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Speeches

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This article reviews developments since the Winter *Quarterly Bulletin* in sterling and global financial markets, in market structure and in the Bank's balance sheet.

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.

Dealing with data uncertainty (by James Ashley, Ronnie Driver, Simon Hayes and Christopher Jeffery of the Bank's Conjunctural Assessment and Projections Division). True values of key macroeconomic variables are unobservable and can only be estimated. A key question for the Monetary Policy Committee is how best to take account of the resultant uncertainty in its economic assessment. Official estimates of economic variables are produced by the Office for National Statistics (ONS), and some private sector organisations publish surveys of business activity that may also give clues as to the underlying state of the economy. This article presents a simple methodology for deriving 'best guesses' of the true values of economic variables by weighting together official estimates and information from business surveys.

Indicators of short-term movements in business investment (by Sebastian Barnes of the Bank's Structural Economic Analysis Division and Colin Ellis of the Bank's Inflation Report and Bulletin Division). Business surveys provide more timely news about investment than official data. The surveys also include forward-looking information. This article examines some survey-based indicators of business investment. Using simple techniques, several indicators are found to contain information about the path of investment. Moreover, as official business investment data are often revised, survey data can also usefully supplement the official data when interpreting recent movements in investment.

Divisia money (by Matthew Hancock of the Bank's Monetary Assessment and Strategy Division). This article reviews the Bank's measure of Divisia money — a gauge of the money supply that gives greatest weight to those components most used in transactions — and explains some recent changes to its calculation. These changes aim to make the Bank's series more theoretically appealing and to make use of some recently developed statistics. Five improvements have been made. First, a new approach has been introduced to determine the benchmark interest rate. Second, new effective interest rate data have been incorporated. Third, the level of aggregation has been changed slightly. Fourth, non break-adjusted levels are now used as the denominator in the Divisia calculation. Finally, a series for aggregate Divisia excluding other financial corporations, and a set of monthly series, have been introduced. In this article we begin with a discussion of the purpose of Divisia money, then we set out the changes that have been made, and the motivation behind them. Throughout we describe the impact of the changes on the Bank's series.

Reports
(pages 56–71)

Inside the MPC (Richard Lambert explains what life is like as a member of the MPC).

The role of central banks in payment systems oversight (by Andrew G Haldane and Edwin Latter of the Bank's Market Infrastructure Division). Payment systems are essential to the functioning of monetary economies. This article explains the Bank's role in overseeing UK payment systems to ensure their robustness, including the role of the Bank's recently published first *Oversight Report*. It also sets out some future priorities for payment systems oversight in the light of international consolidation and technological innovation.

Reports
(pages 56–71)

Inside the MPC

The role of central banks in payment systems oversight

Markets and operations

This article reviews developments since the Winter Quarterly Bulletin *in sterling and global financial markets, in market structure and in the Bank's balance sheet.*[1]

- *Sterling short-term interest rates increased as market participants appeared to revise upwards the probability they attached to a rise in official rates during 2005. US dollar short-term interest rates also increased as the Federal Reserve continued to withdraw its accommodative monetary policy. Short-term euro rates were little changed.*

- *The US dollar strengthened over the review period supported by higher short-term dollar interest rates and signs of robust economic growth in the United States.*

- *Long-horizon sterling nominal forward rates rose slightly, although there were marked falls in dollar and euro nominal long forward rates. But real long forward rates declined across currencies. This continued a general drift down in sterling and euro real forwards over the past year or so.*

- *Equity markets rose internationally, credit spreads narrowed and measures of implied volatility remained historically low in a number of markets. Risk premia appeared to fall across financial markets, perhaps consistent with the so-called 'search for yield' having continued. This may have reflected better risk diversification, but risk may have been underpriced.*

- *The Bank announced interim changes to its official operations in the sterling money markets with the aim of stabilising overnight market interest rates further.*

Following a soft patch in 2004 Q3, GDP growth in the United Kingdom was estimated to have picked up during the final quarter of 2004. And output growth was robust in the United States in 2004 Q4.

But the recovery in Japan and the euro area faltered slightly and economists' forecasts suggested that some of this weakness was expected to persist: Consensus forecasts for euro-area and Japanese GDP growth in 2005 were revised down (Chart 1).

Against this background, market participants' views about the future path of monetary policy in the United Kingdom were revised slightly — short-term implied interest rates rose and by the end of the review period suggested that official rates would remain unchanged over the next few months, with some possibility of a further rate rise later this year (Table A). Elsewhere, market prices suggested that the Federal Reserve was

Chart 1
Expected real GDP growth for 2005
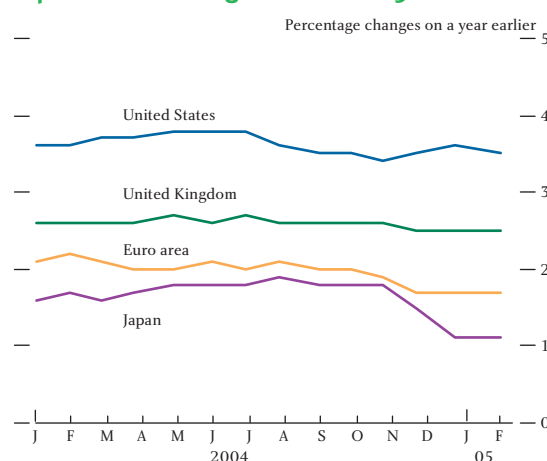
Source: Consensus Economics.

expected to continue its measured pace of tightening in the United States, whereas, in the near term, interest rates were expected to remain on hold in the euro area.

(1) The period under review is 26 November (the data cut-off for the previous *Quarterly Bulletin*) to 18 February.

Table A
Summary of changes in market prices

	26 Nov.	18 Feb.	Change
December 2005 three-month interbank interest rate (per cent)			
United Kingdom	4.68	5.00	32 bp
Euro area	2.49	2.57	8 bp
United States	3.61	3.88	27 bp
Ten-year nominal forward rate (per cent)(a)			
United Kingdom	4.53	4.57	4 bp
Euro area	4.80	4.50	-30 bp
United States	5.81	5.33	-48 bp
Equity indices (domestic currency)			
FTSE All-Share	2362	2535	7.3%
DJ Euro Stoxx	262	282	7.5%
S&P 500	1183	1202	1.6%
Exchange rates			
Sterling effective exchange rate	101.8	103.4	1.6%
$/€ exchange rate	1.33	1.31	-1.4%

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/main.htm.

At longer horizons, sterling ten-year forward rates increased a little, while dollar and euro rates fell. But long-horizon *real* forward rates declined across currencies.

Risk premia in credit markets also seem to have fallen. Spreads on high-yield, investment-grade and emerging market bonds narrowed further over the review period and remained close to historical lows.

Implied volatility — a market-based measure of uncertainty — remained low across a number of markets. This might suggest that market participants expected a period of continued macroeconomic and financial market stability, which may have contributed to lower risk premia across asset classes. Alternatively, these developments may have reflected a more temporary increase in risk appetite with investors seeking to maintain/increase returns in an environment of low risk-free interest rates — the so-called 'search for yield'.

Against this backdrop, financial markets could be vulnerable to particular shocks; for example, a sharper-than-expected pace of monetary policy tightening in the United States, a more abrupt unwinding of the imbalances that exist in the global economy or a large-scale credit event. A risk remains that the search for yield could unravel quite quickly.[1]

Short-term interest rates

As had been widely anticipated, sterling, euro and yen official interest rates remained unchanged over the

review period, but US dollar official rates were raised by 50 basis points, in two 25 basis point moves.

A slightly more pessimistic near-term outlook for growth in some continental European economies may have contributed to a fall in the very short end of the euro forward curve, although the market still expected an upward move in euro policy rates in 2005 H2 (Chart 2). By contrast, the short end of the US dollar forward curve steepened slightly; implied rates for end-2005 rose by around 20 basis points. The dollar forward curve suggested that market participants expected the FOMC to continue to tighten policy through 2005.

Chart 2
Short-term international official and nominal forward interest rates(a)
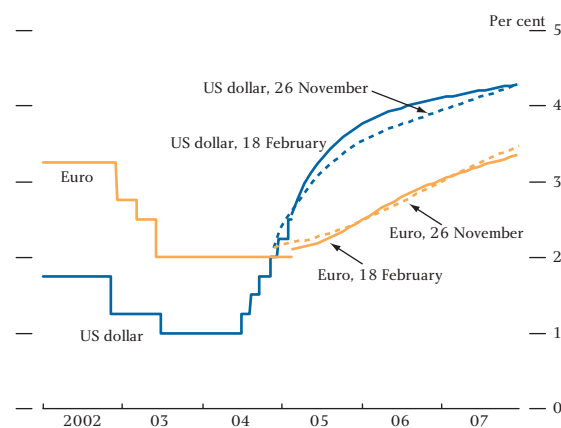
Sources: Bank of England, Bloomberg and LIFFE.

(a) Two-week nominal forward rates implied by a curve fitted to a combination of instruments that settle on Libor.

Reflecting the different positions in the economic cycle, measures of dollar short-term real interest rates rose slightly relative to euro and sterling real rates (Chart 3). Nonetheless, short-term dollar and euro real interest rates remained low by historical standards.

Short-term sterling real rates also rose slightly over the review period, although they remained around 40 basis points below the levels reached in mid-2004, despite the official nominal rate having risen over that same period. As discussed in the box on pages 8–9, market reactions to individual data releases have become smaller over the past couple of years. However, some stronger-than-expected UK data releases, such as the December CPI and the preliminary estimate of Q4 GDP, led sterling forward rates for end-2005 to increase over the review period (Chart 4). This suggested that market

(1) The 'search for yield' and possible downside risks to the international financial system were described in more detail in Chapter 2 of 'The financial stability conjuncture and outlook' (2004), *Bank of England Financial Stability Review*, December, pages 50–64.

Chart 3
Indicative international two-year real spot rates[a][b]

Sources: Consensus Economics and Bank calculations.

(a) Two-year nominal spot rates (from the Bank's government liability yield curves) 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) UK inflation expectations refer to RPI.

Chart 4
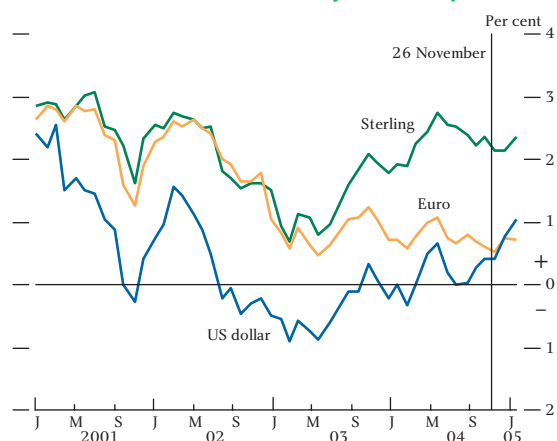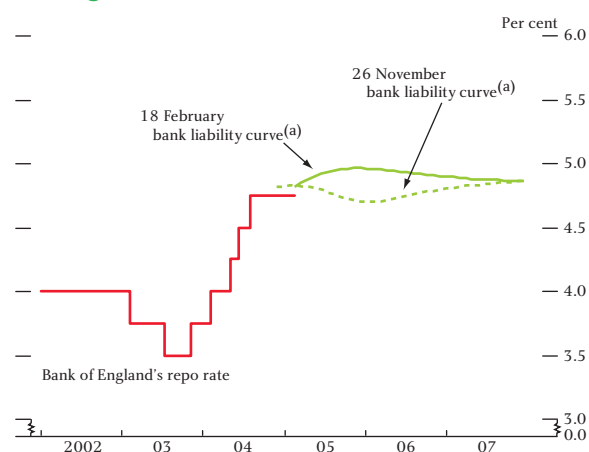### Sterling official and nominal forward interest rates

Sources: Bank of England, Bloomberg and LIFFE.

(a) Two-week nominal forward rates implied by a curve fitted to a combination of instruments that settle on Libor.

Chart 5
Economists' forecasts for the Bank of England repo rate at end-2005
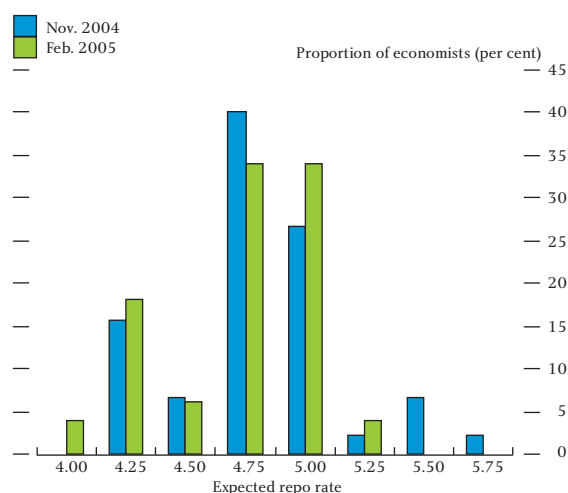
Source: Reuters.

Chart 6
Six-month implied skew from interest rate options
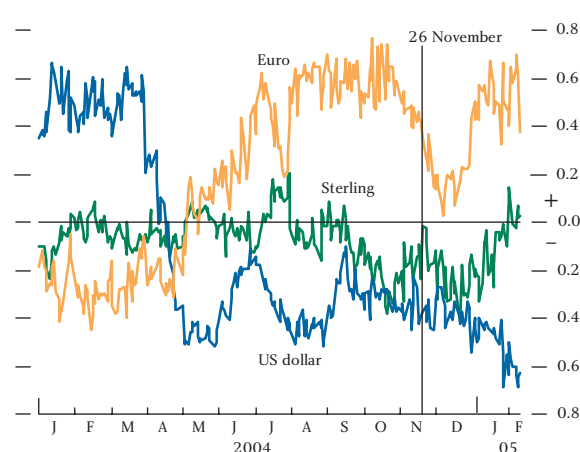
Sources: Bank of England, CME and LIFFE.

participants perceived some chance of an interest rate rise during 2005, whereas at the time of the previous *Bulletin*, sterling implied rates were consistent with some probability of a reduction in official rates.

Market-based measures of implied interest rates have moved more into line with the average of economists' expectations, as suggested by survey data. Most economists expected official rates to remain unchanged or rise by a further 25 basis points through 2005 (Chart 5).

The balance of risks to sterling interest rates implied by options prices, which had been skewed to the downside through much of late 2004 and early 2005, ended the period largely symmetric. This suggests that market

participants perceived little bias toward higher or lower rates in the near term (Chart 6). By contrast, risks to euro interest rates became more skewed to the upside, whereas the balance of risks to dollar rates moved more to the downside.

Measures of implied short-term interest rate uncertainty declined over the period, most markedly for dollar rates (Chart 7). Using swaption prices to examine measures of sterling interest rate uncertainty over longer periods suggested that the decline in implied uncertainty was not confined to short horizons (Chart 8). But there was a slight steepening in the term structure of volatility: implied volatility over a one-year horizon fell further than implied volatility over a five-year horizon.

What economic indicators move short-term sterling interest rates?

Sharp movements in short-term interest rates are likely to stem from surprises, either as a result of data releases being significantly different from expectations, or from an unanticipated news event.

The magnitude of reactions to specific data releases should also depend on market participants' views on the economic outlook. More specifically, the importance that market participants place on certain specific types of data releases may change over time, depending on how informative they are about the perceived profile of shocks hitting the economy.

This box aims to identify which news events and/or data releases had the greatest impact on short sterling implied interest rates during 2004, and whether similar data releases have consistently triggered a large market reaction over recent years.

Intraday data on short sterling futures contracts can be used to identify 'large' hourly moves in implied rates[1] — a large move is defined as one that changed implied interest rates by 5 basis points or more in an hour.[2] Chart A shows the number of 'large' movements in implied rates over the past five years.

Chart A
Large movements in short-term sterling implied interest rates and intraday volatility
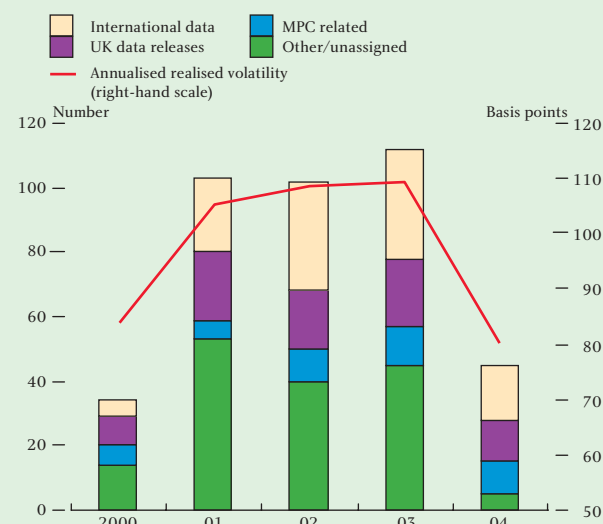

Sources: Bank of England and LIFFE.

In 2004, the number of large reactions fell to its lowest level since 2000, consistent with a decline in realised intraday volatility.[3] This might be because there were fewer big 'news' items, or data releases were more in line with market expectations.

The time and date of each 'large' move was noted in order to attempt to identify the data release/news item that triggered the movement. The majority of these movements can be attributed to a specific event or data release.

US non-farm payrolls releases coincided with the four largest intraday movements in implied rates in 2004 (Table 1). In total, US non-farm payrolls appear to have been associated with nine out of the 45 'large' movements identified during 2004.

Table 1
Largest ten movements in sterling implied interest rates during 2004

Rank	Change	Data release/ news event	Date
1	-14.7	US non-farm payrolls	9 Jan. 2004
2	-13.6	US non-farm payrolls	5 Mar. 2004
3	-13.5	US non-farm payrolls	6 Aug. 2004
4	13.4	US non-farm payrolls	2 Apr. 2004
5	12.0	UK GDP/retail sales	23 Jan. 2004
6	-11.5	*Inflation Report*	10 Nov. 2004
7	-11.0	Madrid terrorist attacks	11 Mar. 2004
8	-11.0	Greenspan testimony[a]	11 Feb. 2004
9	9.6	*MPC Minutes*	19 May 2004
10	9.1	UK ITEM Club Report[b]	1 Mar. 2004

(a) Testimony by Fed Chairman Greenspan to Financial Services Committee.
(b) The UK-based ITEM Club economic forecasters were reported in the weekend press to have called for higher UK interest rates.

Indeed, the average absolute reaction of implied sterling rates to US non-farm payrolls data has increased markedly over recent years (Table 2).

Table 2
UK implied rate reaction to US non-farm payrolls data releases (2000–04)

	2000	2001	2002	2003	2004
Average absolute reaction (percentage points)	2.50	3.65	3.31	4.29	8.13
Standard deviation	1.61	2.48	2.99	2.74	4.59

Turning to domestic news, Table 3 shows the largest ten movements in implied rates that appeared to be linked to UK-specific events (including both MPC-related news and other UK data releases).

MPC-related news (including MPC decisions, *MPC Minutes*, *Inflation Report* publication, and speeches/interviews) was linked to several 'large' movements. However, the largest absolute reaction to a change in the repo interest rate was only 7 basis points, suggesting that interest rate decisions in 2004 were largely anticipated by market participants. Indeed, comparing the path of interest rates implied by market prices at the time of the Bank's November 2003 *Inflation Report* supports the

(1) Twelve-month constant maturity implied forward rates were derived from adjacent contracts.
(2) Approximately 2.5% of hourly intraday movements were greater than 5 basis points in this sample.
(3) Intraday realised volatility is measured as the annualised standard deviation of hourly changes during each calendar year.

Table 3
Largest ten movements in sterling implied rate linked to UK-specific news in 2004

Rank	Change	Data release/ news event	Date
1	12.0	UK GDP/retail sales	23 Jan. 2004
2	-11.5	*Inflation Report*	10 Nov. 2004
3	9.6	*MPC Minutes*	19 May 2004
4	9.1	UK ITEM Club Report	1 Mar. 2004
5	-9.0	Kate Barker interview	29 Sep. 2004
6	9.0	*MPC Minutes*	17 Mar. 2004
7	8.6	Nationwide survey	29 Jan. 2004
8	-7.8	UK CPI/RPIX	12 Oct. 2004
9	7.6	UK CPI/RPIX	20 Jan. 2004
10	7.0	MPC decision (+25 bp)	6 May 2004

hypothesis that moves in official interest rates through 2004 were widely anticipated (Chart B).

