may also sometimes matter, for example movements in the accounts of other central banks or of the government. When, in the light of these forecasts, the Bank judges that it needs to make more reserves available it will simply lend more on a Thursday than the counterparties have to repay in OMOs maturing on that day. And when the reserve-holders are forecast to be oversupplied with reserves the Bank will simply lend less than the amount the counterparties are repaying. In the overnight 'fine-tuning' OMO on the final day of a maintenance period the Bank will simply lend money if it needs to provide reserves. But since there will normally be no OMOs maturing on a Wednesday, if the Bank needs to drain reserves in a 'fine-tuning' OMO, it will repo out assets to its counterparties and take cash from them overnight, at the official rate.

The forecasts underpinning each weekly OMO cannot be expected to be completely accurate, but the impact of any discrepancies between outturns and forecasts will be offset in subsequent OMOs within the same reserve maintenance period, including the fine-tuning OMO on the final day of the period. The width of the target range for reserves has been set so that only very rarely should an error in the forecast underlying the final-day OMO take reserves outside the reserve-holders' target ranges.

One factor which might invalidate the forecasts would be any (unexpected) use of the standing facilities, which would add to or subtract from reserve balances. Use of the standing facilities before the final day of the maintenance period will be taken into account in subsequent OMOs, because the Bank's aim will remain that of supplying as exactly as possible the amount of reserves needed for reserve targets to be hit. On the final day of the maintenance period that will hardly be possible. This means that on that final day, if the forecast underlying the fine-tuning OMO is correct, but a bank nevertheless makes use of one of the facilities, reserve-holders in aggregate will be under or over-supplied with liquidity. If the use of the facility is small enough, reserve-holders may still be able to remain within their reserve target ranges. If not, some other reserve-holder will be obliged to make use of the 'opposite' facility. Even with a narrow corridor on the final day, such an outcome would be costly for the institutions concerned. But this provides an incentive for reserve-holders and others to trade with each other in the market on the final day of the period, rather than using the standing facilities.

Weekly OMOs will not allow reserve-holders to hold their target level of reserves on every single day. Each Friday notes in circulation will rise, as now,(2) and reserve balances will fall as these extra notes are paid for.

(1) See footnote 2 on page 213. In one-week repos, the Bank will of course agree to sell assets back to its counterparties after seven days.

(2) Normal demand patterns result in a slight increase in the value of Bank of England notes in general circulation at weekends compared with mid-week. Additionally, certain Scottish and Northern Ireland banks are permitted to issue their own banknotes provided that the great bulk of them are covered by equivalent holdings of Bank of England notes. The Acts of 1845 and 1928 that govern the issue of notes in Scotland and Northern Ireland allow these issuing banks some flexibility in managing the timing and amount of Bank of England notes held as cover but lay down that the amount of cover should be calculated as at close of business on Saturdays. This flexibility means that the issuing banks' holdings of Bank of England notes are greatest at the weekend, which accounts for the bulk of the weekly seasonality in the Bank of England note issue.

So reserve balances on Friday, Saturday and Sunday will be relatively low, and balances will be relatively high from Monday to Thursday after the note circulation has fallen back. Such intra-week variations will be possible because of the averaging arrangements to be applied to reserves. Discussions with prospective reserve-holders suggest that targets for reserve balances may total more than £25 billion. If so, reserve balances will be quite large enough to absorb within-week variation in the note issue, which typically amounts to £2 billion–£3 billion. The Bank will publish each day its forecast of aggregate reserves balances at the end of that day, to help individual reserve-holders to plan their operations.

The Bank will pre-announce the size of each of its OMOs. If bids from its counterparties are for more than the amount on offer they will be scaled back. In theory it might happen that counterparties' bids sum to less than the amount on offer. In that case the shortfall would be taken into account in the planning of OMOs in the rest of the maintenance period. However, because the Bank will never lend more in an OMO than it thinks is necessary, but may find itself providing less, the only possible risk to interest rates is that underbidding might make for firmer rates. But then counterparties that had obtained funds in the OMO at the official rate would be at an advantage, since they could lend into the market at higher rates. Since there would be no equivalent risk of soft rates through oversupply, this should encourage counterparties to bid.

## Different counterparties for different instruments

The instruments used to implement monetary policy will have different specific functions. There is no need for the Bank to deal with an identical group of counterparties for all instruments and it does not expect to do so.

Some banks will automatically be members of the reserve-holding scheme. These are the settlement banks that already have settlement accounts at the Bank because they are members of the sterling wholesale payment system (CHAPS Sterling) or are payment banks in CREST, the securities settlement system. (That will be equally true of banks that become settlement banks in the future.) The same accounts at the Bank will be used for settlement purposes and as reserve accounts. This means that settlement banks will be able to make use of their reserves during each day to make payments in CHAPS Sterling or CREST. For these banks, reserve balances will be a source of intraday liquidity to complement or replace intraday repos from the Bank which are their main source of such liquidity in the current arrangements.

In addition, any bank in the United Kingdom above a certain size may opt to hold remunerated reserves, although groups of institutions related through ownership links will be asked to nominate one member to hold reserves on their behalf. The size cut-off will be based on the Cash Ratio Deposit (CRD) scheme, so that any bank that actually holds CRDs will be eligible to hold remunerated reserves, if it so wishes.(1) Around 100 groups of institutions are currently above this threshold. CRDs are non-interest-bearing deposits, invested in assets whose yield pays for the Bank's sterling liquidity function among others.(2) The Bank thinks it right that institutions contributing to the financing of this function should be able to benefit directly from the Bank's new channels for providing liquidity. The Bank hopes that institutions other than settlement banks will choose to hold reserves, and a significant number have expressed interest in doing so.

Any bank that holds reserves will also be expected to sign up for standing facilities. Any other bank that actually holds CRDs will also be eligible to sign up for standing facilities. The Bank believes that direct access to the central bank should form part of the contingency planning of a wide range of banks and hopes therefore that many institutions will sign standing facility agreements with it.

The purpose of the Bank's open market operations is to ensure that reserve-holders in aggregate can meet their reserve targets. But individual institutions can adjust their positions by dealing in the money market. So it is not necessary for reserve-holders to be counterparties in the Bank's OMOs, or for OMO counterparties to be reserve-holders. Reserve-holders will be eligible to take part in OMOs but so will any other banks, building societies or indeed securities dealers that are active in the sterling money markets. OMO counterparties will

(1) Banks are in principle required to hold Cash Ratio Deposits (CRDs) with the Bank, related to the size of their Eligible Liabilities (ELs, see footnote 1 on page 213). But for ELs up to £500 million the ratio is set at 0%, so that small institutions actually hold no CRDs. For ELs over £500 million the ratio of CRDs to ELs is 0.15%.
(2) See HM Treasury 'Review of the Cash Ratio Scheme and Consultation on proposed changes', August 2003, at www.hm-treasury.gov.uk./media/FC1/FD/crd_279.pdf.

also need to meet standards of prudence and risk and the legal basis of transactions with them will need to be robust.

Counterparties will of course need the operational capability to make use of whichever instruments they sign up for. They will be expected to settle promptly their transactions with the Bank. There are also two more general requirements. They must act in a way that is consistent with the Bank's objectives of competitive and fair sterling money markets. And they must be willing to contribute to the Bank's market intelligence work — not just with respect to the sterling money markets, but also, from their knowledge of other markets in which they are engaged, in support of the Bank's monetary and financial stability objectives more widely.

## The monetary policy timetable

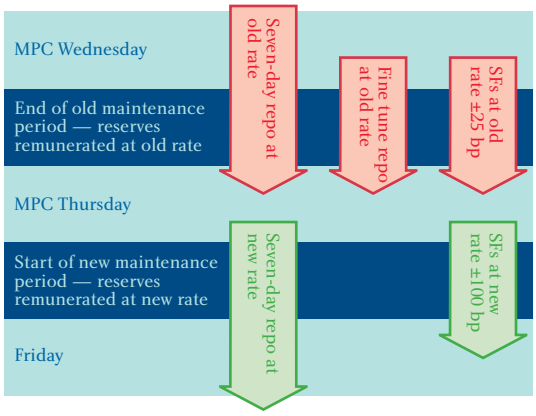
The timetable for MPC meetings is set out well in advance. Interest rate decisions are announced once a month, usually on a Thursday early in the month, at midday.(1) The Bank's new instruments for implementing policy are designed to fit in with this timetable.

The maintenance period for reserve holdings will run from one MPC decision to the next. Reserve holdings at close of business on the day of an MPC decision will be the first to be counted towards that period's average. Reserves held at close of business on the day (normally a Wednesday) immediately before the next decision will be the last to contribute to the average for that maintenance period. Thus remuneration of reserves will change immediately if the MPC decides to change the Bank's official rate.

Similarly, standing facility rates will be based on the official rate established for each 'MPC month' and will change immediately if the official rate changes. Any use of the Bank's overnight standing facilities on the Thursday of an MPC decision would be at 100 basis points above or below the new official rate.(2) Use of the facilities on the Wednesday before an MPC decision day would be at 25 basis points above or below the previously established official rate.

Open market operations undertaken in any maintenance period will be at the official rate established for that

**Chart 2**
**Interest rates on monetary policy instruments around MPC decision day**




'MPC month'. All outstanding OMOs (whether seven-day repos or overnight fine-tuning repos) will mature on an MPC decision day. New seven-day repos undertaken on that day will of course be at the new rate.

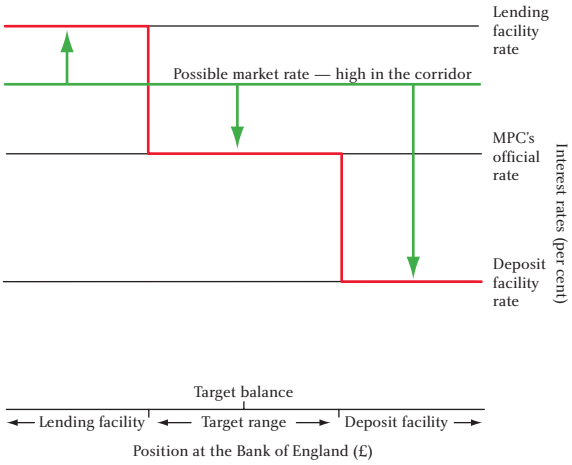
The rates on the new instruments of monetary policy will thus all be set one month at a time. As the next MPC meeting approaches, the maturity of the interest rates that the Bank is seeking to influence will shorten. Immediately after an MPC decision the focus will be on all maturities from overnight to around one month. But as the time to the next MPC meeting shortens, so too will the section of the yield curve in question. On the eve of an MPC decision the focus will be solely on the overnight rate.

## How the instruments will fit together

The new arrangements are designed to permit arbitrage between market interest rates and rates paid or charged by the Bank. Chart 3 shows (in red) the official rates relevant to a reserve-holding bank on the last day of the reserve maintenance period. If, at close of business that day, average reserves are within the target range, they will be remunerated at the MPC's official rate (along the middle 'step' of the red line). If an unexpected inflow to the bank would push reserves above the top of the target range, the bank would expect to put the excess into the Bank's deposit facility (on the right-hand side of the chart). Equally an unexpected outflow might oblige it to use the Bank's lending facility (on the left-hand side). These different possible outcomes will have different implications for the reserve-holding bank, depending on the level of market interest rates.

(1) Rates can also be changed in unscheduled meetings. But this has happened only once, in September 2001.
(2) This would include any use of the facilities in the morning of an MPC decision, when the rate to be charged would not be known.

**Chart 3**
**Interest rates on the last day of the maintenance period**



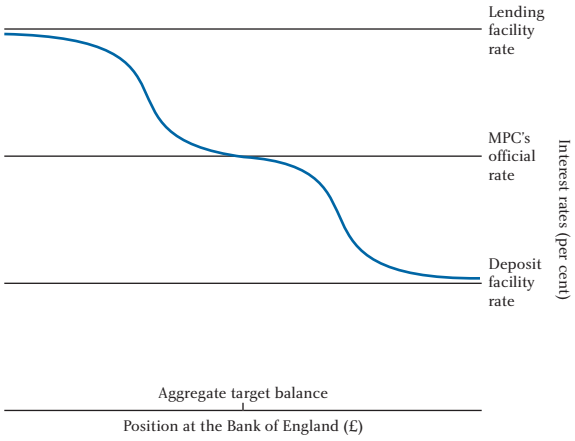

The chart is drawn to illustrate the case that would arise if the relevant market rate (shown by the green line) were above the MPC's official rate. The arrows indicate the relevant interest rate comparisons. First, with market rates above the remuneration rate for reserve balances, the bank might be expected to place more (or borrow less) in the market and to place less in its reserve account, thus holding reserve balances towards the bottom of its target range. But if the bank were uncertain about its liquidity position it might not aim to hit the very bottom of its target range, for fear that an unexpected outflow would force it into the Bank's lending facility, at a rate of interest above the market rate. The more uncertain it was, the less willing it would be to aim for the bottom of the range. On the other hand, if the market rate were very high within the interest rate corridor, the cost of using that facility would be very small (the left-hand green arrow would be very short) and the bank would be more willing to risk using the facility.

If the market rate were low in the corridor the incentives would all be reversed. The cost of using the deposit facility would be relatively low and that of using the lending facility relatively high. So at low market rates the bank would have incentives to borrow in the market and to hold relatively high reserve balances. The low market rate of interest would in effect compensate it for the risk of having to use the deposit facility.

For each individual reserve-holding bank, market rates may thus be expected to influence its choice of reserve balance for which it is aiming. Aggregating across all the reserve-holding banks, the aggregate 'demand curve' for reserve balances might resemble the line in Chart 4.

The precise shape would depend on the size of banks' target ranges and just how uncertain they were about their liquidity position. The actual level of the market interest rate would result from the intersection of this demand curve with the Bank's supply. The chart illustrates that if the Bank in its OMOs can provide just the right amount of liquidity to enable banks to hit their reserve targets, then the market rate should be in line with the official rate. And because there is a relatively flat part of the curve either side of the aggregate target level, influenced by the target ranges, small mistakes in the Bank's supply should not have a significant impact on the market rate.

**Chart 4**
**Possible demand schedule for balances at the Bank of England**




Market expectations of the market rate on the last day of the maintenance period are also important. The narrow corridor and the fine-tuning OMO on the last day of every maintenance period, together with the effect of target ranges, are designed to give market participants confidence that the market rate will indeed be close to the official rate on the final day of the maintenance period.

## Smoothing rates from day to day within the maintenance period

On days other than the last in a maintenance period, arbitrage is expected to work somewhat differently. Here, reserve-holding banks have a choice between holding reserves today and holding reserves later in the maintenance period. And how they exercise their choice is expected to depend on the relationship between market rates today and market rates expected later in the maintenance period.

If rates today were higher than those expected later in the maintenance period, reserve-holders with a need for finance would tend to let their reserves at the Bank run down, expecting to be able to rebuild them as necessary by borrowing in the market more cheaply later in the maintenance period. Similarly, banks with funds to place would place them in the market on the day in question, rather than build up their reserves then and place funds in the market at lower rates later in the period. If rates were soft on any day that would encourage transactions going in the opposite direction. And banks whose own *ex-ante* positions were reasonably well balanced might also choose to borrow or lend in the market, making use of their reserve accounts at the Bank to, in effect, arbitrage between market rates on different days of the maintenance period. All these transactions would tend to work together to keep market rates in line with those expected later in the period, and ultimately in line with the rate expected on the final day. The averaging provisions for reserve holdings should smooth rates from day to day within each maintenance period. And so long as the market expects that on the final day of the period market rates will be close to the official rate, market rates earlier in the period should also be close to that level.

## The possibility of 'back-loading'

Reserve-holders will not be allowed to overdraw their reserve accounts on any day. But there is no equivalent upper limit to their daily reserve holdings. If a reserve-holder accidentally over-fulfils its reserves target before the end of a maintenance period it cannot rectify its position by holding negative reserves in the rest of the period. Nor will it then want to hold positive reserves since they will bear no interest.

However, a reserve-holder that approaches the end of the maintenance period with below-target reserves is able to increase its average, towards its target, by holding high levels of reserves late in the period. If costly over-fulfilment were a serious risk, reserve-holders might choose to hold a relatively large proportion of their reserves later in the period ('back-loading'). There is some evidence of this effect in the United States, where reserves are low relative to the uncertainty surrounding individual banks' payment flows, so that accidental over-fulfilment may indeed be an issue. But there is little or no evidence in the euro area, where reserve holdings are higher.

Given the likely level of reserves in the new UK system, the Bank does not expect 'back-loading' to be at all significant here. If it were to be a factor it might become apparent in underbidding in OMOs early in the maintenance period. But that would have no necessary implications for the course of interest rates, if the pattern of reserve supply through the maintenance period were merely being brought into line with the pattern of demand.

## Different market rates

Secured wholesale money market rates will be most directly affected by official rates because they will be most directly comparable to rates on accounts at the Bank. Borrowing from the Bank of England in its standing lending facility will be by way of repo, that is to say, secured. And deposits with the Bank of England in its standing deposit facility will be of the highest credit quality. Unsecured rates in the wholesale money markets can be expected to diverge, as now, from secured rates, depending on the view, taken in the market, of any credit risk incurred in lending unsecured to a private sector institution. Nothing in the new arrangements is intended to constrain the market in its pricing of credit or other risk. Indeed, secured market rates might also, as now, diverge a little from the official rate, for example because the terms of which collateral was provided in the private market differed from the precise terms of the Bank of England's secured lending.

## Comparisons with other systems

Many of the elements in the Bank's new money market operations are already to be found in other countries, but the particular combination planned for this country is new. The general pattern of operations will resemble that in the euro area — with standing facilities, weekly one-week OMOs and a roughly monthly maintenance period for reserve averaging. The main differences are that in the United Kingdom reserves will be voluntary and contractual rather than required by regulation, there will be a range around the target levels of reserves, the interest rate corridor in the United Kingdom will narrow to ±25 basis points on the final day of the maintenance period, and the Bank of England will commit to always undertaking a fine-tuning open market operation on the last day of the period.

In the United States, banks may contract with a Federal Reserve Bank to hold 'clearing balances' in addition to required reserves. These are a form of

voluntary reserves, but unlike those planned for the United Kingdom, they do not carry explicit interest. As in the new UK system, US banks contract to hold clearing balances within a range (the 'clearing balance band').

The narrow, ±25 basis point, corridor on the final day of the UK system will closely resemble the corridors to be found in the 'channel' systems of Canada, Australia and New Zealand. But there the narrow corridors apply on every day, and because there is no reserve averaging the central banks have to manage liquidity in their systems day by day.

The new system will show many differences from the one used in this country up to now. Importantly, banks and building societies will be able to deal with the Bank at the official interest rate, not just by taking part in set-piece open market operations but by making use of remunerated balances at the Bank, at their own initiative, and at times of their own choosing. Moreover, many more banks and societies will have access to standing facilities at the Bank, in unlimited amounts, at interest rates that will narrow to a spread of just 25 basis points to the official rate on days when they are most likely to be needed. Because reserve balances at the Bank will bear interest at the official rate, demand for them is expected to be several hundred times greater than for the non-interest-bearing settlement balances of the current system, which the Bank aims to supply in the amount of only £45 million. For this reason, and because reserve targets will apply to the average of an 'MPC month' and not every day, reserve-holders will have much greater flexibility in their liquidity management. Because settlement banks currently hold very small balances on their accounts at the Bank, they need to be active every day to ensure that these accounts remain in credit. They do so predominantly by trading in the market, but to cope with late swings in their positions they also need to use special off-market arrangements at the end of each day. In the new arrangements, because reserve balances be so much larger, avoiding overdrafts should be very much easier. And reserve averaging will mean that reserve-holding institutions will need to square off their position completely at the central bank only twelve times a year. The Bank will be able to undertake open market operations just five or six times a month, instead of a number of times per day.

Volatility in very short-term sterling interest rates has already fallen, as the Bank has made clear that it intends to have much closer control over these rates and as it has laid out the reforms to bring this about. To consolidate this welcome development ahead of full reform, the Bank introduced some interim changes to its operations on 14 March this year. These were described on page 22 of the Spring 2005 edition of this *Bulletin* and their initial effect is considered on page 139 of this issue.

## Other potential effects of reform

The reforms currently in train are designed primarily to improve the implementation of the Monetary Policy Committee's interest rate decisions. They should also have other beneficial effects. Locking in lower volatility in very short-term interest rates should make the financing of other assets less risky and further improve the liquidity of derivative and other markets related to the short-term money markets.

As already noted, reserve balances will have a role in the payments system, as a source of liquidity that can be used by settlement banks to keep payments flowing throughout the day. The remuneration of balances at the Bank of England overnight may also make the role of settlement bank more attractive. The Bank would welcome any resulting increase in the number of settlement banks. That would help to reduce intraday credit exposures that currently exist between settlement banks and their largest correspondent bank customers and that are a potential weakness in the United Kingdom's financial architecture.

Standing facilities and reserve balances will be available to a wide range of banks. As a result, the Bank of England expects to have established financial relationships with a much larger number of banks than is currently the case. With liquidity able to flow in many more channels between the Bank and other institutions, there should be less scope for any player to exercise market power in the money market, which will help to make for fair and predictable trading conditions. Moreover, the increased number of links between the Bank and market participants should make it easier to deal with stressed conditions, whether related to general problems with the financial infrastructure, or indeed to liquidity strains affecting particular institutions. And a closer operational relationship with a wider range of institutions will help the Bank, for example in its market surveillance work.

Reserve averaging will mean that more transactions will occur over the balance sheet of the Bank of England, but experience in other averaging systems suggests that this will still leave plenty of scope for trading even in very short-term money markets. Trading will however be expected to be for liquidity management purposes. Since the aim is to keep market risk-free rates between MPC meetings in line with the official rate, markets have little or no role in price discovery in this very short part of the secured yield curve.

The reforms currently underway will mean large changes for the Bank, for the money markets and for the institutions with which the Bank does or will do business. But plans are well advanced and all but the most detailed aspects of the design of the new system are now settled. The Bank currently expects to have the new system up and running between March and June of 2006.

In these reforms the Bank is equipping itself with a more complete set of tools for the implementation of monetary policy. Most of the tools are in use in systems abroad, although the particular combination to be adopted in this country will be new. Experience of the use of these tools elsewhere suggests that they will make for improvements not only in monetary policy implementation but also in the functioning of money markets and the robustness of the financial system. The Bank will continue to work closely with market participants in the remaining period before the reforms come fully into effect. It will also monitor carefully the performance of the new system, once it is in operation.

# A review of the work of the London Foreign Exchange Joint Standing Committee in 2004

*This note reviews the work undertaken by the London Foreign Exchange Joint Standing Committee during 2004.*

## Introduction and overview

The Foreign Exchange Joint Standing Committee (FXJSC — 'the Committee') was established in 1973, under the auspices of the Bank of England, as a forum for banks and brokers to discuss broad market issues. The Committee comprises senior staff from many of the major banks operating in the foreign exchange market in London, representatives from brokers, the Association of Corporate Treasurers (ACT) — representing corporate users of the foreign exchange market, the Financial Services Authority (FSA) and the British Bankers' Association (BBA). A list of the members of the Committee, as at end-2004, may be found at the end of this review.

The Committee met six times during 2004. The year's work focused on the implementation of undisclosed principal trading, proposals for and implementation of a semi-annual survey of the UK foreign exchange market, the establishment of a legal subgroup for contingency planning and testing, and developing communication with other international foreign exchange committees.

## Undisclosed principal trading

In September 2002, the Committee decided to consult with the foreign exchange market on whether the Non-Investment Products (NIPs) Code[1] should be amended to discourage the practice of undisclosed (or unnamed) principal trading. This is where a fund manager acts as an agent for clients who do not want their identity disclosed to a third party (usually a bank). The Committee was particularly concerned with this practice because the third party is unable to quantify accurately the counterparty credit, legal and operational risks in undertaking the trade. In addition, there is the possibility that anti money-laundering regulations might not be properly observed.

After consultation with the market, the Committee agreed in 2003 that revised wording should be introduced to discourage undisclosed trading. It also recommended that there should be a grace period of one year to allow banks and fund managers to amend their legal agreements and to make the IT system changes required to introduce the change. After further consultation among the other bodies that endorse the NIPs Code,[2] the Committee formally approved the change which was publicised on 28 May 2003.[3]

The Committee has continued to liaise with institutions and industry bodies to monitor banks' and fund managers' preparations to comply with the new requirements of undisclosed principal trading, while maintaining close contact with a number of trade associations, including the Investment Managers Association (IMA).

Reports from market participants indicate that the agreed procedures had been accepted and implemented by market practitioners by the time the one year's grace period ended in June 2004. The Committee received strong support for this initiative from all of the overseas committees that it consulted.

## FXJSC semi-annual FX turnover survey of the UK foreign exchange market

The Committee has been aware for some time that there is a lack of timely and robust statistics on turnover in

(1) This is a code of good market conduct for the sterling foreign exchange and bullion wholesale deposit markets, as well as the spot and forward foreign exchange and bullion markets. It can be downloaded from: www.bankofengland.co.uk/markets/forex/fxjsc/nipscode.pdf. The Committee has lead responsibility for its maintenance.
(2) The Money Market Liaison Group and the London Bullion Market Association co-ordinate the NIPs Code in their relevant markets, jointly with the Committee. The Association of Corporate Treasurers, the British Bankers' Association, the Building Societies Association, the Chartered Institute of Public Finance and Accountancy, the London Investment Banking Association, and the Wholesale Markets Brokers' Association also endorse the code.
(3) See www.bankofengland.co.uk/publications/news/2003/058.htm for a copy of this press release.

the foreign exchange market, both in the United Kingdom and globally. The BIS co-ordinates a detailed survey of market turnover, but this only takes place every three years. Though a number of qualitative trade publication surveys are also available, no other regular quantitative analyses exist in this area.

Consultations with member banks suggested that more regular collection of a limited amount of turnover data in a format similar to that required by the BIS would not prove too onerous and would generate a number of benefits. The main advantage would be the provision of improved statistics on market turnover, thereby enabling the participating banks to monitor their own market share, and to view trends in foreign exchange market turnover. More frequent data would also be of wider interest and may help improve the quality of the BIS statistics.

The first data were collected by the FXJSC in April 2004 as a pilot exercise, alongside the BIS triennial survey, to enable some benchmarking. In October 2004, 31 financial institutions active in the UK foreign exchange market participated in the first turnover survey for the Committee. The results of this survey were published on 24 January 2005 and a summary of those results is presented in Tables A and B below (more detailed data are available at www.bankofengland.co.uk/markets/forex/fxjsc/index.htm). The results of subsequent surveys will continue to be published at six-monthly intervals.

The current format of collecting turnover data for one entire month split by five products, ten currency pairs, and six types of counterparty on a semi-annual basis was designed to give a balance between the need for timely and comprehensive data and the reporting burden placed upon financial institutions by the collection of the data.

As well as being collected more frequently than the data contained in the BIS triennial survey, there is one small difference in the reporting methodology in the FXJSC survey. The basis of reporting for the JSC survey is the location of the price-setting dealer. However, for the 2004 BIS triennial survey, the basis of reporting was changed to be the location of the sales desk for the trade. Figures from the April 2004 pilot JSC survey, when compared to the April 2004 BIS triennial survey, indicate that the alternative reporting basis used by the BIS may have been consistent with a slightly lower level of reported UK foreign exchange market turnover.

### Table A
### Reported UK foreign exchange and OTC foreign exchange derivatives market turnover(a)

Daily averages in US$ billions

| Instrument | October 2004 |
|---|---|
| Spot transactions | 207 |
| Outright forwards | 40 |
| Foreign exchange swaps | 335 |
| **Total 'traditional' foreign exchange turnover** | **582** |
| Currency swaps | 5 |
| Foreign exchange options | 70 |
| **Total OTC foreign exchange derivatives turnover** | **75** |

(a) Adjusted for double counting of deals between survey contributors.

### Table B
### Reported UK foreign exchange and OTC foreign exchange derivatives market turnover by currency pair(a)

Daily averages in US$ billions and percentage shares

| Currency pair | October 2004 | |
|---|---|---|
| | Amount | Proportion of total (%) |
| USD/EUR | 239 | 36 |
| USD/GBP | 110 | 17 |
| USD/JPY | 78 | 12 |
| USD/CHF | 31 | 5 |
| USD/AUD | 28 | 4 |
| USD/CAD | 20 | 3 |
| EUR/GBP | 26 | 4 |
| EUR/JPY | 14 | 2 |
| EUR/CHF | 13 | 2 |
| GBP/JPY | 2 | 0 |
| Other currency pairs | 96 | 15 |
| **All currency pairs** | **657** | **100** |

(a) Adjusted for double counting of deals between survey contributors.

A similar survey was also conducted for the New York market in October 2004 by the New York Foreign Exchange Committee, the results of which can be found on their website: www.newyorkfed.org/fxc/. The two committees maintained contact during the preparations for their surveys and co-ordinated on the timing of their releases.

## The work of the legal subgroup

In Summer 2004, a legal subgroup of the FXJSC was established. The subgroup comprises approximately 15 members.

The key objective of the legal subgroup is to advise the main Committee on issues relating to the foreign exchange market and to progress the work of the operations subgroup.

In the latter part of 2004, the legal subgroup considered draft wording on confirmations, and issues relating to mandates and prime brokerage raised by the relevant working groups.

## The work of the operations subgroup[1]

The operations subgroup has received regular updates of developments in and the impact of Continuous Linked Settlement[2] (CLS) on the foreign exchange market. CLS is a payment-versus-payment settlement system for foreign exchange transactions that has eliminated the principal risk for those trades that it settles. CLS volumes and values have grown strongly since the system was launched in September 2002 and the daily value of transactions settled now frequently exceeds $2 trillion — a significant proportion of the interbank market. Third-party membership of CLS, the introduction of new currencies and opportunities to expand the CLS service to provide a bilateral netting service for non-eligible currencies have been discussed by the subgroup.

The subgroup has also set up working groups chaired by FXJSC members of the subgroup, as a useful mechanism for allowing experts at member banks and in the wider market to participate in, and progress, the work of the subgroup. This includes, for example, a working group to review existing NIPs Code guidance relating to Standard Settlement Instructions (SSIs) and to study the possibility of standardisation in the provision, delivery and structure of SSI data.

The subgroup has also continued to keep the special recommendations of the Financial Action Task Force on Money Laundering (FATF)[3] under review, monitored discussions regarding the possible introduction of a central clearing counterparty for the London foreign exchange market and reviewed developments in the outsourcing of settlement functions abroad. It has also investigated the possibility of amending or augmenting the guidance on best market practice for confirmations contained in the NIPs Code with a particular focus on enhancing the use of confirmations in post-trade processes and best practice for non-bank foreign exchange trade confirmations.

In November, a working group was established to review mandate letters in circulation in the market. The review concluded that it would be helpful if the legal subgroup could draft three standard documents: a basic market-standard mandate template for providing operational information to which companies and banks could refer; a standard rebuttal letter to be sent by banks when they receive mandate requests to which they do not wish to agree; and a letter for the JSC along the lines of the letter sent by the New York Foreign Exchange committee, restating the NIPs Code. As a result of this work, the language in the NIPs Code may be updated.

## Contingency planning

During 2004, the Committee and its operations subgroup continued to focus on the issue of contingency planning. The contingency subgroup of the FXJSC continues to play an active role in the arena of contingency planning. The subgroup is focusing on facilitating and refining the contingency plans for the group, including conference calls, and highlighting issues relevant to members of the committee on business continuity issues. The Committee and the operations subgroup have set up a secure website, access to which is restricted to members of the two groups. This website contains members' emergency contact details and would be used to exchange information during times of market disruption.

Both the main committee and operations subgroup participated in a market-wide business continuity test held on 22 November 2004. This was organised by the United Kingdom's tripartite financial authorities (HM Treasury, the Bank of England and the Financial Services Authority) and included a wide range of market participants. The main committee and operations subgroup successfully conducted conference calls as part of the test scenario, and another such exercise is to take place in November 2005 as part of the tripartite authorities' longer-term strategy for market-wide exercises.

## Other subgroups

Following the report included in the Summer 2003 edition of the *Quarterly Bulletin*[4] on e-commerce developments in the foreign exchange market, the

(1) In 2002 the Committee decided that an operations subgroup, consisting of technical settlement experts including the main infrastructure providers, should be created. Its remit is to cover issues relating to contingency planning; to act as a forum for the discussion of technical operational issues; to raise with the Committee the potential or actual implications of developments in these operational issues for market practice; and where appropriate to suggest actions to improve procedures or update the NIPs Code.
(2) For more details see the *Bank of England Quarterly Bulletin*, Autumn 2002, pages 257–58. For more information on CLS see www.cls-group.com.
(3) Particularly Special Recommendation VII, which covers customer information to be included in cross-border payment messages. See www.fatf-gafi.org for further details of the FATF Special Recommendations.
(4) See www.bankofengland.co.uk/publications/quarterlybulletin/qb030208.pdf.

Committee has paid particular attention to developments in this area with a focus on the distribution of liquidity in the market. In 2004, the Committee began to prepare terms of reference for the formation of a new subgroup to monitor and report on developments in e-commerce and prime brokerage. Also, planning began for an inaugural meeting of chief foreign exchange dealers.

The operations subgroup set up a working group to prepare for the global operations conference to be hosted by the FXJSC operations subgroup in London in 2005.

## International co-operation

Following the Joint Standing Committee's 30-year anniversary conference in November 2003, the Committee has been pursuing its objective of fostering and improving links with the other international foreign exchange committees in 2004. To this end, the Secretary of the Committee set up a quarterly liaison conference call with the secretary of the New York Foreign Exchange Committee, the Canadian Foreign Exchange Committee and the secretariat of the ECB committees. It is hoped that the secretaries of some of the other international sister foreign exchange committees may be able to participate in these conference calls in 2005.

## Turkish lira conversion

Following a presentation by the London representative of the Turkish central bank, the operations subgroup consulted with firms on their plans for the confirmation of Turkish lira trades after the conversion from old Turkish lira to the new Turkish lira. The conversion entailed the removal of six noughts from the quoted currency using the conversion rate of 1 YTL = 1,000,000 TRL) and was effective 1 January 2005. It was most relevant to forward FX transactions. The operations subgroup co-ordinated with the New York Foreign Exchange Operations group, a subgroup of the New York Foreign Exchange Committee, to release recommendations on the post-conversion arrangements.

The joint international statement released by the FXJSC operations subgroup and the New York Foreign Exchange committee operations managers working group reported the results of the consultation. This consultation found that the majority of members intended to cancel old Turkish Lira (TRL) trades with a value date after the effective conversion date (1 January 2005) and they suggested re-submitting and re-confirming these trades. The original value date for a trade would then be used when re-submitting it for settlement. The statement was published on 7 December 2004.

## Members of the London Foreign Exchange Joint Standing Committee as at December 2004

| Name | Firm/Organisation |
|---|---|
| John Nelson | ABN Amro |
| Shigeyasu Kobayashi | Bank of Tokyo-Mitsubishi |
| Ivan Ritossa | Barclays |
| John Simmonds | Calyon |
| Jeff Feig | Citigroup |
| Matthew Spicer | CSFB |
| Gordon Wallace | Deutsche Bank |
| Andrew Brown | HSBC |
| Adam Burke | JPMorgan Chase |
| Marcus Browning | Merrill Lynch |
| Paul Blain | Morgan Stanley |
| Peter Nielsen | Royal Bank of Scotland |
| Nick Beecroft | Standard Chartered |
| Michael Kahn | State Street |
| Darren Coote | UBS |
| Jack Jeffery | EBS |
| Phil Weisberg | FXAll |
| John Herbert | ICAP |
| Brian Welch | Association of Corporate Treasurers |
| Alex Merriman | British Bankers' Association |
| Mike Beales | Wholesale Markets Brokers' Association |
| David Bloom | HSBC<br>Chair, legal subgroup |
| Oonagh O'Neill | Morgan Stanley<br>Chair, operations subgroup |
| David Hacon | Financial Services Authority |
| Paul Fisher (Chair) | Bank of England |
| Sumita Ghosh/Howard Jones (Secretariat) | Bank of England |

## Members of the Foreign Exchange Joint Standing Committee operations subgroup as at December 2004

| Name | Firm/Organisation |
|---|---|
| Jos Dijsselhof | ABN Amro |
| Michael Douglas | Bank of America |
| Chris Mann | Bank of England |
| Barry Holland | Barclays |
| Leigh Meyer | Citibank |
| Robert Bishop | CSFB |
| Darryl Webb | Deutsche Bank |
| Susan Balogh | Goldman Sachs |
| Chris Roberts | HSBC |
| Mike Neale | JPMorgan Chase |
| Derrick Pearson | Lloyds |
| Kim Serendran | Mellon Bank |
| Richard White | Royal Bank of Scotland |
| Stephen Smith | State Street |
| William Deighton | UBS |
| John Hagon | CLS Services |
| Neil Penney | FXAll |
| Colin Perry | ICAP |
| John Moorhouse | Reuters |
| Adrian Walton | SWIFT |
| John Whelan | Association of Foreign Banks |
| Alex Merriman | British Bankers' Association |
| Oonagh O'Neill (Chair) | Morgan Stanley |
| Sumita Ghosh/Howard Jones (Secretariat) | Bank of England |

During the year, the following members stood down from the main committee: Robert Loewy (HSBC), Peter Murray (Morgan Stanley), Geoff Grant (Goldman Sachs) and Simon Hills (BBA).

# Monetary policy: practice ahead of theory
# The Mais Lecture 2005: speech by the Governor[1][2]

## Introduction

Monetary policy is aimed at maintaining price stability. That may seem self-evident. Thirty years ago it was not. From the end of the second world war until the mid to late 1970s, the majority view of academic economists and policymakers alike was that monetary policy had rather little to do with inflation, and was largely ineffective as an instrument of demand management.[3] The intellectual basis for that view was never clear. And painful experience taught us that price instability led to costly fluctuations in real output and employment. Far from being ineffective, a monetary policy aimed at price stability has proved to be the key to successful management of aggregate demand. Fortunately, the theory and practice of monetary policy in the United Kingdom have changed out of all recognition in the past twenty-five years.[4] We have moved from the Great Inflation to the Great Stability.

The story of monetary policy in Britain during the intervening period is told by the Mais Lectures. The first Mais Lecture was delivered by my predecessor, Lord Richardson, in 1978, at a point when monetary policy was emerging as the main tool to deal with inflation. Not before time, you might think, since only two years earlier inflation had reached 27%. In 1981 the Chancellor of the Exchequer, Geoffrey Howe, chose as the title of his Mais Lecture: 'The Fight Against Inflation'. As he said then, with inflation still in double figures, 'squeezing inflation out from an economy which has become accustomed to higher rates over a period of years cannot be an easy or painless task. … the inflationary mentality must be eradicated. … When we have done that we will find that low inflation or even price stability need not be painful'. The conquest of inflation was to prove harder than expected. In the decade that followed Geoffrey Howe's lecture, inflation averaged over 7% a year. Only since 1992 has inflation fallen to levels that could be described as price stability.

In retrospect, two Mais Lectures seem to have been of particular significance: those by Nigel Lawson in 1984 and by Tony Blair, then Leader of the Opposition, ten years ago this month. Despite clear differences of view, what stand out from those two lectures are their similarities. Both emphasised the need for a medium-term framework for monetary and fiscal policy. Over twenty-five years we have moved from monetary targets to an inflation target and from a medium term financial strategy to rules for fiscal policy over the cycle. Yet the essential objective of maintaining monetary and fiscal discipline remains the same. All major political parties in the United Kingdom now agree that stability is the key to economic success.

We do not know whether the Great Stability will continue, as it has for more than a decade now. In part, it will depend upon whether our framework of inflation targeting can respond to the economic shocks that will undoubtedly be visited upon us in the years ahead. And that is the subject of my lecture. In only fifteen years inflation targeting has taken the central banking world by storm. Table A shows that there are now 22 countries

**Table A**
**Inflation targeting countries**

| Country | Adoption of inflation targeting |
|---|---|
| New Zealand | Dec. 1989 |
| Chile | Jan. 1991 |
| Canada | Feb. 1991 |
| Israel | Jan. 1992 |
| United Kingdom | Oct. 1992 |
| Sweden | Jan. 1993 |
| Finland | Feb. 1993 |
| Australia | Mar. 1993 |
| Spain | Jan. 1995 |
| Czech Republic | Apr. 1998 |
| Korea | Apr. 1998 |
| Poland | Oct. 1998 |
| Mexico | Jan. 1999 |
| Brazil | June 1999 |
| Colombia | Sep. 1999 |
| South Africa | Feb. 2000 |
| Thailand | May 2000 |
| Iceland | Mar. 2001 |
| Norway | Mar. 2001 |
| Hungary | July 2001 |
| Peru | Jan. 2002 |
| Philippines | Jan. 2002 |

Source: Truman (2003), *Inflation targeting in the world economy*, Institute for International Economics, Washington DC. The table not only includes current inflation targeting countries, but also Spain and Finland, which have since joined EMU.

(1) Delivered on 17 May 2005 at the Cass Business School, City University, London. This speech can be found on the Bank's website at www.bankofengland.co.uk/publications/speeches/2005/speech245.pdf.
(2) I am indebted to James Proudman, Gertjan Vlieghe, Tony Yates and Richard Harrison who have worked closely with me on this lecture and are effectively co-authors. Alan Mankikar and Tim Taylor provided excellent assistance in preparing the empirical and historical research that support this lecture.
(3) This proposition is documented in detail by Batini and Nelson (2005).
(4) See Capie and Wood (2001).

in which monetary policy is based on an inflation targeting regime. So tonight I want to discuss what inflation targeting really means, why it has been successful in Britain and elsewhere, and what challenges it faces in the years ahead.

The lecture tries to answer three questions. First, what can monetary policy do and how has our understanding of that changed over time? Second, what are the challenges for central banks that result from incomplete knowledge of the transmission mechanism of monetary policy? Third, is inflation targeting the answer to those challenges? I believe that it is. Inflation targeting, I shall argue, is the natural way to conduct policy when there is a great deal about its effects that we do not understand. The practice of monetary policy must recognise that monetary theory will continue to evolve. That is why my lecture is subtitled: practice ahead of theory.

## What can monetary policy do?

In practice, monetary policy means setting the level of the official interest rate at which the central bank deals with the banking system.(1) But ideas about how interest rates should be set, and with what objective, have been subject to radical changes since the 1970s. Let me give three examples. None is new; the subject has moved on. I give them to show that monetary policy operates against an ever-changing backdrop of ideas about the way the economy works, a theme that lies at the heart of my lecture.

First, it is now widely accepted that there is no long-run trade-off between output and inflation. Both theory — following Friedman and Phelps — and practice — particularly in the 1970s — showed that permanently higher inflation does not bring faster growth or higher employment, and may well reduce both. But in the post-war period views were different. In 1959 the Radcliffe Report on the Workings of the Monetary System seemed to support the idea of a permanent trade-off. The objectives of monetary policy included, it argued, 'a high and stable level of employment' and 'reasonably stability of the internal purchasing power of money'. But it went on, '…there are serious possibilities of conflict between them.'(2)

Second, the rate of inflation in the long run is determined by monetary policy, not by microeconomic factors. Again, that is now taken for granted, but much effort was devoted to the imposition of detailed direct wage and price controls in the 1960s and 1970s. Nicholas Kaldor, adviser to Harold Wilson, wrote in 1971 that 'It is also far more generally acknowledged — even by Conservative Prime Ministers — that the process of inflation is 'cost-induced' and not demand-induced', with the evident implication that it can be tackled only by an incomes policy''.(3) Not many Whitehall advisers would give that answer today.

Third, in the short run monetary policy does affect output and employment and so has the potential to be an effective stabilisation tool. Reflecting a post-war consensus that monetary policy was rather ineffective, however, the Radcliffe Report concluded that '… there can be no reliance on this weapon [interest rate policy] as a major short-term stabiliser of demand'.(4) It is now accepted that monetary policy lies at the heart of any attempt to stabilise the economy.

The source of monetary policy's influence over output and employment lies in frictions, which mean that prices and wages do not adjust instantaneously to clear markets whenever demand and supply are out of balance. Firms change prices only irregularly in response to changes in demand; wages adjust only slowly as labour market conditions alter; and expectations are updated only slowly as new information is received. Such frictions generate short-run relationships between money, activity and inflation.(5) The nature of frictions goes right to the heart of the policy debate over inflation targeting. From time to time shocks will move inflation away from its desired long-run level, and the policy question is how quickly should it be brought back to that level. There is no right or wrong answer to that question. Only an analysis of the nature

(1) For many years there was a debate about whether policy was better seen as setting short-term interest rates or determining the monetary base. That is no longer an issue. For some time, the demand for money has been purely demand-determined. As a result, central banks can set the short-term interest rate either to influence real interest rates or to determine the path of the monetary base or a broader monetary aggregate. Money remains at the heart of the transmission mechanism but since its velocity is unstable most central banks use interest rates as their instrument rather than a monetary aggregate.
(2) Radcliffe Report, Cmnd. 827, pages 18–21.
(3) Kaldor (1971).
(4) Radcliffe Report (1959), page 177.
(5) In a deep sense, only a complete understanding of the nature of the frictions makes it possible to decide on the objectives of monetary policy. Woodford (2003) and others discuss the link between that fundamental analysis and the proposition that monetary policy should aim to stabilise inflation and output.

of the relevant frictions tells us what is the 'optimal' monetary policy.

That is why recent academic analysis portrays monetary policy as a 'policy reaction function' which describes the reaction of the official short-term interest rate to any possible configuration of economic shocks that might arise in future. For a given model of frictions it is possible to derive the appropriate policy reaction function which most advances the objectives of the policymakers. Such a reaction function is a state-contingent monetary policy rule. It describes policy in every situation. There are no exceptions and, by construction, the rule does not change over time.

Monetary policy rules have become a major area of research.(1) Perhaps the most famous is the so-called Taylor rule, named after John Taylor who has just returned to Stanford after serving as Under Secretary at the US Treasury. The Taylor rule implies that interest rates should rise if inflation is above its target and output is above its trend level, and fall when the converse is true. The path along which inflation should return to its desirable long-run level will therefore vary according to the state of the economy.

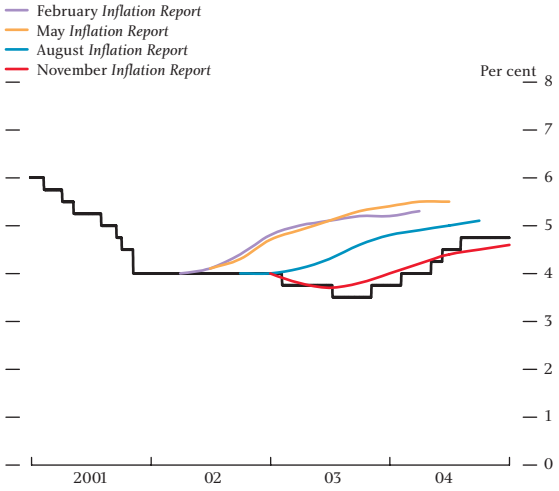
A key motivation for the study of monetary policy rules was the insight that if economic agents base their decisions on expectations of the future then the way monetary policy is expected to be conducted in the future affects economic outcomes today. Hence it is very important to think about how policy influences the expectations of the private sector. Consider a simple and stark example. Suppose that a central bank managed to control inflation perfectly by responding to all shocks instantaneously. The outcome would be a constant inflation rate. Households and firms would know that potential movements in inflation would never emerge because all future shocks would be instantly offset by changes in interest rates. Interest rates would change with no apparent link to or effect on inflation. To an observer — whether journalist or econometrician — interest rate changes would appear to have little to do with inflation. The central bank would appear to be behaving almost randomly. But that inference would be false. Indeed, if people did expect the central bank to behave randomly, then the behaviour of households and firms would change and inflation would no longer be stable.

This is what I call the Maradona theory of interest rates. The great Argentine footballer, Diego Maradona, is not usually associated with the theory of monetary policy. But his performance against England in the World Cup in Mexico City in June 1986 when he scored twice is a perfect illustration of my point. Maradona's first 'hand of God' goal was an exercise of the old 'mystery and mystique' approach to central banking. His action was unexpected, time-inconsistent and against the rules. He was lucky to get away with it. His second goal, however, was an example of the power of expectations in the modern theory of interest rates. Maradona ran 60 yards from inside his own half beating five players before placing the ball in the English goal. The truly remarkable thing, however, is that, Maradona ran virtually in a straight line. How can you beat five players by running in a straight line? The answer is that the English defenders reacted to what they expected Maradona to do. Because they expected Maradona to move either left or right, he was able to go straight on.

Monetary policy works in a similar way. Market interest rates react to what the central bank is expected to do. In recent years the Bank of England and other central banks have experienced periods in which they have been able to influence the path of the economy without making large moves in official interest rates. They headed in a straight line for their goals. How was that possible? Because financial markets did not expect interest rates to remain constant. They expected that rates would move either up or down. Those expectations were sufficient — at times — to stabilise private spending while official interest rates in fact moved very little. An example of the Maradona theory of interest rates in action is shown in Chart 1. It is a 'porcupine' chart which shows the Bank's official interest rate (the repo rate) as the thick black line together with forward interest rate curves at the time of successive *Inflation Reports* in 2002. Although by no means a perfect measure, the forward interest rate curve provides an idea of market participants' expectations of future policy rates. During 2002 the Bank of England was able to achieve its goal by moving on a straight line with unchanged official interest rates. But, although interest rates scarcely moved, expectations of future interest

(1) An excellent example is the recent book by Michael Woodford (2003) which builds on the ideas of the Swedish economist Knut Wicksell one hundred years ago that the key to price stability lies in thinking about the appropriate path for future nominal interest rates.

**Chart 1**
**The Maradona theory of interest rates in 2002**




Note: The black line represents the Bank of England official interest rate. The coloured lines represent the market's expectations of future interest rates, as calculated in each of the four *Inflation Reports* published in 2002.

rates — as embodied in the forward curve — did move around as the economic outlook changed from an expectation of a swift recovery to worries about a protracted slowdown. And in turn those changes in expected future rates affected activity and inflation. In other words, monetary policy was able to respond by less than would otherwise have been necessary because it affected expectations.

That pattern is sometimes described as 'the market doing the work for us'. I prefer a different description. It is the framework of monetary policy doing the work for us. Because inflation expectations matter to the behaviour of households and firms, the critical aspect of monetary policy is how the decisions of the central bank influence those expectations. As Michael Woodford has put it, 'not only do expectations about policy matter, but, at least under current conditions, very little *else* matters'. Indeed, one can argue that the real influence of monetary policy is less the effect of any individual monthly decision on interest rates and more the ability of the framework of policy to condition inflation expectations. The precise 'rule' which central banks follow is less important than their ability to condition expectations. That is a fundamental point on which my later argument will rest.

It should be clear that, just as Maradona could not hope to score in every game by running towards goal in a straight line, so monetary policy cannot hope to meet the inflation target by leaving official interest rates unchanged indefinitely. Rates must always be set in a way that is consistent with the overall strategy of keeping inflation on track to meet the target; sometimes that will imply changes in rates, at other times not.

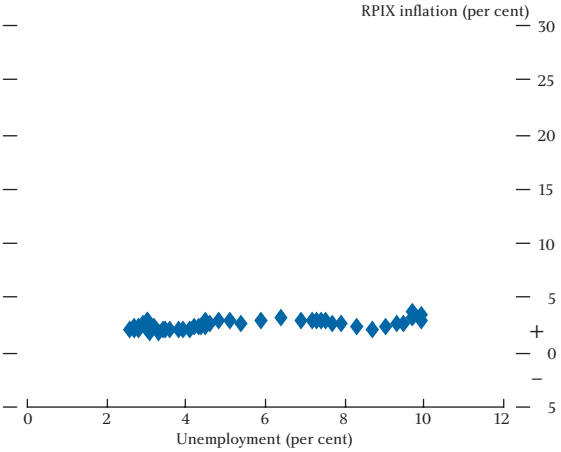
## Learning and its implication for monetary policy

The academic literature on monetary policy rules has performed a great service in emphasising the importance of expectations. But there are two basic problems with the use of rules. The first is that the validity of any given rule depends upon the model of the economy that underlies it being true. The second is that the calculation of the rule — or policy reaction function — is extraordinarily complex. Moreover, these two problems interact, in that the complexity of the decision rule is increased enormously when the possibility of learning about the true model is introduced. So although policy rules offer important insights they do not provide a practical guide to decision-making, and it is useful to examine more deeply why that is the case.

No economist can point to a particular model, and in honesty say 'that is how the world works'. A crucial difference between economic and, say, meteorological analysis is that in economics there are no natural constants, not even for the natural rate of unemployment. Our understanding of the economy is incomplete and constantly evolving, sometimes in small steps, sometimes in big leaps. The stock of knowledge is not static. So any monetary policy rule that is judged to be optimal today is likely to be superseded by a new and improved version tomorrow. In other words, there is no time-invariant policy reaction function which could describe the policy intentions of a central bank. Rather, monetary policy in practice is characterised by a continuous process of learning embedded, in the case of the Bank of England, in the rounds of meetings and forecasts that are the daily life of the Monetary Policy Committee.

To convince you of how important learning about key economic relationships is to decisions on monetary policy, let me show you two charts which illustrate some of the challenges facing the Monetary Policy Committee. A basic proposition common to most models of the economy is that if demand exceeds the supply capacity of the economy then there will be upward pressure on wage and price inflation. In the labour market supply capacity is often equated, in the long run, with a particular rate of unemployment. Chart 2 plots the unemployment rate against the inflation rate in the

## Chart 2
## Inflation and unemployment 1993–2005




Note: The unemployment rate used here is the claimant count measure.

Source: ONS.

United Kingdom over the period 1993–2005. It shows the trade-off between unemployment and inflation in the short run, also known as the Phillips curve. Unemployment fell from nearly 10% in 1993 to less than 3% in 2004. But — in stark contrast to the earlier post-war period — inflation remained virtually unchanged. How can we explain this phenomenon? Was it because the natural rate of unemployment also fell — perhaps as a result of labour market reforms enacted in the 1980s and 1990s? Or did the Phillips curve become flatter — perhaps because inflation expectations were anchored on the target so that deviations of unemployment from the natural rate generated less pressure on wages and inflation than before? Or was the outcome the result of a chance sequence of shocks that held inflation down?

Chart 3 shows that the slope of the short-run Phillips curve has moved around during the post-war period, apparently in response to changes in the monetary policy regime. In the 1970s labour market pressure was not offset by tighter monetary policy, leading to a spiral of wage and price inflation. The short-run Phillips curve steepened, with larger inflationary consequences of any deviation from the natural rate of unemployment. As monetary policy became more focused on controlling inflation, the Phillips curve flattened in the latter part of the 1980s and 1990s. Such changes in the monetary policy regime can also be detected in the behaviour of inflation over time. Table B shows that the persistence of inflation — measured by the estimated explanatory power of past inflation in predicting current inflation — has fallen quite markedly since the inflation target was introduced in 1992. Was this because the failure of monetary policy to react quickly to an inflationary shock in the 1970s meant that inflation remained high for some time? And has the prompt response of monetary policy meant that movements in inflation more recently have proved short-lived?

## Table B
## The persistence of inflation 1950–2005

| | Persistence |
|---|---|
| 1950–59 | 0.5 |
| 1960–69 | 0.3 |
| 1970–79 | 0.7 |
| 1980–92 | 0.8 |
| 1993–2005 | 0.2 |

Note: Persistence in this table is the sum of the coefficients on lagged inflation in a regression of quarterly inflation on a constant and four lags. The measure of inflation is RPI before 1976 and RPIX from 1976, seasonally adjusted.

Sources: ONS and Bank of England calculations.

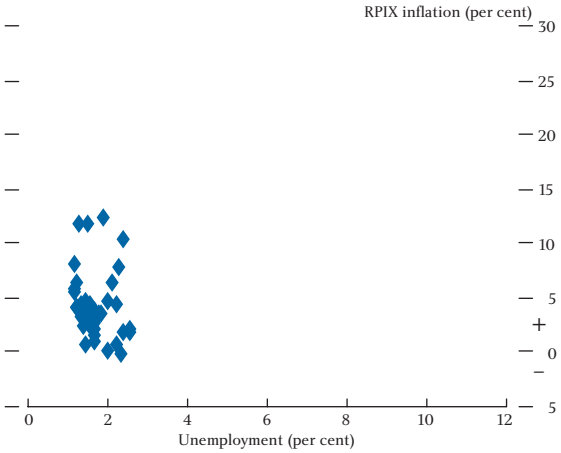
The answers to these questions matter for monetary policy. But the economy is continually evolving, and we can never definitively conclude that one answer is right and the others wrong. So learning about changes in the structure of the economy lies at the heart of the daily work of central banks. To describe monetary policy in terms of a constant rule derived from a known model of the economy is to ignore this process of learning. So how should central banks behave in the light of their ignorance? Two approaches have been suggested.

Interestingly, at one end of the spectrum, both Milton Friedman and Robert Lucas argued that policy should be based on a simple rule precisely because of our ignorance. Central banks, in their view, should have limited ambitions and aim simply at steady growth of the money supply — the so-called *k% rule* under which the money stock rises at a fixed rate, k%, each year. As Friedman (1968) put it, 'Steady monetary growth would provide a monetary climate favourable to the operation of those basic forces …… that are the true springs of economic growth. That is the most that we can ask of monetary policy at our present state of knowledge'.(1) The principle of adopting a strategy that takes into account limits to our knowledge is a sound one. But advocates of a rigid *k% rule* argue that we should ignore all other sources of information (estimates of the output gap, for example) and allow any shocks to the velocity of money to feed through to activity or the price level. In practice, experience in both Europe and the United States has shown that velocity shocks can be large and few economists now advocate the use of k% rules. So

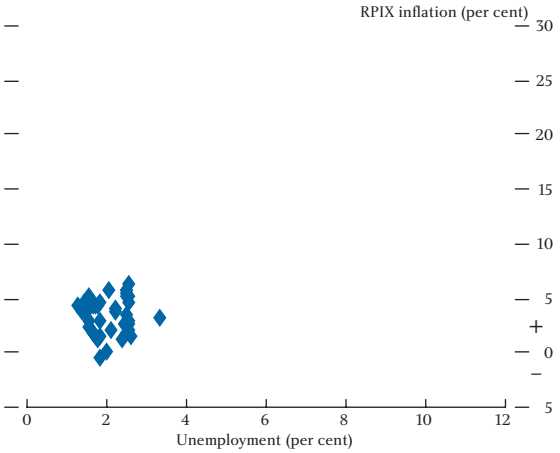
(1) Friedman (1968).

## Chart 3
## Inflation and unemployment by decade

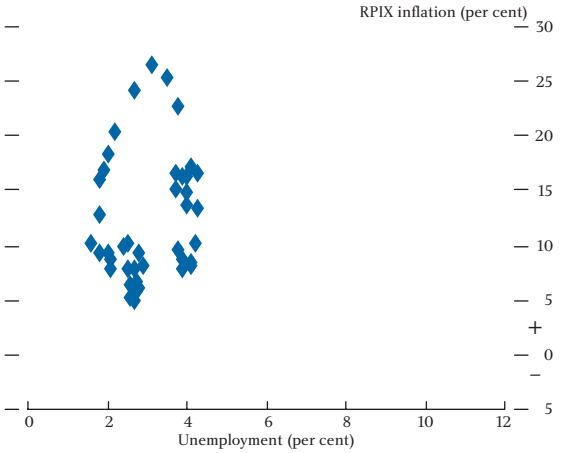
### 1950–59



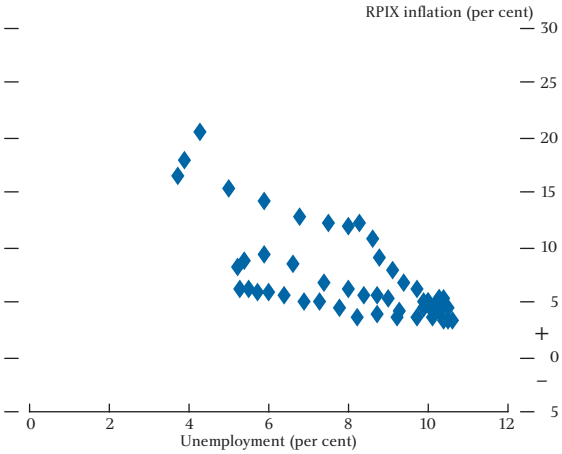

### 1960–69



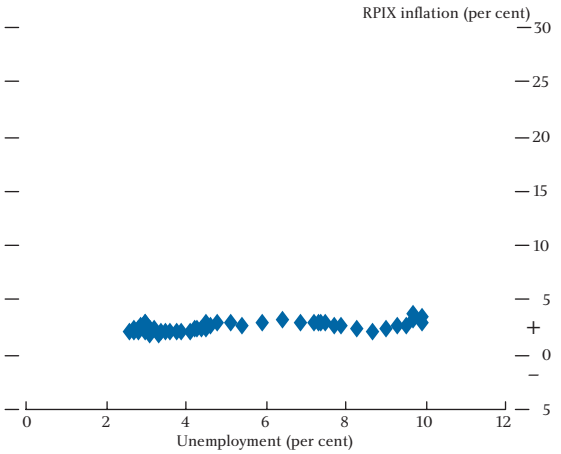

### 1970–79




### 1980–92




### 1993–2005




Note: The unemployment rate used here is the claimant count measure, published by the ONS from 1971. Unemployment data before 1971 is from Haldane and Quah (1999). The published RPIX series starts in 1976. For observations before 1976, the all-items RPI was used. The RPI series before 1976 did not include mortgage interest payments.

committing to a wholly inflexible rule is likely to be neither desirable nor credible. Our knowledge is neither complete nor constant.

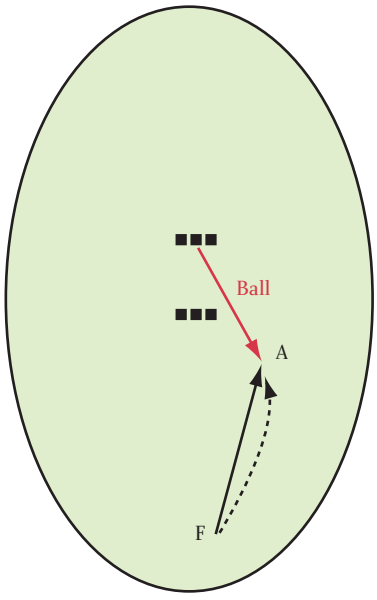
At the other end of the spectrum, rational optimising behaviour can, in principle, generate a policy reaction function which takes into account uncertainty about the economy and the process of learning about economic relationships. Such a reaction function would describe how a central bank would respond to any conceivable shock in the future, and explain how estimates of parameter values and the weights attached to particular models would be updated. But even in very simple examples the cleverest economists find the solution of those decision problems almost impossibly complicated. Fully rational optimising behaviour is unreasonably demanding. In the words of Gerd Gigerenzer (2001), optimisation is for 'Laplacean demons' not human beings — a reference to an imaginary being that '…could condense into a single formula the movement of the greatest bodies of the universe and that of the lightest atom…'(1)

Both approaches, for very different reasons, end up with a monetary policy rule. The simple rule is not credible because we do know some things and we can learn from the past. The complicated rule is not feasible because it places unrealistic demands on our ability to process information. Given the lack of further guidance from economists as to how to make decisions, central banks have often retreated to the position that setting interest rates requires the exercise of unfettered discretion. But this has problems of its own. As has long been recognised, pure discretion does not keep private sector expectations of inflation in line with the desired rate of inflation. If we are to find our way through the minefield between rules, on the one hand, and pure discretion, on the other, we need to think more carefully about the nature of decision-making in a complex world where the central bank and economic agents alike are learning about their environment.

Human beings, including central bankers, are not 'Laplacean demons'. Given the constraints on their scarce time, observation suggests that people follow simple rules of thumb.(2) These rules of thumb are sometimes described as 'heuristics'. The easiest way to understand a heuristic is to imagine a cricket match.

The fielder is standing in the deep when the batsman hits the ball somewhere in his direction — see Chart 4. How should the fielder try to catch the ball? One view — the rational optimisation view — is that the fielder either knows, or behaves as if he knows, the laws of physics. Then he could compute the trajectory of the ball, run to the point at which he could catch it (A in Chart 4), and wait for the ball to arrive. This theory of decision-making has testable implications. The fielder will run in a straight line (the solid line FA), and will normally be stationary when making the catch. But that is not how fielders behave in practice. Various empirical studies of baseball and cricket players suggest that fielders follow simple heuristics. For example, they keep their eye on the ball, adjusting their running speed so that the angle of the gaze — the angle between the eye and the ball — remains roughly constant.(3) The heuristic will guide the fielder to the point at which he can catch the ball, without a need to acquire information about variables such as wind speed and direction, spin or the other relevant factors, nor perform complex calculations on those data. But it means that the fielder will run in a slight arc (the dotted line FA) and be moving when the ball arrives. What is instructive about this example is the ability to distinguish empirically between a simple heuristic and fully optimising behaviour, and that the evidence favours the former.

**Chart 4**
**Catching a cricket ball**




(1) Laplace (1995 translation).
(2) Todd (2001).
(3) To be precise, the angle of gaze remains within a certain range — reported by Gigerenzer and Selten (2001).

A useful heuristic has two characteristics. It should be *fast* to compute and *frugal* in its data requirements. New heuristics can be adopted when needed. We might think of a 'toolbox' of heuristics from which an appropriate choice can be made according to the task that is to be performed. Experimental evidence in laboratory settings shows that some fast and frugal heuristics can be about as accurate as much more data-intensive, optimisation-based methods such as multiple regression.

What are the implications of heuristics for monetary policy? There are two issues. First, although the central bank will try to be as rational as possible in processing all the relevant information, it may well itself use a range of heuristics. For example, in normal circumstances the heuristic 'set interest rates such that expected inflation two years ahead is equal to the target' might serve the Monetary Policy committee well. But in other circumstances, say following a large shock, the heuristic might be 'bring inflation back to target over a period of more than two years and explain carefully why the heuristic has changed'. The central bank can adapt its particular policy-setting heuristic to changing circumstances and evolving knowledge, so that the policy regime as a whole is robust to changing views about how the economy works.

Second, we do not know whether — and, if so, to what extent — people use heuristics to make real economic decisions. But a central bank should be alert to the possibility of their doing so. Given the importance of expectations, the more the central bank can do to behave in a way that makes it easy for the private sector to adopt a simple heuristic to guide expectations the better. A good heuristic from that point of view would be 'expect inflation to be equal to target'. A bad heuristic would be 'if inflation is well away from target expect it to deviate further'. We can encourage people to use the first by announcing targets that are quantitative and useful. We can discourage the second by being open and transparent about the reasons for movements in inflation and decisions on monetary policy. If we have no hidden message, then eventually people will stop looking for it.

Rational optimising behaviour is in many situations too demanding, and actual decisions may reflect the use of heuristics. That must be taken on board in the choice of monetary policy strategy. In turn the strategy may affect the heuristic chosen by economic agents. And a good strategy will not only help agents choose a heuristic but will be robust with respect to that choice. Does inflation targeting meet those criteria?

## Inflation targeting as a framework which accommodates learning

So far I have emphasised three key points about monetary policy. First, expectations play a fundamental role in the way monetary policy works. As the Maradona theory of interest rates shows, expectations of future monetary policy actions are at least as important as the level at which the official interest rate is set today. Second, our knowledge of the economy is continuously evolving — as the history of the Mais Lecture has itself demonstrated. There simply is no unchanging rule, however complex, that can adequately describe the optimal monetary policy strategy. Third, the complexity of optimising behaviour means that central banks need to allow for the possibility that people use simple rules of thumb.

Taken together, these arguments provide a powerful case for inflation targeting. An inflation targeting framework combines two distinct elements: (a) a precise numerical target for inflation in the medium term and (b) a response to economic shocks in the short term. The inflation target provides a rule-like framework on which the private sector can anchor its expectations about future inflation. As Gordon Brown put it in his Mais Lecture in 1999, 'a credible framework means working within clearly defined long-term policy objectives, maximum openness and transparency, and clear and accountable divisions of responsibility'. It is a natural heuristic around which agents can form their expectations. And the discretion in responding to shocks afforded by inflation targeting allows the central bank to adapt its strategy to new information. That is why inflation targeting is sometimes referred to as a framework of 'constrained discretion'. Following a shock which moves inflation away from target and output from its normal level, there is discretion about the horizon over which inflation is brought back to target. But the exercise of that discretion must be clearly explained and justified in terms of the need, in the words of the remit of the Monetary Policy Committee, to avoid 'undesirable volatility in output'. The great attraction of an inflation target is that it is a framework that does not have to be changed each time we learn about aspects of the economy such as the velocity of money or the underlying rate of productivity growth, as was the case in

the past with frameworks based on targets for money aggregates or nominal GDP growth. It is a framework designed for a world of learning.

The empirical evidence suggests that inflation targeting has helped to confer tangible benefits. One test of whether inflation expectations are well-anchored is the volatility of long-term interest rates. Chart 5 shows the standard deviation of ten-year forward interest rates in the United Kingdom since 1992 and compares it with the figure for the United States. In both countries, volatility rose in the early 1990s. But whereas volatility has been broadly stable in the United States since the mid-1990s, it has fallen steadily in the United Kingdom. In a comparative study of OECD countries, Levin *et al* (2004) found that inflation expectations were better anchored in inflation targeting countries in the sense that movements in actual inflation were less likely to cause inflation expectations to change. The clarity and simplicity of an inflation target mean that a natural heuristic for the private sector is 'expected inflation equals the inflation target'.