Several UK-specific data releases also had a large impact on implied rates, including a number of GDP and consumer price inflation releases — this was broadly similar to previous years. However, despite the fall in the absolute number of 'large' reactions to UK data releases, the number of reactions to house price data was slightly higher in 2004, compared to previous years (four in 2004 versus two in 2003),

Chart B
Bank of England repo rate and two-week forward curve at time of November 2003 *Inflation Report*
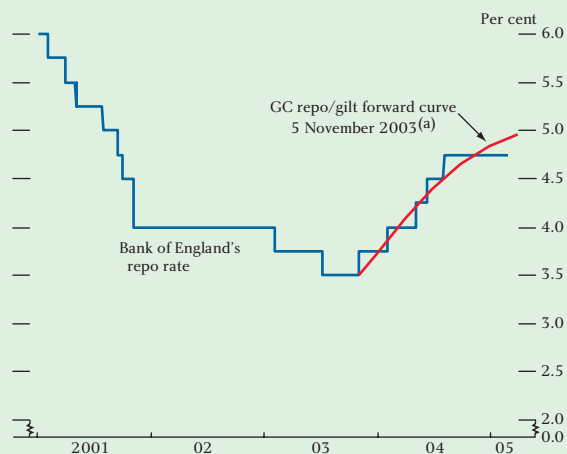
(a) A general collateral (GC) repo rate is the rate that one financial institution pays to borrow money from another when it effectively offers any gilt as a security against default.

suggesting some increased focus by market participants on these data releases.

Chart 7
Three-month implied volatility from interest rate options
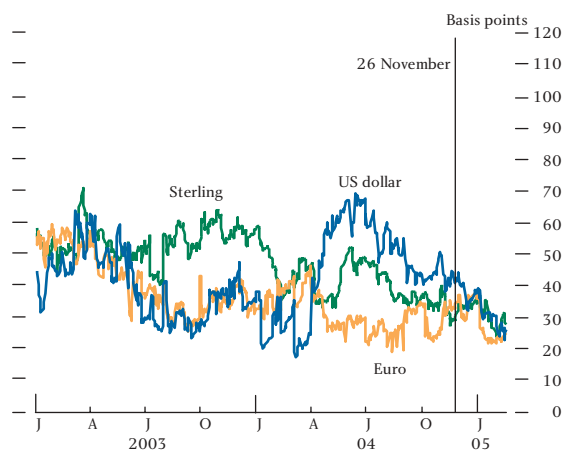
Sources: Bank of England, CME and LIFFE.

Foreign exchange markets

In mid-December, the sterling ERI reached a level 2.5% higher than at the time of the previous *Bulletin*. It then fell before strengthening again to end the period 1.6% higher.

In the United States, the further withdrawal of monetary accommodation, together with signs of stronger activity, provided some support for the dollar after it reached a

Chart 8
Sterling swaption implied volatility

Source: JPMorgan Chase and Co.

local trough in January. Since the previous *Bulletin*, the dollar ERI[1] increased by around 2¹/₂% (Chart 9), driven largely by an appreciation against the euro and the yen (Chart 10).

Nonetheless, the US dollar remained well below levels reached in recent years. From its recent peak in February 2002, the dollar ERI has fallen by more than 25%. The fall was widely attributed by market participants and commentators to investor concerns about the sustainability of the US current account

(1) This refers to the 'Major currency' index, including the Australian, Canadian, euro area, Japanese, Swedish, Swiss and UK currencies.

Chart 9
International effective exchange rate indices

Indices: Jan. 2004 = 100
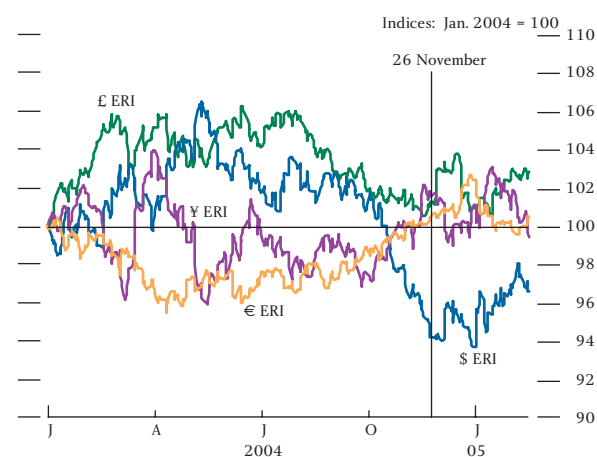
Source: Bank of England.

Chart 10
Cumulative changes in dollar bilateral exchange rates

Percentage changes since 26 November
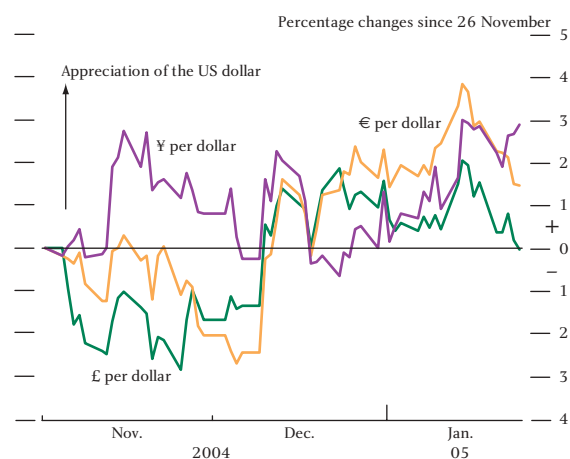
Source: Bank of England.

deficit, which was equivalent to around 5 1/2% of GDP in 2004 Q3, and the risks associated with financing the stock of US external liabilities.

Most of the depreciation in the dollar since 2002 has occurred against the currencies of the major industrial countries; since February 2002 the dollar has depreciated by nearly 35% against the euro, by roughly 25% against sterling and around 20% against the Japanese yen.

Among emerging market currencies, the Indonesian rupiah and the Korean won have appreciated against the US dollar since the beginning of 2002, by over 10% and about 20% respectively. But most emerging Asian currencies have appreciated very little against the US dollar during the past three years, reflecting official exchange rate policies. As a result, Asian central bank

holdings of overseas assets, particularly US dollar assets, have increased significantly. Collectively, at the end of 2004, Asian central banks held financial assets worth more than $2,300 billion, compared with US official reserves of $87 billion. The continued build-up of reserves by Asian central banks has given rise to market speculation that there could be currency revaluations in the region.

Information from option prices provided little evidence to suggest that market participants anticipated disorderly adjustments in foreign exchange markets. In fact, implied volatilities fell over the review period for all the major currency pairings (Chart 11).

Chart 11
Three-month implied foreign exchange volatilities

Per cent
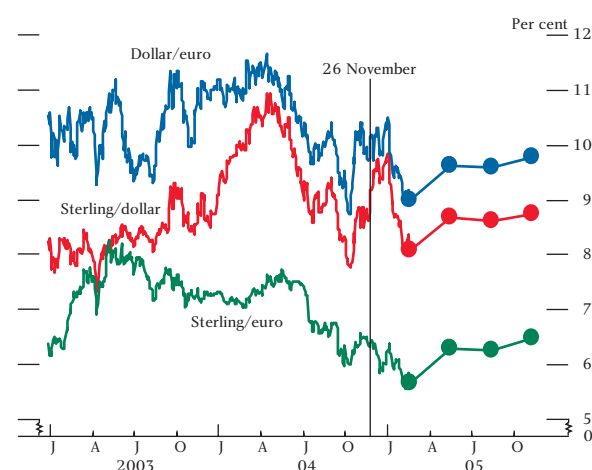
Long-term interest rates

Since the previous *Bulletin*, sterling long-term interest rates have risen a little — by around 20 basis points at very long horizons. In contrast, euro and US dollar long-term interest rates have fallen (Chart 12). At horizons of ten years and beyond, nominal dollar and euro-area forward rates fell by between 30–70 basis points.

However, decomposing the movements in nominal long forward rates into their real and inflation components suggests that long-horizon real forward rates have declined internationally (Chart 13). Sterling real forwards fell by around 5 basis points over the review period; euro real rates fell by around 25 basis points; while the decline in dollar real forwards was even more pronounced, at close to 40 basis points.

Chart 14 shows that real forward rates have been drifting down for some time in the United Kingdom and the euro

Chart 12
Changes in implied nominal forward rates(a)

Basis point changes since 26 November
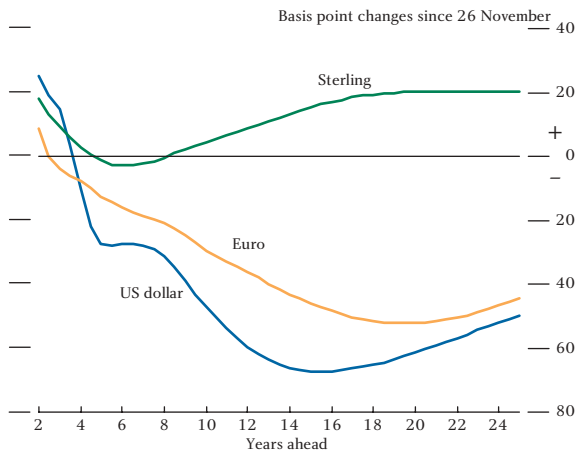
(a) Instantaneous forward rates derived from the Bank's government liability curve.

Chart 13
Changes in nine-year forward rates(a)
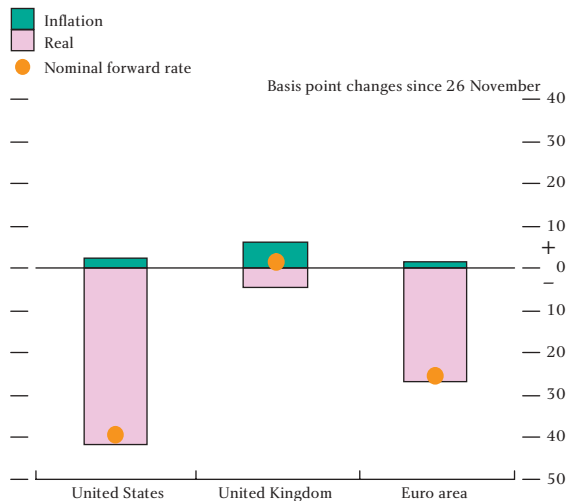
(a) Real component of euro rates implied by nominal government bond yields
less inflation swap rates, which are not strictly comparable because of credit risk.
Sterling and dollar real rates derived from the Bank's government liability curves.

Chart 14
Nine-year real forward rates(a)
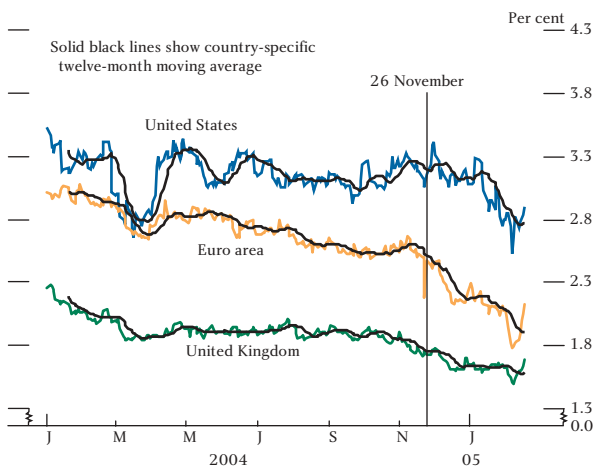
(a) Real components of euro rates implied by nominal government bond yields
less inflation swap rates, which are not strictly comparable because of credit risk.
Sterling and dollar real rates derived from the Bank's government liability curve.

area. There would also appear to have been a discernible fall in US real rates, at least since the autumn of last year. Survey-based measures also suggested that long-horizon real forward rates have fallen over the past year or so. Possible explanations for the recent falls are reviewed in the box on pages 12–13.

Equity markets

Perhaps consistent with the fall in long-term international real interest rates, which, other things equal, would tend to lead to higher stock market valuations via lower discount rates, global equity prices have increased over the review period (Chart 15). Between 26 November and 18 February, the S&P 500 rose by around 1.6%, and the Topix and Euro Stoxx indices rose by between 7% and 8%. The FTSE All-Share also rose by around 7%, despite the relatively small declines in long-term sterling real interest rates.

Chart 15
International equity indices (local currency)

Indices: Jan. 2004 = 100
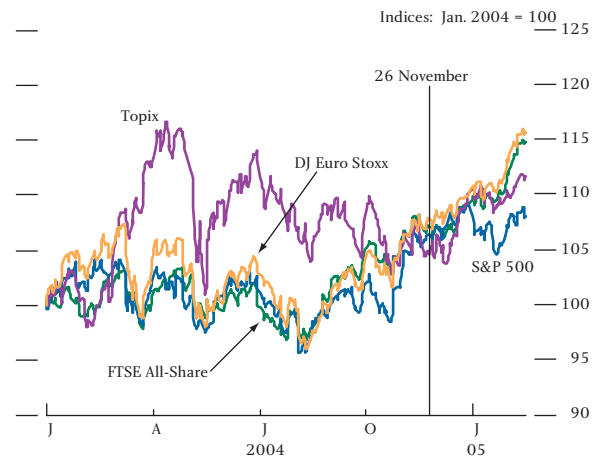
The rise in equity prices could also have reflected developments in earnings. A number of market contacts attributed the rally in UK share prices over the second half of last year to better-than-expected earnings outturns, despite the impact of the US dollar depreciation on some large UK firms' dollar earnings. And the latest IBES survey data did point to a slight pickup in the growth of prospective earnings per share for large UK companies over 2005.

Equity market valuations may have been underpinned by the return of funds to investors via either higher dividends or share buy-backs. This could have boosted *aggregate* equity indices if, for example, the return of cash to investors represented a transfer of capital from mature industries with relatively low return prospects to growth sectors where the capital could be used to generate higher returns.

The fall in global long-term real interest rates

In principle, long-term real interest rates equate the desired level of saving to the planned level of investment and are largely determined by the balance of supply and demand for global funds. Possible explanations for the fall in long-term forward real interest rates are therefore likely to focus on developments in global investment and saving, as well as the role of financial institutions as intermediaries between savers and borrowers. In addition, specific market factors may have also played a role in reducing real forward rates.

Investment

Outside the United States, investment growth in major developed economies has been quite sluggish over the past year, given the recovery in profits and falls in the cost of capital (Chart A). If this reflected a fall in the *trend* rate of productivity growth in these countries, the decline in long-term real interest rates might indicate a fall in the long-run equilibrium rate of return on capital. However, it seems more likely to reflect temporary factors, perhaps associated with uncertainty about the strength and sustainability of the global recovery. Such cyclical influences on investment would not be expected to affect

Chart A
International real investment growth
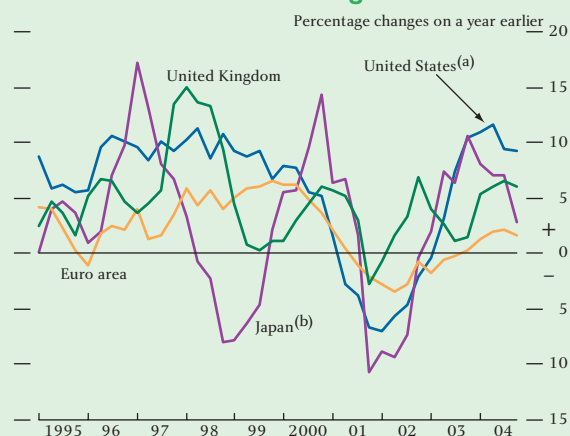
Source: National accounts.

(a) US data refer to private investment.
(b) Japanese data refer to business investment.

long-horizon real forward rates which are determined by the supply and demand for saving when all cyclical influences have been fully unwound.

Moreover, the impact of new information and communication technologies in the late 1990s may have boosted productivity growth, which, other things equal, would argue for higher long-term equilibrium real interest rates.[1] So weak investment does not appear to have been the reason for the recent falls in long-term interest rates.

Saving

Saving rates in developing countries, especially in Asia, have continued to increase in recent years. And many Asian central banks have been investing their foreign reserves in overseas government debt, particularly US bonds.

Private sector saving rates in some European countries, such as Germany and Italy, have risen recently. This could reflect demographic factors — the generation that was born in the 'baby boom' after the Second World War have reached the age in their life cycle when they may be saving most actively. But in other countries, such as the United States, household saving rates have been falling. Furthermore, fiscal positions in a number of developed economies have deteriorated over the past few years, which would act to reduce national saving rates in those countries[2] (Chart B). On balance, therefore, the evidence on *current* saving behaviour is mixed.

However, financial market prices may have responded to the prospect of increased saving in the future. That is, the recent falls in long-term real interest rates might have reflected higher *expected* global saving.[3] As life expectancies rise, households and companies

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(1) The impact of new technology on economic growth is discussed in greater detail in Berry, S and England, D (2001), 'Has there been a structural improvement in US productivity?', *Bank of England Quarterly Bulletin*, Summer, pages 203–09.
(2) A study for the Ministers and Governors by the Group of Deputies, October 1995, 'Saving, investment and real interest rates', concluded that the decline in public saving was the most important single cause of the decline in national saving over the period 1965 to 1995.
(3) In fact, the available empirical evidence investigating the link between demographic changes and asset price developments is weak. This could reflect the limited amount of time-series data on returns and demographic variation, and the difficulty of controlling for all of the other factors that may affect asset values and asset returns. See discussion in Poterba, J, 'The impact of population aging on financial markets', a paper presented at the Federal Reserve Bank of Kansas City's symposium, Global Demographic Change: Economic Impacts and Policy Challenges, in Jackson Hole, Wyoming, 26–28 August 2004.

Chart B
General government financial balances — total of OECD countries(a)
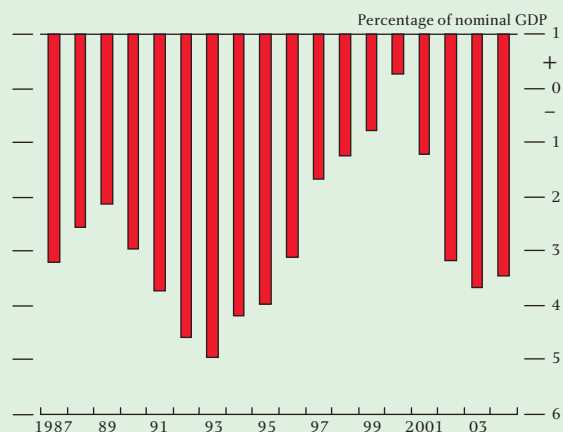
Source: OECD.

(a) Some data points refer to OECD projections.

will typically need to save more to fund retirement costs. And institutional demand for long-dated fixed income securities may have increased in anticipation of the effects of ageing populations on funds' future liabilities. Indeed, insurance companies, and to a lesser extent pension funds, in the United Kingdom and other major economies have been switching their investments towards greater holdings of bonds and away from equities to match better their assets with liabilities.

But given that such demographic changes are slow-moving and largely predictable, why should the switch from equities to bonds have become more pronounced recently? It is possible that life insurance companies or pension fund sponsors have become less willing to bear the risks of mismatches in their assets and liabilities. The weakness in stock markets between 2000 and 2003 and lower long-term interest rates increased institutions' awareness of potential shortfalls in asset valuations. At the same time, changes to regulation may have prompted institutions to accelerate the adjustment towards fixed-income securities. For example, in the United Kingdom, the FSA recently published details of capital regulations for life insurance companies.(4) Similarly, in a number of European countries,

regulatory changes have recently been introduced that aim to improve the solvency positions of pension funds and insurance companies, and these could have boosted demand for bonds.

Market factors

The precise extent to which institutional investors have been re-balancing their portfolios is unclear. But market contacts reported that some speculative traders had been buying long-dated government bonds with the aim of profiting from expected future institutional flows, and this activity may have contributed to the falls in long-term yields.

At the same time, the fall in long-term interest rates might have reflected the broader effects on asset prices of continued monetary accommodation, reflected in robust broad money growth. Annual M4 growth in the United Kingdom was 8.6% in December 2004. Euro-area M3 rose by 6.4% in the year to December 2004, up from 5.5% in August 2004, and US broad money rose by 5.9% in the year to January 2005. To the extent that the build-up in money balances has led to 'excess' liquidity, it could have prompted investors to move into other asset classes, including long-term government bonds. In turn, such a process of portfolio adjustment could have helped to bid up asset prices and drive down term premia on credit-risk-free bonds, and risk premia on other asset classes.

Another factor could be that the continuing development in the markets for index-linked securities in a number of countries (greater issuance, new products, etc) may have made such instruments more attractive to investors. In particular, the increased supply and trading of such instruments may have reduced the liquidity premia that investors demand. Some market contacts estimate that trading volume in US inflation-linked derivatives in 2004 totalled over $12 billion, an eight-fold increase on 2003, with a particular increase in the second half of 2004.

(4) The underlying principles of the new regulatory regime were outlined in 'Markets and operations' (2004), *Bank of England Quarterly Bulletin*, Autumn, page 276.