**Chart 5**
**The variability of expected future interest rates, United States and United Kingdom**


Note: Variability is calculated as the standard deviation of daily changes in the ten-year instantaneous nominal forward rate over a yearly window.

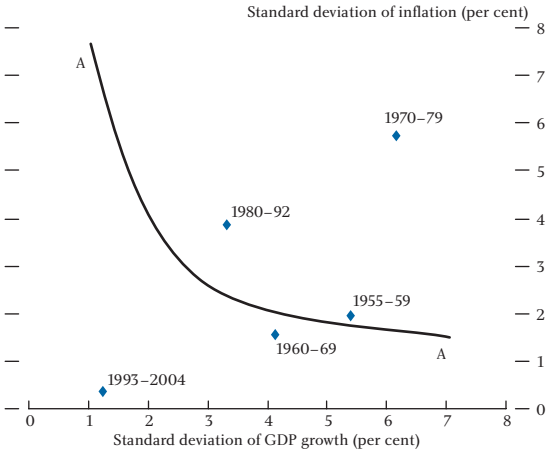
Source: Bank of England calculations.

Inflation targeting is a framework for making and communicating decisions. It is not a new theory of the transmission mechanism of monetary policy. It does not reflect a new understanding of the laws of economics. But, by anchoring inflation expectations on the target, it can alter the transmission mechanism by reducing the persistence of inflationary shocks. And it does so without pretending to commit to a rule that is incredible because it is not expected to last.

The implications of an inflation target for central bank communications are natural enough. First, the clarity of the inflation target focuses attention on the case for price stability which must be made continuously. Second, each forecast must be accompanied by an explanation of the current thinking behind the MPC's views; in essence the 'model' underlying the MPC's thinking is changing all the time. Third, there is no point trying to communicate a time-invariant policy reaction function when that does not exist. The regular commentary on its thinking published in its *Minutes* and *Inflation Reports* is part of a process by which the MPC communicates with the general public. A reputation for communicating openly and honestly about the range of possible outcomes matters, because it makes it more likely that people will continue to listen.

What are the main challenges for inflation targeting in the future? The most immediate stems from its very success. Although it is now widely accepted that there is no long-run trade-off between inflation and output, the ability of monetary policy to affect output in the short run means that there is, in principle, a permanent trade-off between the volatility of inflation and the volatility of output, which might be represented by the line AA in Chart 6. The choice of a horizon over which to bring inflation back to target is equivalent to choosing a point on this volatility trade-off. The striking change, however, is the remarkable improvement in the trade-off that followed the introduction of inflation targeting, as can be seen in Chart 6. The volatility of both inflation and output growth were much lower than in earlier periods.

**Chart 6**
**The variability of inflation and output, 1955–2004**




Note: Standard deviation of inflation is calculated from quarterly observations of annual inflation; standard deviation of output growth is calculated using annualised quarterly observations of output growth.

Sources: ONS and Bank of England calculations.

Part of the improvement may lie in the pattern of shocks over the past decade, although the world economy has hardly contributed to that stability. So the challenge ahead is that if a shock, larger than we have experienced recently but not large relative to historical experience, were to move inflation significantly away from target, then inflation expectations might become dislodged from the target. The behaviour of expectations and so the economy as a whole would change. So far there is little sign that the shocks we have experienced have detached inflation expectations from the target, and that is a source of comfort. But the MPC will continue to pay particular attention to the evidence on inflation expectations. Many of the problems of the past resulted from the failure to take action before expectations had started to drift upwards, and the cost of that inaction proved to be high. When the time comes for me to write an open letter to the Chancellor because inflation has deviated by more than 1 percentage point from target — and it is very surprising that such a letter has not been required in the eight years since the MPC was set up — I will welcome the opportunity to explain how we expect to bring inflation back to target and over what horizon. Such letters are an integral part of the policy framework, not an indication of its failure.

## Conclusions

In this lecture I have advanced three propositions. First, expectations are of fundamental importance to monetary policy. Second, the strategy of policy is more important than any of the individual monthly decisions on interest rates. Third, in designing a strategy be aware of the likely role of heuristics in forming expectations, and so keep it simple.

From those perspectives inflation targeting appears a natural way to conduct monetary policy. And experience of inflation targeting suggests that a managed monetary standard can lead to stability — of both inflation and the economy as a whole — without the straitjacket of a gold standard, currency board or rigid fixed exchange rate target. Inflation targeting anchors inflation expectations, yet allows a flexible response to economic shocks.

Is inflation targeting the last word in monetary policy? Almost certainly not. Twenty-five years from now, I am confident that one of my successors will be able to look back and explain in his or her Mais Lecture the great improvements that took place between 2005 and 2030. But I like to think that the inflation target framework has the ability to serve us well over that period.

Thirty years ago the theory of monetary policy was ahead of its practice, at least in the United Kingdom. Now I hope that the practice has given the theorists something to think about.

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# Inflation targeting in practice: models, forecasts and hunches

*In this speech,[1] Rachel Lomax, Deputy Governor responsible for monetary policy, reviews the role that model-based forecasts play in the monetary policy process, with particular reference to the Bank's new quarterly model and continuing research into other statistical approaches. The Bank's models provide a consistent framework for considering alternative scenarios and risks but judgement always plays a large role in constructing forecasts. It is hard to say precisely how important forecasts are in driving policy decisions, but there is some evidence that the rethink of key issues during the forecast round has been a source of policy 'surprises'. Forecasts also play a central part in communicating the MPC's thinking to the outside world. But forecasts are highly fallible. So the MPC's forecast-centred approach to inflation targeting has gone hand in hand with a determined effort to illustrate the wide range of uncertainties around its central projections.*

## Introduction

Five and a half years ago in his Monnet lecture Charles Goodhart[2] was able to talk with some confidence of the features that particularly distinguished the United Kingdom's approach to inflation targeting. Today with over 20 countries, in every habitable continent, formally operating some variant of inflation targeting and many more adopting some parts of the framework, all actively sharing experience and best practice, I suspect that most aspects of our approach would find a counterpart somewhere else in the world. But Charles's focus on the Monetary Policy Committee's (MPC) personal engagement in producing a published inflation forecast still seems to me to capture the essence of the United Kingdom's approach.

Today I want to talk about the role that forecasting has come to play in helping the MPC to take and communicate its decisions. In what sense does the Committee really 'own' the published forecasts that go out under its name? How much use do we make of models, and what models do we use? How far do our forecasts appear to drive interest rate decisions? And is there any evidence that this has helped to make policy more predictable? Finally I want to end by commenting on some of the issues raised by forecasts as a means of communication.

## Why the MPC has always been involved in forecasting

The MPC's early involvement in the forecast process is firmly rooted in the kind of committee it is, as well as the nature of the remit it has been given.

The objectives of UK monetary policy have been expressed in terms of an annual inflation target since 1992, but responsibility for achieving the target initially lay with the Treasury, acting on the Bank's advice. In 1997, as part of a wide-ranging restructuring of the Bank of England's role, decisions about interest rates were delegated to the Bank's new MPC. Its nine members — five internal Bank officials and four external members chosen for their relevant knowledge and experience — are individually, and publicly, accountable for meeting the inflation target.

The Government remains responsible for setting the annual inflation target, within the context of legislation that requires the Bank of England to achieve 'price stability and subject to that to support the government's objectives for output and employment'. Under its current remit, the MPC is required to achieve 2% consumer price inflation 'at all times'. If inflation deviates from target by more than 1 percentage point, the MPC has to write a public letter to the Chancellor to explain why, and what it is doing to bring it back.

(1) Given to the 59th International Atlantic Economic Conference in London on 12 March 2005. This speech can be found on the Bank's website at www.bankofengland.co.uk/publications/speeches/2005/speech242.pdf. I am most grateful to Jens Larsen, James Bell, Fabrizio Zampolli and Robin Windle for research support; and to Charlie Bean, Peter Andrews, Spencer Dale, Phil Evans, Laura Piscitelli and other colleagues at the Bank of England for helpful comments.

(2) Goodhart, C (1999), 'Recent developments in central banking: some special features of the Monetary Policy Committee and of the European system of central Banks', Jean Monnet Lecture, Dublin European Institute.

These arrangements remain relatively novel and unusual in UK constitutional terms. Prior to 1997, the longstanding objection to Bank of England independence was concern that such arrangements would be inconsistent with Ministerial duty to answer to the House of Commons on major matters of policy. A high level of transparency and openness about MPC decisions has been a critical aspect of meeting expectations of parliamentary and public accountability as well as an effective way of enhancing the credibility of monetary policy.

In fact, greater openness about monetary policy was part of the package of changes that were made to restore credibility after the UK's exit from the ERM in 1992. The Bank played its part by introducing a new quarterly *Inflation Report*, which by 1997 had won widespread respect for its objectivity and professionalism. Against this background, the 1998 Bank of England Act required the new Monetary Policy Committee to sign off the Bank's *Inflation Report*. In practice, the MPC's sign off has been far from a formality, though the *Inflation Report* formally remains the Bank's report.

It is not that surprising that a committee of experts whose external members are based in the Bank and who devote at least 60% of their time to monetary policy should get deeply involved in preparing and debating the forecasts that they sign off. It may be more remarkable that nine economists, labouring under the burden of individual accountability, have so far succeeded in signing off 31 editions of the *Inflation Report*, and found ways of dealing with the inevitable range of views.

## The nature and role of the forecast

Nowadays the forecast has two related roles in the monetary policy process. First, it helps the Committee to set monetary policy by organising, informing and focusing its discussions. And second, it provides transparency about the Committee's thinking and plays a key part of its public communication strategy.(1)

## Helping the MPC make decisions

Monetary policy needs to be forward-looking, because interest rates act with a lag. No monetary policymaker can avoid taking a view on the future. That view needs to be coherent and disciplined, and informed by the best information available. But it also needs to reflect a realistic appreciation of the massive uncertainties inherent in any forecast.

The MPC spends many hours discussing the projections that go into the *Inflation Report* and the text that accompanies them. Although the process has been somewhat streamlined since Charles's day (when the committee spent a gruelling ten meetings a quarter on the forecast on top of the usual monthly decision meetings) the forecast round is probably still the largest single commitment of the Committee's time.

Why? An important reason is that the forecast is not just an occasion for agreeing a set of projections for the inflation outlook. It has come to provide an organising framework for assessing all the relevant information, and an opportunity for a deeper discussion of economic developments. Since I have been on the Committee, we have spent at least half our allotted forecasting time debating longer-term issues, such as the effect of structural change in the labour market and the relationship between house price inflation and consumption. Sometimes the outcome of those discussions has had a material influence on our thinking about risks, even when the direct impact on the central projections has been relatively minor.

What role do formal economic models play in the forecast? No set of economic projections — least of all one owned by a committee of nine experts — can ever be the outcome of a purely model-based operation. Judgement always plays a large role — although different people frame their judgements in more or less model-based ways. But it is difficult to make a forecast without using models: they provide an organising framework for ensuring intellectual and accounting consistency in generating baseline projections, and for considering alternative scenarios and risks.

What sorts of models does the Committee find useful?

In his peer review of the Bank's use of economic models,(2) Adrian Pagan suggested that economic modelling may involve a trade off between theoretical consistency (good economics) and data coherence (a

(1) Charles gives five arguments for having an *Inflation Report* that is the responsibility of the MPC itself: transparency, discipline, a better informed MPC, better forecasts and accountability (in that order). I think they fit within my taxonomy.

(2) Pagan, A (2003), 'Modelling and forecasting at the Bank of England', *Bank of England Quarterly Bulletin*, Spring. His 'Addendum to *Report on modelling and forecasting at the Bank of England*' is published in this *Bulletin*.

good fit); our goal should be to ensure that we are positioned on the efficient frontier between the two.

Any model we use should in principle be on this frontier — but we want to be able to move along the frontier and use different sorts of models for different purposes.

For example, if, as I have suggested, we want to use models to facilitate discussions about fundamental economic issues, we clearly need models with rich economic structures — structures that reflect the Committee's views on the way the economy works. The Bank's new Quarterly Model (BEQM)[1] has been developed with this function very much in mind. But we also use other and smaller models with rich economic structures to look at specific issues as part of our suite of models.

We also want to quantify the likely impacts on inflation and output of a range of pieces of data news as accurately as possible. The numbers matter, so empirical performance is important, too. We have worked hard at ensuring that BEQM does well in this dimension, but we have also, within our suite, been developing more statistically based models. We may use these models either on their own — as stand alone forecasting tools — or to inform the judgements that we make in using BEQM.

Let me say a few words about both the main model and the suite.

The motivation for the BEQM project was to help with the 'intellectual framework' role of the forecast. Without losing empirical performance, we wanted to improve upon the previous main model's articulation of the underlying structure of the economy, to make it more explicitly consistent with the Committee's beliefs.[2] This was made possible in the light of recent advances both in economic understanding — particularly the emphasis on providing coherent micro foundations in macroeconomic models — and in sheer computational power (both in terms of computing power and the techniques applied).

BEQM is a large scale model by the standards of most academic research, but it is small scale compared with traditional macroeconometric models. Compared with the latter, it is also more of a general equilibrium model with an emphasis on internal consistency. Households and firms optimise — they are forward-looking and they use available information efficiently. Unlike our previous model, things add up: flows add to stocks, profits are allocated, and so on. There is a high degree of simultaneity in the way the model is solved. It no longer makes sense, nor is it at all easy, to consider the model equation by equation.

This provides a greater degree of discipline on Committee members and staff, who are now forced to confront the full implications of their judgements more explicitly. If someone wants to change one of the economic relationships, they need to say why, and acknowledge the possible implications for other behavioural relationships. If, for example, we want to assume that the trend rate of labour productivity growth has changed, the model requires us to recognise that there are implications for both demand and supply. Faster productivity growth will increase productive capacity, but income will also grow faster. So what might that mean for demand now?

This is a definite advance — providing the general equilibrium mechanisms in the new model do in fact reflect our ideas about how the world works. But it also makes for a more demanding discussion. There are no easy fixes, and it can be difficult to accommodate views that differ from the model's paradigm. As an example, the model is firmly rooted in the rational expectations tradition. And we have assumed that monetary policy is credible. Both are perfectly reasonable, arguably essential, modelling assumptions. The fact that the new model makes them explicit can be intellectually helpful. But it doesn't make it any easier to provide answers to questions about expectations and credibility. What if some agents base their decisions on simple rules of thumb? BEQM has features that allow us to accommodate such questions when we are forecasting — but in a more ad-hoc way that requires a substantial degree of judgement.

We are still learning how to exploit all BEQM's possibilities. But it clearly represents a move towards the 'Pagan frontier', offering a higher degree of theoretical coherence without losing empirical performance. A number of other central banks are working on similar models — the ECB, Bank of Canada, FRB, Norges Bank and Bank of Finland — as well as the

(1) Harrison, R, Nikolov, K, Quinn, M, Ramsay, G, Scott, A and Thomas, R (2005), *The Bank of England Quarterly Model*.
(2) For a description of the previous model, see *Economic Models at the Bank of England* (1999).

IMF. The international modelling community is an exemplary forum for the exchange of ideas and experiences, and we have learnt — and will continue to learn — a lot from the experience of others.

No model can do everything. All models oversimplify drastically. The trick is to identify an appropriate degree of simplification for the task in hand. So the Committee has never been prepared to rely on one model. This has led to attempts to develop a suite of models.

The suite takes two forms.

One is a range of models that are *complementary* to the core forecasting model. These hold up a magnifying glass to particular parts of the economy, and allow us to take account of the influence of a wider range of factors in more detail than could be accommodated in the main model. These (sub-) models might be geared towards analysing particular policy issues (eg, supply chain pricing models, the future development of household and corporate gearing, productivity growth in the distribution sector). Or they might also provide the interface between our very short-term conjunctural analysis, and the 2–3 year forecast.

Second, we have a set of *statistical* models. The MPC attempts to process a huge amount of information before each monthly decision. The Committee already uses some data-driven forecasts (for example, forecasts that uses many variables to forecast in an atheoretic way, statistical models to produce near-term forecasts for key data such as CPI, and small models that filter ONS first releases, to handle the inevitable data uncertainty associated with early releases(1)). But it is a herculean task to absorb and analyse all the data. So, responding to the needs of the MPC, but also to suggestions by Pagan, the staff is in the process of developing and evaluating more models geared towards empirical forecasting accuracy and finding ways of combining these forecasts in a statistically efficient way. This is very much work in progress, with the aim of helping the MPC to form judgements both about the most likely outturns and the uncertainty surrounding them.

## Handling uncertainty and disagreement

Even armed with a range of economic models to aid structured discussion and enforce a degree of intellectual discipline, how is it possible for a group of nine individually accountable economists to reach sufficient agreement to publish a forecast which is described as reflecting their best collective judgement?

An important part of the answer lies in the use of formal techniques to capture uncertainty and risk. These antedate the MPC. The Bank of England started publishing fan charts for its inflation projections in February 1996, following an early experiment with what might be called 'trumpet charts.'(2) The motivation was purely to illustrate the uncertainty inherent in all economic projections. While trumpets consisted of a single shaded area around a central projection, corresponding to average absolute forecast errors (see Chart 1), fan charts (see Chart 2) were graduated to show the full distribution of possible outcomes.(3)

**Chart 1**
**November 1995 RPIX inflation projection — symmetric error bands**

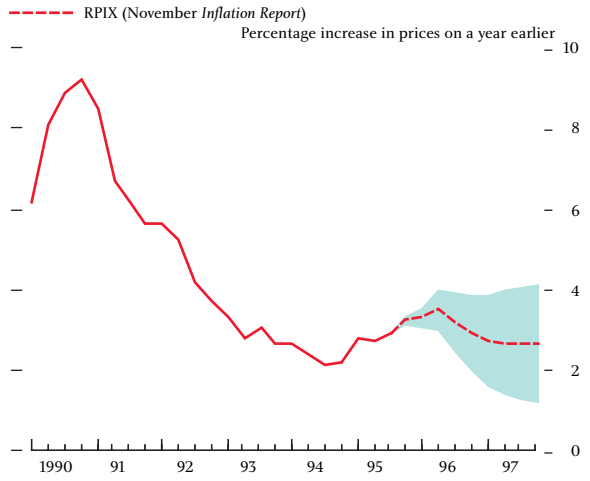
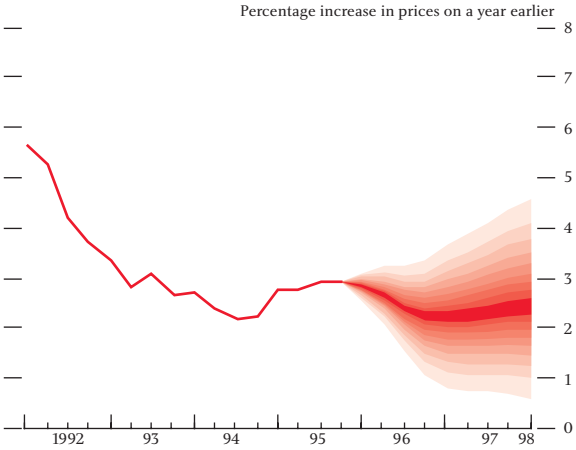



**Chart 2**
**February 1996 RPIX inflation projection — fan chart**




(1) Ashley, J, Driver, R, Hayes, S and Jeffrey, C (2005), 'Dealing with data uncertainty', *Bank of England Quarterly Bulletin*, Spring, pages 23–29.
(2) I am indebted to Mark Allan and James Bell for this nice descriptor.
(3) For a further description of the fan chart methodology, see *Inflation Report*, May 2002 pages 48–49 and Britton, E, Fisher, P and Whitley, J (1998), 'The *Inflation Report* projections: understanding the fan chart', *Bank of England Quarterly Bulletin*, February.

Nowadays, each *Inflation Report* includes fan charts for inflation and output which reflect the Committee's views on the full distribution of possible outcomes. While the width of the fan bears some relation to the size of forecast errors over the past decade (the distribution of past forecast errors provide a benchmark calibration), its main features — the moments of the underlying distribution — change with each forecast to reflect the Committee's best judgement about the balance of risks around the outlook for inflation and output and the degree of uncertainty. While many other central banks now publish fan charts, the MPC is still relatively unusual in basing them on the policymakers' subjective view about the distribution of risks, rather than staff views or historical/statistical measures of past errors.

A key point is that the MPC's approach to constructing fan charts can help the members come to an agreement on the substantive issues, while retaining their individual views. This is because the risks are often where the major differences of opinion amongst members lie. And while the members may be able to agree on a collective view of the overall outlook including the degree of uncertainty and balance of risks, it might be for slightly different reasons. To be sure, there have been times when differences of view about the central projection have been too significant to be handled within the ambit of the fan chart and on those (few) occasions the *Inflation Report* has included material illustrating the minority view. But, as the MPC's preface to the *Inflation Report* notes, the fan charts reflect the Committee's best collective judgement about the most likely paths for output and inflation and the uncertainties surrounding the central projections, while recognising that members may have slightly different views about the underlying assumptions.

## Forecasts and interest rate decisions

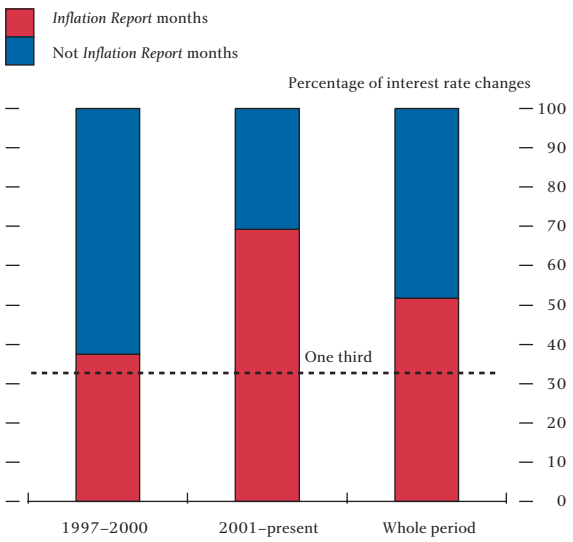
How influential is the forecasting process when it comes to the actual business of taking decisions about interest rates?

One yardstick might be whether the MPC is more likely to change rates in *Inflation Report* months. There is no necessary reason why this should be so: information accrues relatively evenly over the year, and the Committee goes through the same decision taking process every month. On the other hand, the MPC might be more likely to change rates after a systematic and full review of the inflation outlook, rather than in response to the news on the month. On this argument, ready-reckoners may give a rough indication of what the impact of new data may be, but they are no substitute for a full analysis. So in non-*Inflation Report* months the MPC may sometimes decide to 'wait and see' — to postpone a possible interest rate change until more evidence has accumulated.

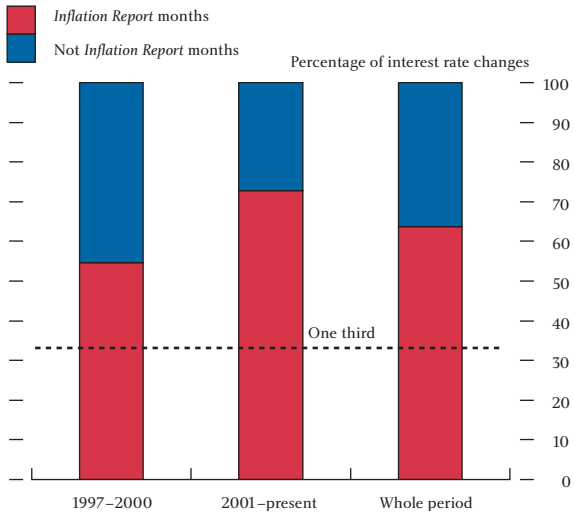
As it happens, market economists have tended to think that interest rate changes were more likely in *Inflation Report* months. Since 1998, Reuters has asked a group of economists (initially around 20–30, now 40 or more) to attach probabilities to a range of different outcomes for interest rates, so we can calculate a mean and a mode expected interest rate change across individuals. Panel B in Chart 3 split the months in which the mode

**Chart 3**
**Proportion of actual and expected interest rate changes occurring in *Inflation Report* months**

**(A) Actual changes**




**(B) Expected changes**



is for a (25 basis points) change into *Inflation Report* and non-*Inflation Report* months. According to this measure, markets have consistently thought that changes were more likely in *Inflation Report* months.

The data on interest rate changes provide mixed evidence. Over the period since 1997 as a whole, the Committee has displayed a preference for changing rates in *Inflation Report* months. But it showed no such tendency in its early years. The picture since 2001 is very different, with almost two thirds of rates changes taking place in *Inflation Report* months, compared with the one third that would be expected if rate changes were evenly spread over the year. And no fewer than six of the last eight rate changes have coincided with the publication of an *Inflation Report*. (See Chart 3 and Table B for details.)

What — if anything — should be read into the MPC's apparent change in behaviour? On the face of it, the evidence might suggest that the re-evaluation of the outlook undertaken during the quarterly forecast has become more influential. But there are a number of possible explanations.

Most obviously, it could be a reflection of the shocks that have come along in the past four years. These may have required fewer changes in the policy rate than in the pre-2001 period. Alternatively, the required adjustments in rates might have been bigger in the early days, and if the MPC had an inclination to change rates in small steps, perhaps because it had good reasons for proceeding cautiously, then larger desired adjustments might have required more frequent changes: of the 16 changes in the first period, 7 were back-to-back, while in the second period, only 4 out of the 14 changes happened in consecutive meetings.

The turnover in the Committee's membership since 2001 might provide a different kind of explanation. The present Committee contains only one member (the present Governor) who has been there from the outset, and some of the early members served short terms. Might the latter day tendency towards changing rates only after a forecast reflect a generally less activist approach to setting rates?

Table A provides an unscientific guide to Committee members' degree of activism: it is arranged with the most 'activist members' (identified as those voting proportionately most frequently for a rate change) at the top.(1) If personal preferences played no role, we might expect to see a relationship between activism and 'MPC vintage' — if MPC members responded to the same shocks, or their behaviour was affected by some other common factor, there would be clusters. Keen MPC watchers will no doubt find some support for the view that personality matters. But, in general, the members who voted for the most rate changes are associated with the earlier years of the Committee, consistent with the idea that the MPC may have needed to respond more frequently during that period.(2)

**Table A**
**MPC members' voting statistics from January 1998 (current members in red)**(a)

| | Per cent of months voted for a rate change | Per cent of changes voted for that were in *IR* months | Number of meetings attended since Jan. 1998 | Time of membership |
|---|---|---|---|---|
| Willem Buiter | 79 | 36 | 29 | 1997–2000 |
| Sir Alan Budd | 65 | 30 | 17 | 1997–1999 |
| John Vickers | 61 | 29 | 28 | 1998–2000 |
| Charles Goodhart | 52 | 36 | 29 | 1997–2000 |
| Sushil Wadhwani | 51 | 37 | 37 | 1999–2002 |
| Christopher Allsopp | 49 | 44 | 37 | 2000–2003 |
| DeAnne Julius | 46 | 47 | 41 | 1997–2001 |
| Stephen Nickell | 41 | 50 | 58 | 2000–date |
| Mervyn King | 39 | 41 | 87 | 1997–date |
| David Clementi | 37 | 43 | 57 | 1997–2002 |
| Sir Andrew Large | 34 | 40 | 29 | 2002–date |
| Ian Plenderleith | 33 | 44 | 54 | 1997–2002 |
| Kate Barker | 33 | 53 | 46 | 2001–date |
| Sir Edward George | 30 | 45 | 67 | 1997–2003 |
| Richard Lambert | 29 | 67 | 21 | 2003–date |
| Marian Bell | 28 | 56 | 32 | 2002–date |
| Charles Bean | 28 | 60 | 54 | 2000–date |
| Rachel Lomax | 25 | 80 | 20 | 2003–date |
| Paul Tucker | 24 | 63 | 33 | 2002–date |

(a) Up to and including the February 2005 MPC meeting.

Another issue of interest is whether the publication of regular forecasts, which are seen to bear a close relationship to the decision taking process, has helped to make the policy decisions themselves more predictable? The test is whether markets are less likely to be surprised by interest rate changes in the recent period, given full knowledge of all the relevant economic news.

We ran some simple statistical tests on two measures of 'market surprises'.(3) One is based on the Reuters poll of economists. The surprise measure is the difference

(1) We have excluded the first seven months of the MPC's existence to allow for the possibility that the first rate changes were reflecting necessary adjustments to reach what the MPC thought was the right level of interest rates.
(2) There are, of course, also other possible explanations, eg if a member has views which are consistently adrift of the rest of the Committee, leading them to believe that rates are significantly too low/high, then they may repeatedly — and unsuccessfully — vote for a change without being 'activist' in the sense of wanting to change rates frequently in response to news.
(3) Bell, J and Windle, R (2005), 'Monetary policy news and market reaction to the *Inflation Report* and MPC *Minutes*' on pages 169–78 of this *Bulletin*.

between the actual repo rate change and the mean expected repo rate change. The other surprise measure is a bit further out along the yield curve: changes in the implied three-month forward Libor rate.(1)

Both measures suggest that interest rate surprises have become significantly smaller in the post-2001 period than previously (Table B, Panel C), consistent with improved policy predictability. But, intriguingly, there is also some tentative evidence that surprises in *Inflation Report* months tend to be relatively large.(2) What are we to make of that?

On closer inspection, this finding seems to relate to the decision in *Inflation Report* months — not the publication of the *Report* itself a week later, or the minutes the week after that (Panel E shows that the market reaction to the policy decision is, on average, significantly bigger than the reaction to the *Report* and the minutes). This might imply that it is the rethink during the preparation of the *Inflation Report* that counts. But, once announced, the decision itself (and the accompanying press notice, if rates have changed) provides most of the information the market needs to understand the Committee's approach. This too would be consistent with a fairly high degree of policy predictability.

But let me stress one important point. The observed tendency for interest rate changes to coincide with the publication of an *Inflation Report* does not imply that interest rate changes are tied in any mechanical way to the central projection for inflation. The assessment of risks is always a material factor in determining policy, as well as an important aspect of the presentation of the forecast. For example in the February *Inflation Report* we published a central projection which showed inflation rising gently but steadily above the 2% target, assuming a nearly flat profile of interest rates out to three years. But the *Report* noted that the balance of risks was to the downside and singled out some key near term risk areas, such as the household sector. This provided a nuanced background to the MPC's February decision to hold rates unchanged.

## Forecasts and public communication

All inflation targeting central banks use their forecasts as a communication tool. They provide a coherent statement of policymakers' thinking about the economic outlook and the policy stance. Together with the minutes of the policy meetings (in our case published with individual votes after two weeks), this helps to discharge the Committee's democratic duty to explain itself, as well as supporting its credibility and helping to anchor inflation expectations.(3) The *Inflation Report* has always played a central role in the Committee's communication. And since August 2003 the Governor has fronted the regular *Inflation Report* press conference, and the MPC's appearances in front of the Treasury Select Committee has been (loosely) linked to the *Inflation Report* cycle.

This brings me to a much debated question: how much information should a central bank provide? Academics have tended to press the case for more transparency, while practising central bankers have been more cautious, (though much more predisposed to openness than they would have been twenty years ago). Don Kohn(4) argues that 'more is not necessarily always better, and at each step of the way central banks have needed to take account of the potential costs as well as the benefits of greater transparency'. In particular it is argued that the publication of some kinds of information could make it more difficult for policymakers to do their job, with discussions of the possible path of future interest rates being seen as particularly hazardous, if they appear 'as a firmer pre commitment than they were intended to be'.(5)

(1) More precisely, this is an implied three-month Libor forward rate at a constant horizon of three months, where the constant horizon is calculated by linear interpolation of adjacent futures contracts. The results are largely invariant to using six or twelve-month horizons.

(2) This could, of course, be entirely driven by the expectation that there would be no move in non-*Inflation Report* months: in the extreme, if the distribution of surprises in those months is degenerate (ie so that no one expected a change in rate and this was what actually happened) then the statement that surprises are bigger in *Inflation Report* months is no different from the statement that rates are only expected to change in these months. The closer the distribution comes to being degenerate, the more weight should be attached to that interpretation. But both the average surprise and its variance are significant.

(3) As Mishkin puts it '…having secretive central banks is inherently undemocratic…basic democratic principles require that the central bank be accountable for its actions: this requires that the public understands what the central bank is doing. In addition, democratic principles indicate that the preferences of policymakers need to be aligned with those of the society at large.' Mishkin, F (2004), 'Can central bank transparency go too far?', in Kent, C and Guttman, S (eds), *The future of inflation targeting*, Reserve Bank of Australia.

(4) Kohn, D (2005), 'Central Bank Communication'. Remarks at the Annual Meeting of the American Economic Association, January.

(5) Mishkin has sympathy for this view, noting that 'when new information comes in and the central bank changes the policy rate from its projected path, the public may see this as reneging on its announced policy or an indication that the central bank's previous policy settings were a mistake. Thus, even when the central bank is conducting its policy in an optimal manner, deviations from its projected path may be viewed as a central bank failure and could hurt the central bank's credibility'.

Arguably these should not be a first order issues for central banks with a transparent inflation targeting framework. The objectives of policy are clear, and outside commentators should have access to enough information to work out the future direction of rates for themselves. Nevertheless, there has been a closely related debate about how transparent an inflation targeting central bank should be about the interest rates on which its forecasts are based. An obvious reason why commentators might want more direct information about the MPC's 'preferred' or policy-consistent path is to get direct evidence on the interest rate strategy. (How quickly will rates rise? What are the advantages of a 'wait-and-see' approach?)

The MPC has long published forecasts on two different interest rate assumptions. On one — the constant rate assumption — interest rates are held constant over the entire forecast horizon. On the other, interest rates evolve in line with rates expected by financial markets. Until August 2004, the presentation emphasised the forecast based on constant rates. Since last August we have reversed the presentation, to emphasise the market rate assumption.(1)

The constant interest rate path is obviously a stylised assumption, which conveys limited information about future policy intentions. The message is that the MPC makes interest rate decisions a month at a time, and that it has not made up its mind about what future path of rates will be consistent with the inflation target. The market interest rate path too is a conditioning assumption, not the MPC's prediction about future rates. The difference is that, to the extent that the market rate curve embodies the market's guess about where the MPC will take rates, forecasts predicated on the market rate are more easily interpreted as a comment on that view.

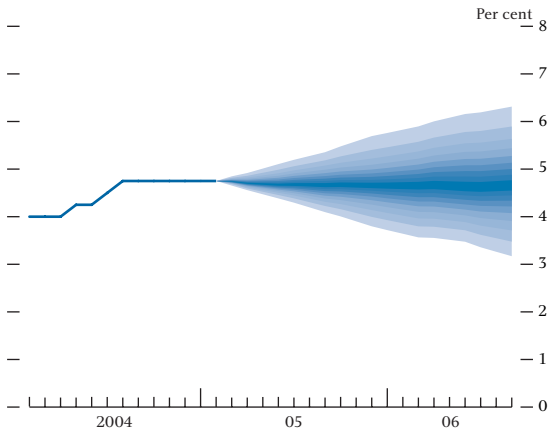
So how much significance should be read into our change of conditioning assumption? Did the switch to market rates represent a tentative step towards providing more guidance on the future direction of policy?

The fact that interest rates were historically very low in 2003 and early 2004 has some bearing on the matter. Many academics, notably Lars Svensson, have argued persuasively that the use of an unrealistic conditioning assumption makes it more difficult for the public to interpret the MPC's reading of the economic outlook. As Charlie Bean has pointed out,(2) this is certainly true if interest rates are some way off 'normal' levels or if for other reasons, they are expected to increase or decrease substantially over the forecast horizon — and the longer the time horizon of the forecast, the more force this argument has.

Our decision to shift the focus of the presentation to market rates was coupled with a decision to publish forecasts for three years, rather than two, as was previously the case. This did not reflect a change in policy horizon — we are required to meet our 2% target 'at all times'. But it did provide useful context for interpreting the gradient of inflation forecasts at the two year horizon, and hence a clearer indication of future policy, if the economy evolves in line with the central projection.

Against this background, we saw the shift to using a market-rate assumption was a very modest step towards greater transparency. At a technical level, it is a non-trivial task to translate any market-rate yield curve into a conventional forecasting assumption which is a genuine reflection of market expectations of future official interest rates.(3) And markets are themselves uncertain about the path of future rates so we publish a fan chart for market interest rate to help quantify that uncertainty, based on options prices.

**Chart 4**
**Market beliefs about future interest rates — *Inflation Report* February 2005**




Clearly, there is a big difference between a conditioning assumption and a commitment, not least because there

(1) See *Inflation Report* August 2004, pages 42–43.
(2) Bean, C (2004), 'Some current issues in UK monetary policy', *Bank of England Quarterly Bulletin*, Autumn.
(3) For further details on this issue see Brooke, M, Cooper, N and Scholtes, C (2000), 'Inferring market interest rates from money market rates', *Bank of England Quarterly Bulletin*, November. For further information and data, please see the Bank of England website www.bankofengland.co.uk.

is a big gap between anyone's current guess at where rates might need to go to meet the inflation target, conditional on the data available at any point in time, and where the MPC will actually take rates given the information it may have in the future. But the MPC was conscious of the risk of misinterpretation, so the transition was made gradually — with the Governor reflecting on the market curve in his remarks at the February and May *Inflation Report* press conferences, and the MPC referring to the market curve in the minutes during the spring. By the time the switch was introduced in the August *Inflation Report*, MPC and markets understood the nature of the conditioning assumption, and the change itself was seen as the marginal improvement that it is.

Other inflation targeting central banks have evolved their own ways of communicating. At one extreme, the Governor of the Reserve Bank of New Zealand publishes his own forecast of future interest rates — though he is the sole decision taker in that regime. And at the Norges Bank, staff produce material that explicitly sets out possible strategies for interest rate decisions in the form of a range of interest rates for the next 3–4 months, and invite the interest rate setting committee to endorse them, and provide a commentary on market expectations of future interest rates. As Charles Goodhart has argued, it is difficult, as a practical matter, to imagine a committee of nine individually accountable experts doing that.

Institutional and political arrangements matter. What works in one environment may not work elsewhere. And central banks need to employ consistent modes of communication and language if they are to be well understood. Abrupt changes in what is communicated, and how, always carry risks of confusion. But even the best designed system needs to evolve. Greater transparency always involves learning both by policymakers and by those who seek to interpret their actions. The degree of monetary policy transparency in the UK now would have been regarded as quite unthinkable fifteen years ago. I see no reason to suppose that we have reached the end of the road yet.

## Conclusions

Published forecasts have come to play a key role in formulating and communicating interest rate decisions within the UK approach to inflation targeting. The strength of this approach is that — flawed and inadequate as all projections inevitably are — a good forecast paints a picture that is worth a thousand words. And that counts, both when it comes to organising the debate between nine experts, and when it comes to explaining the basis of policy to a non-expert public.

But forecasts are highly fallible, so our forecast centred approach to inflation targeting has gone hand in hand with a determined effort to illustrate the wide range of uncertainties around any central projection and a systematic attempt to factor the Committee's own judgements about the risks into decision taking. That, for me, is a key reason for resisting recent calls by the IMF and others for the Bank to 'publish numerical projections for a broader range of key variables'. Detail is seductive — but it can also be highly misleading, and a committee that spent its time debating the details of the forecast rather than using it as a tool to address big picture issues would be at risk of losing its way.

Forecasts are indispensable — but they should be handled with care.

# Table B
# Interest rate surprises

**A. Are rate changes evenly spread over the months of the year?**

| | Rate changes | | $\chi^2$ statistic |
|---|---|---|---|
| | *Inflation Report* months | Non-*Inflation Report* months | |
| Whole period | 15 | 14 | 4.41 ** |
| 1997–2000 | 6 | 10 | 0.13 |
| 2001–present | 9 | 4 | 7.54 *** |

**B. Are rate changes expected to be spread evenly over the months of the year?**

| | Expected rate changes | | $\chi^2$ statistic |
|---|---|---|---|
| | *Inflation Report* months | Non-*Inflation Report* months | |
| Whole period | 14 | 8 | 9.09 *** |
| 1997–2000 | 6 | 5 | 2.23 |
| 2001–present | 8 | 3 | 7.68 *** |

**C. Are interest rate surprises getting smaller?**

| | Observation | Average magnitude of rate 'surprises' (basis points) |
|---|---|---|
| Reuters measure: | | |
| 1998–2000 | 30 | 11.0 |
| 2001–present | 50 | 7.6 |
| *Difference* | | *-3.3* ** |
| Libor measure: | | |
| 1997–2000 | 43 | 5.4 |
| 2001–present | 50 | 3.6 |
| *Difference* | | *-1.8* * |

**D. Are interest rate surprises larger in *Inflation Report* months?**

| | Average of 'surprise' variable (basis points) | | |
|---|---|---|---|
| | *Inflation Report* months | Other months | *Difference* |
| Reuters measure: | | | |
| Whole period | 10.6 | 7.9 | +2.7 * |
| 1998–2000 | 12.6 | 10.0 | *+2.6* |
| 2001–present | 9.5 | 6.6 | *+2.8* |
| Libor measure: | | | |
| Whole period | 5.9 | 3.7 | +2.3 ** |
| 1997–2000 | 5.5 | 5.3 | *+0.2* |
| 2001–present | 6.3 | 2.2 | *+4.0* ** |

**E. Market reactions in *Inflation Report* months**

| | Average magnitude of 'surprise'/market reaction (basis points) | | | Difference between reaction to policy decision and *Inflation Report* publication | Difference between reaction to policy decision and MPC *Minutes* publication | Observations |
|---|---|---|---|---|---|---|
| | Policy decision | *Inflation Report* publication | MPC *Minutes* publication | | | |
| Libor measure: | | | | | | |
| Whole period | 5.9 | 3.0 | 2.8 | +2.9 ** | +3.1 ** | 31 |
| 1997–2000 | 5.5 | 3.4 | 2.4 | +2.1 | +3.1 ** | 14 |
| 2001–present | 6.3 | 2.7 | 3.1 | +3.6 ** | +3.2 ** | 17 |
| *Difference* | *0.7* | *-0.8* | *0.7* | | | |

Notes: Tests are for significance based on t-test for difference between two sample means, except for Panels (A) and (B), which is a test for whether rate changes are distributed 1/3 in *Inflation Report* months and 2/3 in other months. The critical values for Panels (A) and (B) are derived from Monte Carlo simulations.
Excludes the special MPC meeting following 11 September 2001.
*** significantly higher/lower than zero at 1% level, ** 5% level, * 10% level (one-tailed tests).
Libor measure: based on the change in implied three-month Libor forward rate derived by linear interpolation of adjacent short sterling futures contracts.
Changes in implied forward rates normally taken from: 11:30 am to 12:30 pm for interest rate announcements; 10:00 am to 12:00 pm for *Inflation Report* publication; and 9:00 am to 10:30 am for *Minutes* publication.
Reuters measure: difference between the actual repo rate change and the mean expectation of the economists.

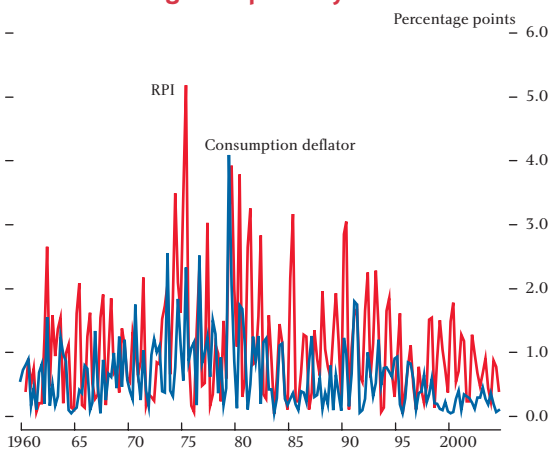
# Monetary policy, stability and structural change

*In this speech,(1) Paul Tucker,(2) Executive Director for Markets and a member of the Monetary Policy Committee, discusses structural changes affecting the UK economy and confronting policymakers. That pervasive change has occurred is evident in, for example, lower variability in output growth and inflation; less inertia in inflation; and uncertainty about the extent to which demand pressures feed through into wages and prices. The underlying forces affecting firms' price and wage-setting behaviour include more flexible labour markets, more complete capital markets, globalisation, the IT revolution — and also monetary regime change itself, which makes it easier for businesses and consumers to distinguish relative price changes from more generalised price inflation. Disentangling the effects of such structural shifts from cyclical influences on the economy is a major challenge, which highlights the uncertainty facing policymakers. Against that background, Mr Tucker points out that debates about cyclical conditions often lie well within the margins of error of any sensible estimate of underlying trends; and that a sense of perspective is needed about month-to-month deviations from the inflation target. Over the medium term, well-anchored inflation expectations are vital to the regime. But policy credibility cannot be assumed. It has to be achieved, and continually re-achieved, by policymakers — through actions, and reasoned explanations of those actions.*

Judging by the macroeconomic data, either there have been some fairly profound changes in our economy or we have been blessed by extraordinary good luck over the past decade or so. GDP has grown without interruption for 50 quarters. Unemployment has fallen from around 10½% in 1992 to 6½% in 1997, and just over 4½% on the latest reading. Inflation fell through the first half of the 1990s, and since 1997 has, on average, been close to the Government's target. All that is, of course, well known.

But it may be less familiar that quarter-to-quarter changes in output growth and inflation have over recent years exhibited a strikingly different pattern from those of previous decades. Both output growth and inflation have been less variable (Chart 1; Table A). Inflation also seems to have become less persistent. By that, I mean that, whereas in the past rises or falls in inflation tended to be protracted, more recent fluctuations in inflation have been short-lived. Work undertaken by Bank of England and other economists,(3) summarised in Table B, suggests that — at least statistically — this apparent change occurred around the time of the

**Chart 1**
**Absolute changes in quarterly inflation**




Sources: Bank of England and ONS.

**Table A**
**Average absolute changes in quarterly inflation and GDP growth**

Percentage points

| | RPI | Consumption deflator | GDP growth |
|---|---|---|---|
| 1960–79 | 1.10 | 0.76 | 1.45 |
| *1960–72* | *0.83* | *0.57* | *1.18* |
| *1973–79* | *1.58* | *1.11* | *1.93* |
| 1980–92 | 1.19 | 0.59 | 0.69 |
| 1993–2004 | 0.79 | 0.34 | 0.34 |

Source: Bank calculations.

(1) Given at the Confederation of British Industry in Guildford on 1 March 2005. This speech can be found on the Bank's website at www.bankofengland.co.uk/publications/speeches/2005/speech240.pdf.
(2) My thanks to Peter Andrews, Ian Bond, Spencer Dale, Neal Hatch, John Whitley and Tony Yates for comments; to Damien Lynch for comments and research and to Sandra Bannister for secretarial support.
(3) Data in Table B are from Benati, L (2005), 'The inflation-targeting framework from an historical perspective', published in this *Bulletin*. Previous work has also documented this change — see for example, Batini, N and Nelson, E (2001), 'The lag from monetary policy actions to inflation: Friedman revisited', *International Finance*, Winter, Vol. 4, No. 3, pages 381–400.

## Table B
## RPI inflation persistence(a)

| | |
|---|---|
| 1947–72 | 0.56 |
| 1972–92 | 0.91 |
| 1992–2004 | -0.05 |

Source: Benati, L (2005), 'The inflation-targeting framework from an historical perspective', published in this *Bulletin*.

(a) The statistics show the sum of the coefficients of the lagged terms in an autoregressive equation for inflation. A value of 1 indicates that a shock to inflation is permanent. See Table C on page 166 of this *Bulletin*.

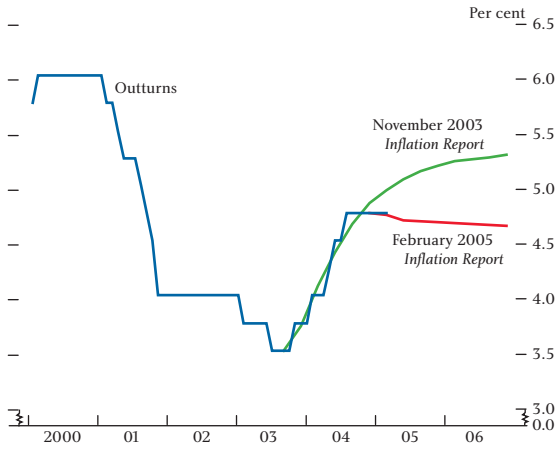
United Kingdom's introduction of inflation targeting in 1992.

The policy debate — inside and outside the Bank — has recently refocused on the possibility of some other changes in the way our economy functions. Less than 18 months ago, the Bank's interest rate was just 3.5%, essentially because the MPC wanted to stimulate private sector domestic spending to offset the effects on aggregate demand of weak net trade, given adverse developments in the world economy. As global conditions recovered, and with a pickup in public sector spending, we were able gradually to withdraw much of that stimulus during 2004 in a series of steps which were widely anticipated and understood across the financial and real economy (Chart 2). With the slack in the economy being absorbed, attention shifted to gauging the degree of demand pressures and their implications for the inflation outlook. In particular, on the basis of some simple statistical relationships, a question has been posed about whether there has been some change in the extent to which demand pressures feed through into wages and prices. Most notably, as discussed in the Bank's February *Inflation Report*, the steady falls in unemployment over recent years have not been accompanied by a rising rate of earnings growth (Chart 3). These issues obtained some prominence towards the end of last year when, despite apparently buoyant demand, inflation on the CPI measure fell to 1.1%.

Lower variability in output growth and inflation, lower inflation persistence, apparently weaker pass-through of demand pressures — all told, this points to the importance of identifying and understanding the complex combination of structural changes affecting our economy. Today, I plan to give a broad overview of some of them, as they confront policymakers.

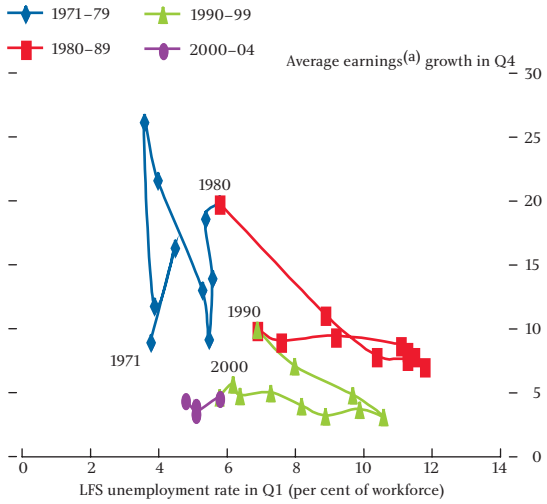
Our standard tools of economic analysis — in particular, statistical modelling — are not especially well-suited to real-time detection or quantification of the underlying forces of change. They can, though, alert us to puzzles when the data persistently deviate from past patterns. Business managers, by contrast, are exposed to the reality of change day by day. Unable to shield yourselves from

## Chart 2
## Bank of England repo rate and two-week forward curves(a)




(a) Bank of England two-week repo rate outturns and 15-day averages of two-week forward curves up to 5 November 2003 and 9 February 2005. November 2003 curve is derived from interest rates on gilt-edged securities, including those used as collateral in short-term repo contracts. February 2005 curve is derived from instruments that settle on the London interbank offered rate. Both curves are adjusted to allow for differences with the Bank's official interest rate.

## Chart 3
## Earnings growth and unemployment




(a) Whole economy, including bonuses. 2004 data proxied by average of October and November.

change, businesses can indeed succeed by embracing it — shaping your environment as well as responding to it. That underlines the value of the Bank's dialogue with business, facilitated and led by our regional Agents across the United Kingdom. Colloquially, you enrich our grasp of what is 'going on out there'. Economic analysis then helps us to match your various real-world stories to puzzles we see in the data.

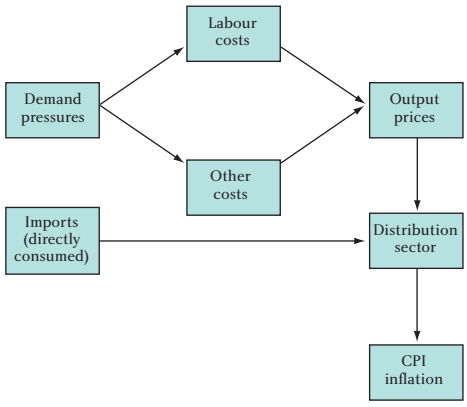
## Inflation and firms' price-setting behaviour

In the medium-to-long run, the average rate of inflation is determined by the rate of nominal expansion permitted by the monetary authority. But over shorter horizons, decisions taken by businesses — in particular, about wages and prices — affect quarter-to-quarter

fluctuations in inflation and, more generally, how demand pressures feed through to inflation.

Economic policymakers draw on a number of ways of thinking about those influences on inflation dynamics. There is no model that can, uniquely, capture the richness of the real world. But surprising though it may be to some, one of the ways in which we think about firms' price-setting behaviour would be familiar to anyone running a business. Namely, that firms charge a mark up, or profit margin, over the marginal costs of their various inputs — labour, capital, raw and intermediate materials, etc — with both the mark up and costs varying according to current and prospective demand conditions. This is represented schematically, indeed crudely, in Diagram 1. The key feature is that when demand rises and firms utilise their capacity more fully and add to their labour force, their costs and prices tend to rise. That might involve old-fashioned 'cost-push' inflation, with firms raising prices to maintain margins in the face of increased (marginal) costs. Or firms might initially be able temporarily to raise margins, with labour and other costs later 'catching up'. In either case, firms and wage bargainers will be influenced by what they think is going to happen to inflation in the future. Again simplifying, two features are added to the diagram to bridge from firms' so-called 'output' — or wholesale — prices to the retail prices which the Bank targets. First, as well as being an input to producing firms, some imports are directly consumed by households. Second, distributors — including, most obviously, retailers — add another mark up, reflecting their own costs and desired profit margins. Changes in the economy affecting any of the links in this (stylised) chain will have a bearing on inflation dynamics. The challenge is to separate out cyclical, or temporary, factors from the more structural influences that over some periods alter firms' costs and margins. That is important for policymakers, as to form a view on the medium-term outlook for inflation we need to distinguish between short-lived and persistent influences.

**Diagram 1**
**Inflation process**

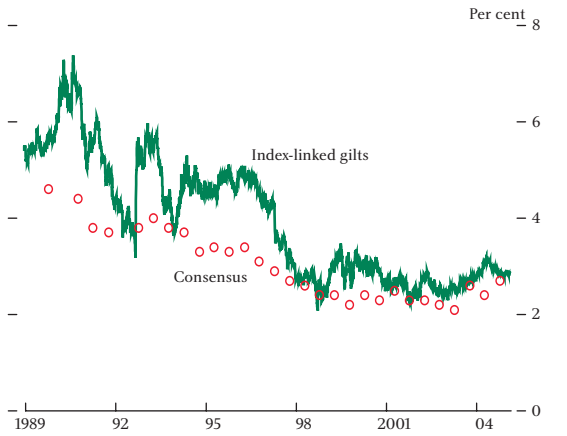



## Monetary regime change

The monetary framework is one such structural influence.

One of the most encouraging features of the post-1997 landscape has been that, as well as inflation tracking the target fairly well, expectations of inflation have been well anchored to the target (Chart 4). Uncertainty about future inflation has also fallen(1) (Chart 5). It was different in the past. A characteristic shared by the

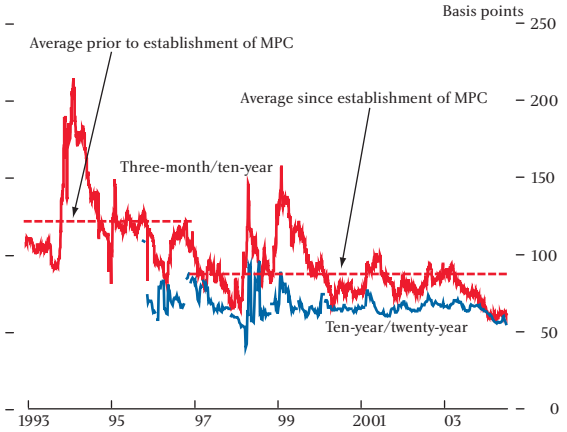
**Chart 4**
**RPI inflation expectations(a)**




Sources: Consensus and Bank calculations.

(a) Inferred expectations are for five-year RPI inflation in five years' time.

**Chart 5**
**Implied volatility of a three-month option on a ten-year swap contract and ten-year option on a twenty-year swap contract**




Sources: Barclays Capital and JPMorgan Chase.

(1) Tucker, P M W (2004), 'Risk, uncertainty and monetary policy regimes', *Bank of England Quarterly Bulletin*, Spring, pages 84–96.

various monetary regimes tried out by UK governments during the 1970s and 1980s was that no one could easily judge what rate of inflation the authorities were trying to achieve — or, therefore, have much idea about the outlook for inflation. As feared by one distinguished economist of an earlier generation, 'every business venture [risks being] transformed into a speculation on monetary policy'.(1) In those circumstances, it may well have seemed reasonable to assume that recent inflation outturns were a good basis for guessing the near-term path of inflation. And given the evidence, firms and households could also have been forgiven for acting on an assumption that the authorities would be slow to respond to excess demand and so to upward pressures on inflation.

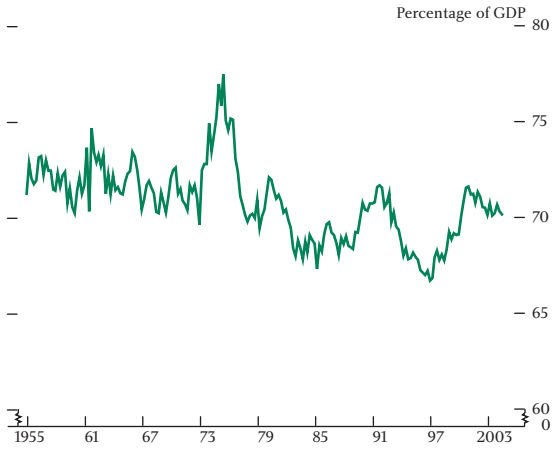
By contrast, the current regime seems, so far at least, to enjoy high credibility. In consequence, when setting prices, firms might well place more weight on policy delivering inflation in line with the target than on recent inflation outturns. If so, that might be part of the explanation for the much lower persistence in inflation I described earlier. In other words, when shocks to the economy cause inflation to deviate from target, firms may nevertheless set prices on the basis that it will return to target fairly quickly — which would, of course, itself help to bring inflation back to target. In a similar vein, firms and households might now expect the Bank to tweak policy fairly promptly in response to shifts in demand. In which case, the influence of such demand shocks on wage and price-setting, and so on inflation, would plausibly be somewhat weaker than in the past.

But sound monetary policy is not the only important change in the economic environment. That much is apparent from even a brief examination of real-economy influences on firms' costs and prices. I shall discuss just three: the labour market, financing markets, and competitive conditions in product markets.

## Labour market

For most businesses, their workforce accounts for the major part of their input costs (Chart 6). Firms in general — and the economy in aggregate — have therefore been profoundly affected by the transformation in the United Kingdom's labour market over the past quarter century. The key influences have been well documented.(2) In particular, industrial relations legislation altered the way in which unions operate, and union membership has fallen (Chart 7). Unemployment and social security benefits have been progressively reformed, increasing incentives to work. Use of part-time workers has increased (Chart 8), in part due to the expansion of the services sector, and perhaps also more flexible ideas about working patterns. The mechanisms via which employers and employees find each other — job search — have improved, helped by investment in employment exchanges and perhaps recently by the internet.

**Chart 6**
**UK labour share**

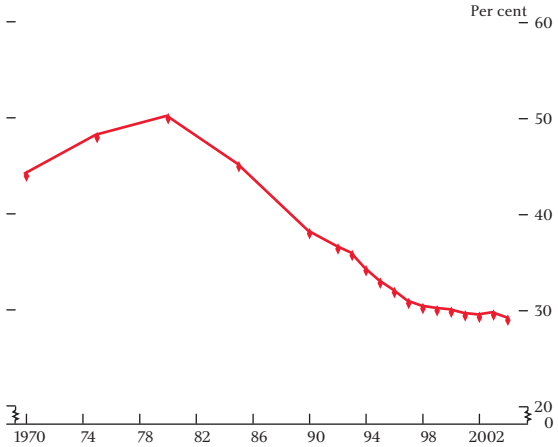



Source: ONS.

In combination, these developments provided the conditions for unemployment to fall over the past decade without adding to inflationary pressure. During the transition, the supply capacity of the economy accordingly increased by more than would otherwise have been achieved; and any given increase in real aggregate demand would have put less pressure than otherwise on supply, and so would have had a weaker effect on firms' costs and prices. That does not mean, however, that the feed-through of demand pressures into inflation will be permanently weaker. Instead, the apparently flat relationship, illustrated in Chart 3, between unemployment and wage inflation is, at least in part, most probably a symptom of the sustainable level of unemployment having gradually fallen. That is effectively what the MPC has assumed in making judgements about the outlook for inflation. We can be reasonably confident about the direction of change, but not about its size.

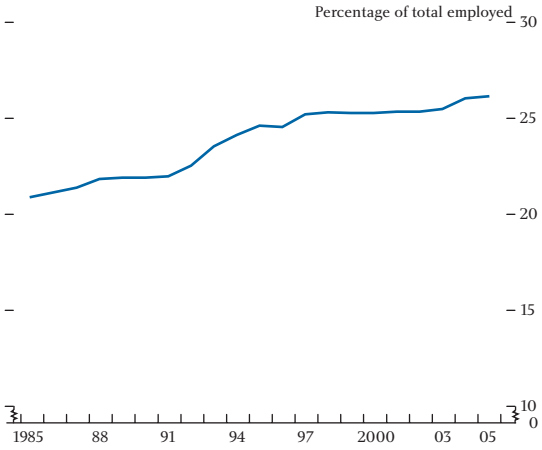
(1) Simons, H (1947), 'Rules versus authorities in monetary policy', in *A positive program for laissez-faire and other essays*, Chicago.
(2) See, for example, Nickell, S and Quintini, G (2002), 'The recent performance of the UK labour market', *Oxford Review of Economic Policy*, Vol. 6(4), pages 26–35.

**Chart 7**
**Percentage of workforce with trade union membership**




Sources: LFS and Nickell, S and Quintini, G (2002), 'The recent performance of the UK labour market', *Oxford Review of Economic Policy*, Vol. 6(4), pages 26–35.

**Chart 8**
**Proportion of part-time workers**




Sources: ONS and Bank calculations.

That can be illustrated by the current conjuncture. Over the past few years, there have been at least two other influences at work. First, for some years we enjoyed an improvement in our 'terms of trade'. That meant, simply put, that the aggregate price of the goods and services we produce and export rose relative to the aggregate prices of our imports. This increased the purchasing power of households' incomes (Chart 9), and so may have dampened wage pressures as the labour market tightened. To the extent that this explanation should be given any weight, it would tend to be a temporary factor, pointing to an upside risk to earnings growth looking ahead.

A second apparent feature of our environment works the other way round. Anecdotally, the role of migrant labour

**Chart 9**
**Real household disposable income growth and terms of trade**


has increased in various sectors — partly associated with the enlargement of the EU's single labour market. If that continued, with new residents continuing to help to meet particular skill shortages, the labour supply available to UK businesses would increase, implying that the economy could potentially accommodate stronger aggregate demand than otherwise. However, the available data do not really enable us to get beyond anecdote and speculation.

## Financing

Another important input for firms is finance — for working capital and investment. Here too, there seem to have been changes — in the range and terms of the sources of finance available to both firms and households — that could potentially influence the extent of cyclical fluctuations in output and inflation.

One characterisation of the past would be that firms and households depended on bank loans for external finance; and that banks loosened or tightened credit conditions sharply in the different phases of a business cycle, reining back when the economy suffered a downturn and arrears and losses mounted. For the United Kingdom, this is well documented for small-firm finance during the early 1990s' recession.(1)

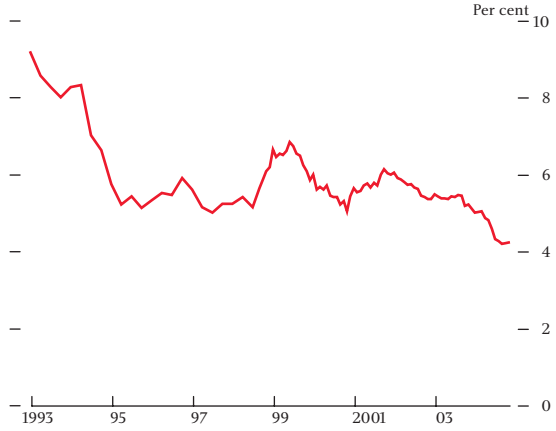
Although the stability of output growth over the recent past happily deprives us of a proper test, there are reasons to think that cyclical swings in the availability of finance may now be somewhat less marked than in the past. In the first place, the greater stability brought by the new monetary regime may make a difference.

(1) 'The financing environment for smaller firms over the last decade', in *Finance for Small Firms — An Eleventh Report*, Bank of England (2004).

Compared with the past, there should be less risk of the monetary authority delaying a response to incipient inflation until the point that it is forced to slam on the brakes, effectively engineering recession to quell inflation expectations and in the process contributing to a sharp spike in unemployment, loan defaults and bank losses.

A more stable macroeconomic environment may also, by reducing the risks for new entrants, be one amongst a number of influences fostering competition. There is perhaps some circumstantial evidence of that in, for example, the decline in margins on personal loans (Chart 10). That would tend to reduce the credit constraints facing households. As does the increased availability of loan products that enable homeowners to borrow against the free equity in their houses.

**Chart 10**
**Margins on personal loans to households**(a)



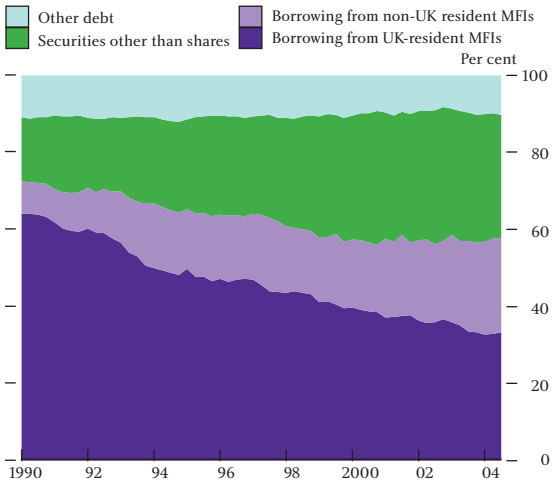

Source: Bank calculations.

(a) Spread of effective personal loan rates over Bank of England repo rate.

Broadly similar changes have been underway in business finance, where competition also comes from outside the banking sector through firms' access to richer capital markets. The proportion of UK non-financial firms' debt accounted for by bonds has risen from around 15% in 1990 to over 30% now (Chart 11). Our largest firms have access to the international commercial paper, bond and asset-backed markets; and to derivative markets for managing their financial risks. For smaller firms, compared with a decade or so ago, there seems to have been an expansion in asset-based financing options enabling them to utilise collateral more effectively.(1)

Taken together, a richer supply menu may leave firms and households somewhat less exposed to being severely

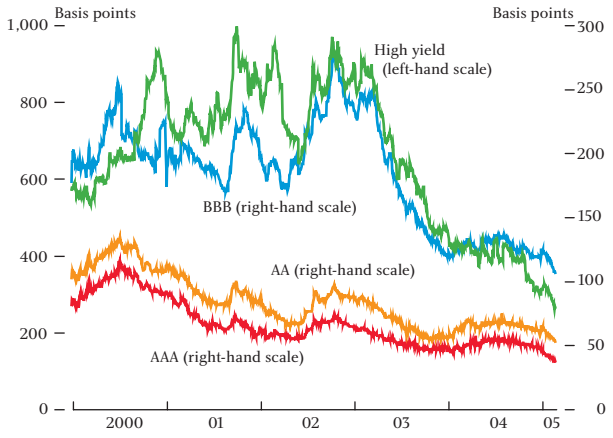
**Chart 11**
**Composition of UK PNFC sector gross debt**




credit rationed in an economic downturn; and may enhance their ability to cope with cyclical economic fluctuations. If that helped to dampen the effect of shocks, output growth and inflation may vary a little less than otherwise, and monetary policy may need to respond less aggressively than in the past to keep the economy on a stable path.

But, again, it can be difficult to disentangle cyclical from more durable changes. A topical example is the risk premium priced into financial instruments. To pick just one indicator, corporate credit spreads have been falling for a few years, to levels that last prevailed in the mid-1990s (Chart 12). In degree, that seems likely to reflect a relatively benign global macroeconomic environment together with balance-sheet strengthening in the corporate sectors of a number of major industrialised countries. But, conceivably, it also reflects better diversification of risk — facilitated, for example,

**Chart 12**
**Corporate credit spreads**




Source: Merrill Lynch option-adjusted corporate bond spreads.