Income distributed by UK private non-financial companies, the bulk of which are dividend payments, was broadly flat during 2004 after picking up in 2003 (Chart 16). But UK financial companies did distribute more income during 2004. Furthermore, anecdotal evidence suggests that the use of share purchase schemes has increased in a number of economies over the past year.

A fall in the equity risk premium might also have contributed to the continued strength in equity prices. Over short horizons, information from options prices suggests that equity price uncertainty, as measured by implied volatility, fell over the review period (Chart 17). Both realised and implied equity volatility was low, having reached levels last seen in the early 1990s.

There is evidence that merger and acquisition activity has picked up recently, which may also have boosted equity prices (Chart 18). This could partly explain why equity prices of medium-sized companies have outperformed those of larger companies in the United Kingdom, United States, France and Germany (Chart 19). Many of these bids have been by private equity funds which have benefited from the freely available credit in the high-yield bond and leveraged loan markets. In this way, credit market conditions may have helped to underpin the rise in equity valuations and brought about some re-leveraging of the corporate sector.

Corporate credit markets

Accompanying the rise in equity prices, spreads on investment grade corporate bonds narrowed slightly over the period and remained low by historical standards (Chart 20). Similarly, spreads on high-yield and emerging market bonds narrowed, suggesting conditions for lower-rated issuers also remained favourable (Chart 21). Indeed, the Merrill Lynch high-yield euro-denominated credit spread index narrowed to the lowest level since the series began in December 1997 (Chart 22).

Against the background of a continued benign macroeconomic environment and with company balance sheets having been strengthened over recent years in a number of the major economies, corporate defaults remained low. Moodys' speculative-grade annual default rate fell to 2.3% in 2004, and defaults were forecast to remain relatively low through 2005. Ratings agencies also reported that there were no investment-grade

Chart 16
Income distributed by UK corporations
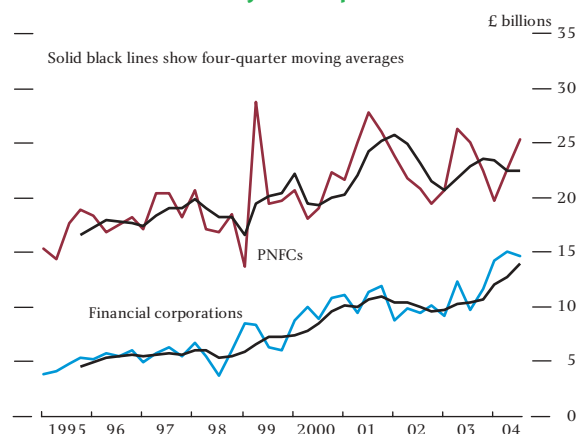
Sources: ONS and Bank calculations.

Chart 17
FTSE 100 realised and implied volatility
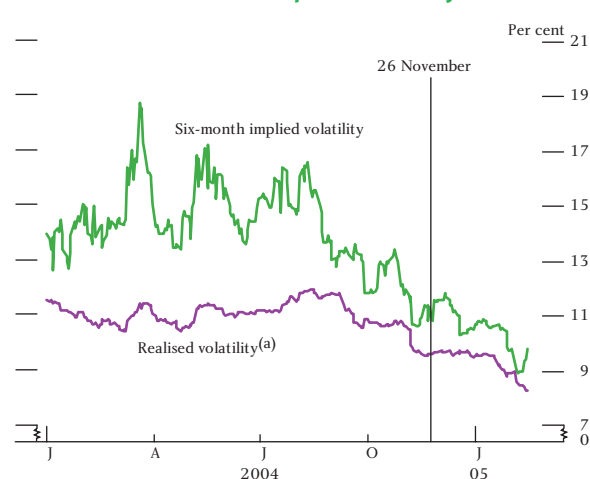
Sources: Bloomberg, LIFFE and Bank calculations.

(a) Annualised rolling standard deviation of log returns estimated over a six-month window.

Chart 18
Global merger and acquisitions(a)
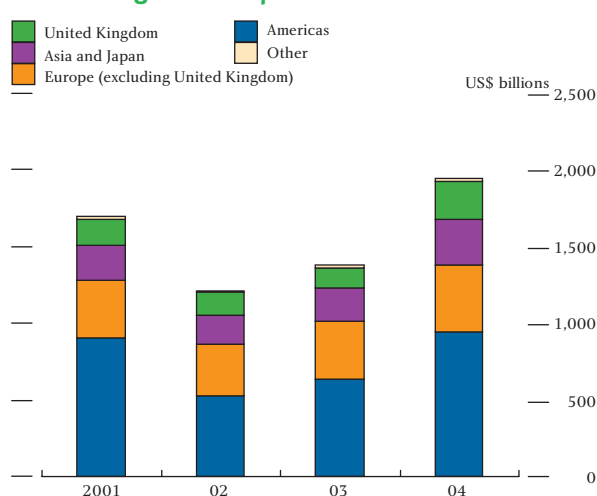
Source: Thomson Financial.

(a) Data represent the value of announced mergers and acquisitions, where the merger value is based on the target company alone.

Chart 19
Mid-cap equity indices relative to large-cap indices
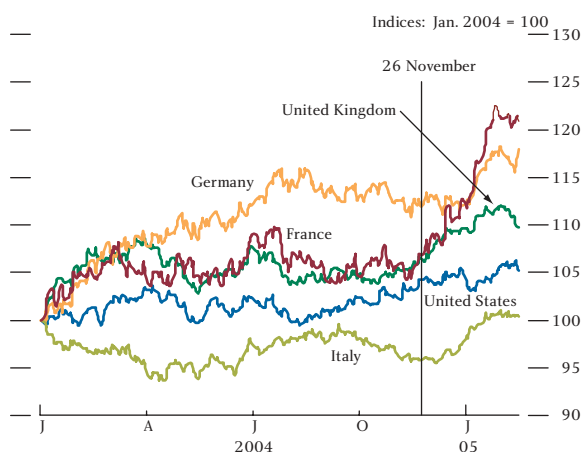
Sources: Bloomberg and Bank calculations.

Chart 20
Option-adjusted corporate bond spreads

Source: Merrill Lynch.

Chart 21
Emerging market and high-yield corporate bond spreads

Sources: JPMorgan Chase and Co. and Merrill Lynch.

(a) Emerging markets bond index.

Chart 22
High-yield option-adjusted corporate bond spreads and global default rates

Sources: Merrill Lynch and Moody's.

defaults during 2004 and ratings upgrades exceeded downgrades by 89% in 2004 Q4, compared with 36% in 2004 Q3.

Chart 22 shows a marked correlation between realised default rates and credit spreads. The recent trend of narrowing credit spreads could therefore be consistent with a fall in underlying default risk. But this is not the only explanation. For example, a fall in liquidity premia could have contributed to the continued narrowing in spreads; as with risk-free instruments, any 'excess' liquidity among investors could have spilled over into corporate credit markets boosting bond prices and lowering yields. A more durable effect on spreads might have arisen from structural changes in credit markets. The rapid growth in credit markets over recent years — for example, in tradable credit indices — might mean that investors can more easily diversify their credit portfolios, which could have reduced required risk premia on credit instruments.

Narrow spreads in corporate credit markets may have prompted some investors to move into other credit products (for example more complex/leveraged products such as collateralised debt obligations (CDOs)) in search of higher returns.

CDO issuance was high during 2004 Q4 and, despite a significant fall in January (Chart 23), market commentators expected issuance to remain high through 2005. Furthermore, the market has continued to find innovative ways of structuring products that generate higher yields. For example, December saw the launch of the first collateralised commodity obligation (CCO), a vehicle that repackages the risk on a pool of commodity price derivatives. And demand reportedly remained high

Chart 23
Funded CDO issuance(a)
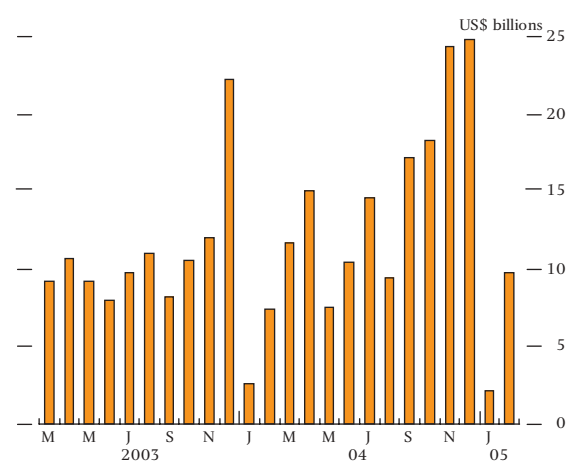
Source: JPMorgan Chase and Co.

(a) February 2005 data refer to issuance up to 18 February.

for credit products that offer higher leverage, in particular for both standardised tranches on credit indices and bespoke single-tranche CDOs, including CDOs that reference other CDOs (so-called CDO-squared products).(1)

One specific uncertainty facing credit markets is the potential impact of ratings downgrades in the US automobiles sector. Since 2002, tradable debt of both General Motors (GM) and Ford has been rated close to the bottom of the investment-grade spectrum by S&P. In January, S&P announced that it would review the appropriateness of GM's stable outlook (although it did not anticipate taking any action in the near future). Should GM be downgraded those fund managers who lack the mandate to hold speculative-grade credits could sell their holdings of GM bonds.

Of course, any future downgrade would have been well signalled — GM and Ford debt already traded apart from other auto sector credits (Chart 24). And over recent months, spreads on GM and Ford credit default swaps (CDS) were trading at levels closer to those of high-yield rather than investment-grade CDS indices. But any future downgrade of GM and Ford debt could have a potentially disruptive effect on the high-yield market: combined, the two companies have outstanding euro-denominated debt equivalent to around half the outstanding total euro high-yield debt market (Chart 25).

Chart 24
US dollar-denominated auto sector bond spreads
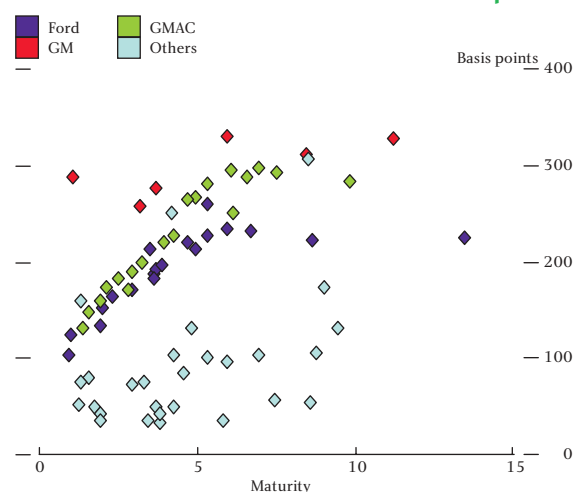
Sources: Merrill Lynch and Bank calculations.

Chart 25
GM and Ford debt outstanding relative to total high-yield debt
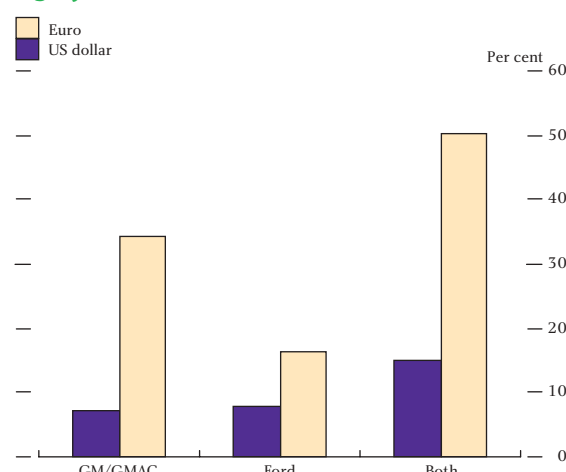
Sources: Merrill Lynch and Bank calculations.

Risk appetite and market volatility

Taken together, the narrowing of credit spreads, rises in equity prices and generally low levels of realised and expected volatility across financial markets might have suggested a broad-based fall in risk premia. This could have reflected a fall in the perceived riskiness of financial assets. For example, particularly in credit markets, developments in derivative markets may have made it possible for investors to diversify their portfolios more effectively. It could also suggest a more general increase in investors' risk appetite as the so-called 'search for yield' continued, as evidenced by the increased demand for leveraged products that offer a yield pickup.(2)

(1) Recent developments in structured credit markets were described in more detail in Chapter 2 of 'The financial stability conjuncture and outlook' (2004), *Bank of England Financial Stability Review*, December, pages 50–64.
(2) The term 'risk appetite' is used here to mean the general willingness to hold any given quantity of asset risk, which may vary over time, for example as macroeconomic conditions change. For more details, see Gai, P and Vause, N (2004), 'Risk appetite: concept and measurement', *Bank of England Financial Stability Review*, December, pages 127–36.

But why might investors' risk appetite have increased? Simple textbook asset pricing models assume that investors seek to smooth their consumption through time. Lower consumption volatility (ie a generally less risky macroeconomic environment) means investors require lower compensation for taking risk. Given that asset prices reflect claims on future consumption, the broad-based fall in market volatility observed since 2002 may have been caused by a fall in expected consumption volatility. In the context of a simple asset pricing framework, this could be consistent with an increase in investors' risk appetite and, in turn, a reduction in the required risk premia across asset classes.

Moreover, lower volatility may have encouraged some investors to use greater leverage or hold riskier assets. This in turn may have increased liquidity in markets for risky assets, which may have further reduced apparent risks.

Against this backdrop, it is possible that the recent low levels of volatility will prove temporary. A sudden rise in asset volatility could prompt a more generalised fall in risk appetite and, in turn, a broad-based asset price correction, possibly fuelled by an unwinding of leveraged positions or an abrupt unwinding of market liquidity.

Developments in market structure

This section notes three risk-reducing developments in global financial markets. It also notes the issuance of the first 50-year euro-denominated government bonds, and reviews activity in the sterling money markets and gilt repo market since the Bank announced reforms to its operations in the sterling money markets.

Continuous Linked Settlement (CLS) and foreign exchange settlement risk

CLS is the international foreign exchange settlement system owned by 69 of the world's largest financial organisations and overseen on a co-operative basis by the central banks that issue the currencies settled in the system.[1] Following the resolution of outstanding regulatory and legal issues, transactions involving four new currencies — the Hong Kong dollar, the Korean won, the New Zealand dollar and the South African rand — started settling in CLS on 7 December 2004. This

brought the total number of currencies settled in the system to 15.

BMA guidelines on repo delivery

The Bond Market Association (BMA) recently issued guidelines for so-called 'prompt delivery' of interdealer repo trades. Repo transactions undertaken on this basis will require the delivery of the underlying security to take place within 15 minutes of the trade, after which point the trade will be cancelled if the security has not been delivered.

The guidelines are part of BMA initiatives to address the problem of settlement 'fails' in US Treasury bond repo markets. In particular, the guidelines aim to ensure that there is a mechanism whereby firms that are holding a particular Government Security have adequate incentives for making such securities available to dealers and other participants that require these securities to cover a short position or otherwise make delivery to a third party.

Early termination of credit default swaps

The rapid growth in credit derivatives markets over recent years has prompted market initiatives to introduce early termination (or 'tear-up') facilities into the credit default swap (CDS) market. During November 2004, CDS positions with a notional value of around $38 billion referencing US and European credit indices were terminated early. The termination was facilitated by TriOptima, a private company who have previously been involved in similar 'tear ups' in interest rate swap markets.[2] From a systemic standpoint, the extension of this facility to credit markets should contribute to reducing counterparty risk.

Issuance of long-dated government securities

The Agence France Trésor (AFT) issued the first ever 50-year euro-denominated bond — the OAT 4% 25 April 2055 — on 23 February 2005. The issue of €6 billion was covered more than three times, confirming earlier survey evidence, compiled for the AFT, which suggested that there was significant investor interest in such long-dated securities. In the United Kingdom, the Debt Management Office has consulted the market about issuing ultra-long gilts, as reported in the previous *Bulletin*.

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(1) For more details about CLS see Sawyer, D (2004), 'Continuous Linked Settlement (CLS) and foreign exchange settlement risk', *Bank of England Financial Stability Review,* December, pages 86–92.
(2) See 'Markets and operations' (2003), *Bank of England Quarterly Bulletin,* Summer, page 160.

Sterling money markets over the past year

As discussed in this and previous *Bulletins*, since the Bank announced its objectives for reforming its operations in the sterling money markets in May 2004, the spread between very short-dated interest rates and the Bank's repo rate has narrowed and become more stable.

There is some evidence that the reduction in uncertainty has encouraged a pickup in wider market activity. In particular, more stable short-dated interest rates have reportedly encouraged growth in over-the-counter (OTC) derivatives markets that reference these rates. For example, the sterling overnight index average (SONIA), published by the Wholesale Markets Brokers' Association (WMBA), is used as the reference rate for the floating leg of sterling overnight index swaps (OIS). Market participants have suggested that the OIS market has grown rapidly during the past year.

In the cash markets, there has been high growth in amounts outstanding for both the interbank and certificates of deposit markets since 2004 Q2 (Chart 26). Market contacts suggested that reduced uncertainty surrounding short-term funding costs, and greater liquidity in the markets for hedging the risks in these instruments, has encouraged lending and borrowing at longer maturities.

Quoted bid-offer spreads in the sterling unsecured market have also narrowed. This may reflect not only more stable short-dated interest rates but also the recent move from quoting short-dated unsecured rates in fractions to decimals.

Turnover in the gilt repo market

The steady growth in amounts outstanding in the gilt repo market experienced over recent years reversed slightly in 2004 H2 (Chart 26). The fall in repo activity in the second half of 2004 was said to reflect both the flat shape of the money market curve and banks' efforts to reduce balance sheet size ahead of the year-end. Turnover, however, has continued to rise and, during the past few years, an increased proportion of trading in gilt repo, particularly at overnight maturities, has been conducted on BrokerTec's electronic trading platform with turnover data suggesting it accounted for just under one half of aggregate market turnover by November 2004 (Chart 27). One of the benefits of the

Chart 26
Size of the sterling money market
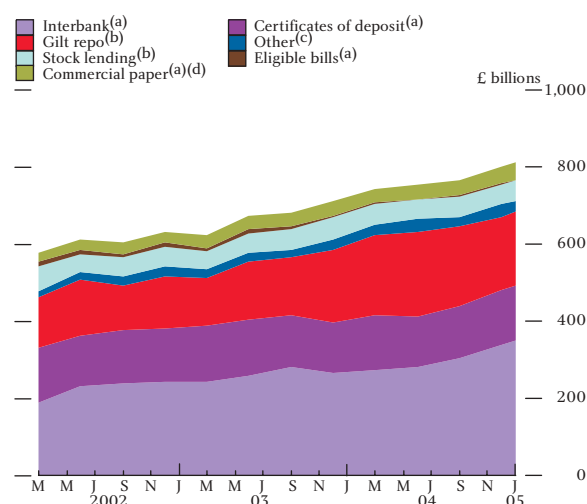
Source: Bank of England.

(a) Reporting dates are end-quarter.
(b) Reporting dates are end-February for Q1, end-May for Q2, end-August for Q3 and end-November for Q4.
(c) Includes Treasury bills, sell/buy-backs and local authority bills.
(d) Bank of England data series discontinued after 2004 Q2. Euroclear data used thereafter.

Chart 27
Average daily turnover in gilt repo(a)
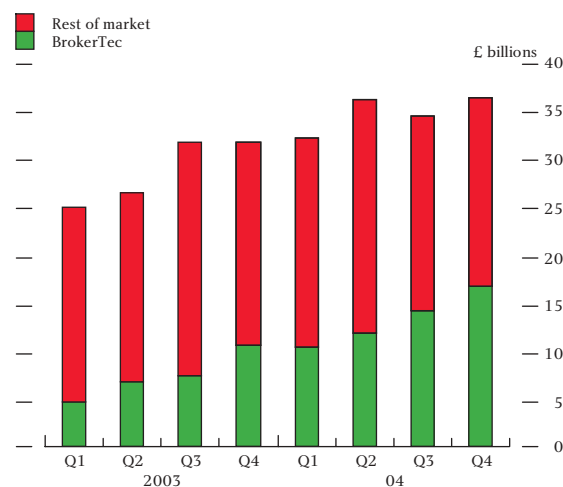
Sources: BrokerTec and Bank of England quarterly survey of repo market.

(a) Quarters refer to three months ending February, May, August and November.

system is the ability to settle repo transactions through the London Clearing House, enabling banks to reduce their credit risk both by netting exposures and by dealing with a high quality central counterparty.