(1) Hewitt, A (2003), 'Asset finance', *Bank of England Quarterly Bulletin*, Summer, pages 207–16.

by the rapid growth of new instruments such as credit derivatives and by greater cross-border investment of savings. If so — if risk premia were systemically lowered — that would tend to reduce firms' cost of capital and increase households' financial wealth. Alternatively, the price of risk may just be temporarily low, possibly too low.(1) The upshot is that we cannot yet be confident about the durability and macroeconomic implications of the changes seen in the financial environment.

## Mark ups

It is a commonplace that competition has intensified.

This is associated with 'globalisation'. The facts are familiar. World trade has grown relative to world output (Chart 13). A wide range of emerging market economies, notably in Asia, have become material participants in the world economy. Some UK businesses have relocated part of their production, or outsourced to firms operating in markets with cheaper labour costs. Partly reflecting these developments, although also increased specialisation, the share of imports in UK business investment and in consumption has steadily risen (Chart 14).

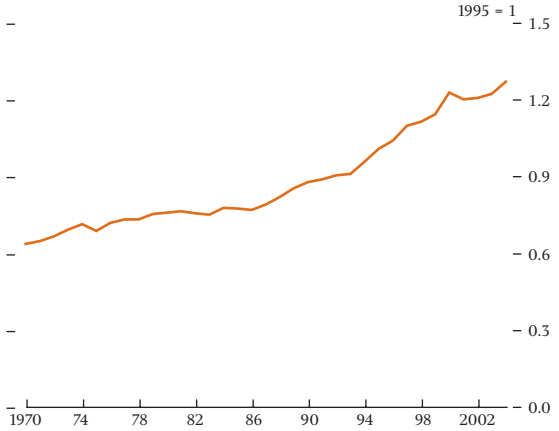
These developments make markets more contestable. As does effective competition policy. An example in recent years was the car market, where prices converged with those prevailing on continental Europe.

The internet, or e-commerce, also brings greater contestability, by making it a lot easier for businesses to check the prices of competing suppliers, and for consumers to compare prices across different retailers (Table C).

Over time, these forces would be expected to reduce firms' margins — at least in sectors that were not previously especially competitive. So long as that process of adjustment was underway, inflation would tend to be lower than would otherwise be implied by any given set of demand conditions. In addition, if and when their margins became thinner, firms might become more aggressive in controlling costs in the face of fluctuating demand, which might weaken the pass-through of demand shocks into inflation.

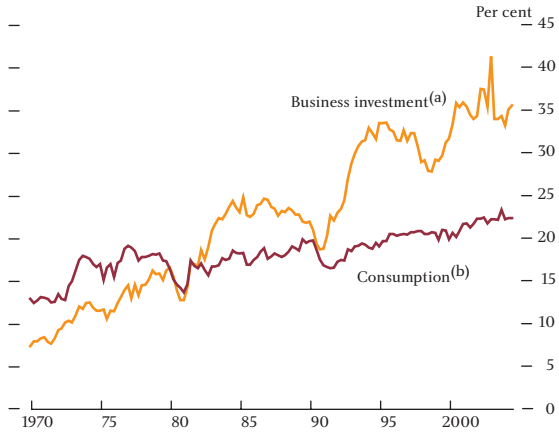
The new monetary framework might reinforce some of those effects. Over recent years, more than a handful of business managers have commented that, when inflation was both high and highly variable, it used to be easier to implement — or 'get away with' — price increases. In a low inflation environment, it should be easier for business customers and consumers to distinguish relative price changes from increases in the general price level. That too should foster greater flexibility and efficiency in our economy; and is one of the contributions that low and stable inflation can potentially make to broader economic welfare.

**Chart 13**
**Share of world imports in world GDP**




Sources: IMF *WEO* Summer 2004 database (post-1980) and United Nations (pre-1980).

**Chart 14**
**Import shares in consumption and business investment expenditures**




Source: ONS.

(a) Ratio of imported capital goods to business investment, chained volumes.
(b) Imported consumption is measured as aggregate expenditure on imports of food, beverages, tobacco and cars.

**Table C**
**Value of sales over the internet by UK non-financial sectors**

£ billions

| | Households | Business-to-business | Total |
|---|---|---|---|
| 2002 | 6.4 | 12.7 | 19.0 |
| 2003 | 11.4 | 28.2 | 39.5 |

Source: ONS.

(1) See, for example, Section 2 of 'Financial stability conjuncture and outlook', *Financial Stability Review*, December 2004.

One striking example is the distribution sector. Anecdotally, competition in UK retailing has been intense. This seems to manifest itself in the aggregate data in two phases. As documented recently by my MPC colleague Steve Nickell,(1) retailers' margins were compressed in the years around the turn of the century. Since then, they seem to have crushed their costs through measures delivering rapid productivity growth. In part, that appears to have been achieved by disintermediating wholesale distributors, whose margins have continued to fall (Chart 15). At a macro level, the effect was, for a period, to open up a gap between producer output price inflation and retail goods price inflation (Chart 16). In other words, for a while some structural changes in the distribution sector reduced the feed-through of demand pressures into retail price inflation. Looking ahead, one downside risk to the MPC's central projection is that we cannot rule out that this process has further to go.

**Chart 15**
**Distribution sector profits (margins)**

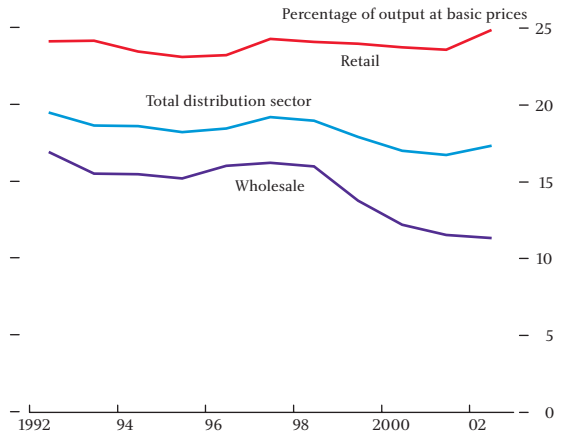
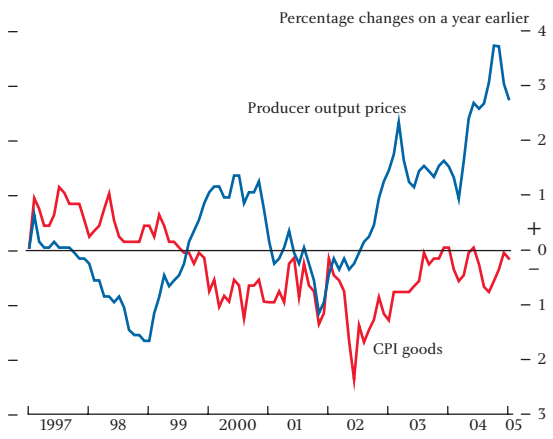



**Chart 16**
**Output price inflation and CPI goods price inflation**



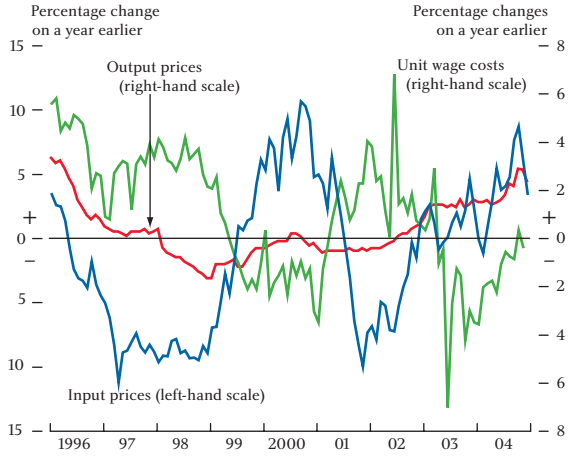

## The current conjuncture and policy

Monetary regime change, labour market reform, financial innovation, the technological revolution, globalisation — it is a heady combination, which unavoidably adds to the challenge of discriminating between cyclical and structural influences when forming a view on the macroeconomic outlook. But it is equally unavoidable that policymakers must try to do just that.

That brings me to the current conjuncture and so to policy.

My own take at present is as follows. In my judgement, there is, on balance, most likely a degree of excess demand in the economy. Surveys suggest above-average capacity utilisation. And there is some corroborative evidence in the rise in output price inflation relative to costs, and in anecdote of some firms being able to pass on cost increases (Chart 17).

**Chart 17**
**Domestically produced manufactured goods: costs and prices**

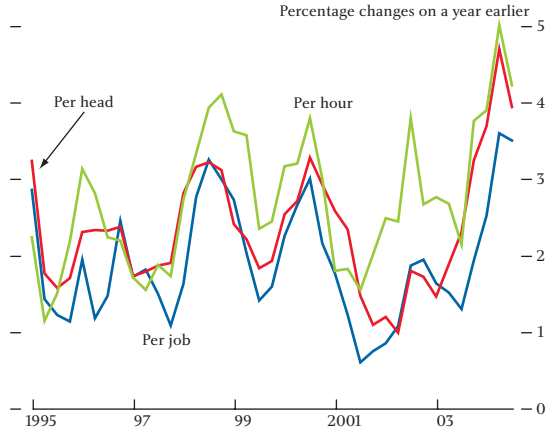



Given a tight labour market, how does that fit with earnings inflation having been relatively subdued? One possibility is that as aggregate demand has picked up, firms have in the first place increased output by making greater use of their existing workforce and capital. That would be consistent with anecdotal evidence of firms having held on to labour during the earlier slowdown in aggregate demand; and with the pickup in private sector productivity growth over the past year or so (Chart 18). Looking ahead, it would also suggest a degree of upwards pressure on earnings growth.

As reflected in the February 2005 *Inflation Report*, conditions of excess demand, combined with the

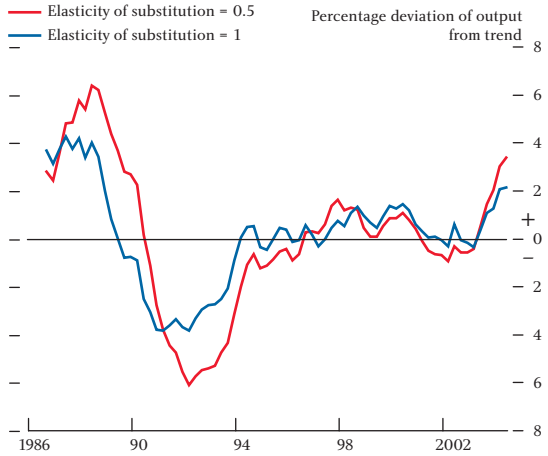
(1) Nickell, S (2005), 'Why has inflation been so low since 1999?', *Bank of England Quarterly Bulletin*, Spring, pages 92–107.

**Chart 18**
**Private sector productivity**




Sources: Bank of England and ONS.

**Chart 19**
**Private sector factor utilisation (based on production functions)**(a)




Source: Bank of England calculations.

(a) Based on an assumed production function which describes the relationship between inputs — labour and capital — and output. The measures show estimates of the changes in output estimated to be due purely to changes in the utilisation of the inputs.

likelihood of stronger import prices, point to inflation gradually rising back towards and through the 2% target over the next two years or so. There are many risks around that central outlook but, taken together, compared with November 2004 I judge them to be slightly less to the downside over the medium term. The recent rise in CPI inflation suggests, for example, that we were not stuck materially below the inflation target. And, as I discussed earlier, the puzzle about the apparent weak feed-through from demand to inflation is reduced somewhat by the Committee's judgement that the performance of the labour market improved over recent years. That leaves continuing demand pressures likely to feed through to inflation, looking ahead. With monetary policy needing to be set on a medium-term view, overall I concluded at the MPC's latest meeting that our interest rate should be increased by 25 basis points — a small tweak to reflect the outlook.

But, as my remarks today have emphasised, there are considerable uncertainties. Two final thoughts about them.

The first concerns the precision with which any monetary authority can achieve its objective. In the bad old days, it should probably have been clear when the economy was experiencing unsustainable excess demand. In today's world, when we discuss excess or deficient demand we are generally addressing much smaller deviations from trend than in the past, as Chart 19 suggests. In consequence, our debates about cyclical conditions lie well within the margin of error of any sensible estimate of underlying trends — especially given uncertainty about the structural changes affecting the economy. In a similar vein, we — and commentators — need to keep some perspective about deviations from the inflation target. In November 2004, the year-on-year measure of CPI inflation was 1.1%. By January 2005 it was 1.6%.

Second, when inflationary problems loomed in the past, inflation expectations — amongst businesses, households and in financial markets — increased, both signalling and bringing about the incipient rise in inflation. Today, we appear to enjoy well-anchored inflation expectations, which will affect price-setting behaviour in the ways I have touched on. Indeed, modern economic models of various kinds — inside and outside the Bank — tend to assume policy credibility, anchoring medium-term expectations. If that were so, the medium-term outlook for inflation would be assured. In fact, credibility is not something that can just be assumed. It has to be achieved, and continually re-achieved, by policymakers — through our actions, and reasoned explanations of them.

For that reason alone, policy inevitably remains a judgemental process — not one mechanically tied to a particular model, but one that draws on a wide range of inputs, including the insights of our business contacts. Learning is, accordingly, inherent in our mission. Over the next few years, if the economy escapes being buffeted by shocks, we will learn quite a lot. In the meantime, notwithstanding the uncertainties, we have to make judgements and explain them.

# How much spare capacity is there in the UK economy?

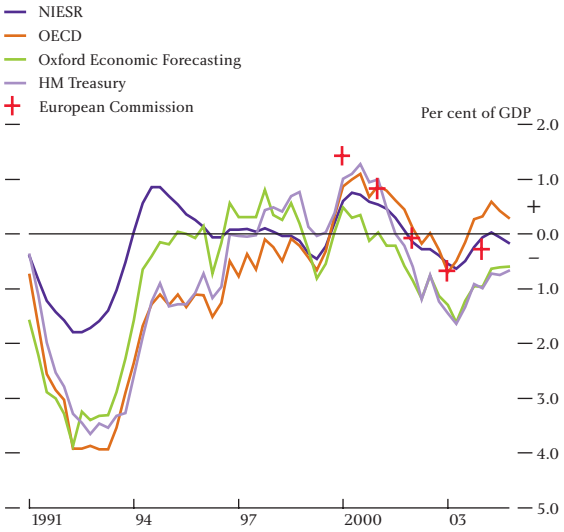
*In this paper, Stephen Nickell,[1] member of the Bank's Monetary Policy Committee, analyses the extent of spare capacity in the UK economy. The results indicate that the amount of spare capacity available in 2004 is greater than in 1999–2000, not very different from that in 2001–03 and slightly less than in 1995–98. On balance, there still appears to be some spare capacity available in the labour market, but within firms the overall situation is tight.*

## Introduction

The amount of spare capacity in an economy is the difference between potential output and actual output, where potential output is the amount which can be produced given the existing capital stock using the equilibrium number of employees working for equilibrium hours at the equilibrium level of intensity. Without going into unnecessary detail, one may think of the equilibrium levels of labour inputs as those consistent with stable inflation. Consequently, if actual output exceeds potential output, there is no spare capacity and we may expect inflation to be rising. So the extent of spare capacity in an economy is a key variable when setting short-term interest rates to hit an inflation target.

Many forecasting groups produce inverse measures of spare capacity which they term the output gap (actual output less potential output). In Chart 1, we show a number of different measures of the output gap. What is plain is that, currently, there is a wide variety of estimates of the level of the output gap. To see more precise numerical estimates, we set out some averages in Table A. What we find is that at one extreme, HM Treasury sees the UK economy in 2004 as having at least as much spare capacity as in the previous three years, on average, and very much more than in either of the periods 1995–98 or 1999–2000. By contrast, the OECD[2] estimates that there is no available spare capacity in 2004, with more spare capacity available in 2001–03 and much more in 1995–98. The other forecasters lie between these two extremes.

**Chart 1**
**Output gap measures**




Sources: European Commission, HM Treasury, NIESR, OECD and Oxford Economic Forecasting.

**Table A**
**Output gap measures**

Per cent of GDP

| | 1995–98 | 1999–2000 | 2001–03 | 2004 |
|---|---|---|---|---|
| OECD | -0.8 | 0.3 | 0.1 | 0.4 |
| EC | | | 0.0 | -0.3 |
| NIESR | 0.1 | 0.2 | -0.1 | -0.1 |
| OEF | 0.2 | -0.1 | -0.8 | -0.7 |
| HMT | -0.3 | 0.6 | -0.7 | -0.8 |

Notes: OECD is the Organisation for Economic Co-operation and Development, EC is the European Commission, NIESR is the National Institute of Economic and Social Research, OEF is Oxford Economic Forecasting and HMT is HM Treasury.

A positive figure indicates that actual output is above potential output.

Source: Bank of England.

The measures of the output gap seen in Chart 1 differ because the organisations use different methods, particularly in the treatment of the public sector, and

(1) I am very grateful to Jumana Saleheen and Ryan Banerjee for their tremendous help in writing this paper and to Kate Barker for valuable comments on an earlier draft. This paper can be found on the Bank's website at www.bankofengland.co.uk/publications/speeches/2005/sncapacity050531.pdf.
(2) When estimating the output gap, the OECD correctly focuses on the private sector. The other forecasters tend to operate in the context of the whole economy including the government sector.

have different estimates of equilibrium employment, hours etc. Our purpose here is not to try and construct yet another measure of the output gap but to see what light other published data can shed on this issue. The first data series which we consider refers to capacity utilisation, where firms are asked questions of the form 'Are you operating at full capacity?' or 'Is system capacity likely to limit your ability to increase business over the next twelve months?'. A problem here is that the notion of full capacity is not well defined. It seems reasonable to suppose that a manufacturing firm is operating at full capacity if it is using its capital stock at the normal maximum level of operation. The same would also apply to a service firm like a restaurant. An accountancy firm would, however, probably say it was operating at full capacity if all the professionals within the firm were busy. It is obvious from these examples that working at full capacity does not refer to the production of the absolute maximum level of output. However, data on capacity utilisation do tell us something about the extent of spare capacity within firms given the existing levels of physical or human capital employed.

Spare capacity in the economy, however, also exists if there are individuals who are not currently employed who are willing and able to assist in the expansion of existing capacity by, for example, manning an extra shift or increasing the number of professionals in a business services company. This leads on to the second group of data series we consider, namely those which capture the extent of spare resources in the labour market. In particular we look both at pure labour market data, such as the unemployment rate, and at data capturing firms' views on the extent of spare capacity in the labour market.

Finally, the third type of data series we consider refers to the direct inflationary consequences of both labour market tightness and high levels of excess demand facing firms. We then finish with our overall conclusions on the current level of spare capacity in the United Kingdom.

## Spare capacity within firms

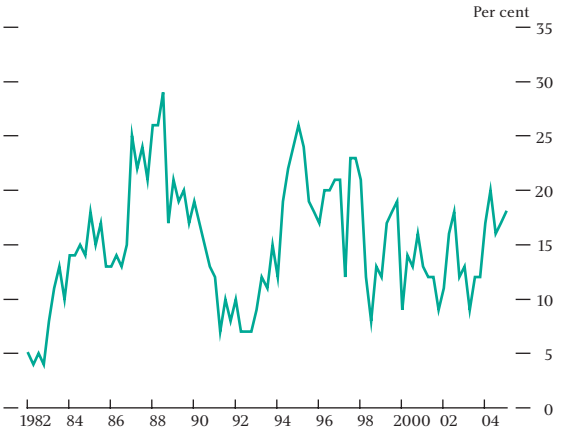
Information on capacity utilisation in manufacturing (20.5% of the private sector) is available from CBI (Confederation of British Industry) surveys, and these are set out in Chart 2. We have three capacity related questions. The first, in Chart 2a, reveals the proportion of firms which are currently operating at full capacity. In Chart 2b, we see the proportion of firms where

**Chart 2**
**Manufacturing capacity constraints**

**Chart 2a**
**Manufacturing capacity utilisation**


Source: CBI manufacturing, percentage of firms not working below a satisfactory full rate of operation.

**Chart 2b**
**Manufacturing, capacity shortage limits output**




Source: CBI manufacturing, percentage of firms which say that plant capacity is a factor limiting output over the next three months.

**Chart 2c**
**Manufacturing, investing for capacity reasons**

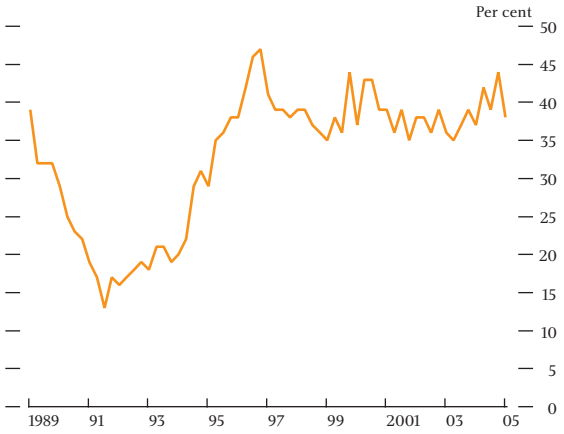

Source: CBI manufacturing, percentage of firms which say that capacity is one of the main reasons for investing in the coming year.

(shortage of) plant capacity is expected to limit output over the next three months and in Chart 2c we have the proportion of firms where (shortage of) capacity is a reason for capital expenditure over the next twelve

months. The overall picture is one where the 2004 level of capacity utilisation is close to that in 1999–2000, above that in 2001–03 but below that in 1995–98 and well below that in the late 1980s boom.

Turning to the service sector (67.4% of the private sector), the main overall measure of capacity utilisation is that reported by the BCC (British Chambers of Commerce), presented in Chart 3. On this measure, capacity utilisation in the service sector in 2004 is a little above that in 1999–2000 and above that in 2001–03 and 1995–98. The CBI produces data on the service sector which gives a slightly different impression. Services are divided into three sub-sectors, business services (39% of services), consumer services (48% of services) and financial services (13% of services). The data series presented in Charts 4a, 5a and 6a refer to the proportion of firms whose level of business is above normal and those in Charts 4b, 5b and 6b capture the proportion of firms where system capacity is

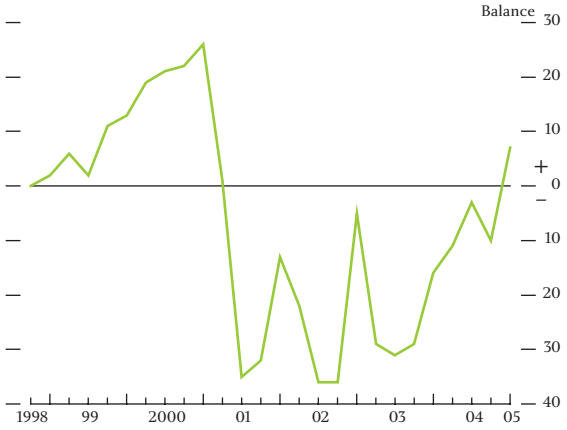
## Chart 3
## Service sector capacity utilisation




Source: BCC services, percentage of firms operating at full capacity.

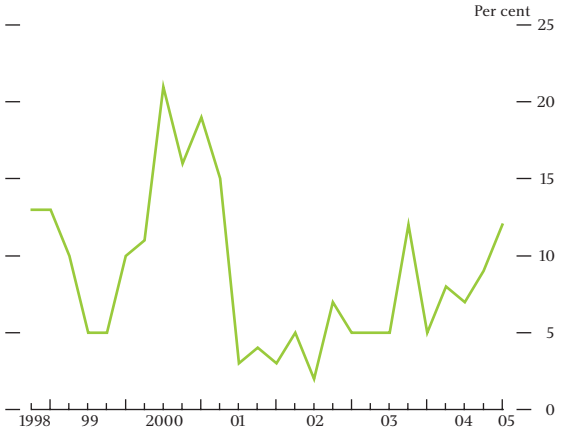
## Chart 4
## Business services capacity constraints

### Chart 4a
### Business services capacity utilisation




Source: CBI business services, percentage balance of firms with level of business above/below normal.

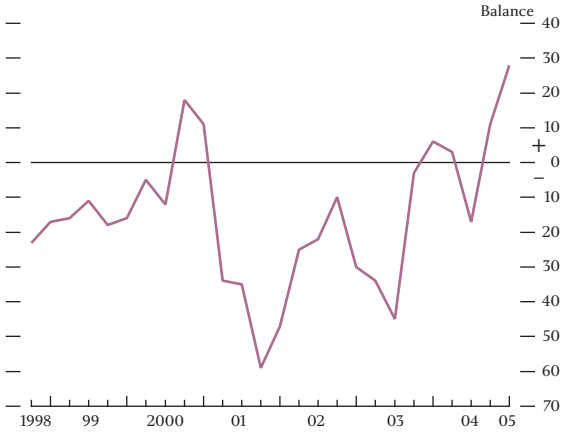
### Chart 4b
### Business services, capacity shortage limits output




Source: CBI business services, percentage of firms which say that system capacity is a factor limiting the level of business over the next year.

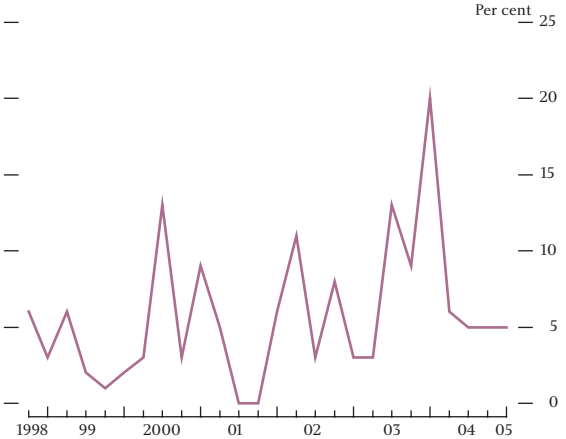
## Chart 5
## Consumer services capacity constraints

### Chart 5a
### Consumer services capacity utilisation




Source: CBI consumer services, percentage balance of firms with level of business above/below normal.

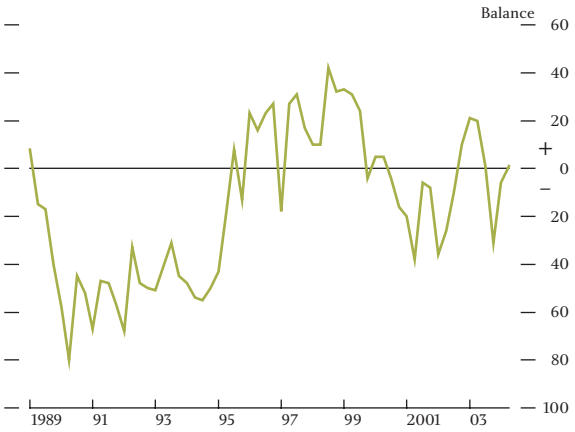
### Chart 5b
### Consumer services, capacity shortage limits output




Source: CBI consumer services, percentage of firms which say that system capacity is a factor limiting the level of business over the next year.

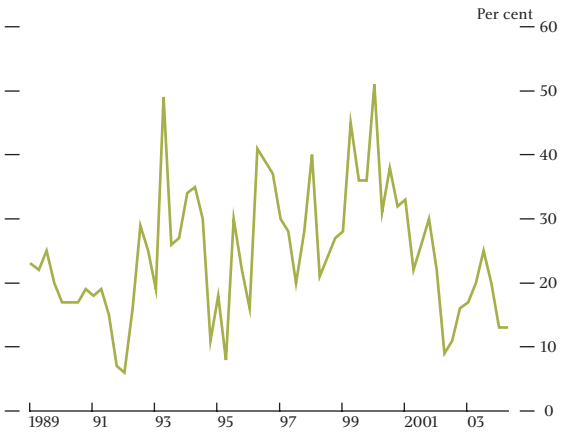
## Chart 6
## Financial services capacity constraints

### Chart 6a
### Financial services capacity utilisation




Source: CBI financial services, percentage balance of firms with level of business above/below normal.

### Chart 6b
### Financial services, capacity shortage limits output




Source: CBI financial services, percentage of firms which say that system capacity is a factor limiting the level of business over the next year.

likely to limit the level of business over the next twelve months. The overall picture here suggests that the 2004 level of capacity utilisation is, on balance, below that in 1999–2000, which contrasts with the BCC series.

In order to help us obtain a complete picture, we present a summary table of all the series (Table B). The overall impression is that capacity utilisation within firms in 2004 is a little below that in 1999–2000 but well above 2001–03. Looking at the first four rows, it is clear that capacity utilisation in 1995–98 is only a little below that in 2004. Finally, it is plain that manufacturing sector capacity utilisation was far higher in the late 1980s boom than in any recent period.

## Table B
## Capacity utilisation measures

Per cent

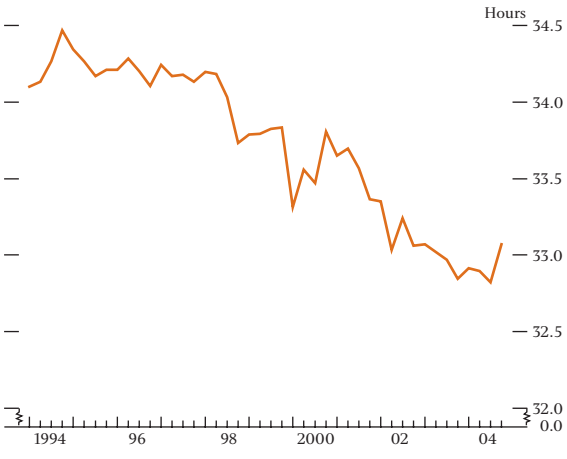
| | Per cent of private sector | 1987–88 | 1995–98 | 1999–2000 | 2001–03 | 2004 |
|---|---|---|---|---|---|---|
| CBI manufacturing (Chart 2a) | 20.5 | 63.1 | 46.0 | 39.4 | 31.7 | 41.5 |
| CBI manufacturing (Chart 2b) | 20.5 | 23.8 | 18.6 | 14.8 | 12.4 | 17.5 |
| CBI manufacturing (Chart 2c) | 20.5 | 36.8 | 35.4 | 31.3 | 24.5 | 34.3 |
| BCC services (Chart 3) | 67.4 | | 38.7 | 39.4 | 37.3 | 40.5 |
| CBI business services (Chart 4a) | 23.5 | | | 12.0 | -20.1 | -10.0 |
| CBI consumer services (Chart 5a) | 26.1 | | | -9.6 | -27.8 | 0.8 |
| CBI financial services (Chart 6a) | 8.6 | | -4.4 | 21.6 | -10.7 | -4.0 |
| CBI business services (Chart 4b) | 23.5 | | | 11.4 | 7.1 | 7.3 |
| CBI consumer services (Chart 5b) | 26.1 | | | 4.1 | 5.8 | 9.0 |
| CBI financial services (Chart 6b) | 8.6 | | 27.1 | 33.5 | 23.9 | 19.5 |
| Weighted average | | | | 20.2 | 11.9 | 18.9 |

Note: The weighted average is balanced in the sense that the series in this table cover both the manufacturing sector and the service sector three times. The distribution sector is not in CBI consumer services.

## Spare capacity in the labour market

One way for a firm to raise its output without increasing its capital stock or employing more people is to raise weekly hours. Average weekly working hours have been falling steadily since the 19th century, essentially because as individuals become richer, they choose to take more of their time in the form of leisure. Over the past ten years, average weekly hours worked in the private sector have still been falling, in part as a continuation of the long-term trend increase in the demand for leisure, partly as a consequence of the EU Working Time Directive and, more recently, as a response to the cyclical weakness in 2001–03. In recent months, average weekly hours have started to rise (see Chart 7). This turnaround may simply reflect a temporary blip in the secular downward trend. On the other hand, it may represent the start of a cyclical

## Chart 7
## Average weekly hours of work in the private sector



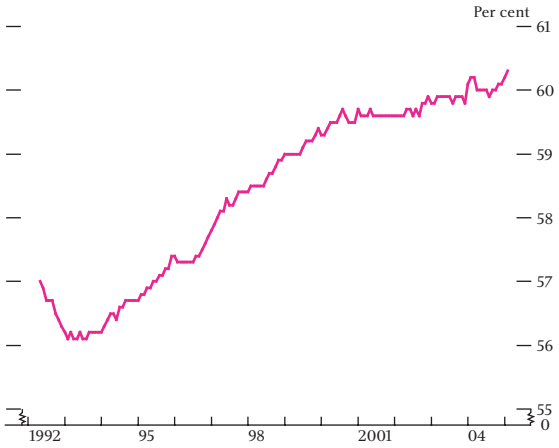

Source: UK Labour Force Survey.

upturn leading to a more permanent increase in normal working hours.

Which of these is correct has important implications for the extent of spare capacity. In the latter case, firms could expand output significantly without hiring any more employees. In the former case, when weekly hours fall back to their normal levels, firms would have to raise employment significantly in order to sustain output levels.(1) It is hard to say which of these is correct although the fact that there is no apparent increase in weekly pay corresponding to the rise in weekly hours may suggest a degree of measurement error in the latter series.

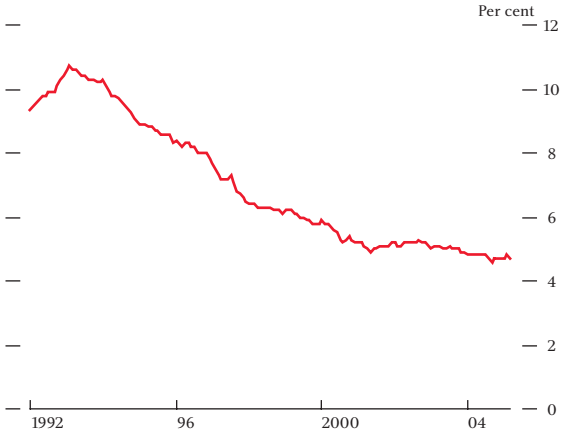
Turning now to the labour market, the overall picture is one where the UK population aged 16 or over is rising at around 300,000 per annum with a little under half of this being the consequence of net in-migration. This rate of net in-migration has been relatively stable since 1998 and is significantly higher than in previous decades, probably because of the buoyancy of the UK labour market over this period relative to that in continental Europe. In order to maintain a constant employment rate, employment would have to rise by around 180,000 per annum. Over the past twelve months, employment has in fact risen very close to this 'neutral' rate. That is consistent with the flattening off of the employment rate observed in Chart 8 and the unemployment rate in Chart 9. These days, the unemployment rate is not a particularly good measure of labour market slack because of the large number of individuals who enter employment from the inactive population (those who are without work who say they are not looking for work). To deal with this, we may look at the weighted non-employment rate, which covers all the non-employed, the numbers in different groups(2) of non-employed being weighted by their exit rates into employment relative to the exit rate of the short-term unemployed. This series is presented in Chart 10 and shows that the current level of spare capacity in the labour market is a little above the minimum level attained in 2000.

**Chart 8**
**Employment rate**



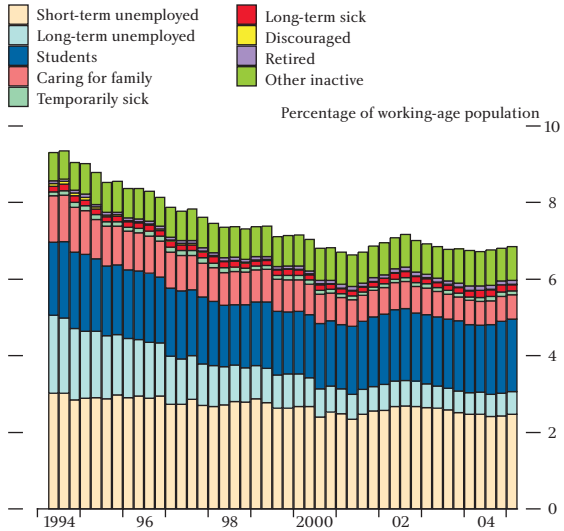

Source: UK Labour Force Survey (LFS). Employment as a percentage of the 16+ population.

**Chart 9**
**Unemployment rate**




Source: UK Labour Force Survey (LFS). Unemployment as a percentage of the labour force. Data are backward-looking three-month moving averages.

**Chart 10**
**Weighted non-employment rate**

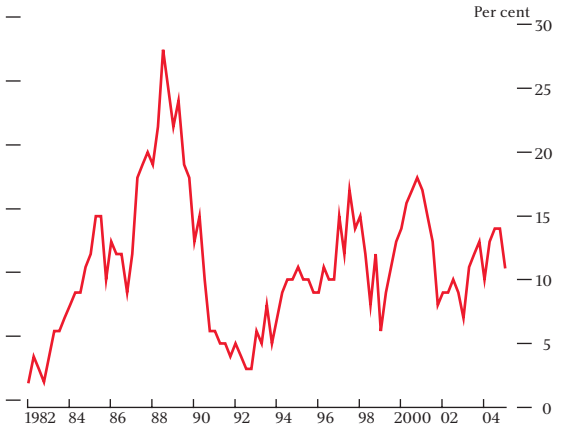



Source: UK Labour Force Survey (LFS). Take nine groups of non-employed (short-term unemployed, long-term unemployed, students, temporarily sick, discouraged, long-term sick, caring for family, retired and other), weight by their exit rates into employment relative to the exit rate into employment of the short-term unemployed, sum and divide by the working-age population.

(1) It is worth noting that apparently small changes in average weekly hours generate significant changes in overall GDP. Thus an increase of half an hour in average weekly hours corresponds to a 1½% rise in GDP.
(2) The groups are short-term unemployed (less than twelve months), long-term unemployed (greater than twelve months), students, temporarily sick, discouraged, caring for family, long-term sick, retired, other.

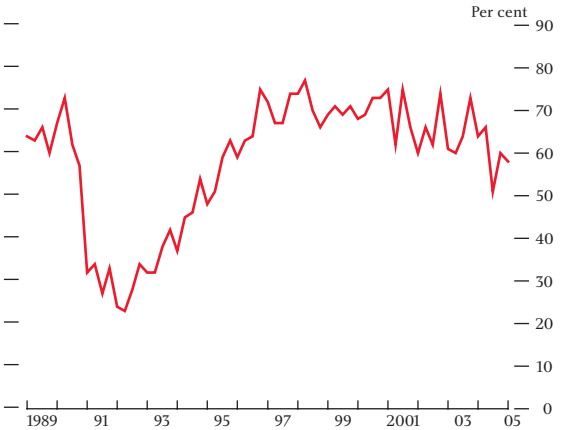
## Chart 11
## Manufacturing labour shortages

### Chart 11a
### Manufacturing skilled labour shortage




Source: CBI manufacturing, percentage of firms which report that a shortage of skilled labour will limit output over the next three months.

### Chart 11b
### Manufacturing recruitment difficulties



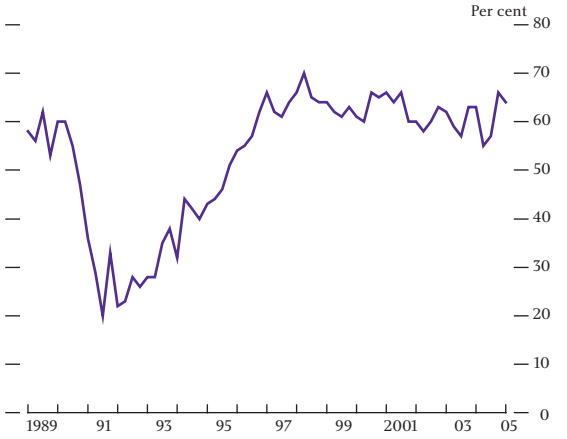

Source: BCC manufacturing, percentage of firms experiencing difficulties finding suitable staff.

These overall labour market ratios are not wholly reliable as indicators of labour market slack, in part because structural changes in the labour market have raised effective labour supply in recent years (see, for example, Nickell and Quintini (2002)). And this is a continuing process with the various New Deal programmes and in-work benefits (tax credits) still raising the effective supply of labour, albeit slowly.

Looking at the extent of labour market slack from the point of view of firms, we have a number of relevant series in both the manufacturing and service sectors. In manufacturing, we present in Charts 11a and 11b the CBI series giving the proportion of firms where one of the factors limiting output over the next three months is a shortage of skilled labour and the BCC series on the proportion of firms suffering from recruitment difficulties. Both series give the same impression of more labour market slack in 2004 than in 1999–2000 and the first reveals much more slack than in the late 1980s boom. In the service sector, we show the BCC series on recruitment difficulties (Chart 12) and three CBI series on the proportion of firms where the availability of professional staff is likely to limit the level of business over the next twelve months (Charts 13a, 13b and 13c). The overall picture suggests again that there is more labour market slack in 2004 than in 1999–2000.

To arrive at an overview, we present a summary table of all the series (Table C). The overall picture is one in which labour market tightness in 2004 is somewhat lower than in recent years, being well down on 1999–2000 and a little down on 2001–03. This contrasts with the degree of capacity utilisation within firms in 2004, which is well up on 2001–03.

## Chart 12
## Service sector recruitment difficulties




Source: BCC services, percentage of firms experiencing difficulties finding suitable staff.

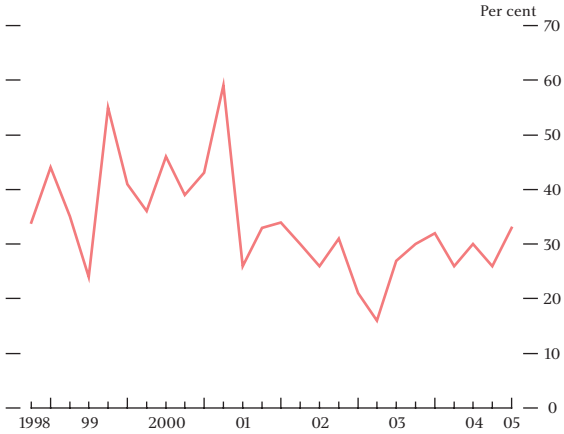
## Table C
## Labour market tightness measures

| | Per cent of private sector | 1987–88 | 1995–98 | 1999–2000 | 2001–03 | 2004 |
|---|---|---|---|---|---|---|
| CBI manufacturing (Chart 11a) | 20.5 | 20.4 | 11.6 | 13.0 | 11.1 | 12.8 |
| BCC manufacturing (Chart 11b) | 20.5 | | 65.6 | 70.4 | 66.5 | 60.3 |
| BCC services (Chart 12) | 67.4 | | 58.1 | 62.8 | 61.5 | 60.3 |
| CBI business services (Chart 13a) | 23.5 | | | 40.4 | 31.3 | 28.5 |
| CBI consumer services (Chart 13b) | 26.1 | | | 14.5 | 17.6 | 16.3 |
| CBI financial services (Chart 13c) | 8.6 | | 24.4 | 25.5 | 20.9 | 15.5 |
| Weighted average | | | | 42.8 | 40.7 | 38.8 |
| Weighted average (first three rows) | | | 53.5 | 57.7 | 56.1 | 54.6 |

See Note in Table B. The weighted average for the first three rows involves averaging the first two rows, and then taking a weighted average of this and the third row. The distribution sector is not in CBI services.

## Chart 13
## Services — availability of professional staff limits output

### Chart 13a
### Business services — availability of professional staff limits output

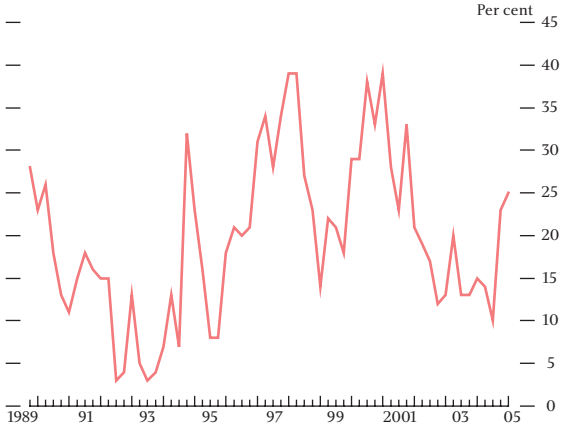



Source: CBI business services, the percentage of firms which say that the availability of professional staff limits the level of business.

### Chart 13b
### Consumer services — availability of professional staff limits output


Source: CBI consumer services, the percentage of firms which say that the availability of professional staff limits the level of business.

### Chart 13c
### Financial services — availability of professional staff limits output




Source: CBI financial services, the percentage of firms which say that the availability of professional staff limits the level of business.

## Direct measures of inflationary pressure

If there is no spare capacity in a market and demand continues to rise, then prices in that market will tend to accelerate, rising relative to costs. So, in circumstances where it is hard to detect the levels of spare capacity directly, it may be useful to look at what is happening to prices. Of course, there may be other reasons why prices accelerate or rise relative to costs — for example, falls in the level of competition in the market — so this sort of evidence can never be decisive. But it may nevertheless be helpful to see whether it is consistent with the quantity evidence.

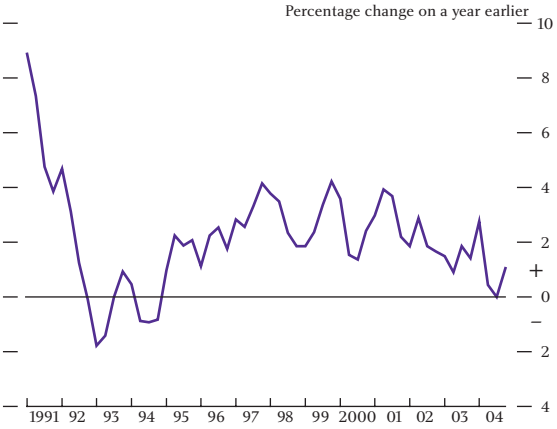
Starting with the labour market, we see in Chart 14 that underlying annual earnings growth in the private sector has been rising since mid-2003 at roughly the same average rate as it rose during 1999 and 2000. However, the rate of increase has slowed in the second half of 2004. Indeed, if we look at the three-month on three-month rate, this had been flat for nearly a year. Turning to the unit labour costs faced by companies, as opposed to pay, we see from Chart 15 that this has been trending downwards in recent years, essentially because private sector productivity growth has been outpacing private sector pay growth over this period. Overall, this evidence is consistent with the view that labour market tightness has not significantly worsened since 2000.

## Chart 14
## Underlying annual earnings growth in the private sector


Source: ONS Average Earnings Index, private sector three-month annual earnings growth excluding bonuses.

Turning to product market prices, first we look at the pattern of price inflation and second we consider the key issue of whether or not output price inflation has been higher than unit cost inflation, since this would be a typical consequence of excess demand. Output price

**Chart 15**
**Private sector unit wage costs**




Source: Bank of England.

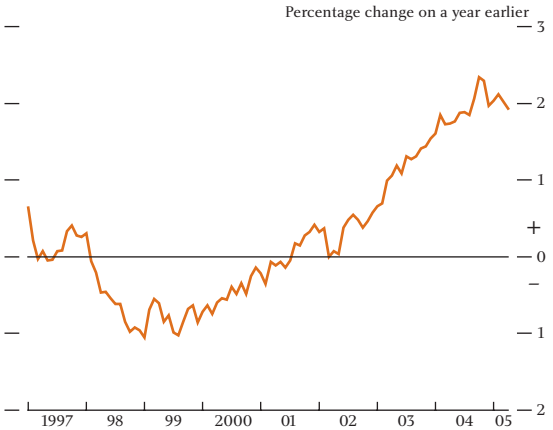
inflation exceeding unit cost inflation is equivalent to rising profit margins,(1) so we look at profit margins in various sectors.

A broad picture of domestic output price inflation is provided in Chart 16, where we present domestic goods price inflation (excluding petroleum products) in Chart 16a and CPI services price inflation in Chart 16b. Goods price inflation started rising in 1999 and continued to rise until 2004. However, since mid-2004, the inflation rate has stopped rising, flattening off at around 2%, despite cost inflation continuing to rise (driven by commodity prices). CPI services price inflation started rising in 2000 and continued to rise for nearly three years before falling back. Recently, however, it has gradually begun to increase again, mainly because package holiday prices were unusually weak in 2003.

Turning to profit margins, in Chart 17 we present two measures, one based on the Annual Business Inquiry (ABI), the other on National Accounts (NA) data. In Charts 17a and 17c we present estimates of average profit margins in manufacturing from 1995. The overall picture is one of declining margins from 1997 to 2001. Then, the ABI data suggest some recovery of margins in 2002 and 2003. However, the NA data suggest a continuing slow decline in margins right up until 2004. As yet, we do not clearly understand this discrepancy. (The ONS indicates that the ABI numbers for 2003 are probably better. However, the Datastream estimates of manufacturing margins for quoted companies look more like the NA data.)

**Chart 16**
**Domestic price inflation**

**Chart 16a**
**Domestic goods inflation**




Source: ONS, domestic goods price inflation excluding petroleum products.

**Chart 16b**
**CPI services inflation**


Source: ONS consumer prices index, services price inflation.

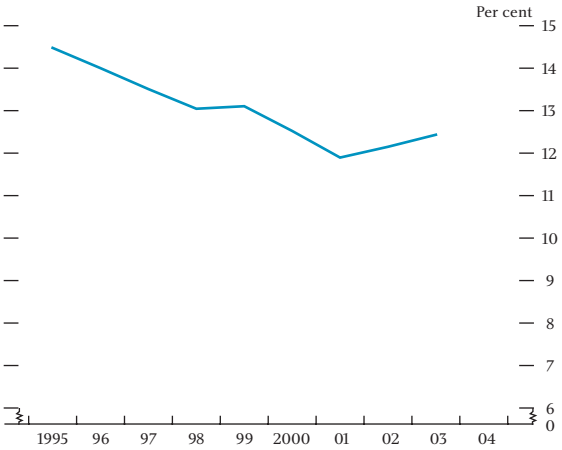
The data are more consistent in the service sector, where both the series in Charts 17b and 17d indicate declines in service sector margins around the turn of the century, then stability in recent years. There is no evidence of any increase in margins in 2004 in the NA data.

Overall, the data suggest that margins have been relatively stable recently, whereas they were generally falling around the turn of the century. In the manufacturing sector, falling margins from 1998 were only to be expected following the huge rise in the sterling exchange rate during 1996–97. This would have vastly increased the competitiveness of foreign companies, leading to strong pressure on the margins of

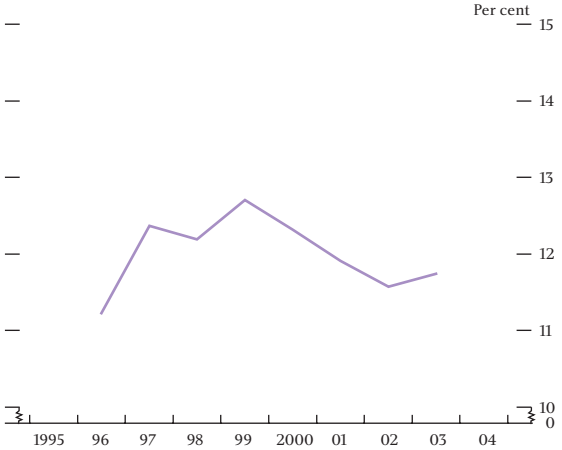
(1) The profit margin is profit/(sales revenue).
profit/(sales revenue) = (sales revenue – costs)/(sales revenue)
= 1 – (costs/sales revenue)
= 1 – (unit cost/price)
So if prices are rising relative to unit costs, then the profit margin is rising.

## Chart 17
## UK profit margins

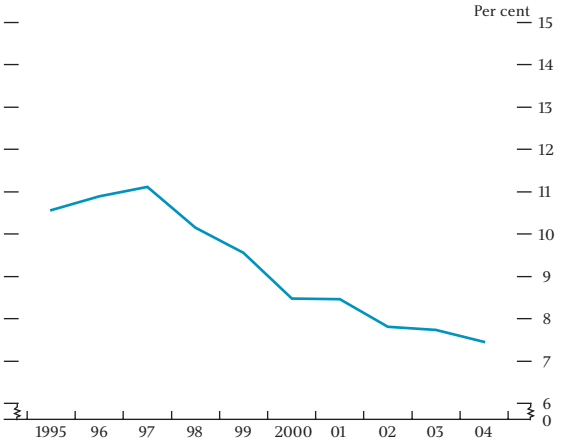
### Chart 17a
### Margins in manufacturing (ABI)




### Chart 17b
### Margins in services (ABI)




### Chart 17c
### Margins in manufacturing (NA)




Note: The manufacturing sector is defined as SIC(92), sector D.

### Chart 17d
### Margins in services (NA)


Note: The service sector is defined as SIC(92), sectors G, H, J, K, O, namely wholesale and retail, hotels and restaurants, transport and communication, renting and business activities and other services.

Note: Margins are defined as (gross operating surplus)/(gross output). The ABI measure comes from the Annual Business Inquiry, the NA measure from the National Accounts. They differ because the data come from different sources, notably for 2003 and 2004. The pattern of NA data is thought to be more accurate prior to 2002.

home companies which would have masked any excess demand effects in 1999–2000. Quite why service sector margins were falling for several years after 1999 is not clear, because all the other data suggest that demand was particularly strong in 1999–2000.

## How much spare capacity is there in the UK economy?

The general picture from the within-firm data is that there is slightly more spare capacity in 2004 than during the previous peak in 1999–2000, with slightly less capacity than in the late 1990s and considerably less than in 2001–03. Within the labour market there is more evidence of spare capacity in 2004, the data suggesting that in 2004, spare capacity is greater, on average, than over the whole period 1999–2003 although a little less than 1995–98. The wage inflation and labour cost data are broadly consistent with this picture. However, the price and margins data are more difficult to interpret, although there is no strong evidence of either accelerating prices or rising margins in 2004.

So what does this all add up to? The overall impression is that the amount of spare capacity available in 2004 is greater than in 1999–2000, not very different from that in 2001–03 and slightly less than in 1995–98. This is at

variance with the OECD numbers in Table A, where there is less spare capacity in 2004 than in any other period. It is also at variance with the HM Treasury numbers, where there is more spare capacity in 2004 than in any other period. On balance, there still appears to be some spare capacity available in the labour market, but within firms the overall situation is relatively tight. It is plain, however, that the amount of capacity available is significantly greater than in the boom of the late 1980s.

## Reference

**Nickell, S and Quintini, G (2002)**, 'The recent performance of the UK labour market', *Oxford Review of Economic Policy,* Vol. 18, Issue 2, Summer.

# Communicating monetary policy in practice

*In this speech,[1] Marian Bell[2] reflects on the process and communication of monetary policy and examines four occasions on which the interest rate decision has 'surprised' the financial markets. The MPC is straightforward in its communications, she says, but monetary policy deals with risks and uncertainties and can be over-simplified or over-interpreted by commentators, keen for a direct steer on the next interest rate decision. Moreover, commentators need to distinguish between individual views and the collective message. There is an inevitable tension between the two, but individual accountability is an important factor in the strength of the current framework and it would be folly to interfere with it. It is unlikely that interest rate 'surprises' can be eliminated altogether in a transparent monetary policy regime. If monetary policy announcements contain new information on the state of the economy, perhaps because policymakers are better placed to interpret what macroeconomic news means for the outlook for inflation and output, then transparency might increase the extent to which financial markets react to policy announcements.*

It is a great pleasure to be here, the third member of the Monetary Policy Committee to have the privilege of speaking in this distinguished Vital Topics lecture series at the Manchester Business School. My links with Manchester and its business community go back around thirty years, to when my late father, Denis Bell, was appointed chairman of the then North Western Electricity Board (Norweb) and my family moved to the area. They still live here, and I have been able to witness Manchester's stunning development and progress of recent years, be it Salford Quays, the new merged University, or the Spinningfields development where The Royal Bank of Scotland has its new offices.

When I accepted Professor John Arnold's kind invitation to give one of this year's Vital Topics lectures, I must confess I had not appreciated that it was to be sponsored by the *Manchester Evening News* and The Royal Bank of Scotland. So I am surprised and delighted to discover that tonight I have a double pleasure: not only am I honoured to be speaking in this, the first Vital Topics lecture series of the new Manchester Business School, now the largest campus-based business school in the United Kingdom, but I am sharing the platform with an old friend and colleague from RBS, Martin Merryman, Director of RBS Financial Markets North.

Aware that I would be approaching the end of a three-year term on the Monetary Policy Committee when I spoke to you this evening, I had considered that it might be appropriate to offer you some reflections on the process and communication of monetary policy in this country. In the event that seems to have been a felicitous judgement. For it was in May, almost exactly eight years ago, shortly after an historic election victory by the Labour party, that significant changes to the framework of monetary policy in the United Kingdom were announced, which established the monetary policy regime we have today. And it was in a Royal Bank of Scotland dealing room that I heard the news.

In those days interest rate announcements were a big deal and a crew from ITN were standing ready to film the financial markets' reaction to the first interest rate decision of the new Chancellor, Gordon Brown, and to record my comments. But it was not just an interest rate change that was announced. A new Monetary Policy Committee of the Bank of England was to be formed and given operational independence to set interest rates to achieve the Government's inflation target.

Hitherto interest rates had been determined by the Chancellor of the Exchequer following consultation with

(1) A Vital Topics lecture given at the Manchester Business School on Tuesday 17 May 2005. This speech can be found on the Bank's website at www.bankofengland.co.uk/publications/speeches/2005/speech244.pdf.

(2) I would like to thank Jenni Greenslade, Stuart Lee, Lavan Mahadeva, Jonathan Marrow and Alex Muscatelli for their help in preparing this speech; Rachel Reeves and Michael Sawicki for allowing me to draw on their work; the Governor, Peter Andrews, Kate Barker, Charles Bean, Vanessa Crowe, Rebecca Driver, Howard Picton, Peter Rodgers, Alison Stuart and Peter Westaway for helpful comments on an earlier draft; and my family for their patience. 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.

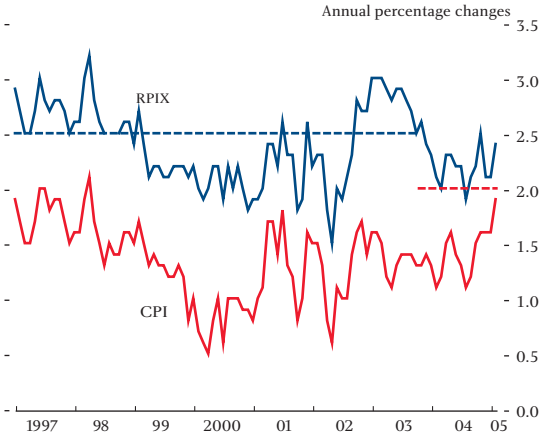
the Governor of the Bank of England. The shortcomings of this procedure, which had become known as the 'Ken and Eddie' show under the previous administration, were contrasted with the new arrangements by then Governor Edward, now Lord, George in a Manchester Business School Vital Topics lecture in February 1998. As he told this audience: 'the reflective, interactive, debate within the Monetary Policy Committee is very different (too) from the sometimes exaggerated advocacy of a particular viewpoint which inevitably crept in to the Ken and Eddie show during which the Bank usually had at most an hour in which to persuade a sometimes reluctant Chancellor!'(1)

So unexpected was the announcement of Bank of England independence when it came in May 1997 that it took me some minutes to persuade the assembled team from ITN that the real story was not the interest rate change (a rise of a quarter percentage point as it turned out) but the new monetary regime, a story which, I believed, should lead the lunchtime news. I was whisked to the studios where I declared that this was an event of historic significance, a brave and progressive move that subsequent governments would be unlikely to reverse.

And so it has proved. In the recent election campaign no major political party proposed any changes to the system in their manifestos. And even the particular choice of inflation target (currently 2% on the consumer prices index measure of inflation), a legitimate matter for democratic choice, was unchallenged. The new system is widely perceived to have been a success. Until December 2003 the Monetary Policy Committee was charged with keeping inflation of the retail prices index excluding mortgage interest payments (RPIX) at 2.5%. It averaged almost exactly that, 2.4%, over the period, never deviating by more than 1 percentage point either side of target. And inflation on the new consumer prices index measure is currently close to its 2% target (Chart 1). As an aside, it should be noted that the rather higher rate recently recorded by the RPI is due to higher mortgage costs as the MPC has raised interest rates over the past year. RPIX, which strips this effect out, is close to its old 2.5% target. Moreover economic growth and employment have been remarkably stable, though one can argue about the extent to which that reflects good luck rather than good judgement.(2)

For the past three years, as a member of the Monetary Policy Committee, I have had the privilege of being part

**Chart 1**
**Annual inflation**




Source: Office for National Statistics.

of that process. Tonight I would like to share with you some reflections.

As Lord George recognised, in that first MPC Vital Topics lecture in which he described the new arrangements, a key element of the United Kingdom's monetary policy framework is its transparency. Under the Bank of England Act 1998, the goal of monetary policy is clear. It is to achieve price stability as defined by the government's inflation target, reconfirmed to the Committee each year at Budget time, and, subject to that, to support the government's economic policy objectives. We are lucky; not all monetary policy makers have such a clear objective. The transparency of the target buttresses the credibility of monetary policy, helping inflation expectations to remain anchored and making it easier to bring inflation back to target in the event of shocks. A clear understanding of the policy process builds confidence and mitigates sudden surprising moves in interest rates which can unsettle real economic behaviour.

The Committee communicates its policy in several ways. Many of the tools it has at its disposal are an integral part of the policy framework, enshrined in legislation and detailed in the Chancellor's annual letter to the Governor setting out the MPC's remit. First, there is the monthly interest rate announcement itself, sometimes with an accompanying statement. Two weeks after the meeting to which they refer minutes are published. A quarterly *Inflation Report* gives a detailed assessment of the economic conjuncture and the Committee's forecasts for growth and inflation, detailing the uncertainties and risks to the central projection, and is

(1) See George (1998).
(2) See Bean (2005) and Bell (2005).

followed by a televised press conference by the Governor. Individual members of the Committee are regularly called before parliamentary committees, the Treasury Select Committee of the House of Commons and the Economic Affairs Committee of the House of Lords, and they give media interviews and speeches, working with the twelve Agencies of the Bank around the regions and nations of the United Kingdom. No doubt many of you will be familiar with the Bank's Agent in the North West of England, John Young, and his two deputies, Graeme Chaplin and Neil Ashbridge.

Of course under the framework the Committee has another tool of communication at its disposal that it has in fact not so far been able to use in practice. Should inflation deviate from target by more than 1 percentage point the Governor is required to write the Chancellor an open letter explaining why, outlining the steps the Committee proposes to take in response, the period within which inflation is expected to return to target, and how this approach meets the government's monetary policy objectives. A further letter is to be sent after three months if inflation remains more than 1 percentage point away from target. Some commentators have interpreted this system as the Committee's punishment for failure if inflation falls outside an acceptable target range. It is not. The target is a symmetric point target. The MPC is required to achieve 2% CPI inflation at all times. But it is recognised that 'the actual inflation rate will on occasions depart from its target as a result of shocks and disturbances. Attempts to keep inflation at the inflation target in these circumstances may cause undesirable volatility in output' and employment.(1) In other words, in the event of a substantial shock the letter provides a public opportunity for the Committee and Chancellor to engage in an open debate about the desirable strategy for bringing inflation back to target. As the Chancellor noted when setting out the MPC's remit: 'In responding to your letter, I shall, of course, have regard for the circumstances prevailing at the time.'

So how good is MPC communication in practice? How transparent are we? In my experience the MPC is straightforward in its communications. The MPC doesn't spin. Nor are we disingenuous. For instance, if MPC members say they are not targeting house prices, that means they are not targeting house prices. This doesn't always make interesting copy and there is sometimes a tendency to look for hidden messages. But the truth is often more simple. We are even more boring than you might think.

Unfortunately for headline writers, however, the stuff of monetary discourse is risk and uncertainty, the nuanced probabilistic language of possibilities and likelihoods. As the present Governor, Mervyn King, likes to point out, the probability that our central projections for output and inflation will be realised is close to zero. That is why the forecasts are presented in the form of fan charts representing the Committee's collective view of the likely probabilities of a range of different outturns. But, as the Governor also reminded us recently, public debate in many policy areas deals poorly with issues of risk and uncertainty: 'The reluctance to give adequate prominence to risks may reflect the fact that many of us feel uncomfortable with formal statements of probabilities.'(2) Perhaps as a result, commentators may be inclined to oversimplify and overinterpret MPC comment. A speech or interview is rarely a direct hint about the next vote. It would be a foolhardy hostage to fortune if it were.

In addition, the MPC faces a challenge in communicating policy that is not faced by many other central banks. Monetary policy in the United Kingdom is not formulated collectively by the Committee, but individually. The policy decision each month is taken by majority vote and each member is individually accountable to the government, parliament and the public at large for his or her decisions. The votes, and the arguments which inform them, are published in the *Minutes*. If I have formed one overwhelming impression from my years on the MPC it is of the importance of individual accountability, and of the respect accorded to the integrity of members' individual views among the staff of the Bank and within the process itself. The individual accountability of members of the Monetary Policy Committee is paramount. And the procedures originally established by Governor George and the then Chief Economist, now Governor, Mervyn King, respect and safeguard individual accountability. You can see this in the influence individual members have on the research agenda and the willingness of the staff to pursue minority interests. You can see it in the complete absence of pressure to vote in a particular way for, while issues are discussed in great depth, there is no advance disclosure of voting intentions, no deals struck in cabals or smoke-filled rooms (in fact since

(1) See Bank of England (2005b).
(2) King (2004).

Sir Edward ceased to be Governor we have had no smoke-filled rooms at all). And you can see it in the care the Governor takes, as his predecessor did, always to be the last to give his policy recommendation, after the rest of the Committee have spoken, so as not to exercise any undue influence on the vote.

This is important. There is evidence that committees make better decisions,(1) not just reflecting majority voting, but also because the pooling of individual knowledge among committee members 'means that a group can be more than just the sum of its parts'.(2) Some commentators have argued that dissent on the Monetary Policy Committee, as measured by the frequency of split votes, appears to have diminished and that might mean the Committee is less effective. But what appears to matter to the effectiveness of committees is the exposure to a diversity of view, the wide-ranging nature of discussion, the willingness to consider all possibilities. The persistence or otherwise of minority voting tells us little about the diversity of opinion expressed. Having disagreed with and voted against the majority on the Committee, as I have on several occasions, I have been happy to find that real engagement has enabled me to vote with the majority again, at least for a while. Indeed two MPC colleagues, Lomax (2005) and Lambert (2005), have noted the importance of the lengthy discussion that takes place on the Committee in formulating the *Inflation Report* projections, and indeed it appears that Committee members are individually more likely to alter their views in *Inflation Report* months, suggesting that the process has informed their views.(3)

In fact the financial markets appear to recognise that the discussion can be as informative as the vote. Analysis undertaken at the Bank of England finds that on average the MPC *Minutes* contain as much news for the financial markets when the vote is unanimous as when it is split.(4) But it is important that both the *Minutes* and the *Inflation Report* adequately reflect the breadth of debate and views on the Committee. There can be many routes to the same conclusion. At least one observer has suggested that concentration on the voting record might encourage individual members to raise their profile by dissenting.(5) That would be unfortunate.

It has been supposed that individual accountability might confuse the clear communication of monetary policy. The Committee does not co-ordinate a communications strategy. If we all speak at once it may tell you something about the common pressures on our diaries, but not that we have a strategy to get a collective message across. In any case speeches are usually arranged too far in advance for that to be practicable. To form expectations of the future course of interest rates, therefore, observers need to understand the thinking not of one but of nine, and not just on the central view but also on the attendant risks and uncertainties. Might a multiplicity of voices speaking about monetary policy make it harder to understand? In the early days of the Committee I had feared that it might and that there might be a tension between individual accountability and effective communication.(6)

So what are the features of a transparent monetary policy regime against which the performance of the MPC can be assessed? First, there is credibility. On this the current policy framework scores highly. After the new framework was announced in 1997 inflation expectations in the financial markets, which had generally exceeded the old target, quickly came in line with the new target (Chart 2). Expectations have remained anchored at target since, suggesting that the new regime is more credible than the old.

It might also be expected that movements in official interest rates would be fully anticipated in a totally transparent monetary policy regime in which the policymakers' so-called 'reaction function' was fully understood. Although expectations of the future course of interest rates would respond to economic developments, the public would know how the policymakers would process the information and the interest rate moves themselves would be anticipated. Monetary policy would indeed be boring. However, in an early study using data from January 1994 up to

(1) See Blinder and Morgan (2000), Lombardelli, Proudman and Talbot (2002) and Surowiecki (2004).
(2) Lombardelli, Proudman and Talbot (2002).
(3) In her speech Rachel Lomax (Lomax (2005)) showed that 'since 2001, almost two thirds of rates changes taking place in *Inflation Report* months, compared with the one third that would be expected if rate changes were evenly spread over the year.' We can see a similar pattern in changes to the level of interest rates that members individually voted for. On average, members changed the level of interest rates they voted for 48% of the time in all *Inflation Report* meetings, compared to 37% of the time for all meetings.
(4) I am grateful to Rachel Reeves and Michael Sawicki for this analysis.
(5) See Gerlach-Kristen (2003).
(6) See Bell (1999).

## Chart 2
## Ten-year ahead inflation expectations (market-based)


Notes: This chart shows the ten-year ahead annual inflation forward rate, defined as the difference between the ten-year ahead annual nominal rate and the ten-year ahead annual real rate, as calculated from nominal and index-linked government bonds.