Bank of England official operations

Changes in the Bank of England balance sheet

There was little change in the sterling value of the foreign-currency components of the Bank's balance sheet over the review period (Table B). On 28 January 2005, the 2005 euro note, one of the Bank's three-year euro-denominated notes, matured. To maintain the

Table B
Simplified version of Bank of England consolidated(a) **balance sheet**(b)

£ billions

Liabilities	18 Feb.	26 Nov.	Assets	18 Feb.	26 Nov.
Bank note issue	38	40	Stock of refinancing	27	28
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	8	8	Other sterling-denominated assets	3	5
Foreign currency denominated liabilities	13	13	Foreign currency denominated assets	15	14
Total(c)	**59**	**61**	**Total**(c)	**59**	**61**

(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.

nominal value of euro notes outstanding, the Bank created €2,200 million of notes maturing on 28 January 2008. A €1,000 million first tranche of this 2008 euro note was auctioned on 18 January 2005 for issue on the 28 January. Cover at auction was 3.2 times the amount on offer, and the average accepted yield was 2.648%, 11.3 basis points below the three-year euro swaps curve. A second auction of €1,000 million nominal of the 2008 note is scheduled for 15 March 2005. The remaining €200 million nominal of notes will be retained by the Bank and may be made available for sale and repurchase operations with market-makers for the note programme.

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 widened to 10.2 basis points below Euribor, compared with 9.8 basis points over the previous review period (September-November); for six-month bills, the average issuance spread widened to 10.6 basis points below Euribor from 10.1 basis points.

The size of the sterling components of the Bank's balance sheet fluctuated with seasonal and weekly variation in demand for banknotes (Table B). Notes in circulation rose over the Christmas and New Year period, with a corresponding rise in the stock of refinancing via open market operations (OMOs) (Chart 28).

As described in the Autumn 2004 *Quarterly Bulletin*, the Bank has changed the way it manages its sterling bond portfolio. Gilt purchases were made in accordance with the screen announcement of 2 December 2004; no purchases in December, £16 million of 4³/₄% Treasury 2015 in January and £16 million of 5% Treasury 2014 in

Chart 28
Bank notes in circulation, the stock of OMO refinancing, and 'Ways and Means'(a)
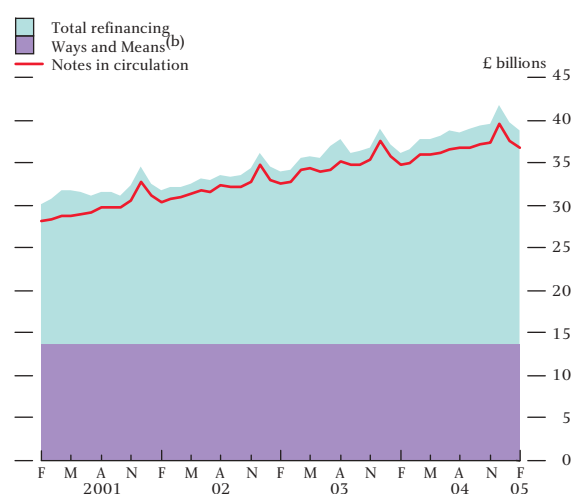
(a) Monthly averages.
(b) An illiquid advance to HM Government. This fluctuated prior to the transfer of responsibility for UK central government cash management to the UK Debt Management Office in April 2000. The Ways and Means is now usually constant.

Chart 29
Instruments used as OMO collateral(a)
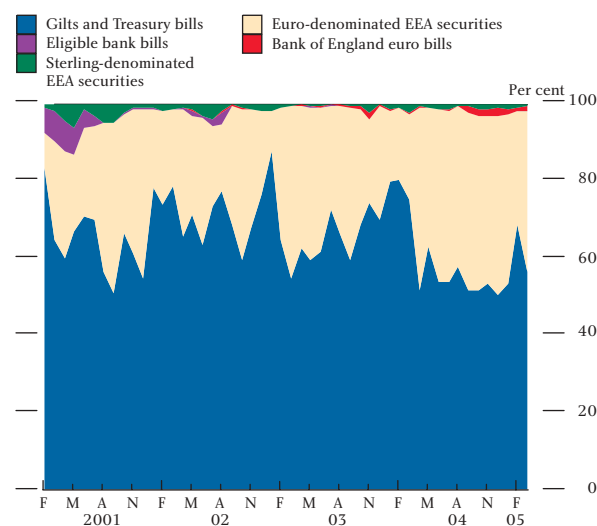
(a) Monthly averages.

Chart 30
**Refinancing provided in the Bank's open
market operations**(a)
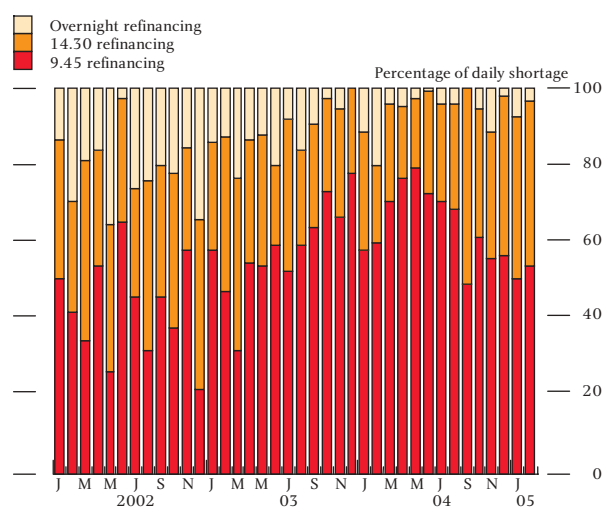
(a) Monthly averages.

Chart 31
**Relative cost and use in OMOs of
euro-denominated EEA government securities**
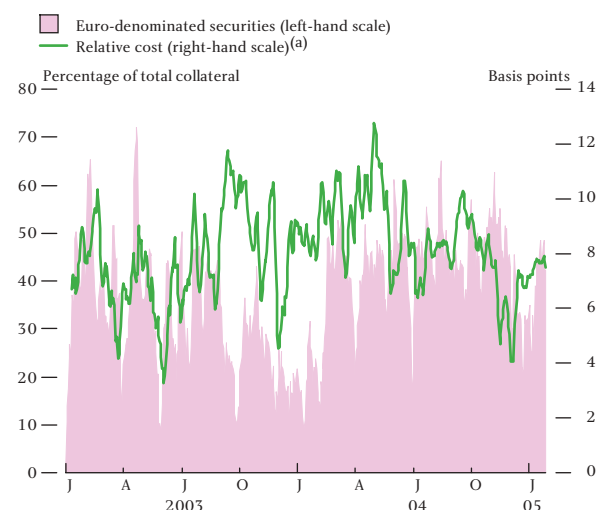
(a) Relative cost calculated as the difference between one-month BBA repo and
     Libor fixing spread and one-month European Banking Federation repo
     and Euribor spread. A wider spread indicates a lower cost of repoing
     euro-denominated debt relative to repoing gilts.

February 2005. A screen announcement on
1 March 2005 detailed the purchases to be made over
the following three months.

Counterparties participating in the Bank's OMOs
reduced their use of euro-denominated collateral,
especially during January (Chart 29), despite a fall in its
relative cost (Chart 30). The majority of OMO financing
continued to be provided at the Bank's repo rate (at a
two-week maturity) in the 9.45 and 14.30 rounds, rather
than at a penalty interest rate in the overnight lending
facilities (Chart 31).

Short-dated interest rates

The size of the spread between daily highs and lows in
sterling overnight interest rates has narrowed compared
with the recent past. Since the release of the second
consultative paper on money market reform on
25 November, volatility in overnight interest rates has
remained at the lower level prevailing since the Bank
first announced in May its objectives for reform of its
operations in the sterling money markets in May
(Chart 32). There have been a number of 'tight' days
when overnight rates have risen because the Bank's
penal overnight bank lending facilities have been used.
But these peaks should be reduced following the interim
reforms announced by the Bank on 11 February 2005,
and to be implemented from 14 March 2005 — see the
box on page 22.

Chart 33 shows that the distribution of the spread
between the sterling secured (gilt GC repo) overnight
rate and the official Bank repo rate became skewed
towards tighter overnight rates. In part, this reflected
the absence of rate pivoting ahead of meetings of the
MPC in the current quarter. Given that OMOs span
MPC dates, pivoting occurs when market participants
perceive a significant likelihood that the MPC will
change official rates; speculation about rate increases
causes overnight market rates to decline in the run up to
the MPC meeting date, and *vice versa*. Pivoting was
previously observed ahead of the June and August 2004
meetings (Chart 32). It should be eliminated by the
interim money market reforms.

Chart 32
Volatility of sterling overnight interest rate(a)
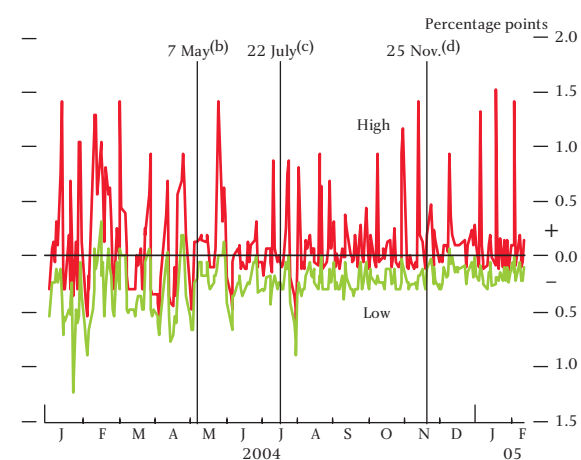
(a) High and low of the day observed by the Bank's dealing desk as a spread
     to the policy rate.
(b) On 7 May, the Bank published a consultative paper on the reform
     of its operations in the sterling money markets.
(c) On 22 July, the Bank announced the results of the review of its official
     operations in the sterling money markets.
(d) On 25 November, the Bank published a second consultative paper on the
     reform of its operations in the sterling money markets.

Chart 33
Cumulative folded distribution of sterling secured overnight rates(a)
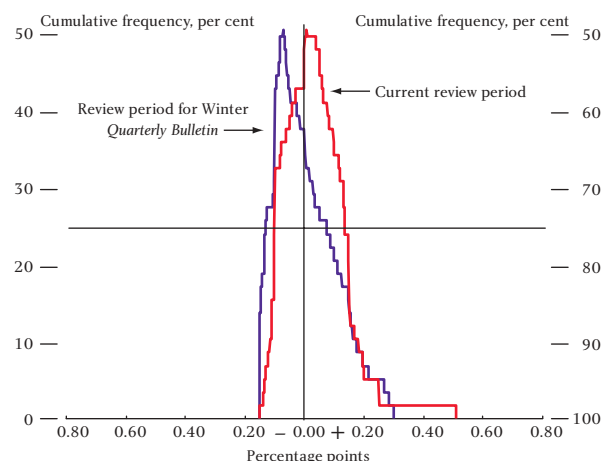
(a) Distribution of the spread between the GC repo rate and the MPC's repo rate.
A negative spread indicates that the market rate is less than the official rate;
if more than 50% of the spread distribution is below zero, it has a negative bias.

Chart 34
Cumulative folded distribution of international unsecured overnight rates(a)
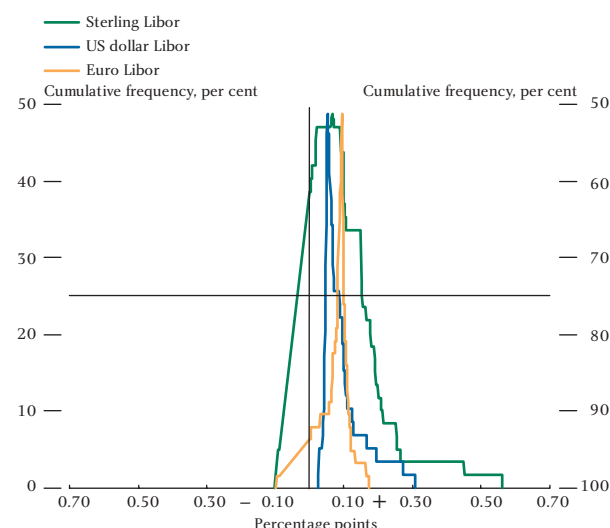
(a) Distribution of the spread between the Libor rate and the official policy rate.
A negative spread indicates that the market rate is less than the official rate;
if more than 50% of the spread distribution is below zero, it has a negative bias.

Comparing overnight sterling, euro and dollar Libor rates to their respective policy rates shows that sterling unsecured rates remained more volatile than dollar and euro rates (Chart 34). The Bank's reforms are intended to reduce sterling overnight rate volatility further.

Forecasting the liquidity shortage

Relative to the previous review period, there was a decline in the accuracy of the Bank's liquidity forecast, in part owing to seasonal volatility in demand for banknotes over the Christmas and New Year period (Table C). This volatility persisted into late January as banknotes in circulation declined more gradually than

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)
2003 Q2	119 (131)	54 (76)	38 (43)
2003 Q3	118 (170)	92 (154)	85 (150)
2003 Q4	87 (91)	52 (57)	46 (36)
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)	57 (63)
Jan.-Feb. 2005	150 (145)	100 (121)	71 (99)

expected after the Christmas and New Year peak. But after allowing for seasonality, there was little deterioration in accuracy: forecast errors were of a similar magnitude to those made in the equivalent period twelve months ago.

Flows in the end-of-day schemes for settlement banks fell, possibly suggesting an improvement in settlement banks' forecasting accuracy. Average payments in the Bank of England Late Transfer Scheme (BELTS) rose moderately over the period, but these were more than offset by a fall in the End-of-Day Transfer Scheme (EoDTS) payments. The volatility of daily flows also fell in the EoDTS but rose in the BELTS, suggesting settlement banks continued to experience large but infrequent variability in their end-of-day balances. The fall in the level of payments in the end-of-day facilities over the past year has been welcome (Chart 35).

Following the Bank's announced reforms, in particular the move to a period-average maintenance requirement and remunerated reserves, settlement banks will not need to square up every day. On most days, they will be able to vary their reserves balances instead.

Chart 35
Bank of England Late Transfer Scheme and End-of-Day Transfer Scheme(a)
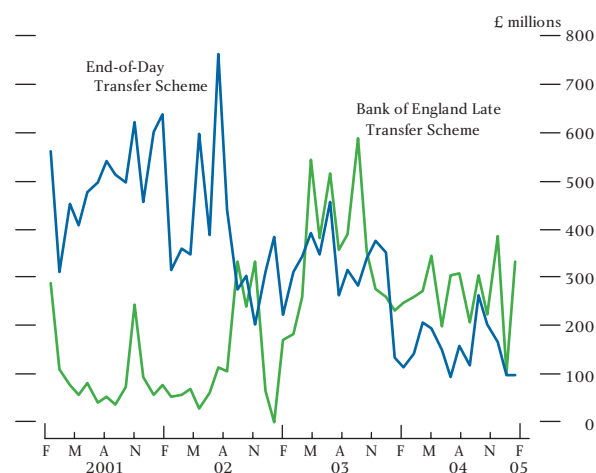
(a) Monthly averages.

Responses to the second consultation paper on money market reform, and interim reforms

As described in the Winter 2004 *Quarterly Bulletin*, the Bank issued a second consultative paper in November 2004 on the planned reforms to its official operations in the sterling money markets.[1] It set out the proposed new framework in detail and invited comments from interested parties on a number of detailed design features. It also asked for indications of interest in participating in the new facilities.

The responses to the consultative paper indicated widespread support for the planned new framework, and many banks and building societies expressed an interest in participating. The responses also provided some important feedback, for example on how potential participants would expect to manage their reserve accounts. In light of these comments, and continuing dialogue with market participants, the Bank will issue a further paper outlining its final plans.

In the November consultative paper, the Bank suggested that it might be possible to sequence changes to the operational framework, since the Bank currently envisages that the necessary preparations for the fully reformed system are unlikely to be completed before the end of 2005. On 11 February, the Bank announced a package of interim measures with the aim of stabilising overnight interest rates further ahead of the launch of the fully reformed system.[2] The measures, which will apply from 14 March, are 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 repos undertaken as part of the Bank's daily open market operations to the MPC repo rate;

● no longer purchasing bills outright in the Bank's open market operations (OMOs); and

● removing bankers' acceptances from the Bank's list of eligible collateral.

Allowing access to the Bank's overnight facilities at

less penal rates is expected to contain volatility in short-term market interest rates directly.

Indexing the Bank's two-week repos to the MPC repo rate will eliminate a specific source of volatility known as 'pivoting'. As discussed in the Summer 2004 *Quarterly Bulletin*, pivoting occurs when fixed-rate repos span an MPC meeting at which the MPC is expected to change its repo rate. Indexed repos will not form part of the final framework and so will be used only in the interim period until the launch of the fully reformed system. Thereafter, the new structure for open market operations will ensure that repos do not span scheduled MPC meetings.

The Bank for many years has conducted its OMOs not only via repos, but also via outright purchases of Treasury bills and eligible bankers' acceptances. However, it is not possible to index the rate applying to outright bill purchases, which is delivered through a discount on the purchase price, and so such purchases will cease with the introduction of indexed repos. Outright purchases form only a small proportion of the Bank's OMOs and would in any case have been discontinued with the launch of the fully reformed scheme.

Bankers' acceptances are two-name paper that is the primary obligation of the issuing bank and the secondary obligation of the firm that borrows money from the bank under the acceptance facility. The Bank has maintained a list of banks whose acceptances will be eligible as collateral in the Bank's OMOs and for intraday liquidity in the RTGS payments system.[3] The decision to remove bankers' acceptances from the Bank's list of eligible collateral reflected their declining use, to the point where they form a tiny part of the overall pool of eligible collateral. As reported in previous *Quarterly Bulletins*, the stock of eligible bankers' acceptances has fallen from around £18 billion in 1998 to less than £1 billion by the end of 2004. That compares with around £340 billion of gilts and £2$^{3}/_{4}$ trillion of eligible EEA government collateral.

Transitional arrangements for eligible bankers' acceptances were also announced on 11 February to allow market participants to adapt to the change.

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(1) See 'Reform of the Bank of England's Operations in the Sterling Money Markets, a second consultative paper', available at www.bankofengland.co.uk/markets/money/smmreform041125.pdf.
(2) The news release announcing these measures is available at www.bankofengland.co.uk/pressreleases/2005/014.htm.
(3) More information on eligible banks and eligible bankers' acceptances is available at www.bankofengland.co.uk/markets/money/eligiblebanks.htm.

Dealing with data uncertainty

By James Ashley, Ronnie Driver, Simon Hayes and Christopher Jeffery of the Bank's Conjunctural Assessment and Projections Division.

True values of key macroeconomic variables are unobservable and can only be estimated. A key question for the Monetary Policy Committee is how best to take account of the resultant uncertainty in its economic assessment. Official estimates of economic variables are produced by the Office for National Statistics (ONS), and some private sector organisations publish surveys of business activity that may also give clues as to the underlying state of the economy. This article presents a simple methodology for deriving 'best guesses' of the true values of economic variables by weighting together official estimates and information from business surveys.

In all walks of life, the future is uncertain. But in macroeconomics, the present and past are uncertain too. True values of key macroeconomic variables — for example, GDP — are unobservable. Although the Office for National Statistics (ONS) produces official estimates of such variables, these are derived from surveys and so can only ever be an approximate guide to the true underlying economic state. Of course, as time passes, new information is received and improved methods for estimation are devised and implemented. This gives rise to revisions that are likely to move estimates progressively closer to the unobserved truth. But regardless of their maturity, estimates always contain sampling error. So uncertainty about the past and current behaviour of the economy is a fact of life for policymakers.[1]

A key question for the Monetary Policy Committee is how best to take account of this uncertainty when assessing the state of the economy. This article sets out a simple methodology for deriving 'best guesses' of the true values of economic variables on the basis of a set of imperfect (or 'noisy') indicators of the underlying economic state. It also shows the extent to which this best-guess methodology may mitigate uncertainty about the unobservable truth.[2]

The challenges of dealing with data uncertainty

The primary source of UK macroeconomic data is the ONS, which produces, among other things, the quarterly UK National Accounts and an array of monthly economic indicators such as the Index of Production and the Retail Sales Index. These statistics are produced on the basis of comprehensive surveys of firms and households, with samples that are designed to mimic the pattern of economic activity across the United Kingdom as a whole. For example, the ONS's Monthly Inquiry into the Distribution and Service Sector, from which estimates of service sector output are derived, is sent to nearly 30,000 firms, accounting for around 60% of service sector turnover. All firms with more than 250 employees are included in the sample, while a representative sample of smaller firms is chosen using sophisticated sampling techniques. The response rate is around 80%. This comprehensiveness makes the official data the authoritative guide to UK economic developments.