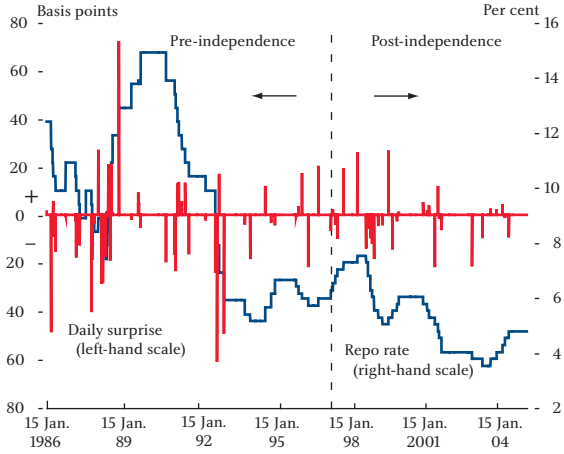
RPI is the measure of inflation used for index-linked bonds, but is not the target measure for inflation in the United Kingdom. RPI will differ from both RPIX and CPI. In part, these differences reflect the coverage of the index. For example RPI includes mortgage interest payments. In addition, RPI will typically be higher than CPI due to a formula effect, as the CPI uses a geometric mean rather than an arithmetic mean to aggregate individual prices within each expenditure category.

Source: Bank of England.

June 1999 Clare and Courtney (2001) found little change in the market reaction(1) to interest rate announcements following independence. In other words interest rate decisions appeared to surprise as much after independence as before. Lasaosa (2005) extended this study to June 2001 and found that not only could interest rate announcements still surprise after 1997 but that macroeconomic data announcements surprised the markets less in the post-independence period, and interest rate changes about the same or more. This was the opposite of what might have been expected. Moreover, at least up until mid-2001, it did not appear that surprises were diminishing, as might have been expected had it taken the markets time to learn how the new regime worked.

How should we make sense of this finding? Could this imply that the UK regime is not so transparent and well understood after all? Or might there be aspects of transparency which could raise the likelihood of surprises? First, it should be noted that these studies compare data post-independence with the period 1994 to 1997, whereas in fact some aspects of the current regime, such as an inflation target, publication of the *Inflation Report* and the minutes of the (albeit very different) monetary policy meeting were in place by 1994.(2) Indeed Chart 3,(3) which shows the extent to which financial markets have been surprised by interest rate decisions since 1986, appears to suggest that surprises had diminished by 1994 compared with the earlier period, although the extent of earlier surprises might have been exaggerated in a less liquid market. Second, Lasaosa (2005) uses data up to mid-2001 and it is possible that more recent evidence taken from the past four years could show that the incidence of surprises has diminished.

## Chart 3
## Daily surprise on policy rate change days (1986–April 2005)




Sources: Bank of England and LIFFE. See footnote 3 below.

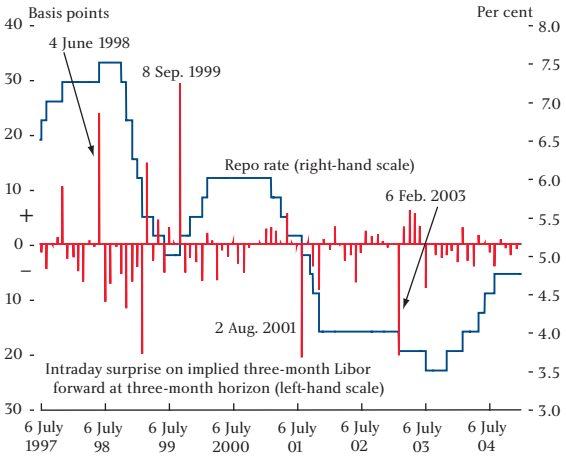
Moreover, in a forthcoming paper, Lavan Mahadeva of the External MPC Unit shows that if monetary policy announcements contain new information on the state of the economy, and hence the likely future stance of policy, then transparency might increase the extent to which financial markets react to policy announcements. This might occur if the policymakers are better placed to interpret what news means for inflation and output, and for policy. Policy announcements would then act as a beacon, helping the private sector understand the economic conjuncture. This would suggest that we

(1) Relative to average volatility.
(2) Important changes which were implemented since September 1992 were the quantification of an inflation target in October 1992 by Chancellor Lamont; the publication of a quarterly *Inflation Report* since February 1993; the formalisation of the role of the monthly meetings between the Governor and the Chancellor; the publication of the minutes of meetings; and the issuance of a press notice outlining the reasons for the change. See, for example, Bowen (1995).
(3) The data used are on the three-month Libor interest rate futures contracts traded on the London International Financial Futures and Options Exchange (LIFFE). A three-month constant horizon implied forward rate is derived from adjacent contracts by linear interpolation. The chart shows the daily (8.00 am to 6.00 pm) surprise on days that the policy rate was changed since 1986. Rate changes were not always implemented according to a pre-announced timetable of days or times for this period. Hence we use the daily surprise.

might expect the relative incidence of surprises to have increased following Bank of England independence, reflecting both the increased transparency of the decision-making process and the role of experts in setting the policy rate.

In an attempt to understand the reasons for the persistence of surprises in the new policy regime we have examined the events and market behaviour leading up to the four occasions on which the financial markets appear to have been most surprised by an interest rate announcement. These are the occasions when the move in the implied three-month interest rate three-months forward(1) from 15 minutes before an interest rate announcement to 45 minutes after it has been the largest (Chart 4). The four occasions are June 1998, September 1999, August 2001 and February 2003. In all cases it was a decision to change the official interest rate that surprised, rather than an unexpected no-change decision; and longer-dated expectations (for three-month interest rates six and twelve months hence) also recorded significant moves, suggesting that the interest rate surprise was more than simply one of the timing of a rate move that was otherwise anticipated. The two most recent surprises were in *Inflation Report* months, perhaps reflecting the intensity of the Committee debate in those months.

**Chart 4**
**The repo rate and intraday surprises on MPC decision days**




Sources: Bank of England and LIFFE. See footnote 3, page 270.

All four surprises seem to have resulted from a difficulty in identifying turning points. Three occurred well into the cycle, when many of the economists surveyed by Reuters had thought that rates had already peaked or troughed; in September 1999 it was the timing of the first rate rise that surprised. The prevalence of surprises at turning points would seem to be consistent with the rate decision having provided a signal to help the private sector understand policy and interpret the current conjuncture. Moreover, the *Minutes* of the meetings reveal that several of the surprises seem to stem from an asymmetric interpretation of economic data by the Committee and the private sector, which would also suggest that the rate decisions played a role in signalling the monetary policy implications of economic news. The Committee's concern about the strong average earnings figures in June 1998 is the most striking example of this, but differences in interpretation of data also appears to have played a role in the September 1999 and the August 2001 surprises.

None of the rate decisions were unanimous. But in all but one instance, the previous month's meeting had seen a minority voting for the move made the following month.(2) This is consistent with Petra Gerlach-Kristen's finding that minority voting is informative about subsequent interest rate moves.(3) However on two occasions there had been a three-way vote in the previous month, with a minority also voting for a move in the opposite direction.(4) On each occasion there had been one or more speeches, and also interviews, by MPC members in the month leading up to the decision. On the first two occasions this included members who didn't support the rate move. On the last occasion, February 2003, a speech by Governor George was incorrectly interpreted by some observers as ruling out a cut. However, although this may have reinforced prevailing interest rate expectations, there is no evidence from financial market prices that this speech altered expectations. In the event, the Governor voted with the majority in favour of a cut in rates. This evidence suggests that a multiplicity of individually accountable voices speaking in the period leading up to the interest rate decisions could have led to a misinterpretation of the majority position and been a factor contributing to the four interest rate surprises we have examined.

## Conclusion

So it would seem that no matter how clear the MPC might be in communicating, asymmetric information

(1) See footnote 3, page 270.
(2) In the case of the June 1998 rate rise the *Minutes* for the prior meeting had not yet been published but the previous published *Minutes* revealed several members voting for a rise.
(3) See Gerlach-Kristen (2004).
(4) Although on the first such occasion, in June 1998, that would not have been known at the time. See footnote 2, above.

and knowledge will mean that surprises cannot be entirely eliminated. Moreover, the complex nature of the subject matter, the range of potential outturns, the risks and uncertainties can militate against simplistic expressions of the outlook for growth, inflation and interest rates.

The inevitable tension between the expression of individual opinion and the expression of a clear message is another ingredient that can complicate communication. But individual accountability is an important factor in the strength of the current framework. It would be folly to interfere with it. So it is important that the full range of argument and diversity of opinion be expressed in the *Minutes* and the *Inflation Report*. Financial markets and the media have shown that they have the sophistication to deal with it. Of course, interviews and speeches can further elucidate individual viewpoints. But the expression of an individual view between meetings has to be regarded as just that — an individual view.

What is clear, however, is that while individuals on the Committee may differ on the outlook, the risks, or the policy implications, they all remain committed to achievement of the inflation target. So you can be sure of one thing; whatever the economic weather, there are nine individuals committed to ensuring that CPI inflation stays close to 2%. That message at least is simple.

# Appendix of tables

## Table 1A
## Surprise of 4 June 1998(1)

| Size of intraday surprise on implied three-month Libor forward rate at a constant horizon of: | | | Monetary policy speeches and published press interviews in prior month | Meeting vote | Previous vote | Reuters Poll summary |
|---|---|---|---|---|---|---|
| Three months | Six months | Twelve months | | | | |
| 0.238 | 0.250 | 0.204 | Speeches: MAK (27/05/98); EAJG (28/05/98) Press interviews (date published): DC (08/05/98); DJ (13/05/98) and MAK (15/05/98). | 8:1 vote for a rise of 25bp to 7.5%. Dissenter: DJ (cut). | Minutes released on 10/06/98. 6:2 vote for no change. Dissenters: WB (rise), DJ (cut). | 25 out of 27 economists predicted no change, 2 predicted a rise. |

## Table 1B
## Surprise of 8 September 1999

| Size of intraday surprise on implied three-month Libor forward rate at a constant horizon of: | | | Monetary policy speeches and published press interviews in prior month | Meeting vote | Previous vote | Reuters Poll summary |
|---|---|---|---|---|---|---|
| Three months | Six months | Twelve months | | | | |
| 0.293 | 0.309 | 0.199 | Speeches: MAK (27/05/99); Press interviews (date published): DJ (02/09/99); and SW (02/09/99). | 7:2 vote for a rise of 25bp to 5.25%. Dissenters: DJ and SW (no change). | Minutes released on 18/08/99. 9:0 vote for no change. | All 23 economists predicted no change. |

## Table 1C
## Surprise of 2 August 2001

| Size of intraday surprise on implied three-month Libor forward rate at a constant horizon of: | | | Monetary policy speeches and published press interviews in prior month | Meeting vote | Previous vote | Reuters Poll summary |
|---|---|---|---|---|---|---|
| Three months | Six months | Twelve months | | | | |
| -0.207 | -0.141 | -0.196 | Speeches: SW (24/07/01). Press interviews (date published): CB (18/07/01) and (21/07/01); EAJG (20/11/01); DJ (23/07/01) and (01/08/01); SJN (23/07/01), (26/07/01) and (27/07/01); SW (20/07/01) and (25/07/01). | 6:3 vote for a cut of 25bp to 5%. Dissenters: DC, MAK and IP (no change). | Minutes released on 18/07/01. 8:1 vote for no change. Dissenter: SW (-25bp) | All 28 economists predicted no change. |

(1) Sources: Bank of England, LIFFE and Reuters. The surprise is measured as the difference between 11.45 am and 12.45 pm values. See footnote 3, page 270. Christopher Allsopp (CA); Charles Bean (CB); Kate Barker (KB); Willem Buiter (WB); David Clementi (DC); Sir Edward George (EAJG); Charles Goodhart (CAEG); DeAnne Julius (DJ); Mervyn King (MAK); Sir Andrew Large (AL); Ian Plenderleith (IP); Stephen Nickell (SJN); Paul Tucker (PMWT); and Sushil Wadhwani (SW).

## Table 1D
## Surprise of 6 February 2003

| Size of intraday surprise on implied three-month Libor forward rate at a constant horizon of: | | | Monetary policy speeches and published press interviews in prior month | Meeting vote | Previous vote | Reuters Poll summary |
|---|---|---|---|---|---|---|
| Three months | Six months | Twelve months | | | | |
| -0.202 | -0.241 | -0.250 | Speeches: CB (29/01/03); and EAJG (20/01/03). Press interviews (date published): KB (17/01/03), (18/01/03), (19/01/03), (23/01/03); and EAJG (21/01/03). | 7:2 vote for a cut of 25bp; rate to 3.75%. Dissenters: AL and PMWT (both no change). | Minutes released on 22/01/03. 7:2 vote for no change. Dissenters: CA and SJN (-25bp). | All 28 economists predicted no change. |

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# Monetary policy in the United Kingdom — the framework and current issues

*In this speech,*[1] *Kate Barker*[2] *member of the Bank's Monetary Policy Committee, describes the background to the introduction of the current UK monetary policy framework and addresses some potential criticisms of the inflation-targeting approach from the perspective of the UK experience. Specifically, she suggests that worries that the inflation targeters place insufficient weight on output are misplaced and that it would be counterproductive to target asset prices. In addition, she stresses the importance of being seen to act symmetrically to hit the target, in order to preserve credibility. Finally, she discusses the problems of setting monetary policy in the face of uncertainty about structural change and asks whether recent productivity improvements, as well as the recent pickup in average hours, have any implications for the split between the trend and cycle in the United Kingdom.*

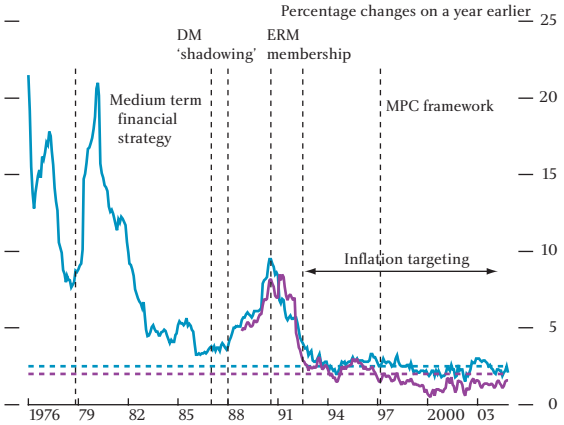
It is a great pleasure for me to have been invited over to discuss with you our approach to monetary policy in the United Kingdom. The UK system is still relatively young — just coming up to its eighth birthday. The key changes made in 1997 were to give the Bank of England operational independence to conduct monetary policy, and to specify a point inflation target. Initially somewhat controversial, central bank independence is now strongly and widely supported. Today, after a brief description of the key features of our framework, I will discuss some issues related to inflation targeting, and also look at the implications for monetary policy of recent trends in UK productivity.

## The United Kingdom's inflation-targeting framework

The monetary policy framework put in place by the newly-elected Labour Government in May 1997 leaves the Government to set the inflation target, which is confirmed or changed annually in the finance minister's Budget. It is a point target (presently 2%), and symmetric, so that we place equal weight on deviations in either direction. Decisions about the repo rate are taken monthly by a Monetary Policy Committee of nine individually accountable members. Each of our votes carries equal weight, and the votes are made public within two weeks of the policy announcement.

In considering the rationale for this structure, it is important to take account of the background. From the mid-1970s, UK monetary policy pursued an unsteady course (Chart 1), at different times based on money supply targets (variously defined), and on exchange rate targets (formal and informal). In 1992 sterling was forced out of the European Exchange Rate Mechanism, and subsequently a target was introduced to reduce inflation over the course of the 1992–97 parliament. This policy period was quite successful, but had some key drawbacks. Most significant among these was the

**Chart 1**
**The history of UK inflation**




Note: The solid blue line in this chart shows the annual rate of RPIX inflation. The target for RPIX was 2.5% from June 1997 to December 2003 and is shown by the dashed blue line. The solid purple line shows the annual rate of CPI inflation. The target for CPI inflation has been 2.0% since December 2003 and is shown by the dashed purple line.

(1) Delivered at the National Association of Business Economics Policy Conference, Washington DC on 21 March 2005. This speech can be found on the Bank's website at www.bankofengland.co.uk/publications/speeches/2005/speech243.pdf.

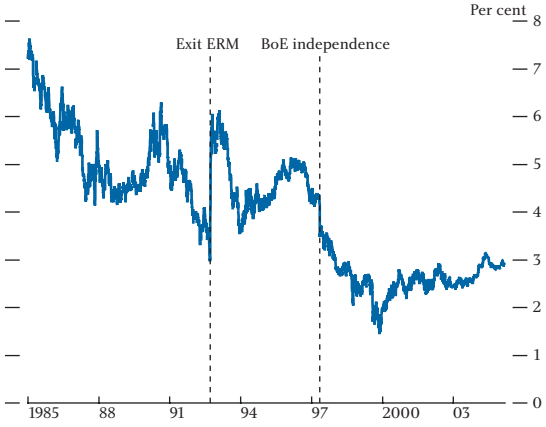
(2) I am extremely grateful to Rebecca Driver and Miles Parker for their research towards this speech, and to Peter Andrews, Charles Bean, Marian Bell, Rob Elder, Katie Farrant, Jennifer Greenslade, Lavan Mahadeva, Steve Nickell, Lea Paterson, Sally Reid, Sally Srinivasan, Jumana Saleheen, Alison Stuart and Jan Vlieghe, for their helpful and pertinent comments. Of course, this speech reflects my personal views.

continued suspicion that interest rate decisions, taken by the finance minister after consultation with the Bank of England Governor, reflected political considerations.

The 1997 framework was a big step forward — clearly set up with permanence in mind, as demonstrated by the passing of the Bank of England Act. Previous monetary frameworks had changed at short notice, raising problems of time inconsistency (the suspicion that governments will renege on monetary policy commitments for reasons of political expediency). The operational independence of the Bank is therefore crucial, but the need to ensure widespread public support for central bank independence underpinned the decision, also welcome on other grounds, to retain political control over the target itself.

Having a symmetric point inflation target means that there is now little room for uncertainty about what the MPC is seeking to achieve, making it relatively straightforward for us to be held to account by the Government, parliament more widely, and the public in general. For the business community, there is clarity over the background relevant to their own price and wage-setting. So this has been a sound framework within which the MPC has been able to establish and retain credibility. The evidence from financial market inflation expectations is that these fell sharply in 1997, and subsequently have remained broadly consistent with achieving the target (Chart 2). The MPC has been

**Chart 2**
**Market expectations of RPI inflation**




Note: This chart shows the ten-year-ahead annual inflation forward rate, defined as the difference between the ten-year-ahead annual nominal rate and the ten-year-ahead annual real rate, as calculated from nominal and index-linked government bonds.

RPI is the measure of inflation used for index-linked bonds, but is not the target measure for inflation in the United Kingdom. RPI will differ from both RPIX and CPI. Part of these differences reflect the coverage of the index, for example, RPI includes mortgage interest payments. In addition, RPI will typically be higher than CPI due to a formula effect, as the CPI uses a geometric mean rather than an arithmetic mean to aggregate individual prices within each expenditure category.

successful in meeting the target; over the 79 months in which our target was 2.5% based on the UK retail prices index excluding mortgage interest payments (RPIX), the average inflation rate was 2.4%. Also, inflation has never moved more than 1% either side of the target in any month (this is perhaps surprising, as more variability in inflation might have been expected due to supply shocks, and would not have indicated a policy failure). This success has been supported by a strong focus on transparency and communication.

At the end of 2003, the MPC's target was changed to 2%, but now based on the consumer prices index. Formula differences in the calculation of the CPI means that it is about 0.5% below RPIX. If this were all, there would be no effect on monetary policy even in the short term. But it is a little more complex than that, as there are coverage differences, in particular that the CPI excludes housing costs, and over the long term the difference is around 0.7%. The changeover has been successfully handled, and the fact that this was not a matter of much economic significance is well understood in financial markets.

## What are the issues for policymakers of operating with an inflation target?

The use of inflation targeting is certainly not without its critics — either generic criticisms of the whole approach, or relating to the particular remit and approach of an individual central bank. The following comments on some key points in this debate are based only on the framework and experience at the Bank of England, and in the time available cannot do full justice to the complexity of the question.

### Inflation and output trade-off

Initially, a criticism from both business and the wider public was that the primacy of the inflation target puts too little weight on output and unemployment. However, one success of our communication is that many businesses at least now understand better that, in the long term, real variables will not be affected by the course of nominal developments. But, of course, since 1997 the UK economy has experienced continuous growth — whether this understanding would prove durable through any future period of sharp downturn is not clear.

The UK framework and the MPC's approach also enables output volatility to be taken into account when that is

desirable. By tackling the remit in a forward-looking manner, focusing on prospects for inflation for the medium term, we are able to allow the first-round, direct effects from shocks (such as big rises in the oil price, or changes in indirect taxation), to feed through to inflation, directing our focus at the possibility of second-round effects if the jump in the price level impacts on wages. In the instance of a deviation from target which is more than 1 percentage point away in either direction, the Governor is required to write to the Government setting out the MPC's strategy for returning to target, providing an opportunity in these circumstances to clarify that we were seeking to avoid unnecessary output volatility (where this applies with smaller deviations a similar point would be made in the published minutes of the policy meeting).

More technically, it is argued that the focus on inflation targeting reduces flexibility and implies that real objectives are not incorporated in an optimal manner.(1) Certainly the MPC's approach aims to be appropriately flexible, rather than overly rule-based. The response to a medium-term central forecast for inflation which is away from the target in either direction (based on the Committee's views of the most likely economic projection), is not an automatic change in the repo rate. Rather, the risks to the outlook, and the question of whether a change should be delayed, will be considered. Often this will be embodied in the mean of the inflation forecast being away from the mode over the medium term, as indeed it was during the February 2005 forecasting round. But my view would be that the MPC should be prepared to contemplate the mean of the forecast, around the two-year horizon, being away from the target if this were due primarily to a supply shock, and if the interest rate response needed to bring inflation to target more quickly would lead to significant output volatility.

Can these trade-offs, and the role of goals other than inflation, be communicated clearly within the inflation targeting approach?(2) It is argued that lack of clarity could weaken claims to policy transparency, and risks an undue focus on inflation as the only quantified target. With regard to the former, the variety of possible economic conjunctures and their associated risks make any attempt to specify trade-off rules in general terms a rather fruitless exercise. But the onus is indeed on the MPC to account for how and why output concerns have affected any particular decision. And while the latter is certainly a theoretical possibility, the distinction of demand and supply shocks in our thinking suggests that in the United Kingdom we are very conscious of the need to strike an appropriate trade-off.

### Potential conflicts with minimising output fluctuations

There is another issue which might be thought of as a disadvantage of a precise target. In general, it is the case that one result of successful inflation targeting is to limit output fluctuations away from trend. But it is possible to imagine some conflicts. For example, in the United Kingdom, CPI inflation was more than 0.5 percentage points below target between July and October 2004. At the same time the economy was growing broadly around trend, and unemployment was at a historically low level. Evidence from business surveys of capacity utilisation chimed with the conclusion of model-based estimates in suggesting that the economy was operating at around full capacity. One of the reasons for this low inflation was the weak trend in import prices. If those circumstances had persisted, then it was possible that the only way in which inflation could be returned to target would have been to allow the rate of growth to be above trend for a time.

Allowing the economy to run above trend to stimulate higher inflation and then slowing it in order to prevent a target overshoot seems rather unattractive. It implies considerable confidence in the ability of monetary policy to fine-tune developments, and runs the risk that it will be more difficult than expected to brake the rise in the inflation rate once it is underway. This risk can, however, be lessened by seeking to return inflation to the target rather gradually. And if inflation expectations are based around the target, and the monetary authorities are credible, then there will be some momentum towards the target in price and wage-setting. But to retain this valuable credibility, it is important both that the target is regained, and that monetary policy is clearly set to achieve this. In fact, in the United Kingdom, subsequent events have changed the picture. One is that the CPI has in any case moved up towards target over the past three months. Another, discussed further below, is the possibility that capacity may be a little less tight.

However, it is in principle correct to be concerned about inflation being below target, even if the level of output

(1) See, for example, Woodford (2004).
(2) Faust and Henderson (2004).

seems to be close to trend, in order to demonstrate the importance attached to the symmetry of the inflation target. In the United Kingdom, influenced by the lengthy period of economic history dominated by a concern to control high and volatile inflation, it is argued that there were signs over the late 1980s and 1990s of a precautionary bias in policy in favour of low inflation, rather than economic expansion.(1) It is important to demonstrate that such asymmetries no longer exist.

### The asset price issue

While questions about trade-offs and communication are important, a criticism that would be more significant if justified is that central banks do not pay enough attention to asset prices. In the four years since I joined the United Kingdom's MPC, we have been criticised for allowing the exchange rate to remain too strong, and more recently for permitting a bubble to develop in the housing market (several commentators remain concerned that there is a risk of a widespread downturn when this possible bubble bursts). In general, I consider there are good reasons for not acting to offset movements in asset prices *per se*. The first is the considerable uncertainty about whether or not a bubble exists — and if it does, how serious it is.

For example, while UK house prices are certainly at historically high levels at present, relative to incomes, there are factors which support an increased equilibrium price: lower interest rates lowering the initial cost of a mortgage; low long-term real interest rates (which have increased the asset value of housing); an inadequate supply of new build; increased use of housing as a savings vehicle for pensions. There are some signs which might indicate a housing bubble — increased private buying of housing for letting with the expectation of capital gain, and parents using equity from their own homes to assist children with deposits — but it is not clear how far these may have contributed to higher prices. So it would also not be clear what scale of adjustment in house prices monetary policy should seek to achieve.

More importantly, a shift to targeting asset prices might result in significant changes of interest rates away from the level which would be appropriate to achieve the inflation target. This is likely to create uncertainty about what the aims of monetary policy are, and lead to volatile inflation expectations. In particular, there is a risk that the central bank would end up chasing one asset price after another, with real costs in terms of uncertain strategy — similar indeed to the problems experienced in the United Kingdom in the 1970s and 1980s.

Concluding that asset prices should not be targeted does not of course mean that their impact on the economy and the related risk of volatility can be ignored. As suggested by fellow MPC member, Charlie Bean, concerns about major economic volatility which could result from a bubble deflating is a factor which should be taken into account in discussing risks around a central forecast, and therefore could have some effect on current decisions.(2) In practice this means giving a bit more weight to possible major deviations from the inflation target which might be beyond the usual policy horizon of around two years' ahead.

The worry about house prices reflects a view that the low level of inflation over the past few years is partly due to external factors (the strong exchange rate and very weak world goods price inflation). The consequent low nominal interest rates may have encouraged consumers to increase debt burdens to unsustainable levels, due to unrealistic income expectations. In the United Kingdom the household savings rate has declined from around 9%–11% in the early 1990s to around 6% in 1998, below the 8% average since 1963. But since 2000 it has remained broadly stable, and consumer spending has moved generally in line with income growth. It seems equally likely that most of the rise in debt has resulted from more stable economic conditions in the United Kingdom, with strong competition among loan providers enabling more effective consumption smoothing for those with sound long-term income prospects. Alongside this there are a number of low income households whose debt levels pose real problems.

## A current question: is recent low UK inflation related to a productivity improvement?

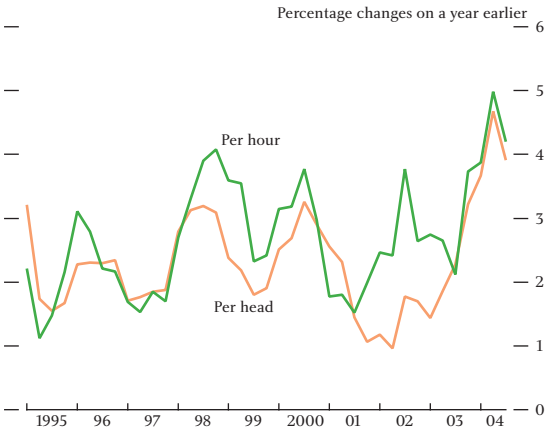
A central question faced by any monetary policy regime in considering the appropriate trade-off between inflation and output variability is identifying structural change. So in considering how to respond to the recent surprisingly low rate of UK inflation discussed above, it

(1) Cukierman and Muscatelli (2002).
(2) Bean (2003).

is necessary to identify the cause. Distinguishing between candidate explanations remains difficult, but one possibility is that the United Kingdom is now experiencing the kind of improvements in productivity that the United States saw around a decade earlier. This was not evident to policymakers in the (official) US productivity data at the time, but became clear through subsequent data revisions. However, on the basis in particular of higher ICT investment, improving profit margins, and anecdotal and survey evidence from business, a number of FOMC members argued that there were signs of a favourable productivity shock, some time ahead of confirmation from the data.

To what extent, picking up on a description of the US economy in the late 1990s, might it be true that Goldilocks has acquired a holiday home? In the United Kingdom, GDP growth over the past eight years has averaged 2.8% — above the average of the previous 25 years. Yet inflation has remained low, and surprisingly so, even when account has been taken of factors such as subdued import price inflation. Data on UK productivity (Chart 3) suggests some pickup in private sector output per head in the late 1990s, with a slowdown in 2001–02. Over the past year, labour productivity per head and per hour have picked up quite sharply, but this is a very short period from which to draw conclusions about a change of trend. Is there any reason to believe that there have been some similar measurement issues, and the recovery in productivity was present earlier?

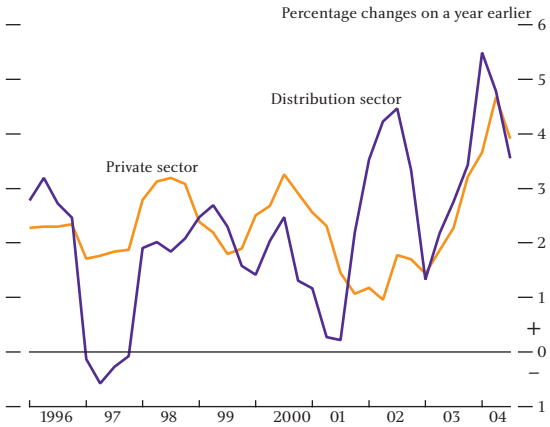
**Chart 3**
**Private sector productivity**




Note: Data on private sector output are measured in chained volume terms, defined as GDP minus the output of public administration, education and health sectors. Data on private sector heads and hours are based on LFS microdata.

Certainly, ICT capital investment did pick up in the United Kingdom during the 1990s. Oulton and Srinivasan[1] suggest that ICT capital does boost productivity growth, though with a lag. But they argue that successful implementation of ICT projects requires costly reorganisation which obscures the productivity benefits for a time. This might support the idea that the recent pickup is the fruition of this ICT capital, and the recent strong relative performance of UK distribution sector productivity might suggest that this sector has reaped these gains earlier (Chart 4). But there are also reasons to be cautious. Work by McKinsey[2] tentatively suggests that IT investment is less important to productivity than management capabilities, and further that the United Kingdom has not, in general, been quick to adopt innovative management techniques.

**Chart 4**
**Productivity growth per head**




Note: Data on private sector output are measured in chained volume terms, defined as GDP minus the output of public administration, education and health sectors. Data on private sector heads are based on LFS microdata. Labour productivity in the distribution sector is defined as gross value added at basic prices divided by employment.

Unlike the United States, where the profit share was strong in the mid-1990s, in the United Kingdom private sector gross operating surplus was declining during the late 1990s. It has picked up since 2001, but remains below the mid-1990s peak. Of course, it is possible that any productivity stimulus in the United Kingdom is coming from a different source. Rather than arising from better use of ICT investment, as in the United States, firms might have been through a period of increased competitive pressures (due both to globalisation and to more intense domestic competition policy). Ultimately the companies that survive this period will seek to improve margins, in order to earn adequate returns.

(1) Oulton and Srinivasan (2005).
(2) Casserley (2004).

Nor has the United Kingdom experienced any particular discrepancy with regard to productivity growth between the real-time official data and company comment — except possibly as regards manufacturing, where anecdote about productivity has been stronger than the data for some time. And business survey data on capacity utilisation accords with the view that capacity utilisation is at fairly high levels, as has been the case broadly since 1995.

While the UK evidence does not indicate the same statistical discrepancy as in the United States, productivity measurement remains uncertain in the service sector, and there is always a possibility that future data improvements will produce a different picture of the past few years. The most recent period, based on current data, does show a pickup in output per hour, and there are factors which might support a continued improvement, including a lagged response to ICT investment, or the stimulus of stronger competition. Both of these explanations could lie behind the gains in distribution sector productivity, which began in 2002. However, 2004 has also been a recovery period, with rising hours worked suggesting more intensive use of labour. It is likely to be several quarters yet until it is possible to distinguish a cyclical pickup from a trend improvement — although equally the latter cannot be ruled out.

The rise in hours worked (average hours per week for all workers have risen by around 0.5 hours from a low point in mid-2004) prompts a slightly different question. Since 1998, hours have generally been declining, and this reversal might indicate that a greater part of the recent decline reflected cyclical factors rather than a structural trend. In this case, the labour market might be a little less tight, and the supply capacity of the economy somewhat better.

## Conclusion

The framework for monetary policy put in place in the United Kingdom in 1997, with operational independence for the central bank, has won widespread acceptance and support. It has weathered some economic squalls, although it is perhaps true to say that it has not yet been tested by a serious storm. The key features of the regime — the symmetric inflation target, the forward-looking nature of decision-taking, and a committee of independently accountable individuals — have all played a part in marking a considerable improvement from the previous history of UK monetary policy decision-taking.

In this context, point inflation targeting has been helpful in communicating clearly about the new regime, and anchoring inflation expectations. There have been criticisms of the framework — in particular that there is insufficient focus on stabilising output, and that insufficient attention is paid to asset prices. But I believe that the practice of UK monetary policy, and the MPC's communication of it, mean that these criticisms are misplaced. For a policymaker, stress on practice is crucial — we know our forecast will not be exactly right, and that the economy may not respond to policy changes quite as we expect. In those circumstances, precise rules about trade-offs are not helpful, but clarity about our objective is.

Finally, is the United Kingdom now set to enjoy a period of a Goldilocks economy, in which strong productivity enables faster growth to be combined with achieving the inflation target? The evidence is building, but cannot yet support optimism similar to that of the United States in the mid-1990s. While the latest data suggest some productivity improvement, it is too early to reject the alternative explanation that this is simply a cyclical rise. Further, given some signs of relatively poor adoption of best practice management techniques in the United Kingdom, a degree of scepticism about productivity gains from ICT seems justified. However, over the coming quarters it will be necessary to look hard at this question, and remain open to the possibility of a structural improvement. A different reason to reconsider the judgement about the present and prospective supply capacity of the economy is the possibility that the recent rise in average hours worked suggests a stronger trend in hours, and that the labour market is not quite as tight as presently estimated.

Over coming months, the MPC will no doubt continue to reflect on these and other issues. And I hope we will continue to examine suggestions for improving policy communication and transparency with an open mind.