Monetary policy decisions are made every month, and need to be informed by the best available assessment of economic activity. As a consequence, timely economic data — that is, data that are released soon after the period to which they refer — are of particular value to the MPC. To meet such demands, the ONS publishes early ('preliminary') estimates of key economic aggregates, derived from a subset of survey responses. These estimates will inevitably be revised as more information is received and processed. The trade-off between timeliness and accuracy is inescapable, and one of which policymakers are fully aware. The challenge for

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(1) The issue of data uncertainty and policymaking was the subject of three recent speeches by MPC members: see Bean (2005), Bell (2004) and Lomax (2004).
(2) This article focuses on the issue of mitigating the effects of data uncertainty in conjunctural economic assessment. Harrison, Kapetanios and Yates (2004) and Busetti (2001) analyse the implications of data uncertainty for forecasting.

the MPC is to devise procedures that take proper account of the resultant uncertainty. And it is here that other sources of information on economic activity may have a role.

Although the ONS is the primary source of macroeconomic data for the United Kingdom, it is not the only source. For example, several business organisations publish surveys that provide indications of output growth, costs and prices for particular industrial sectors. The main strength of the business surveys is their timeliness — they are available some weeks before the first official estimates of key activity variables. Survey providers are able to process responses quickly because they sample a relatively small number of firms (generally in the region of 500 to 1,000)[1] and they ask simple qualitative questions (eg has your output risen, fallen or been unchanged?).[2]

The simplicity of business surveys, however, gives rise to their main deficiencies. First, small sample sizes mean that respondents' experiences may not accord with those of the sector as a whole. Second, the qualitative information gathered by such surveys may give an inaccurate guide to actual changes in output, since the relationship between the (net) number of firms reporting higher output, for example, and the change in output across all firms can at times be quite weak.[3] Furthermore, some business surveys' samples are chosen purely on the basis of membership of a particular organisation, and so could be unrepresentative of the UK economy.

Notwithstanding these deficiencies, however, the information provided by business surveys may usefully augment that in official estimates, particularly at the earlier stages of the ONS's data production cycle. It is sensible, therefore, to establish methodologies for weighing up the information content of the business surveys relative to the official data.

The remainder of the article presents a method for constructing 'best guesses' of services and

manufacturing output, using combinations of official estimates and business surveys. The analysis is split into four sections. First, we discuss characteristics of official data and revisions, with a particular focus on estimates of services and manufacturing output growth. Second, we study the performance of the main business surveys of the services and manufacturing sectors, and construct a 'best' survey-based estimate (SBE). Third, we calculate an overall best guess by assigning relative weights to the official data and the SBE, and show the extent to which this best-guess approach mitigates the uncertainty surrounding early official estimates of economic activity.[4] The final section concludes.

Revisions performance of official estimates

The ONS's own research has established that early official estimates of some key macroeconomic variables have in the past displayed systematic biases. For example, Akritidis (2003) showed that the average total revision to quarterly GDP growth between the first estimates and the latest estimates over the sample period 1993 Q1 to 1999 Q4 was 0.19 percentage points.[5] Does this mean that when an early estimate is observed it is sensible simply to adjust the published figure by the historical bias? To answer that question we need to look in more detail at the revisions process.

As mentioned above, the ONS produces early estimates of certain key macroeconomic data based on incomplete samples. These estimates then tend to be revised in a sequence of publications, each of which incorporates more information than the previous release. For example, GDP growth estimates are published first as preliminary estimates and are subsequently revised over the next two months in the Output, Income and Expenditure, and National Accounts GDP releases. Once a year the ONS produces the *Blue Book*, which reviews and further revises previous data. At this point, some of the information derived from high-frequency surveys is replaced by more accurate and comprehensive information from large-scale annual surveys. Around one year later, the quality of GDP

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(1) The *British Chambers of Commerce Quarterly Survey* is somewhat larger, covering around 4,000 service sector companies and around 2,000 manufacturers.
(2) The Bank's use of business survey data has previously been discussed in Britton, Cutler and Wardlow (1999) and Cunningham (1997).
(3) This can be a particular problem when sub-sectors of an industry are experiencing substantial movements in output compared with the rest of the sector. For example, ONS data indicate that falling output in the information, communications and technology (ICT) sector accounted for much of the decline in manufacturing production between 2001 and 2002. However, the dip in the manufacturing survey balances in this period was much less pronounced, consistent with the qualitative nature of the surveys, which meant that ICT firms could record only that their output had fallen and were unable to report the marked degree of the falls they had experienced.
(4) The methodology presented in this article allows us to track the speed with which ONS estimates converge on 'the truth', but not the absolute degree of measurement error in ONS data relative to the unobservable true data. Kapetanios and Yates (2004) present a method for calculating the latter.
(5) Patterns in GDP revisions are also analysed by, among others, Castle and Ellis (2002) and Richardson (2002, 2003).

estimates is improved further by aligning the information gathered on aggregate output, expenditure and income — the 'balancing' process. When a given data point has been put through two sets of *Blue Book* revisions (known as the '*Blue Book* 2 stage'), it is said to be fully balanced.

In the analysis that follows, we use mature official data — defined as data that have undergone at least two sets of *Blue Book* revisions — as a proxy for the unobservable true data. In other words, we assume that mature official data differ from the unobservable true data only by a random error.

Throughout this data production process, the incorporation of new information may generate revisions to previous estimates. But in addition to these information-based revisions, official estimates may be revised because of methodological developments. For example, in the 2004 *Blue Book* the ONS incorporated improved estimates of health output in the public sector, which led to upward revisions to GDP growth in a number of years.

Information-based biases — that is, systematic patterns in revisions as new information is incorporated — may reflect biases inherent in the data collection process. For example, if there is a relationship between firm size and the speed and accuracy with which firms respond to the ONS survey, a systematic pattern in revisions may be apparent. It therefore seems sensible to take this bias into account when forming a best guess of mature official data on the basis of early estimates. In contrast, we are more wary of carrying forward any significant biases in historical data that are attributable to methodological developments. Given the one-off nature of most methodological changes, the average of past effects of methodological change may not be a useful guide to the impact of future methodological developments.

In practice, the revisions process is complex, and there are occasions when information-based revisions and methodology-based revisions interact. To identify the

two, therefore, we rely on a simple rule of thumb, which is that those revisions up to and including a given estimate's second *Blue Book* reflect information-based revisions, while revisions thereafter reflect changes in methodology.[1]

As an indication of the extent of information-based bias, Charts 1 and 2 show the relationships between the ONS's first estimates of quarterly services and manufacturing output growth and their corresponding *Blue Book* 2 estimates.[2][3] The 45° line shows the locus of points along which the first estimates of growth are equal to the estimates at the *Blue Book* 2 stage, while the

Chart 1
Estimated information-based revisions to quarterly services output growth (1993 Q1–2002 Q4)
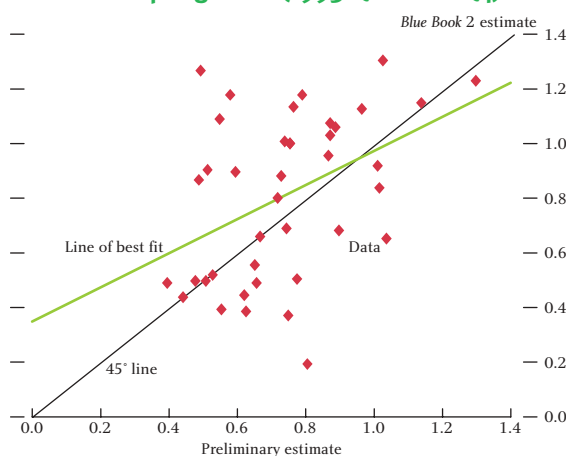
Chart 2
Estimated information-based revisions to quarterly manufacturing output growth (1993 Q1–2002 Q4)
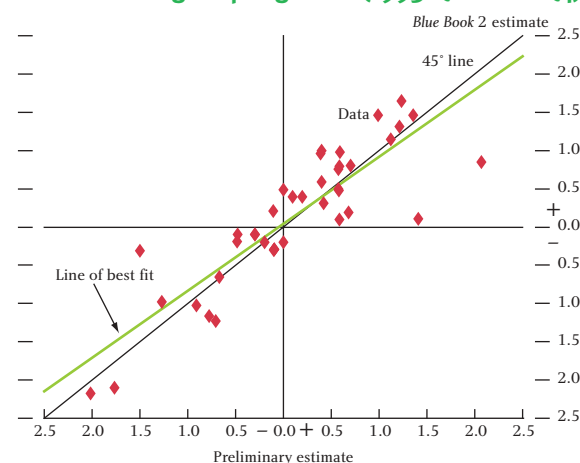
(1) Using the same criterion, Akritidis observes that around half of the bias in estimates of overall GDP growth appears to be due to information-based revisions, and around half due to methodological change.

(2) Prior to this year no explicit estimate of manufacturing output growth was published in the Preliminary GDP release, although estimates for the first two months of the quarter were contained in the monthly Index of Production (IoP) release. We have therefore proxied the preliminary manufacturing estimates with the two months' data from the IoP augmented by an in-house forecast of the third month.

(3) 1993 Q1 is taken as the starting point for the analysis as that was the time that the Preliminary GDP estimate was first published one month after the end of the reference quarter, making way for the Output, Income and Expenditure release in the second month after the reference quarter. The final data point is 2002 Q4 because the subsequent data have not been through two *Blue Books*, and we consider these to be insufficiently mature for this aspect of our analysis.

green line is the least squares line of best fit. Any significant divergence of the line of best fit from the 45° line indicates the presence of a systematic pattern in revisions between the preliminary release and the *Blue Book* 2 estimate.

Chart 1 suggests that revisions to early estimates of service sector output vary systematically with the level of the initial estimate: higher preliminary estimates tend to be revised down, while lower preliminary estimates tend to be revised up. Statistical analysis confirms that this pattern is statistically significant. However, as suggested by Chart 2, there is little pattern in revisions to the first estimates of manufacturing output growth. Indeed, the line of best fit is not statistically distinguishable from the 45° line.[1]

Estimates derived from business surveys

In this section we look at the relationship between mature official estimates and the activity and orders balances of the main business surveys for the services and manufacturing sectors. We then explain how we arrive at 'optimal' survey-based estimates for services and manufacturing output growth.

The surveys we analyse here are: the *Report on Services* and the *Report on Manufacturing* produced by the Chartered Institute of Purchasing and Supply (CIPS); the *Quarterly Survey* produced by the British Chambers of Commerce (BCC); the *Quarterly Industrial Trends* survey, produced by the Confederation of British Industry (CBI); and the *CBI/Grant Thornton Services* survey. The relatively good sample design, coverage and timeliness of these surveys means that they often form an important input into the MPC's economic assessment. In practice, the focus on these surveys is by no means exclusive — the MPC's analysis is informed by an array of other surveys and indicators, including reports from the Bank's regional Agents — but the following analysis provides a good illustration of how such information is assessed and used.

Table A shows the correlations between the survey balances and mature official data.[2][3] For both the CIPS and the BCC services surveys, lagged activity balances are better indicators of output growth than contemporaneous balances. This seems counterintuitive. But service sector output is difficult to define and measure, and so this relationship may reflect differences in the way that survey respondents classify output when responding to business surveys and the way the ONS defines and measures services output. As expected, lagged orders balances perform better than contemporaneous orders. For manufacturing, the contemporaneous activity balances correlate better with the official data than lagged activity, but the empirical distinction between contemporaneous and lagged orders is rather less apparent than it is for services.

Table A
Correlations between the surveys and mature official data — 1993 Q1–2002 Q4

	Contemporaneous activity	Once lagged activity	Contemporaneous orders	Once lagged orders
CIPS services	0.17	0.43	0.07	0.35
BCC services	0.18	0.41	0.09	0.36
CBI services	0.28	0.22	0.16	0.25
CIPS manufacturing	0.54	0.43	0.49	0.44
BCC manufacturing	0.41	0.35	0.48	0.39
CBI quarterly industrial trends	0.40	0.26	0.36	0.27

We have used these individual survey balances to derive a single 'best' model that transforms the survey information into a best guess of the unobservable true data.[4] The survey balances are generally highly correlated with each other, so in practice there is little to choose between them. However, out-of-sample tests indicated that, for both the services and manufacturing output, the most robust models include solely the corresponding CIPS surveys' activity balance. This is not to say that the other survey information should be discarded — it can still provide valuable corroborative evidence if the signals from early official estimates and the CIPS surveys diverge. But it is not included in the baseline best guess described here.

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(1) Nonetheless, we use the line of best fit in Chart 2 to adjust preliminary estimates of manufacturing output growth, since this constitutes our best point estimate of the appropriate adjustment.

(2) Responses to business surveys are usually summarised by diffusion indices or net percentage balances. For example, the CIPS surveys report a diffusion index in which a value of 50 corresponds to no change in the relevant variable compared with the previous period. Values above 50 indicate positive growth, while values below 50 indicate falls. The BCC and CBI surveys report net percentage balances, which take a positive value when the net balance of respondents report positive growth, and a negative value for negative growth.

(3) The CIPS services survey only started in 1996, and the CBI services survey is available only from 1998. We have therefore proxied earlier data for these series using the BCC services balances. However, the qualitative results reported in Table A are unchanged if the period from 1998 is used.

(4) This is done by way of a simple OLS regression of the mature official data on the survey balances.

Constructing a weighted best guess

The preceding sections have shown how we obtain two separate 'best guesses' of manufacturing and services output growth: one that uses the lines of best fit as in Charts 1 and 2 to adust early official estimates (the 'ONS-based best guess'); and one based on business survey balances (the SBE). In this section we show how these forecasts are combined to obtain an overall best guess. We also illustrate the benefits from using this forecast combination methodology in helping to reduce the uncertainty around early official estimates of output growth.

The two separate best guesses are combined using the Bates and Granger (1969) 'variance-covariance' approach to forecast combination. The weight given to each indicator is estimated on the basis of a simple OLS regression of the mature official data (our proxy for the unobservable truth) on the two forecasts, including a constant (see Granger and Ramanathan (1984)).[1] The weights are constrained to be non-negative and to sum to unity. Denoting the mature official data in quarter t as O_t, the ONS-based best guess as ONS_t and the *SBE* as S_t, the following regression is run:

$$O_t - ONS_t = \text{constant} + \alpha(S_t - ONS_t) + \text{error} \qquad \textbf{(1)}$$

The overall best guess (BG_t) is calculated by applying the estimated weights $1 - \hat{\alpha}$ and $\hat{\alpha}$ to the ONS-based best guess and the SBE respectively:

$$BG_t = (1 - \hat{\alpha})\, ONS_t + \hat{\alpha}\, S_t \qquad \textbf{(2)}$$

This exercise is repeated for each step in the GDP data cycle — so weights are estimated using ONS-based best guesses at the Preliminary; Output, Income and Expenditure; Quarterly National Accounts; and *Blue Book* 1 stages.

Having devised a methodology for constructing a best guess through forecast combination, a natural question is what benefit is gained by using this best guess rather than simply taking early official estimates at face value? This is illustrated in Chart 3, which shows how uncertainty about the unobservable true growth rate in a given quarter changes as more data become available. The horizontal axis on the chart denotes stages in the

Chart 3
Uncertainty through the data cycle
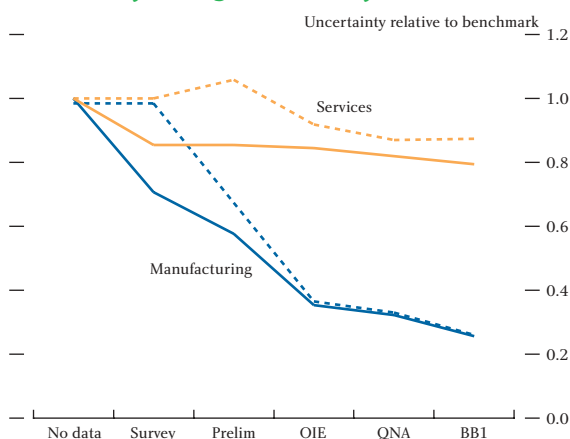
Notes: The x-axis labels refer to different stages in the data cycle. 'Survey' refers to the point at which only survey data are available. The next four labels refer to the points at which successive ONS data releases are also available: Preliminary (Prelim); Output, Income and Expenditure (OIE); Quarterly National Accounts (QNA); first *Blue Book* (BB1).

data cycle. The left-hand-most point marks the stage at which there are no hard data available for a given quarter. At the next point only business survey data are available. Subsequent points mark the sequential publication of more mature official estimates.

The vertical axis shows the level of uncertainty surrounding best guesses derived from any given methodology. As a benchmark, a value of unity corresponds to the variance of mature data outturns. This corresponds to the uncertainty associated with a 'naive' methodology in which the best guess at each point in time is simply set equal to the historical mean of the series. The solid lines show uncertainty at each point in the data cycle under the weighted best-guess methodology presented above: they plot the variance of mature data outturns around the weighted best guesses, as a proportion of benchmark uncertainty. By way of comparison, the dashed lines show how uncertainty evolves (again as a proportion of benchmark uncertainty) if the business survey balances are ignored and the best guess is taken to be the official estimates at each point in the data cycle.

In terms of the weighted best guesses (the solid lines), moving from the point at which no data are available to having the business surveys reduces uncertainty by around 15% in the case of services output growth and around 30% in the case of manufacturing. Uncertainty about services output growth declines only gradually thereafter, indicating that the official data provide

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(1) The constant in equation **(1)** will pick up any bias in official estimates at the *Blue Book* 2 stage relative to the mature data. As discussed earlier, we associate this bias with past methodological change and do not wish to carry it forward in our best guess. Hence the constant is absent from equation **(2)**.

relatively limited additional information once the business surveys have been taken on board. The fact that the solid orange line always lies below the dashed orange line shows that accounting for the information content of the business surveys leads to a persistent reduction in uncertainty relative to relying solely on official estimates. In contrast, although the benefit from using the business surveys for manufacturing output growth is initially larger than that for services, the dashed blue line converges with the solid blue line at the Output, Income and Expenditure release. This indicates that the value of the business surveys over and above the official data from this point onwards is negligible.

It is important to recognise that the weighted best guesses derived from equation **(2)** provide only baseline best guesses that are not used in a mechanical way. In particular, the relatively small sample size (40 observations) means that the estimated weights underlying the best guesses are subject to considerable statistical uncertainty and meaningful out-of-sample testing has not been possible. Moreover, the weights will depend on each indicator's average ability to predict mature official data in the past. But at any given point in time supplementary information may suggest that the 'average of the past' is an inappropriate basis for current assessment. For example, on some occasions survey response rates may be unusually low, suggesting that the resultant estimate contains greater sampling uncertainty than normal.[1] In addition, non-quantitative information such as reports from the Bank's regional Agents is also brought to bear on the MPC's analysis. Ultimately, economic assessment is a matter of judgement.

Related to the above, ongoing ONS initiatives to improve the quality of official statistics may over time lead to increasing weight being given to official estimates throughout the data cycle. In particular, the ONS is at the forefront of international efforts to develop better measures of service sector output including better short-term output indicators. Indeed, within the OECD

only the United Kingdom and Korea produce a monthly Index of Services, the service sector equivalent of the monthly Index of Production for the industrial sector.[2][3] To the extent that this work leads to improvements in the quality of service sector output indicators, we may expect to see the two orange lines in Chart 3 fall, and the gap between them narrow.

Concluding remarks and future work

Data uncertainty can be mitigated to a degree by bringing a wider array of information to bear on economic assessment than relying solely on early official data estimates. However, the practical implementation of techniques to reduce the effects of data uncertainty requires assumptions to be made about the nature of that uncertainty. This article has set out a simple method for combining information from business surveys with early official estimates, on the assumption that the true underlying data differ from mature official estimates only by a random error.

Other statistical techniques could be employed to address this issue. One popular approach invokes the Kalman Filter. Observable data are assumed to provide noisy signals of the true unobservable data, and the aim is to filter out the noise to give the best possible indication of the underlying signal. Given an assumption regarding how the unobservable true data evolve over time, the Kalman Filter can be used to obtain a statistically optimal estimate of the true data series. Another promising area of ongoing research involves so-called 'dynamic factor models', in which each economic variable is assumed to be driven by a small number of shocks that are common to all variables, plus an idiosyncratic component. All available data are used in the estimation of the common shocks, and variables are simultaneously decomposed into their 'common' and 'idiosyncratic' components.[4] But in both of these cases, more work is needed to determine whether the underlying assumptions make them suitable for real-time policy assessment, and this is the focus of current research by Bank staff.

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(1) For example, when the ONS published the Preliminary estimate of GDP growth for 2004 Q1 it noted that the proximity of its data collection to Easter had resulted in it having received significantly fewer survey responses than normal from its Monthly Inquiry into the Distribution and Service Sector, and that the estimates should therefore be treated with a greater-than-normal degree of caution.
(2) The ONS's Index of Services is currently produced on an 'experimental' basis — that is, it is not yet a fully fledged National Statistic. Drew (2003) provides a statement of the ONS's progress and plans in its construction.
(3) See McKenzie (2004).
(4) See, for example, Altissimo *et al* (2001).

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Indicators of short-term movements in business investment

By Sebastian Barnes of the Bank's Structural Economic Analysis Division and Colin Ellis of the Bank's Inflation Report and Bulletin Division.

Business surveys provide more timely news about investment than official data. The surveys also include forward-looking information. This article examines some survey-based indicators of business investment. Using simple techniques, several indicators are found to contain information about the path of investment. Moreover, as official business investment data are often revised, survey data can also usefully supplement the official data when interpreting recent movements in investment.

Introduction

In the short term, the balance of aggregate demand and supply is a key determinant of inflationary pressure. One component of aggregate demand is business investment, which accounted for just under 10% of current-price GDP in 2004. Investment also has an impact on supply, as it adds to the capital stock. So higher investment raises demand, and this will tend to amplify inflationary pressures. But it also increases the supply capacity of the economy, and so can act to dampen pressures on inflation. Analysing the movements in business investment can therefore be important for gauging the likely prospects for inflationary pressure.

Ratios of business investment to output may fall or rise over time, depending on the relative price of investment,

Chart 1
Business investment to output ratios
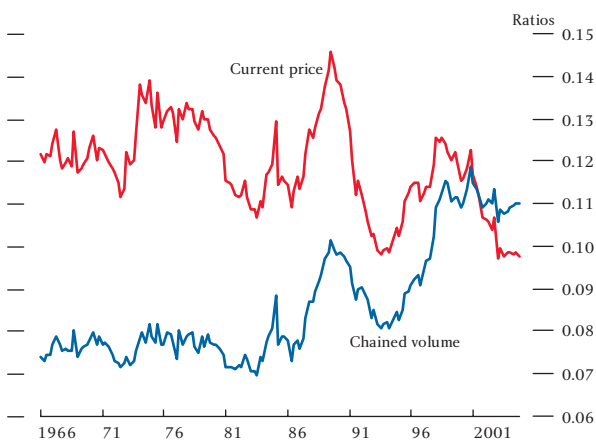
Chart 2
Business investment and GDP
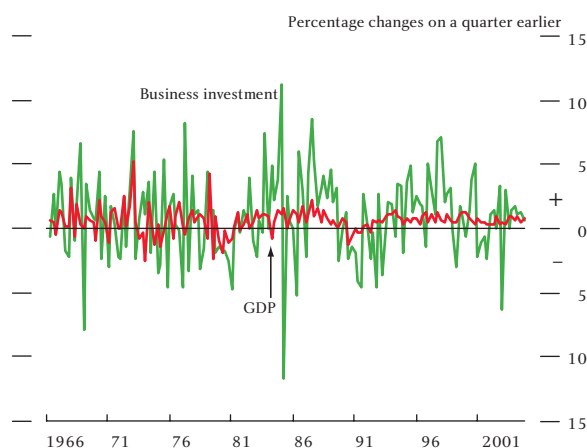
and how easily firms can substitute between capital and other factors, such as labour, when producing output. Chart 1 shows two measures — the current-price and chained-volume business investment to output ratios.[1] Over the past 20 years the trends in the two ratios have moved in opposite directions.[2]

Although there are clear long-run trends in the two ratios, both relationships can be extremely volatile in the shorter term. This variability is largely driven by sharp movements in business investment, rather than GDP (Chart 2). Since 1990, quarterly changes in the volume of business investment have, on average, been over five times more volatile than changes in GDP, and four times more volatile than changes in households' spending. This volatility means that business investment can often account for a significant part of *changes* in GDP growth.

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(1) Chained-volume measures replaced constant-price measures in the 2003 *Blue Book*. See the box on 'The introduction of annual chain-linking into the National Accounts' on pages 14–15 of the May 2003 *Inflation Report*.
(2) For more discussion of these ratios and their long-term trends see Ellis and Groth (2003).

The volatility of investment is unsurprising, as investment is (part of) the *change* in the capital stock and it is firms' demand for capital that is related to the level of output they expect to supply.[1] In the absence of adjustment costs, investment could vary substantially as firms' desired level of capital changes. And the indivisible nature of many capital projects could lead to investment being 'lumpy'.

Intentions survey indicators of business investment

Business surveys ask firms directly whether they plan to increase or to lower investment spending, sometimes over a specified time period. A net balance of firms — the number of those planning an increase in investment minus those planning a decrease — is then reported. The business surveys are typically published several months before ONS investment data that correspond to the same period, so they provide more timely information on developments than the official releases.

Previous work has looked at how the Bank uses survey information on a variety of aspects of the economy.[2] In particular, surveys of intentions have been used to construct a structural forecasting model of investment.[3] Using certain assumptions about how firms formulate their investment plans, the model matches some of the survey responses to the relevant sectors of business investment. The model also requires information from the National Accounts, which lag the publication of the survey data by around two months.

A timely and simple alternative approach is to consider the correlation between investment intentions surveys and ONS data on business investment growth. Unlike the forecast model discussed above, we do not attempt to impose any assumptions about how firms respond to the surveys. Rather, we allow the survey balances themselves to guide our view about the relationship between the answers given and business investment growth.

We examine the correlation between the growth in the volume measure of business investment as currently published by the ONS and surveys of investment intentions; often the latter are for specific sectors, such as manufacturing. Unlike the forecasting model that matches survey data to ONS sectoral investment data, our approach matches information from the various sectoral surveys to total ONS business investment. We did experiment with matching sectoral surveys to sectoral data, but the results were qualitatively similar, and for brevity are not included here. And there are reasons why sectoral surveys may be informative about business investment as a whole. For example, changes in manufacturing investment will be reflected in business investment as a whole.[4] Later in this article, the information in different sectoral surveys of intentions will be combined to construct a survey-based estimate of business investment. This measure combines information about business investment from the different and overlapping sectoral balances.

Table A presents correlations of different survey measures of investment intentions with quarterly growth of real business investment. The table includes large, well known surveys such as the *British Chambers of Commerce* (BCC) *Quarterly Economic Survey*, but also smaller surveys such as the *3i Enterprise Barometer*.[5] All correlations are calculated using quarterly business investment growth from 1994 to 2004.[6] This allows inclusion of some surveys introduced during the 1990s, such as that conducted by the EEF, but excludes some more recently established surveys, such as the CBI Grant/Thornton service sector survey.[7]

We allowed the surveys to lead official data by up to a year.[8] That is because some survey questions refer to investment growth over the year ahead rather than the current quarter. But it is equally possible that respondents may answer these longer-term questions with near-term spending in mind. For example, some, albeit dated, evidence suggests that respondents to the *CBI's Quarterly Industrial Trends (QIT)* survey have answered partly on the basis of investment that was 'just

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(1) See Ellis and Price (2004) for more detail.
(2) See Britton *et al* (1999).
(3) See Larsen and Newton-Smith (2001).
(4) See for example pages 16–17 of the February 2004 *Inflation Report*.
(5) The wording of the survey questions is shown in the appendix.
(6) The sample size was adjusted for lags between the surveys and ONS data when appropriate.
(7) We also considered a sample period beginning in 1990, where survey data allow this. The results were generally similar in terms of the correlations obtained and the preferred number of lags to those presented in the article, for the full range of surveys. We also examined the CBI *QIT* survey from 1971: the correlations were a little weaker, and were highest for a two-quarter lead, rather than four.
(8) We experimented with longer leads, but results were unchanged for most series.

coming on stream', rather than solely based on future investment plans.[1] Table A reports only the lead with the highest correlation between the survey and the current official ONS data for each survey. For example, the *3i Enterprise Barometer* was positively correlated with business investment growth at all leads we considered. But the highest correlation was for a lead of two quarters, and so that is what the table shows.

Table A
Correlations between quarterly business investment growth and survey measures of investment intentions

Survey	Sector	Capital asset in question (if applicable)	Correlation	Leads (no. of quarters)
3i Enterprise Barometer	Private sector		0.37	2
BCC Quarterly Economic Survey	Services	Plant & machinery	0.42	0
	Manufacturing	Plant & machinery	0.43	0
CBI Quarterly Industrial Trends	Manufacturing	Machinery	0.46	4
		Buildings	0.46	4
CBI Distributive Trades	Distribution		0.39	0
CBI Financial Services	Financial services	Information technology	0.35	2
		Vehicles, plant & machinery	0.29	3
		Land & buildings	0.12	2
EEF Business Trends Survey	Engineering		0.40	2

Note: All reported correlations are significant at the 5% level, except the CBI Financial Services Land & Buildings and Vehicles, Plant & Machinery measures. To two decimal places, the standard error of these correlations is around 0.16.

Table A suggests that — compared with quarterly growth in business investment — the intentions surveys that best match ONS data are from the *CBI QIT* survey and the *BCC Quarterly Economic Survey*. Interestingly, the balances from the *CBI QIT* survey appear to lead investment data by a year, despite the potential concern about respondents answering on the basis of recent investment. Most other surveys are also significantly positively correlated with the data, including the *3i Enterprise Barometer*.

Table B presents similar results but this time for correlations with four-quarter business investment growth since 1994. Because quarterly movements in investment are so volatile, it can be easier to spot trends in investment by looking at growth over four quarters. On this basis, the *CBI QIT* and BCC balances are again the most highly correlated with ONS data.

Table B
Correlations between four-quarter business investment growth and intentions survey indicators

Survey	Sector	Capital asset in question (if applicable)	Correlation	Leads (no. of quarters)
3i Enterprise Barometer	Private sector		0.62	2
BCC Quarterly Economic Survey	Services	Plant & machinery	0.68	2
	Manufacturing	Plant & machinery	0.69	3
CBI Quarterly Industrial Trends	Manufacturing	Machinery	0.68	4
		Buildings	0.70	4
CBI Distributive Trades	Distribution		0.46	2
CBI Financial Services	Financial services	Information technology	0.63	2
		Vehicles, plant & machinery	0.37	4
		Land & buildings	0.14	4
EEF Business Trends Survey	Engineering		0.66	3
Memo: First lag of annual business investment growth			0.80	1

Note: All reported correlations are significant at the 5% level, apart from the CBI Financial Services Land & Buildings measure. To two decimal places the standard error of these correlations is around 0.16.

However, four-quarter growth data are serially correlated by construction. For example, four-quarter growth in 2003 Q1 compares the level of business investment in that quarter with the level in 2002 Q1. Correspondingly, the respective growth rate in 2003 Q2 will compare the level to that in 2002 Q2. But part of the change in business investment over the year to 2003 Q2 will also be included over the year to 2003 Q1. That means that four-quarter growth in business investment will be correlated with its lagged values. This is also shown in Table B: and indeed, none of the surveys of intentions is as highly correlated with four-quarter business investment growth as is its own lag.

Other survey indicators of business investment

Apart from direct measures of intentions, business surveys contain other information that may be useful as indicators of future investment. For example, surveys of capital goods orders provide direct information about forthcoming investment purchases. Survey measures of profits may indicate the availability of internal funds,[2] which can act to support firms' ability to finance investment if there are additional costs to raising external finance. Surveys of capacity utilisation, business optimism and demand uncertainty may also

(1) See Price (1977).
(2) We also examined ONS data on profits: however, while the correlation between annual profits growth and annual business investment growth was high, the quarterly correlation was lower than that for survey evidence on profitability. An added complication is that ONS data on profits are revised over time.

contain information about firms' current situation and expectations of the future, which will affect their decisions about future investment.

Table C presents correlations for a number of survey-based indicators with quarterly business investment growth since 1994, on the same basis as Table A. Where there were several different indicators of the same type, only the one most closely correlated with ONS data is shown.

Table C
**Correlations between quarterly business investment growth and other survey indicators**

Indicator	Measure with strongest correlation	*Details*	**Correlation**	*Leads (no. of quarters)*
Capacity utilisation	*CBI Quarterly Industrial Trends Survey*	*Manufacturing*	0.48	1
Business optimism	*3i Enterprise Barometer*	*Barometer index*	0.41	2
Demand uncertainty	*CBI Quarterly Industrial Trends Survey*	*Factors limiting capital expenditure*	-0.49	1
Capital goods orders	*CIPS Manufacturing Survey*	*Investment goods sector*	0.38	4
Profitability	*BCC Survey (Manufacturing)*	*Confidence about future profitability*	0.36	3

Note: All reported correlations are significant at the 5% level. To two decimal places the standard error of these correlations is around 0.16. For the CIPS orders data we used three-month averages of calendar quarters.

The strongest (negative) correlation is with the 'demand uncertainty' balance from the *CBI QIT* survey. That question asks firms which factors are restraining capital spending, and lists a number of possible alternatives. 'Uncertainty about future demand' is generally quoted by the greatest number of survey respondents: Chart 3 shows the most frequently cited reasons over time. 'Inadequate net return' is also a common concern, but the balance for this factor is less highly correlated with business investment.

The negative correlation between short-run investment growth and demand uncertainty is consistent with economic theory. Many investment decisions are not easily reversible. When a firm invests, it gives up the chance to wait for new information that may affect that investment decision. This 'option value' of waiting before committing to investment projects is higher, the less certain firms are of future conditions.[1] So uncertainty reduces the incentive to invest.

(1) See Dixit and Pindyck (1994).

Chart 3
Factors restraining investment spending: evidence from the *CBI QIT* survey
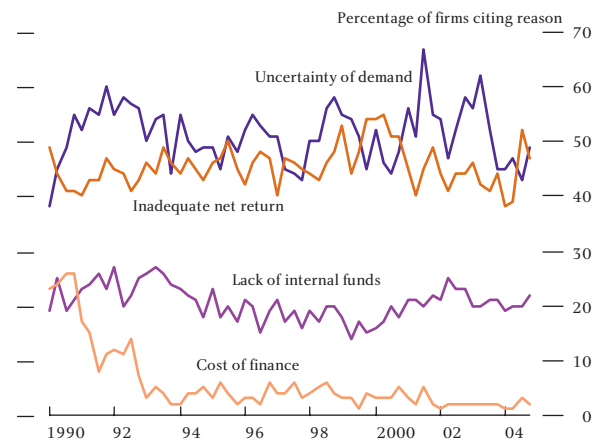
The second strongest correlation is with the capacity utilisation balance from the *CBI QIT* survey. This correlation could reflect two factors. First, high capacity utilisation today may indicate the need for additional investment to cope with future increases in demand. Second, as both capacity utilisation and investment are procyclical, both variables could be responding to the general state of the economy. But whichever of these two factors is more important, the correlation between capacity utilisation and business investment is positive.

Several other indicators are also correlated with quarterly changes in business investment. The 3i Barometer index was more closely correlated than other survey measures of optimism such as the *CBI QIT* optimism balance, so the latter was excluded from Table C. The 3i index also outperformed the BCC survey balance on confidence about profitability. That is despite its sample size being lower than that of the CBI and BCC surveys.

Relating the survey indicators to business investment growth

The previous sections have discussed the relationship between different indicators and the ONS measure of business investment. But how can we best use the information in the various indicators? The problem is how to extract the unique information about business investment in each survey. There are a number of statistical techniques that are available to do this, such as principal component analysis, which is a way of

finding underlying factors common to different series.[1] But principal component analysis requires a large data set, compared with the relatively few indicators that we have.

Fortunately, there is a simple alternative that is an efficient method of doing the same job when there are relatively few indicators. That is to use basic regression methods to map from the survey indicators to investment. One version of this procedure entails regressing business investment growth on the different survey-based indicators. Following Cunningham (1997), we allow for any bias in the survey balances by including a constant.[2] He also suggests using more detailed survey data than just the headline balance, such as the number of firms reporting rises and falls in investment spending. We do not consider this information as few surveys publish such details and, in any case, Cunningham notes that the impact from including this information is 'very small'.

Although many different indicators may contain information about business investment, it is possible that the information in one indicator is also present in others. In this case, the indicators would be correlated both with business investment and with each other. To address this possibility, we drop indicators that are not significant in explaining business investment growth in the regression. In short, we exclude indicators that do not 'add value' in terms of explaining business investment growth relative to other indicators present in the regression.[3] Using only the statistically significant indicators in the regression, we obtain a 'combined indicator' of business investment growth based on the information contained in different surveys.[4]

Chart 4 presents such a 'combined intentions indicator' based on the different survey measures of investment intentions shown in Table A. In practice, the CBI QIT and Distributive Trades Surveys were found to be the most important. Overall, the combined indicator captures around two fifths of the quarterly variation in business investment over the past ten years. As Chart 4 shows, the indicator is relatively smooth compared with actual business investment.

Chart 5 presents an analogous indicator based on the survey indicators in Table C. The most important

Chart 4
An intentions indicator of business investment
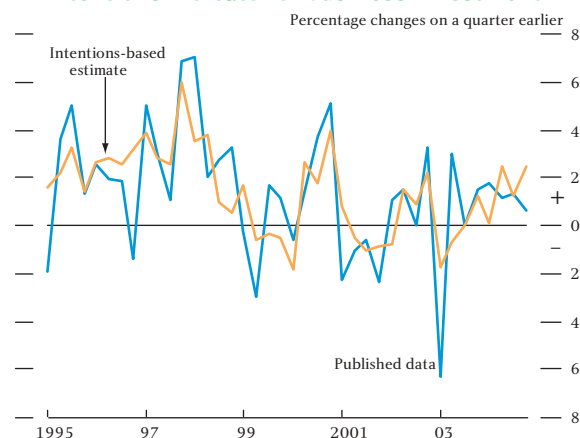
Chart 5
A non-intentions indicator of business investment
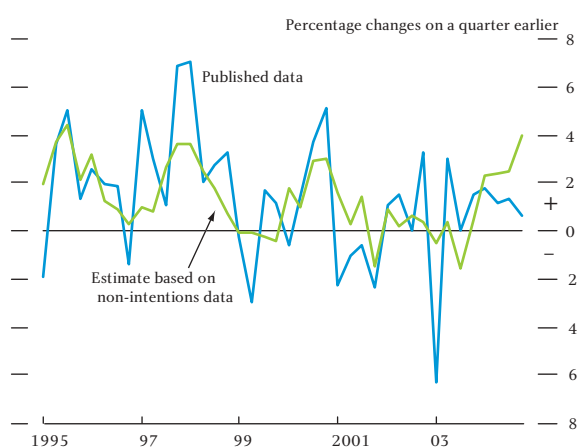
indicators are the CIPS capital goods orders index and the 'demand uncertainty' balance from the *CBI QIT* survey.[5] Together, these indicators can account for around a third of the variance of quarterly changes in business investment. A combined indicator using both intentions and other information from surveys can capture about a half of that variance. The intentions indicators contain some information that is not contained in other survey indicators, and *vice versa*. Together, these indicators appear to capture a significant amount of the variation in investment data, although a substantial amount remains unexplained.

Indicators and revisions to ONS data

Estimates of business investment are published twice each quarter by the ONS. But these data are uncertain, and tend to be substantially revised over time. Revisions are likely to reflect several factors, including late

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(1) See for example Jolliffe (1986).
(2) Lags in the regressions were chosen on the basis of Tables A and C.
(3) In practice, we dropped indicators with a t-value of less than 1.5. Hendry and Hubrich (2004) note that appropriate
    t-values for hypothesis testing may not be the same as appropriate values for other activities, such as forecasting.
(4) This is a version of the technique described in Ashley *et al* (2005) in this *Bulletin* (see pages 23–29).
(5) As in Table C, the CIPS orders series used was a three-month average of calendar quarters.

information from survey respondents and the balancing process for GDP: Castle and Ellis (2002) discuss revisions in more detail. They find that investment growth is generally revised by more than the growth rates of the other major expenditure components of GDP. Chart 6 shows estimates of quarterly changes in business investment published by the ONS in different releases: provisional estimates, subsequent estimates and the most recent estimate — the difference between data vintages is often quite large.