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# A matter of no small interest: real short-term interest rates and inflation since the 1990s

*In this speech,[1] Marian Bell,[2] member of the Monetary Policy Committee, notes how in recent years low and stable inflation has been combined not only with low unemployment and steady growth in nominal demand, but also with low short-term interest rates, both nominal and real. Nor does this phenomenon appear confined to the United Kingdom. The average real short-term interest rate over an economic cycle appears to have been positively correlated with the level of inflation for a variety of developed economies over the past decade or so, suggesting that the real natural rate of interest consistent with an economy growing at potential and stable inflation might have fallen since the late 1980s across a range of economies. Ms Bell discusses a number of factors that might account for this relationship, including a reduction in macroeconomic volatility, a reduction in the risk premium, more credible monetary policy and a reduced tax wedge between real and nominal interest rates at lower levels of inflation.*

UK inflation as measured by the consumer prices index has fluctuated in a relatively narrow band of around ½% to 2% for eight years. Much attention has recently been focused on why inflation has been so subdued and whether it will continue; two of my colleagues on the MPC, Richard Lambert and Steve Nickell, have given speeches on the subject.[3]

One aspect that has surprised has been the combination of sustained low inflation and real rates of economic expansion that have by historical standards been relatively rapid. In a series of publications the MPC have pondered the reasons for the apparent change in the relationship between wage growth and unemployment in particular, and between demand pressure and price inflation more generally. The Committee concluded that a combination of increased potential supply in the British economy and a more favourable short-run trade-off between excess demand and inflation may have been responsible.[4] In its central projections the Committee has assumed that this will continue to some degree, at least in the near term.

This evening I want to concentrate on another aspect of this apparent improvement in the inflation-output trade-off: how is it that persistently low inflation and steady growth in nominal demand has been accompanied by such low short-term interest rates?[5] UK official interest rates have peaked at successively lower levels: 15% in 1989, 7½% in 1998 and 6% in 2000. Rates troughed at 3½% in 2003. And this phenomenon is not just confined to the United Kingdom. Across a wide range of major industrialised economies both inflation and short-term interest rates have been unusually low in recent years.

One explanation for persistently low short-term interest rates in the major economies is of course low inflation itself. The lower inflation, the lower nominal interest rates can be for a given real return. But that isn't the whole story. Even adjusting for inflation, short-term real interest rates have been low. The average *ex-post* real rate in the United Kingdom rose to over 2% in 2004, up from a low in 2003 but still short of the near 7% level it reached in 1990.[6] Using an eclectic mix of

(1) Delivered to the Institute of Directors (South East Midlands) and Milton Keynes and North Bucks Chamber of Commerce at Cranfield University on 2 March 2005. This speech can be found on the Bank's website at www.bankofengland.co.uk/publications/speeches/2005/speech241.pdf.

(2) I would like to thank Lavan Mahadeva, Alex Muscatelli and Jonathan Marrow for their invaluable research assistance in preparing this speech; also Peter Andrews, Ryan Banerjee, Kate Barker, Charlie Bean, Rebecca Driver, Mike Joyce, Mervyn King, Peter Lildholdt, Ben May, Michael Sawicki and Tony Yates for comments on an earlier draft. The cross-country analysis of real interest rates and inflation over the cycle presented here builds on earlier empirical work by Jenni Greenslade, Stuart Lee and Neil Parker. Luca Benati estimated the time series of conditional volatilities of UK interest rates and inflation. I am grateful to them all. The views expressed are my own and do not necessarily reflect those of either the Monetary Policy Committee or the Bank of England.

(3) Lambert (2004), Nickell (2005).

(4) See for instance MPC *Minutes* February 2004 and November 2004, *Inflation Report* February 2004 and February 2005.

(5) This is a separate but related issue to that of low long-term interest rates and the low expected future short-term rates that are embodied in them.

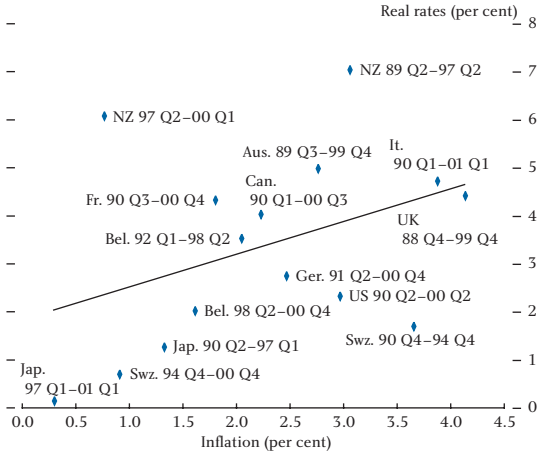
(6) Calculated by subtracting average annual RPIX inflation from the annual average base rate.

methodologies for estimating real interest rates, Larsen, May and Talbot (2003), find a step down in one-year real interest rates in the United Kingdom at around the time of the introduction of inflation targeting in 1992.

Indeed, it appears that the lower the inflation rate, the lower the real, inflation adjusted short-term interest rate over the economic cycle.

Chart 1 shows an empirical observation I became aware of some years ago.(1) It plots average inflation over an economic cycle against the average inflation-adjusted short-term interest rate for up to two economic cycles in eleven economies, a total of 15 observations in all.

**Chart 1**
**Real interest rates and inflation over the cycle, 1990s**




See Table A for definition of cycle (peak to peak).

Sources: The IMF, national statistical offices and central banks of the respective countries.

One might think that the average real interest rate over the cycle comes close to an estimate of the natural real rate, defined as the real interest rate that is consistent with stable inflation and an economy growing in line with its potential. Conceptually, the natural real rate of interest is the rate that would prevail were all prices fully flexible so that aggregate demand always equalled aggregate supply.(2) However, just as with other conceptually appealing ideas, such as the natural rate of unemployment or the output gap, in practice the natural rate of interest is not observable and must be inferred from the behaviour of output and inflation. Estimates are very uncertain.

From the chart it appears that the average short-term real interest rate over the cycle is positively related to the inflation rate; the higher the inflation rate, the higher on average the real interest rate. For the period from the late 1980s, this finding is robust to different methodologies, including using estimates of *ex-ante* real interest rate expectations and alternative specifications of the economic cycle. A casual survey of economic history might also appear to support this finding. In the 1950s and 1960s when inflation was low, short-term real interest rates in the United Kingdom were also low.(3) However, a positive relationship between real short-term interest rates and inflation was not apparent during the high inflation decade of the 1970s.

On the face of it, this seems odd. Economists have tended to assume that the neutral real interest rate is constant at around the long-term average real rate. Even sophisticated dynamic stochastic general equilibrium models, which allow the natural rate to vary, only do so around a steady-state equilibrium rate that is assumed to be constant. We might expect the natural rate to vary with real economic developments. For instance, the MPC has suggested that the fall recently observed in real long-term interest rates might be related to increased planned saving by the ageing baby-boomer generation;(4) an increase in trend productivity growth might be expected, other things being equal, to lead to an increase in the real natural rate in the long run; increased fiscal deficits might raise real long-term interest rates; and a lower natural real interest rate in recent years might have been the consequence of a series of negative demand shocks. But economic theory tells us that nominal values should on average be unrelated to the real economy.(5) So what factors might account for the apparent positive relationship between average real short-term interest rates and inflation over the past decade or so?

We can decompose the short-term nominal interest rate into the expected risk-free real post-tax return, tax, expected inflation and risk premia. But in simple calculations of the real rate of interest, following

(1) I am grateful to former colleagues at the Royal Bank of Scotland for earlier assistance with the collection and analysis of these data.
(2) See for instance Neiss and Nelson (2001) and Woodford (2003).
(3) Chadha and Dimsdale (1999) proxy inflation expectations by the three-year moving average of the *ex-post* inflation rate and examine the behaviour of the real rate in the United Kingdom from 1875–1997. On this *ex-post* measure, the short real rate averages 0.67% from 1951 to 1968.
(4) *Inflation Report*, February 2005.
(5) Indeed the Mundell-Tobin effect suggests that there should be a negative relationship between real interest rates and expected inflation. See, for example, Orphanides and Solow (1990).

## Table A
## The timing of the cycles (peaks) used in Charts 1 and 2

| | Dates of cycle (peak to peak) | Average real rates | Average inflation | Average inflation volatility | Dates of cycle (peak to peak) | Average real rates | Average inflation | Average inflation volatility |
|---|---|---|---|---|---|---|---|---|
| Australia | 1989 Q3–1999 Q4 | 4.99 | 2.76 | 0.85 | | | | |
| Belgium | 1992 Q1–1998 Q2 | 3.53 | 2.05 | 0.57 | 1998 Q2–2000 Q4 | 2.01 | 1.61 | 0.63 |
| Canada | 1990 Q1–2000 Q3 | 4.03 | 2.23 | 0.69 | | | | |
| France | 1990 Q3–2000 Q4 | 4.33 | 1.80 | 0.41 | | | | |
| Germany | 1991 Q2–2000 Q4 | 2.74 | 2.47 | 0.53 | | | | |
| Italy | 1990 Q1–2001 Q1 | 4.72 | 3.88 | 0.46 | | | | |
| Japan | 1990 Q2–1997 Q1 | 1.27 | 1.33 | 0.74 | 1997 Q1–2001 Q1 | 0.15 | 0.30 | 0.78 |
| New Zealand | 1989 Q2–1997Q2 | 7.04 | 3.06 | 1.25 | 1997 Q2–2000 Q1 | 6.08 | 0.77 | 0.81 |
| Switzerland | 1990 Q4–1994 Q4 | 1.70 | 3.66 | 0.78 | 1994 Q4–2000 Q4 | 0.70 | 0.91 | 0.58 |
| United Kingdom | 1988 Q4–1999 Q4 | 4.42 | 4.14 | 0.81 | | | | |
| United States | 1990 Q2–2000 Q2 | 2.33 | 2.97 | 0.45 | | | | |

Note: The cyclical peaks were identified by applying a Hodrick-Prescott filter to GDP data as of June 2002. The results are not sensitive to alternative specifications of the cycle.

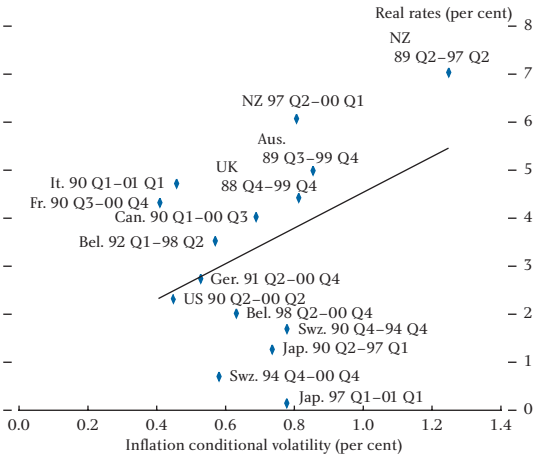
Fisher (1907), it is common to take a measure of inflation (either realised or expected) from the nominal interest rate. This is what I have done in the cross-country calculations. But these calculations make no allowance for either tax effects or risk premia. So the apparent fall in the sustainable real rate might reflect a smaller tax component or declining risk premia, rather than a lower risk-free real post-tax interest rate.

Since tax is paid on nominal interest income, we might expect the tax wedge between nominal and real interest rates to rise with inflation.(1) However, a series of papers in the 1970s and 1980s were unable to identify a consistent tax effect of the expected magnitude. But it is possible that the effect was obscured by other factors in earlier decades(2) and has only become apparent more recently.

Neither inflation expectations nor risk premia are directly observable. But the apparent fall in the sustainable real short-term interest rate may nevertheless be due to declining risk premia. This could result either because the environment is deemed to have become less risky, or because investors require less compensation for taking on the same amount of risk.

What evidence might there be for thinking that the economic environment might have become less risky? Well to start with, there is well-documented evidence that inflation is less volatile at lower inflation rates,(3) as argued by Friedman in his Nobel lecture of 1977. A recent study by Cecchetti, Flores-Lagunes and Krause (2004) found that in a sample of 24 countries (including the United States, the United Kingdom and other EU members as of 2003) inflation variability fell in all countries from the 1980s to the 1990s. And indeed it appears that lower average real interest rates in several OECD economies in the 1990s have been associated with more predictable inflation outturns (defined as the conditional standard deviation), see Chart 2. This can also be seen from the UK experience, where falling inflation and nominal and real interest rates have been accompanied by greater predictability for all three series (Charts 3 and 4).

## Chart 2
## Real interest rates and inflation volatility over the cycle, 1990s

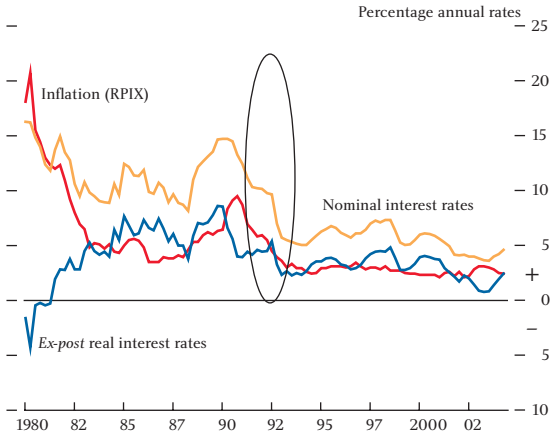



Notes: See Table A for definition of cycle (peak to peak).
The conditional volatility was calculated from a time-series equation for each country with the acceleration in inflation regressed on a constant, lagged inflation and a time trend. The errors followed a GARCH(1,1) process.

Sources: The IMF, national statistical offices and central banks of the respective countries.

(1) This was noted by Darby (1975) and Feldstein (1980). I am grateful to Charlie Bean for bringing it to my attention.
(2) As suggested by Peek (1982).
(3) See, for instance, King (2002).

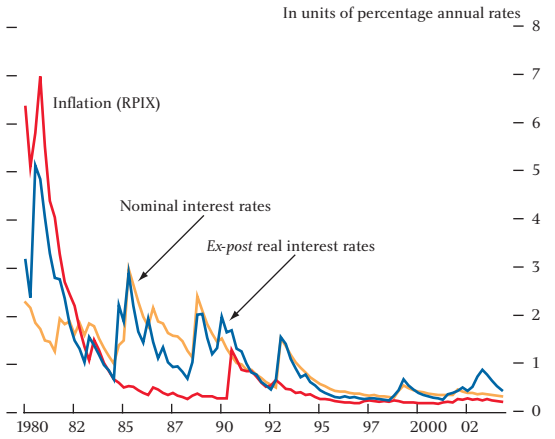
## Chart 3
## Inflation, nominal interest rate and *ex-post* real rates for the United Kingdom




Notes: The Treasury bill rates are annualised quarterly averages of bills of three-month maturity. Inflation is the quarterly average of the annual rate.

Sources: IFS and ONS.

## Chart 4
## Conditional volatilities of inflation, nominal interest rate and the *ex-post* real rate for the United Kingdom




Notes: The conditional volatility was calculated from integrated GARCH(1,1) processes for each of the three series for a sample 1977 Q1 to 2004 Q2. We are grateful to Luca Benati for doing these calculations for us.

But inflation is not the only area in which the macroeconomic environment appears to have become more stable of late. Output has also become more stable in the major economies. Indeed there is a view that these two phenomena, more stable inflation and more stable output, are related. A substantial literature has grown up to document and explain this increased stability, dubbed 'The Great Moderation'. Opinions differ as to whether it has resulted solely from good fortune, as the incidence and magnitude of shocks that buffet the world economy have reduced, or from improved management of macroeconomic policy in the face of an unchanged incidence of shocks.(1) My own view is that the explanation does not lie in a reduced incidence of shocks, but elsewhere. One need only think of the Asian crisis of 1997, the Russian default and Long Term Capital Management crisis of the following year, during which the operation of capital markets stalled, the dotcom collapse leading to the most synchronised global downturn since the war, 9/11 and volatility in several markets, from equities through housing to oil, to see that we still have our fair share of shocks. And it is probably worth saying at this point that my views on this matter date from well before my own stint as a policymaker, so are rather less biased than you might be tempted to think. As Benati (2004) shows, this phenomenon of reduced macroeconomic volatility is also apparent in the United Kingdom for a range of economic data. Might that have led to an associated fall in real interest rates?

One method of estimating the risk premium in nominal interest rates uses bonds that are indexed for inflation. The difference in the yield on indexed and non-indexed bonds of the same maturity should tell us about the combined value of market participants' expectations of future inflation and the premium they are willing to pay for the risk those inflation expectations won't be realised. Scholtes (2002) and Peacock (2004) combine this with an independent measure of inflation expectations taken from surveys to arrive at a measure of the inflation risk premium. There are some important technical considerations to bear in mind in interpreting these data,(2) some of which are more acute at shorter maturities, but nevertheless these results give some indication of the possible scale of the decline in the inflation risk premium. Scholtes suggests that the inflation risk premium, though volatile, might have fallen significantly in the early 1990s.

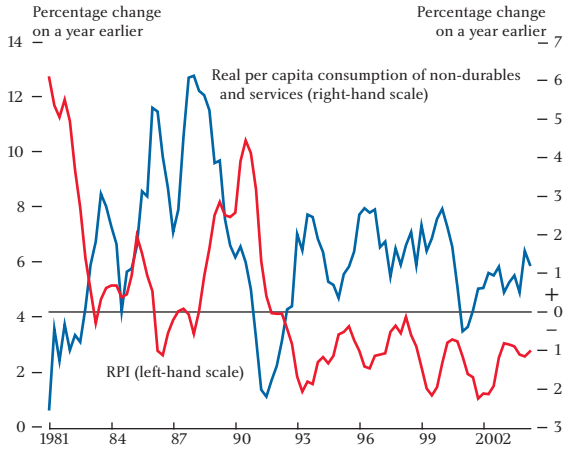
An alternative approach to estimating the risk premium is through the behaviour of consumers. Since the anticipated return from abstaining today and deferring consumption until tomorrow is given by the *ex-ante* expected real interest rate, we should be able to derive the expected real interest rate and associated risk premia from patterns of consumption. Following Ireland (1996) and Sarte (1998) the risk premium in a simple model can be shown to be a positive function of the unpredictability of inflation and the real interest rate;

(1) Bernanke (2004) explains how a better monetary policy response to shocks might show as diminished shocks in empirical work.
(2) See Breedon (1995), Scholtes (2002), Peacock (2004) and Tucker (2004).

and a negative function of uncertainty about the covariance of future consumption and inflation. This last term is because the consumer will require a higher compensation for the risk of unexpectedly high future inflation the more likely this is to coincide with a period of unexpectedly low consumption growth.

It seems likely that the combined effects of the increased predictability of inflation and interest rates observed during the past decade or so might have acted to reduce the risk premium, as might enhanced opportunities to hedge these risks. And Chart 5 suggests that real consumption growth might be negatively correlated with inflation, though of course it is the unpredictable covariance in which we are interested. However, while estimates of the inflation risk premium for the United Kingdom using this approach clearly show a fall in the risk premium since the late 1980s, the scale, both of the risk premium itself and its fall over the period, is tiny. Although problems associated with this approach are well documented(1) and it is possible to make adjustments to deal with some of them that raise the premium, the total effect remains small compared with the observed fall in the real rate.

**Chart 5**
**Consumption and inflation**




Source: ONS.

A more promising avenue to explore might be the approaches taken by Ang and Bekaert (2004) or Goto and Torous (2003), both of which incorporate the effects of regime change in calculations of the term structure of real interest rates and the risk premium in the United States. Ang and Bekaert find a relationship between real rates and inflation that varies across regimes and a stronger role for the inflation risk premium, which entirely accounts for the upward slope of the nominal term structure, but falls significantly in the 1990s. Goto and Torous find that a shift in the inflation process following the introduction of an anti-inflationary interest rate policy leads to a positive relationship between inflation and real interest rates. The risk premium in short-term interest rates initially increases significantly as policy becomes more activist, but might later be expected to decline as credibility is established and inflation shocks become less persistent.

So, in conclusion, it seems that experience across a range of economies since the late 1980s suggests that the natural rate of interest might have fallen. A reduced tax wedge between real and nominal rates at lower inflation rates is likely to have contributed. And it is possible that the decline might be partly associated with reduced risk premia, although it is difficult to derive estimates that are sufficiently large to account for a significant share of the observed fall in average real short-term interest rates. Shifts in inflation regime and greater associated macroeconomic stability might also have played a role, both in lowering the risk-free real natural rate(2) and enhancing the role of risk premia. Since the observed relationship between real interest rates and inflation is a relatively recent phenomenon which was not apparent in the 1970s, this explanation for the decline in real rates is appealing.

But, as with interpreting movements in potential supply and apparent improvements in the inflation-output trade-off, it would be risky for policymakers to assume that any apparent shift down in the real natural rate of interest is a permanent rather than a temporary phenomenon.

We can think of monetary policy as a balloon. If we squeeze air out of one part of a balloon, it will move to expand another part. But the overall volume of air will be unchanged, so long as we don't inflate or deflate the balloon. So it is with monetary policy. Relative price movements give the signals about demand and supply that lead to an effective allocation of resources and facilitate the smooth operation of the real economy. But movements in relative prices and price shocks cannot cause general inflation or deflation in the medium term. So long as monetary policy is not expansionary a faster

(1) See for instance Larsen, May and Talbot (2003) for a summary of problems with the consumption capital asset pricing model.
(2) Although contrary to the results of power utility models, this could be a feature of models of consumption where intertemporal substitution and risk aversion are decoupled.

rate of increase in the price of some goods or services will in time be offset by slower increases in the price of others, as real incomes are squeezed. It is therefore important that monetary policy is set neither too hot nor too cold. Over the medium term that means ensuring that inflation expectations remain anchored to target and getting the real interest rate right. Judging that in the face of uncertainty over the real natural rate of interest will continue to mean taking a pragmatic approach to policy.

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**Scholtes, C (2002)**, 'On market-based measures of inflation expectations', *Bank of England Quarterly Bulletin*, Spring, pages 67–77.

**Tucker, P (2004)**, 'Risk uncertainty and monetary policy', *Bank of England Quarterly Bulletin*, Spring, pages 89–92.

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# Bank of England speeches

Speeches made by Bank personnel since publication of the previous *Bulletin* are listed below.

**Monetary policy-making: fact and fiction.**
Speech by Richard Lambert at a South West Agency Dinner in Bristol on 24 May 2005.
www.bankofengland.co.uk/publications/speeches/2005/speech247.pdf.

**A framework for financial stability.**
Speech by Sir Andrew Large, Deputy Governor, at the International Conference on Financial System Stability and Implications of Basel II, Swiss Hotel in Istanbul on 18 May 2005. www.bankofengland.co.uk/publications/speeches/2005/speech246.pdf.

**Monetary policy: practice ahead of theory.**
Speech by Mervyn King, Governor, given at the Mais Lecture at the Cass Business School in London on 17 May 2005.
www.bankofengland.co.uk/publications/speeches/2005/speech245.pdf. Reproduced on pages 226–36 of this *Bulletin*.

**Communicating monetary policy in practice.**
Speech by Marian Bell at the Manchester Business School's Vital Topics Lecture on 17 May 2005.
www.bankofengland.co.uk/publications/speeches/2005/speech244.pdf. Reproduced on pages 266–75 of this *Bulletin*.

**Monetary policy in the United Kingdom — the framework and current issues.**
Speech by Kate Barker at the National Association of Business Economics Policy Conference in Washington DC on 21 March 2005.
www.bankofengland.co.uk/publications/speeches/2005/speech243.pdf. Reproduced on pages 276–82 of this *Bulletin*.

**Inflation targeting in practice: models, forecasts and hunches.**
Speech by Rachel Lomax to the 59th International Atlantic Economic Conference in London on 12 March 2005.
www.bankofengland.co.uk/publications/speeches/2005/speech242.pdf. Reproduced on pages 237–46 of this *Bulletin*.

# 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.co.uk/publications/quarterlybulletin/index.htm.

## Articles and speeches (indicated S)

*Summer 2004 (continued)*
Recent developments in surveys of exchange rate forecasts
Sterling money market funds
The new Bank of England Quarterly Model
Public attitudes to inflation
Perfect partners or uncomfortable bedfellows? On the nature of the relationship between monetary policy and financial stability
A review of the work of the London Foreign Exchange Joint Standing Committee in 2003
Reform of the Bank of England's operations in the sterling money markets
Puzzles in today's economy—the build-up of household debt (S)
Speech at the National Association of Pension Funds Annual Investment Conference (S)
Boring bankers—should we listen? (S)
Speech at CBI Yorkshire and the Humber annual dinner (S)

*Autumn 2004*
How should we think about consumer confidence?
Household secured debt
Housing equity and consumption: insights from the Survey of English Housing
Why has world trade grown faster than world output?
The institutions of monetary policy (S)
The Governor's speech to the CBI Scotland dinner (S)
The Governor's speech at the Mansion House (S)
Keeping the party under control—anniversary comments on monetary policy (S)
Some current issues in UK monetary policy (S)
Managing the central bank's balance sheet: where monetary policy meets financial stability (S)
Household debt, house prices and consumption growth (S)

*Winter 2004*
British household indebtedness and financial stress: a household-level picture
The new sterling ERI
Using option prices to measure financial market views about balances of risk to future asset prices
The foreign exchange and over-the-counter derivatives markets in the United Kingdom
The external balance sheet of the United Kingdom: recent developments
Stability and statistics (S)
Why is inflation so low? (S)

*Winter 2004 (continued)*
Monetary policy, data uncertainty and the supply side: living with the statistical fog (S)

*Spring 2005*
Dealing with data uncertainty
Indicators of short-term movements in business investment
Divisia money
Inside the MPC
The role of central banks in payment systems oversight
The Governor's speech to the CBI Dinner in Manchester (S)
The Governor's speech on the International Monetary System (S)
Why monetary stability matters to Merseyside (S)
Monetary policy in an uncertain world (S)
Why has inflation been so low since 1999? (S)
The housing market and the wider economy (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)

# 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

Working papers are free of charge; a complete list is available from the address below. An up-to-date list of working papers is also 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 PDF.

| No. | Title | Author |
|---|---|---|
| 232 | Evolving post-World War II UK economic performance *(October 2004)* | Luca Benati |
| 233 | The efficient resolution of capital account crises: how to avoid moral hazard *(October 2004)* | Gregor Irwin<br>David Vines |
| 234 | Intertemporal substitution and household production in labour supply *(October 2004)* | Guillermo Felices<br>David Tinsley |
| 235 | Rule-based monetary policy under central bank learning *(October 2004)* | Kosuke Aoki<br>Kalin Nikolov |
| 236 | The effects of stock market movements on consumption and investment: does the shock matter? *(October 2004)* | Stephen Millard<br>John Power |
| 237 | Forecasting with measurement errors in dynamic models *(November 2004)* | Richard Harrison<br>George Kapetanios<br>Tony Yates |
| 238 | Estimating time-variation in measurement error from data revisions; an application to forecasting in dynamic models *(November 2004)* | George Kapetanios<br>Tony Yates |
| 239 | From tiny samples do mighty populations grow? Using the British Household Panel Survey to analyse the household sector balance sheet *(November 2004)* | Victoria Redwood<br>Merxe Tudela |
| 240 | Price-setting behaviour, competition, and mark-up shocks in the New Keynesian model *(November 2004)* | Hashmat Khan |
| 241 | Anticipation of monetary policy in UK financial markets *(November 2004)* | Peter Lildholdt<br>Anne Vila Wetherilt |
| 242 | Core inflation: a critical guide *(November 2004)* | Alan Mankikar<br>Jo Paisley |
| 243 | Long-term interest rates, wealth and consumption *(November 2004)* | Roy Cromb<br>Emilio Fernandez-Corugedo |
| 244 | Long-horizon equity return predictability: some new evidence for the United Kingdom *(November 2004)* | Anne Vila Wetherilt<br>Simon Wells |
| 245 | Horizontal and vertical integration in securities trading and settlement *(November 2004)* | Jens Tapking<br>Jing Yang |
| 246 | Competitiveness, inflation, and monetary policy *(January 2005)* | Hashmat Khan<br>Richhild Moessner |
| 247 | The exposure of international bank loans to third-country risk: an empirical analysis of overdue claims *(January 2005)* | Drew Dahl<br>Andrew Logan |
| 248 | Concepts of equilibrium exchange rates *(January 2005)* | Rebecca L Driver<br>Peter F Westaway |
| 249 | Optimal collective action clause thresholds *(February 2005)* | Andrew G Haldane<br>Adrian Penalver<br>Victoria Saporta<br>Hyun Song Shin |
| 250 | Asset price based estimates of sterling exchange rate risk premia *(February 2005)* | Jan J J Groen<br>Ravi Balakrishnan |

| | | |
|---|---|---|
| 251 | The stock market and capital accumulation: an application to UK data *(February 2005)* | Demetrios Eliades<br>Olaf Weeken |
| 252 | Real-Time Gross Settlement and hybrid payment systems: a comparison *(March 2005)* | Matthew Willison |
| 253 | Decomposing credit spreads *(March 2005)* | Rohan Churm<br>Nikolaos Panigirtzoglou |
| 254 | On the consumption-real exchange rate anomaly *(March 2005)* | Gianluca Benigno<br>Christoph Thoenissen |
| 255 | Learning the rules of the new game? Comparing the reactions in financial markets to announcements before and after the Bank of England's operational independence *(January 2005)* | Ana Lasaosa |
| 256 | Comovements in the prices of securities issued by large complex financial institutions *(March 2005)* | Christian Hawkesby<br>Ian W Marsh<br>Ibrahim Stevens |
| 257 | The role of ICT in the global investment cycle *(March 2005)* | Michael McMahon<br>Gabriel Sterne<br>Jamie Thompson |
| 258 | Estimating UK capital adjustment costs *(March 2005)* | Charlotta Groth |
| 259 | Productivity growth in UK industries, 1970–2000: structural change and the role of ICT *(March 2005)* | Nicholas Oulton<br>Sylaja Srinivasan |
| 260 | Financial constraints and capacity adjustment in the United Kingdom: evidence from a large panel of survey data *(March 2005)* | Ulf von Kalckreuth<br>Emma Murphy |
| 261 | Default probabilities and expected recovery: an analysis of emerging market sovereign bonds *(April 2005)* | Liz Dixon-Smith<br>Roman Goossens<br>Simon Hayes |
| 262 | The impact of unsecured debt on financial distress among British households *(April 2005)* | Ana Del-Río<br>Garry Young |
| 263 | The determinants of unsecured borrowing: evidence from the British Household Panel Survey *(April 2005)* | Ana Del-Río<br>Garry Young |
| 264 | Liquidity risk and contagion *(May 2005)* | Rodrigo Cifuentes<br>Gianluigi Ferrucci<br>Hyun Song Shin |
| 265 | Asset pricing, asymmetric information and rating announcements: does benchmarking on ratings matter? *(June 2005)* | Spyros Pagratis |

## 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/other/externalmpcpapers/extmpcpaper0000n.pdf (where n refers to the paper number). The following papers have been published recently.

| No. | Title | Author |
|---|---|---|
| 9 | The pricing behaviour of UK firms *(April 2002)* | Nicoletta Batini<br>Brian Jackson<br>Stephen Nickell |
| 10 | Macroeconomic policy rules in theory and in practice *(October 2002)* | Christopher Allsopp |
| 11 | The exchange rate and inflation in the UK *(October 2002)* | Amit Kara<br>Edward Nelson |
| 12 | Measuring the UK short-run NAIRU *(April 2003)* | Nicoletta Batini<br>Jennifer Greenslade |
| 13 | UK consumers' habits *(May 2003)* | Ryan Banerjee<br>Nicoletta Batini |
| 14 | National Accounts revisions and output gap estimates in a model of monetary policy with data uncertainty *(May 2005)* | Lavan Mahadeva<br>Alex Muscatelli |

## 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 monthly on the Internet but paper copies are available on a twice-yearly basis. Paper copies are published for the January and July editions in hard copy on Wednesday 2 February 2005 and Monday 1 August 2005 respectively. The price per annum in the United Kingdom is £40, or £20 per copy. *Bankstats* is available on a monthly basis free of charge from the Bank's website at www.bankofengland.co.uk/statistics/statistics.htm.

Further details are available from: Mark Thompson, Monetary and Financial Statistics Division, Bank of England: telephone 020 7601 5353; fax 020 7601 3208; email mark.thompson@bankofengland.co.uk.

The following articles have been published in recent issues of *Monetary and Financial Statistics*. They may also be found on the Bank of England's website at www.bankofengland.co.uk/statistics/ms/articles.htm.

| Title | Author | Month of issue | Page numbers |
|---|---|---|---|
| A new measure of Divisia money | Matthew Hancock | January | 13–14 |
| A comparison of the industrial analysis of bank lending to and deposits from UK residents and sectoral M4 and M4L | Robert Golcher<br>Simon Walls | January | 9–12 |
| Impact of securitisations and loan transfers activity on M4 lending | Lorna Hall | January | 7–8 |
| Capital issuance statistics: changes to definitions and presentation | Hannah Reynolds | January | 5–6 |
| UK banks' write-offs of bad debt | Al Cattermole | January | 1–4 |

## Financial Stability Review

The *Financial Stability Review* is published twice a year, in June and December. 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 from Financial Stability Review, Bank of England HO-3, Threadneedle Street, London, EC2R 8AH and on the Bank's website at www.bankofengland.co.uk/publications/fsr/index.htm.

## Economic models at the Bank of England

The *Economic models at the Bank of England* book, published in April 1999, contains details of the economic modelling tools that help the Monetary Policy Committee in its work. The price of the book is £10. An update was published in September 2000 and is available free of charge.

## 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. The price of the book is £10.

## Practical issues arising from the euro

This is a series of booklets providing a London perspective on the development of euro-denominated financial markets and the supporting financial infrastructure, and describing the planning and preparation for possible future UK entry. Recent editions have focused on the completion of the transition from the former national currencies to the euro in early 2002, and the lessons that may be drawn from it. Copies are available from Public Enquiries Group, Bank of England, Threadneedle Street, London, EC2R 8AH and on the Bank's website at www.bankofengland.co.uk/publications/practicalissues/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 www.bankofengland.co.uk/publications/psor/index.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.

The *Bulletin* is also available from ProQuest Information and Learning: enquiries from customers in Japan and North and South America should be addressed to ProQuest Information and Learning, 300 North Zeeb Road, Ann Arbor, Michigan 48106, 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.

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 six sections:

- analysis of money and asset prices;
- analysis of demand;
- analysis of output and supply;
- analysis of costs and prices;
- summary of monetary policy during the quarter; and
- assessment of the medium-term inflation prospects and risks.

The *Minutes* of the meetings of the Bank's Monetary Policy Committee appear as a separate publication on the same day as the *Report*.

## Publication dates

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| *Quarterly Bulletin* | | *Inflation Report* | |
|---|---|---|---|
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| Summer | 20 June | May | 11 May |
| Autumn | 26 September | August | 10 August |
| Winter | 12 December | November | 16 November |

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