Chart 6
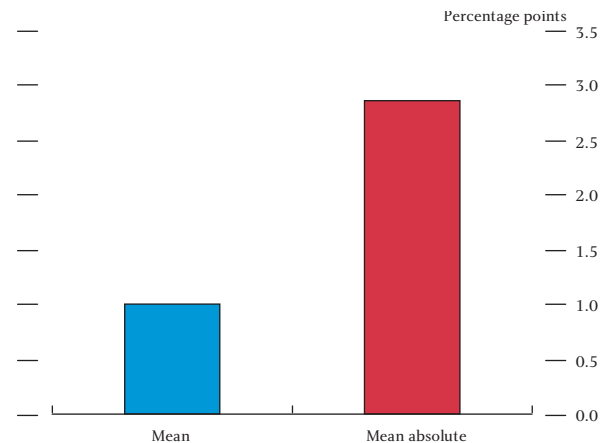**Estimates of business investment growth**(a)
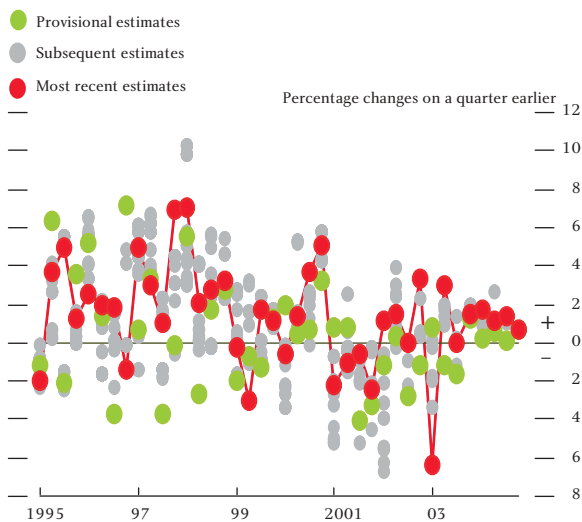
(a) Data published before the implementation of ESA(95) are for 'private other' investment plus investment by 'public corporations'.

The presence of substantial revisions could mean that provisional estimates of business investment growth may not bear much relation to the 'final' published estimates. Chart 7 presents the mean and mean absolute revision to provisional estimates of business investment growth since 1994, based on the latest vintage of data.[1] On average, first estimates of business investment growth have been revised up by around 1 percentage point. But that downward bias in the provisional estimates is dwarfed by the scale of the uncertainty around those first estimates — the mean absolute revision between the provisional data and the latest published estimates was 3 percentage points.[2][3]

It seems that early ONS estimates of business investment growth may not provide a very precise guide to actual

Chart 7
Revisions to provisional estimates of business investment since 1994(a)(b)

(a) See footnote to Chart 6.
(b) Calculated as current estimates minus original data. So some quarters have been revised on more occasions than others.

changes in business investment, as proxied by later vintages of the same data. That suggests that the survey indicators described previously could be useful guides to movements in business investment, at least until the ONS data are revised. So how should we assess initial estimates of business investment, relative to survey evidence?

This exercise is similar to constructing the combined survey-based indicators of investment discussed in the previous section and the method described in Ashley *et al* (2005) in this *Bulletin*. Having constructed a survey estimate of investment growth, based both on intentions and other survey indicators, we can then investigate how much weight should be placed on it, compared with the initial estimate of business investment growth. That can be done simply by regressing the 'final' investment data on the combined survey-based indicator, the provisional estimates of investment and a constant.

But in order to do so, it is necessary to define the 'final' vintage of ONS data. Revisions to data can continue for several years. In practice, to examine the real-time properties of investment we have to define some point at which the data are *taken to be* final. This is a necessary approximation when examining real-time data. For this exercise, data are defined as 'final' where the annual series has been through at least two *Blue Books*: so the

(1) Those were the data released on 24 February 2005. Prior to the introduction of ESA(95) in the 1998 *Blue Book*, business investment is proxied using the sum of 'private other' investment (which excludes dwellings) and investment by 'public corporations'.
(2) This mean absolute revision is similar to the shorter sample (five-year) estimate published in the ONS business investment release; the mean revision over the shorter-sample is smaller.
(3) Note that revisions to business investment growth may not show up in revisions to GDP growth: revisions to other components also matter. It is also worth noting that there are three different measures of GDP, namely the output, income and expenditure measures. So uncertainty around investment data may not translate directly into uncertainty about GDP data, if information from another measurement approach (eg output) is important.

last quarter used in the analysis is 2002 Q4.[1] This, by its nature, is an imperfect approximation.

In principle, we would want to distinguish between information-based revisions and methodological changes, as described in Ashley *et al* (2005). They use a simple 'rule of thumb' for output data: revisions after the second *Blue Book* are assumed to reflect methodology, and revisions prior to that are assumed to reflect new information. However, this may be inappropriate for business investment: data have sometimes been markedly revised after the second *Blue Book*, but without any methodological changes. For example, the 2002 *Blue Book* incorporated revisions to quarterly business investment growth back to 1997: the mean absolute revision was 0.9 percentage points. Yet that was despite no 'substantial methodological improvements' (ONS (2002)). As such, our results are based on the total revision to business investment growth, without attempting to distinguish between revisions reflecting methodology and those reflecting new information.

Chart 8 presents such a survey-based estimate, together with an estimate of 'final' business investment growth based on the provisional releases.[2] The former clearly matches the 'final' vintage of investment data more closely than the latter. Chart 9 shows a combined indicator, that uses both the surveys and initial ONS estimates. The first estimate of business investment growth accounts for a small amount of the information in this indicator, with the remainder accruing to the survey-based indicator. And the results were similar when we examined the second estimate of business investment, published about a month after the provisional data.[3]

One factor that could affect these results is the introduction of annual chain-linking (ACL) in the 2003 *Blue Book*. From time to time, there are major changes to the National Accounts, such as ACL or the implementation of the European System of Accounts 1995 (ESA(95)) in the 1998 *Blue Book*. Such changes can have a significant impact on the published data. So we repeated the weighting exercise just using data

Chart 8
Indicators of business investment growth
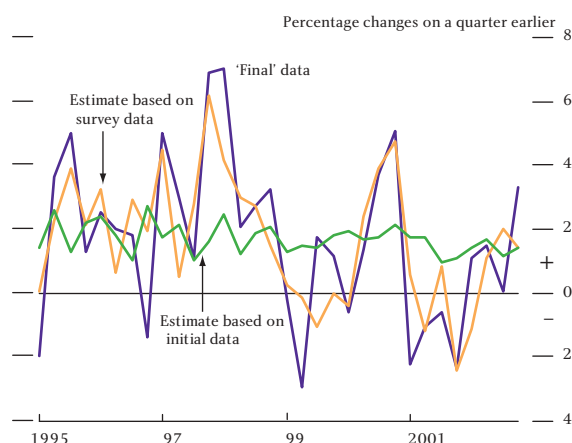
Chart 9
A combined indicator of business investment growth
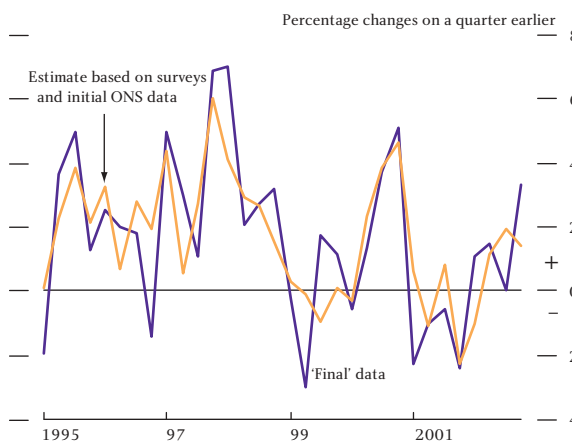
published before the 2003 *Blue Book,* when ACL was implemented.[4] But the results were broadly unaffected.

Conclusion

Business investment is a volatile component of the UK economy. Business surveys provide a number of timely indicators of investment: among these are surveys of investment intentions and other relevant factors, such as capacity utilisation and demand uncertainty. These survey indicators can capture around half of the short-term movements in business investment over the past decade. And they appear to add useful information to the provisional estimates published by the ONS.

(1) This means that some 'final' quarters will have been revised on more occasions than others. Using an alternative criterion — for example defining 'final' data as having been originally published prior to the 2002 *Blue Book* — did not affect the main real-time results presented in this article, although the precise numbers did differ a little.
(2) This estimate is the 'best fit' of the provisional estimates against 'final' data, rather than the provisional estimates themselves.
(3) We also tested for a breakpoint in 2000, when the sample size of the quarterly capital expenditure inquiry was doubled. But there was no significant evidence of such a break in the weighting equation.
(4) Of course, these data would still be affected by the implementation of ESA(95). For comparison with the previous weighting exercise, data were only included where the annual series had been through at least two *Blue Books*.

Appendix

This appendix lists the surveys and specific investment intention questions discussed in the main body of the article.

Survey	**Question**
BCC Quarterly Economic Survey	Over the past three months, what changes have you made to your investment plans: (a) for plant and machinery; (b) for training?
CBI Quarterly Industrial Trends Survey	Do you expect to authorise more or less capital expenditure in the next twelve months than you authorised in the past twelve months on: (a) buildings; (b) plant and machinery?
CBI Financial Services	Do you expect to authorise more or less capital expenditure in the next twelve months than you authorised in the past twelve months on: (a) land and buildings; (b) vehicles, plant and machinery; (c) information technology?
CBI Distributive Trades	Do you expect to authorise more or less capital expenditure (including buildings, machinery, cars and commercial vehicles) in the next twelve months than you authorised in the past twelve months?
3i Enterprise Barometer	Over the current quarter do you expect your investment to be up, the same or down compared with the previous quarter?
Engineering Employers' Federation	Planned capital expenditure (trend over the past three months).

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Divisia money

By Matthew Hancock of the Bank's Monetary Assessment and Strategy Division.

This article reviews the Bank's measure of Divisia money — a gauge of the money supply that gives greatest weight to those components most used in transactions — and explains some recent changes to its calculation. These changes aim to make the Bank's series more theoretically appealing and to make use of some recently developed statistics. Five improvements have been made. First, a new approach has been introduced to determine the benchmark interest rate. Second, new effective interest rate data have been incorporated. Third, the level of aggregation has been changed slightly. Fourth, non break-adjusted levels are now used as the denominator in the Divisia calculation. Finally, a series for aggregate Divisia excluding other financial corporations, and a set of monthly series, have been introduced. In this article we begin with a discussion of the purpose of Divisia money, then we set out the changes that have been made, and the motivation behind them. Throughout we describe the impact of the changes on the Bank's series.

The purpose of Divisia money[1]

When measuring the supply of money in an economy, we often use simple aggregates of broad money like M4. M4 adds together notes and coin in circulation, and all of the deposits held with UK monetary financial institutions (MFIs).[2] These deposits range from current accounts at banks to savings deposits at building societies. This straightforward sum has the advantage of being a simple measure that is easy to understand. It also has an accounting interpretation, as each unit of money has an equal financial value, whatever the form in which it is held.

However, economists are often interested in money as an indicator of near-term economic variables, such as future expenditure or inflation.[3] A simple aggregate like M4 gives equal weight to each component of money — notes and coin, bank current accounts, bank time deposit accounts and so on. But this may not always be appropriate. Some components may be more important than others for particular purposes, so different forms of aggregation may be more useful for certain types of analysis.

Money has three broad purposes. It is used as a unit of account, as a store of value, and as a medium of exchange. Most of the difference in the interest earned on the components of broad money is due to differences in their usefulness for money's third purpose — as a medium of exchange, or usefulness in transactions. Divisia money uses a form of aggregation that takes this into account and weights the components of money according to their usefulness in transactions. For example, notes and coin are very useful for making transactions, and pay no interest, while building society deposits pay relatively more interest, but are less useful for making transactions. Thus Divisia money might be expected to have stronger short-term links to aggregate spending than would a simple nominal aggregate like M4, and so may be a useful aggregate for policymakers to monitor.

To calculate a Divisia index for money we need to make two key assumptions.[4] First, it is assumed that relatively illiquid deposits such as building society deposits are less likely to be used for transaction purposes than liquid measures such as notes and coin. And second, it is assumed that higher interest rates are paid on less liquid deposits. In other words, it is assumed that the higher the relative return on an asset, the less useful it is for transaction purposes. To calculate Divisia money, we aggregate the rate of growth of various components of

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(1) Divisia money calculations were originated by Barnett (1980). For more on the theory behind, and calculation of, the Bank's Divisia money series, see Fisher *et al* (1993a,b).
(2) The monetary financial institutions sector comprises the central bank, other banks and building societies.
(3) For more on the use of Divisia in forecasting economic variables, see Janssen (1996).
(4) A Divisia approach can be taken to the indexation of any variables; it is not specific to money.

money using a weight[1] based on their relative returns.[2] This allows us to derive an index that is a proxy for balances held for use in transactions.

To construct a weight for any single component of money, we need two pieces of information.[3] First, we need to know the interest rate paid (net of tax) on that component. Second, we need to know the *benchmark rate*. The benchmark rate is an important concept in Divisia calculations, and is the interest rate paid on the *benchmark asset*. A benchmark asset is one that has no value for transaction purposes; it is solely used as a store of value. We subtract the interest rate paid (net of tax) on each individual component of money from the benchmark rate to calculate that component's weight. These weights are known as the user cost of holding each asset, because there is a cost (in terms of the interest foregone) associated with not holding the benchmark asset.

Once we have weights for each component of money, we can then calculate the growth rates of Divisia money.[4] These growth rates give an indication of the rate of growth of balances used for transaction purposes. Thus if notes and coin grew faster than bank time deposits, then the higher weight on notes and coin in the Divisia measure — representing their greater usefulness in transactions — would mean that Divisia money would be growing faster than the simple aggregate.

Changes to the Bank's measure of Divisia money

There are a number of difficulties specific to Divisia that the Bank looked at when revising its measure. Broadly speaking, these difficulties fall into four categories: the choice of the benchmark asset and rate; the interest rates paid on individual Divisia components; the appropriate level of aggregation; and problems of 'break-adjustments'. In this section we briefly consider each of these in turn. We then spell out how the Bank's new approach to calculating Divisia addresses these problems, and detail the differences between the new and old Divisia measures. We also describe the series

that have been published since January following the Bank's review of Divisia money.

The benchmark asset and the envelope approach

The first difficulty concerns how to choose our benchmark asset. The optimal benchmark asset should provide at least as good a store of value as the components of the money supply, but have no use for transactions. This implies that in equilibrium the rate of return on such an asset should be greater than the return on any components that are useful in transactions. In practice this may not be the case if some of the benefits of holding the asset are not fully captured by the interest rate — for example free financial advice may be available for holding balances in some accounts. Indeed, it is hard to find an asset that matches all of the requirements for a good benchmark asset. Until recently we proxied the benchmark rate with an artificially constructed interest rate: the interest rate on three-month Local Government (LG) bills[5] plus an arbitrary 200 basis point adjustment.[6] But the 200 basis point adjustment was *ad hoc*, and moreover, LG bills are no longer issued. So this was obviously not a perfect solution.

Two alternative approaches were considered. The first was to find an asset that fitted the characteristics of a good benchmark asset, which could replace the old benchmark. The second was to use an 'envelope approach'. Under an envelope approach, it is assumed that the benchmark asset is the M4 component that pays the highest interest rate.

The drawback of the first approach is that, without an arbitrary adjustment, none of the benchmark assets which might serve our purposes would remain above the rates on all component assets all of the time. This would lead to negative user costs and so negative weights for some assets, which would imply that the wrong benchmark asset had been chosen. This problem does not occur with an envelope approach. In that case, if the asset yielding the highest rate changes, then the benchmark asset automatically switches to reflect this change in the relative usefulness of the assets in

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(1) Other weighting methods could be developed, which would for instance link the weight to the past correlation of a component asset with aggregate spending.
(2) Technically, Divisia money weights together the changes to component assets according to the rate paid on them, and so allows intra-marginal units to have different values for liquidity services.
(3) For more details of this calculation see the appendix.
(4) The Bank publishes a monthly and quarterly measure of UK Divisia money in *Bank of England Monetary and Financial Statistics*, and on the Bank's website. We publish the aggregate measure (as an index and as a growth rate), a sectoral breakdown and a breakdown of the level of, and interest rates on, each component asset.
(5) Previously known as Local Authority bills.
(6) The adjustment ensured that the benchmark rate was indeed always higher than the return on any component of M4.

transactions. We therefore decided to use an envelope approach in the new Divisia series.

For households, we continue to include the rate on LG bills in the envelope while they were in issuance until 1993, and include Tax Exempt Special Savings Accounts (TESSAs) separately from other bank and building society deposits since their introduction in 1991. In the new series, since 1991 the household benchmark rate has been the TESSA or Individual Savings Accounts (ISA) rate after ISAs replaced TESSAs in 1999. This seems satisfactory: because of their tax treatment these accounts are largely held to satisfy a savings motive. Chart 1 shows that the change to using the envelope approach makes little difference to household Divisia growth rates.

For companies, we include in the envelope the rate paid on each component of corporate M4. In the new measure, the benchmark rate switches over time between the rate paid on building society deposits and on bank time deposits. Moving to an envelope for the Divisia

measure for private non-financial corporations (PNFCs) and other financial corporations (OFCs) leads to a small change in the PNFC measures, and a larger change in the OFC series (the red lines in Charts 2 and 3). The most significant of these changes are in the distant past, and their impact on the aggregate measure is small (Chart 4).

Quoted and effective interest rates

A second problem is which interest rates to use. For each component of M4, we need to try to measure the interest rate paid on the marginal unit held, so that the rate is just sufficient to induce the depositor to continue to hold the existing balances in that form. In the past, we have used quoted interest rates, which measure the average interest rate offered on new customers' deposits. However, these suffer from the drawback that deposits from existing customers may yield a different rate, and the rate paid on similar accounts may differ — for example depending on the size of the deposit or the number of withdrawals. For instance, a bank may offer a
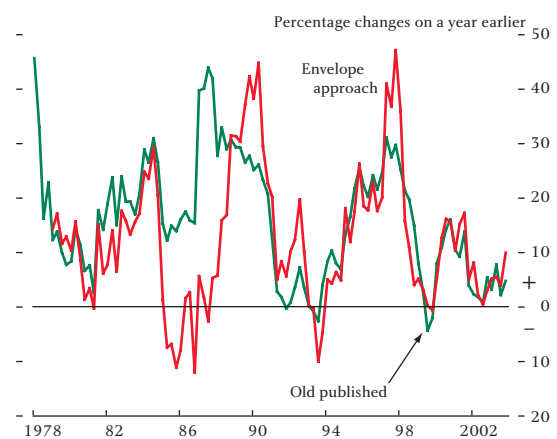
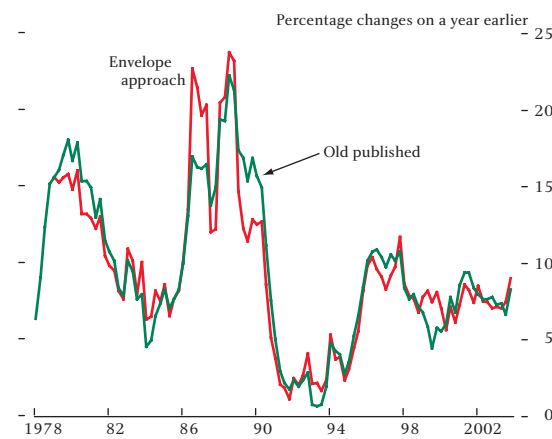**Chart 1**
Household Divisia: effect of envelope approach
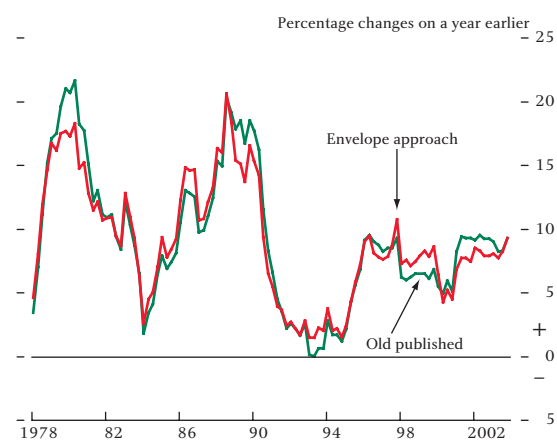
Chart 2
PNFC Divisia: effect of envelope approach
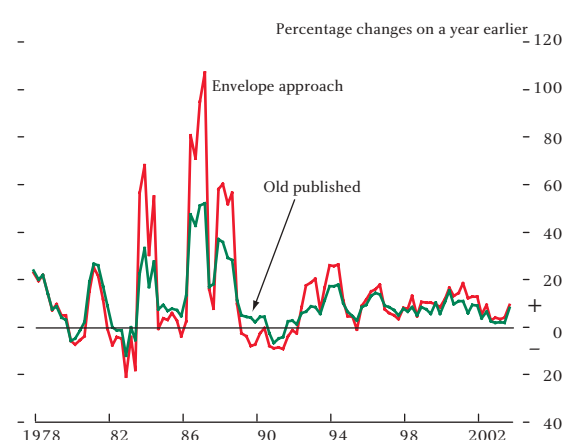
Chart 3
OFC Divisia: effect of envelope approach

Chart 4
Aggregate Divisia: effect of envelope approach

new type of account with a high rate to attract new customers, but continue to pay a lower rate to existing account holders. In that case using the quoted rate would give too little weight to these deposits in measuring Divisia money. Also, quoted rates are susceptible to changes in the way that the sample rates are reported by banks.[1]

Since 1999 the Bank has published a measure of effective interest rates. That measure calculates the average interest paid on all deposit balances, by measuring the value of interest paid and dividing this by the outstanding level of balances. These effective rates data more closely reflect the benefit of holding different types of money asset, and so are better suited for the purpose of measuring the user cost used within the calculation of Divisia money.[2] Although effective rates measure the average, rather than the marginal, rates on balances, they are both practically and theoretically more appealing than quoted rates, so we have decided to use them where possible.

This change leads to a small break in the Divisia indices between 1998 Q4 and 1999 Q2. The Bank recognises that introducing a break into any series is unhelpful for econometric work that typically relies on a long run of data. However, the break is the result of using improved methods and in any case its impact on the Divisia series is small. Furthermore, we will continue to publish the component parts of the old Divisia data,[3] so it will be possible for users to reconstruct the old version of Divisia money should they wish.

There are no effective rates data for corporate building society deposits. However, the value of these deposits is small, and the rate on them can be fairly closely proxied by the effective corporate bank rate. Under an envelope approach, corporate Divisia is almost exactly the same with quoted and effective rates.

Charts 5 and 6 show the impact of the change to effective rates for the calculation of aggregate and household Divisia. As we can see, the differences are not large, with mean absolute differences in growth rates since 1999 of 0.7 percentage points and 0.5 percentage points respectively. The impacts of the changes to PNFC and OFC Divisia are not shown, as they are very small.

Chart 5
Aggregate Divisia: effect of effective rates
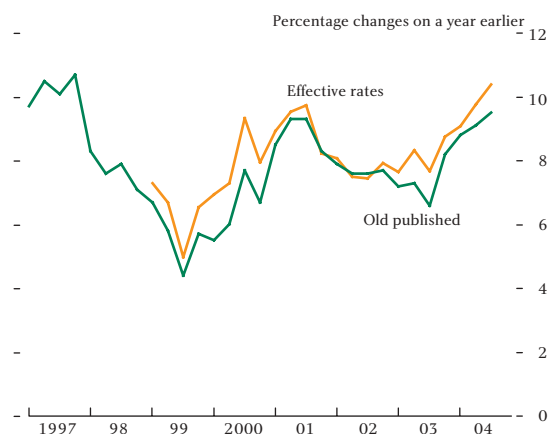
Chart 6
Household Divisia: effect of effective rates
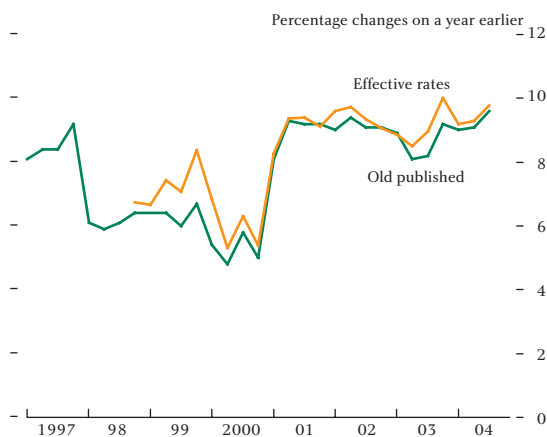
Level of aggregation

A third problem is the question of the level of aggregation. When we weight different components of Divisia, we have already performed a degree of simple aggregation to reach those components. For example the household bank time deposit component is itself an aggregate of all UK bank accounts held by households that do not allow free instant access to the money, whatever the required notice period. In deciding at which level to use Divisia weights, we must take into account the similarity of different components, the accuracy of measurement, and data availability. Optimally, we should group balances only when they are held on identical terms. But this would lead us to treat every bank product and every type of account as separate components, as each has very slightly different properties and non-price features — for instance down

(1) For instance, there is a break in November 2004 in the quoted rates series due to the impact of new regulations concerning the rates that banks can advertise. This reinforces the benefit of the switch to using effective rates.
(2) The Bank's new measure of Divisia money, for example, is more closely correlated to consumption expenditure than the old measure or M4.
(3) Except for data on LG bills, which could in practice be proxied by Treasury bills in future if required.

to the availability of bank branches. These individual data may be hard to find accurately. So in practice we compromise on perfect similarity in return for ease of compiling the data.

In this review of the Bank's measure, we have made no major changes to the level of aggregation used.[1] We have included TESSA and ISA accounts as separate components of M4, instead of including them within bank and building society deposits as in the past. And we have separated out household building society instant access accounts from accounts requiring a period of notice, which reflects our treatment of banks. These changes do not make a significant impact on the Divisia series.
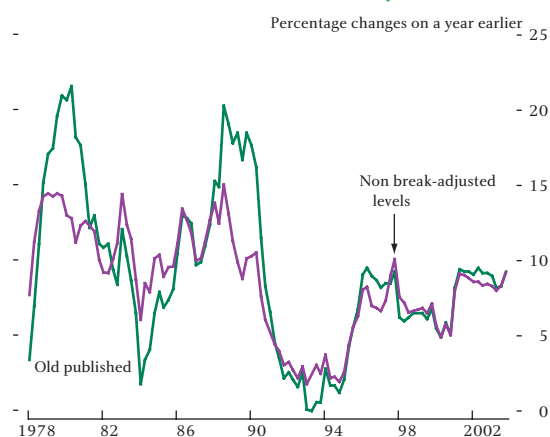
Break-adjustment

Monetary statistics are adjusted for breaks in the data. These breaks largely occur when a building society demutualises and changes classification to become a bank. Were we to leave the data unadjusted, this would lead us to report large flows into banks, and out of building societies, simply because of an institutional change. To avoid this distortion, the data are 'break-adjusted'.

When making break-adjustments, we adjust the back data so that all previous deposits with that institution are reallocated to the new classification. So if, for example, a building society demutualises to become a bank in 1992, then all data up to 1992 are reallocated into the bank series. Break-adjusting Divisia series presents additional problems because of the importance of allocating the right interest rate to past deposits. When a building society becomes a bank, *past* deposits at that building society were still remunerated at *past* building society interest rates, and must be measured as such. So we need to use non break-adjusted levels data, but break-adjusted flows, to weight each component asset correctly.

Charts 7 and 8 show the old measure of Divisia, and Divisia calculated with only this change: using break-adjusted flows (as before) and non break-adjusted levels. This makes a bigger difference than any of the changes we have discussed above. Nonetheless, as with all of these methods, the changes to the recent past are fairly small.

Chart 7
Household Divisia: non break-adjusted levels

Chart 8
Aggregate Divisia: non break-adjusted levels
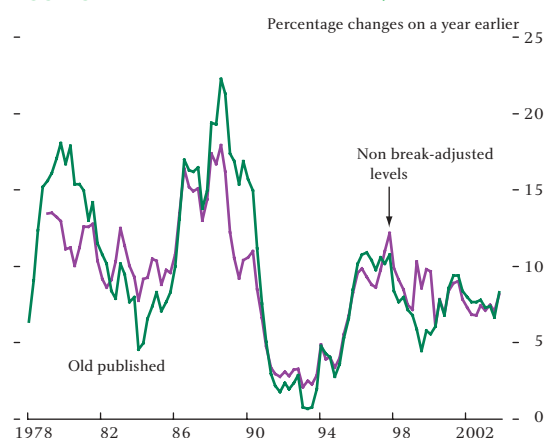
Monthly Divisia and aggregate Divisia excluding OFCs

Until January, the Bank published its Divisia money series on a quarterly basis. However, we now have the constituent data to publish a monthly series from 1999.

We have also added a further sectoral series for aggregate Divisia excluding OFCs (which is equivalent to household and PNFC Divisia). Chart 3 shows that OFC Divisia data have a high variance, and that volatility may be telling us little about their near-term spending plans.

Conclusion

Divisia money weights the component assets of broad money according to an estimate of the transactions services they provide. The availability of some new data sources has given the Bank the opportunity to revisit the computation of its measure of Divisia money. In doing so, five improvements have been made. First, an envelope approach has been introduced to determine the benchmark rate. Second, new effective interest rate

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(1) See the appendix for more details.

data have been incorporated. Third, the level of aggregation has been changed slightly. Fourth, non break-adjusted levels are now used as the denominator in the Divisia calculation, and finally, a series for aggregate Divisia excluding OFCs, and a set of monthly series, have been introduced.

Charts 9 to 13 show the old and new series, combining all of our changes, for the aggregate and each of the four sectoral measures. Although the back data contain some substantial revisions, the changes to the most recent

data are fairly small. The new series reflect a better method and improved data inputs, so should therefore be closer to the true underlying measure of liquidity that we are trying to measure: an estimate of the growth rate of money balances held for the transactions services they provide. The new index, its growth rates, the component asset levels and flows, and the interest rates used are now available along with the components of the old series, in *Monetary and Financial Statistics*, and on the Bank's Statistical Interactive Database.
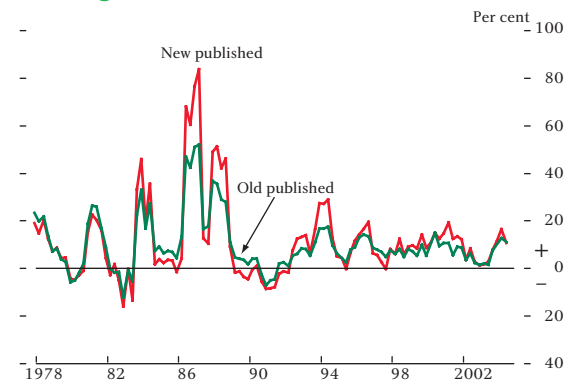
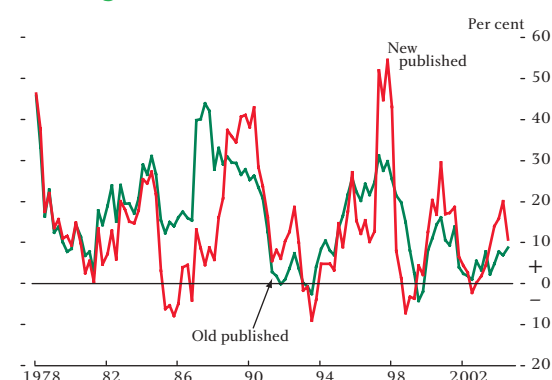**Chart 9**
Annual growth in aggregate Divisia

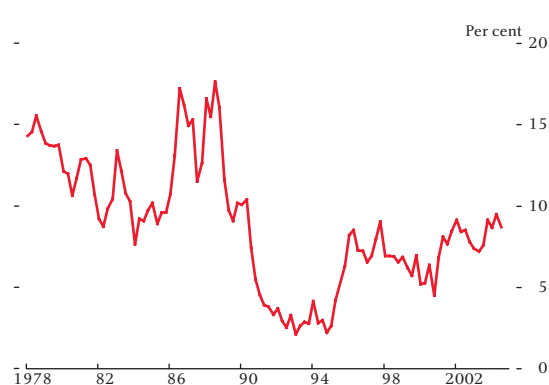

Chart 10
Annual growth in household Divisia

Chart 11
Annual growth in PNFC Divisia

Chart 12
Annual growth in OFC Divisia

Chart 13
Annual growth in aggregate minus OFC Divisia

Appendix
Calculation of Divisia money

Divisia money is calculated as a weighted average of the growth rate of N different component money holdings. The components are weighted according to their usefulness for making transactions, which is proxied by the user cost of holding these components. The user cost is measured by the difference between the benchmark rate, which is the post-tax interest rate paid on balances with no transactions value, and the post-tax interest rate paid on component balances. Divisia is therefore calculated as follows:

$$\frac{\Delta D_t}{D_{t-1}} = \sum_{i=1}^{N} \frac{1}{2}\left(W_{i,t} + W_{i,t-1}\right)\frac{\Delta M_{i,t}}{M_{i,t-1}} \qquad \textbf{(1)}$$

where M_i is the level of the ith money holding, and W_i is the weight on the ith component:

$$W_{i,t} = \frac{M_{i,t}\left(r_{B,t} - r_{i,t}\right)}{\sum\limits_{j=1}^{N} M_{j,t}\left(r_{B,t} - r_{j,t}\right)} \qquad \textbf{(2)}$$

where r_B is the rate on the benchmark asset and r_j is the rate on the jth asset. Under the envelope approach:

$$r_{B,t} = \max(r_{1,t}, r_{2,t} \dots r_{N,t}) \qquad \textbf{(3)}$$

We take ΔM_i to be the average of the change over the past two periods. We allow r_B to vary between households and companies because households cannot access the benchmark rates available to companies and *vice versa*. Below we tabulate the old and new methods of calculating each variable. The changes improve measurement of M_i, r_B, and r_i. The Divisia series includes the following components of money holdings:

> Household, PNFC and OFC bank time deposits[a][b]
> Household, PNFC and OFC bank sight deposits
> Household building society instant access deposits[a]
> Household building society notice deposits[b]
> PNFC and OFC building society deposits
> Household, PNFC and OFC bank non-interest bearing deposits
> Household, PNFC and OFC notes and coin
> Household TESSA and ISA deposits

(a) Excluding household ISA deposits.
(b) Excluding household TESSA deposits.

Variable	Old method	New method
M_i	Break-adjusted	Non break-adjusted
ΔM_i	Break-adjusted	Break-adjusted (no change)
r_B	Quoted rates, arbitrary adjustment	Effective rates since 1999, envelope approach
r_i	Quoted rates	Effective rates since 1999

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Competitiveness, inflation, and monetary policy

Working Paper no. 246

Hashmat Khan and Richhild Moessner

Differences in the degree of competition among firms — 'competitiveness' — may affect the rate of inflation in the short term and the monetary transmission mechanism. In addition, cyclical variations in competitiveness may affect inflation dynamics and the transmission mechanism. It follows that the examination of both types of changes is potentially important for monetary policy makers.

We examine how differences in the level of steady-state competitiveness and the trend rate of inflation might affect inflation responses to monetary policy shocks, using a standard New Keynesian model. We extend the model to allow for positive trend inflation and cyclical variations in competitiveness. This allows us to quantify separately the impact of differences in steady-state levels of and cyclical changes in competitiveness on inflation dynamics, in high and low inflation environments. We apply this model to scenarios chosen to capture broadly the conditions in the UK economy in the early 1990s and more recently.

We show that in a low inflation/high competitiveness environment, the higher degree of price stickiness implied by the low inflation environment, and the higher degree of steady-state competitiveness both have the effect of dampening the inflation response to monetary policy shocks, compared with the high inflation/low competitiveness scenario. By contrast, in the low inflation/low competitiveness environment, we find that the effect of lower steady-state competitiveness partially offsets the effect of the higher degree of price stickiness in the low inflation environment, so that the inflation responses in the high and low inflation environments are similar to each other. Moreover, we quantify the extent to which procyclical changes in competitiveness dampen the impulse response of inflation to a given monetary policy shock, and the extent to which countercyclical changes amplify it.

The exposure of international bank loans to third-country risk: an empirical analysis of overdue claims

Working Paper no. 247

Drew Dahl and Andrew Logan

The paper investigates whether the credit quality of UK-owned banks' international lending is sensitive to conditions in borrower countries' largest trading partners. Borrowers may be dependent on export earnings or other income generated by economic activity in the third country to repay the loan. A deterioration in economic conditions in the third country could impair borrowers' ability to meet their loan obligations.

The existence of trade-based interdependencies has implications for banks' risk management and the authorities. Interlinkages limit banks' ability to diversify away credit risk by lending to different countries. Moreover, banks' risk management techniques will need to address the cross-country correlations in borrowers' ability to repay. Central banks and banking regulators with responsibility for financial stability or prudential supervision also need to take account of the impact of trade-based spillovers. In the Bank of England's case, any judgment of the likely impact of an adverse shock to a particular country on UK financial institutions and markets will need to factor in the knock-on effects on borrowers in third countries.

The paper has some similarities with previous empirical studies on interdependencies in international lending. One branch of the literature focuses on how the quantity of credit supplied by international banks in a country varies with financial conditions in other countries. Another investigates whether risk in international bank lending is systematic (global) or diversifiable (local). A problem in applying these studies to the issue of interdependencies, however, is that they view risk from a global perspective. They do not explore the direction or strength of interdependencies between countries and do not use a direct measure of performance.

The measure of credit quality used in this study is the proportion of the principal of cross-border and overseas operations' non-local currency loans that is in arrears. The data are annual, bank specific and disaggregated by country. This means that we have information on the credit performance of individual banks in a particular country in a given year. We are unaware of any prior empirical study that identifies performance outcomes in different countries for individual creditors. The data are confidential and collected as part of the Bank of England's suite of monetary and banking returns.

The study focuses on the credit quality of 28 of the largest UK-owned banks' international loans to 17 countries between 1991 and 2000. The 17 countries selected are those to which UK-owned banks had the greatest exposure in 2002 and for which the relevant macroeconomic data were available. They are predominately large industrialised countries. The banks included held virtually all of the foreign assets and 96% of total assets owned by UK-owned banks. The banks are important lenders within Europe — which, in turn, accounts for the majority of worldwide international lending — and have country-exposure rankings that are highly correlated with other BIS-area banks. To this extent, the results for our sample of UK-owned banks are applicable to banks in other countries.

We model overdue credit as a function of credit composition, bank characteristics and situational factors and macroeconomic conditions in the largest export market country. Two indicators of financial condition in the linked country are used. The first measures the percentage change in merchandise exports from the country of the borrower to the linked country. The second measures the percentage change in output in the linked country. This effect could encompass merchandise exports, but also trade in services or other international transactions. It may also capture effects unrelated to trade (such as collateral).

We find that economic conditions in a country are transmitted to another country whose borrowers have obtained credit from international banks. As exports to a linked country increase, or gross domestic product in the linked country increases, repayment performance in the country of the borrower improves. We find that this relationship is pronounced in countries, such as Ireland and Mexico, that have close ties to a larger economy and during the later years of our sample period (1997 to 2000).

Concepts of equilibrium exchange rates

Working Paper no. 248

Rebecca L Driver and Peter F Westaway

The term equilibrium exchange rate has been used to mean many different things by many different people. For some, the concept is clearly a long-run one. For others, even short-run movements in exchange rates may represent equilibrium behaviour. So pinning down exactly what people mean when they use the term equilibrium exchange rate may therefore be important for understanding how to interpret the information it provides.

The aim of this paper is to discuss why a range of views on the nature of the equilibrium may be valid. It does this by highlighting the distinction between short, medium and long-run concepts of equilibrium and arguing how, at any point, all these will be relevant to understanding the economy. It emphasises how the choice of equilibrium will depend on the question of interest.

The paper also emphasises that, because real exchange rates are a measure of relative prices, several different definitions can be used, where again the choice will also depend on the question of interest. But for any short, medium or long-term equilibrium concept, there will be an equilibrium configuration of relative prices associated with these different measures.

The paper briefly discusses some of the ways in which different approaches can be assessed, where again the metric employed will depend on the question of interest. For example, assessing a measure of long-run equilibrium using short-term forecast performance is inappropriate. If, however, the concept of equilibrium to be measured is short run, distinguishing between different measures using forecast performance may well be useful.

Finally, the paper provides a taxonomy of the different approaches that researchers have used to analyse equilibrium exchange rates and attempts to highlight the similarities and differences between them.

Optimal collective action clause thresholds

Working Paper no. 249

Andrew G Haldane, Adrian Penalver, Victoria Saporta and Hyun Song Shin

The potential advantages of collective action clauses (CACs) to facilitate the restructuring of debts have long been recognised and have been standard in English law bonds since the 19th century. Collective action clauses allow a contractually specified super-majority of bondholders to agree on a revision to the payment terms that is binding on all, even those who voted against. But until recently it has been the market convention in New York not to include collective action clauses. Achieving a comprehensive debt restructuring has required the unanimous agreement of all bondholders. This is generally felt to be suboptimal. Unanimous agreement means that debt restructurings are potentially held hostage to the actions of recalcitrant or rogue creditors who hope to receive better terms in subsequent offers. This can delay restructuring deals that are to the benefit of the majority of creditors and the debtor and can leave the debtor vulnerable to opportunistic legal action. In response to these concerns, a push to change the market convention in New York to include collective action clauses was first made by the official sector after the Mexican crisis in 1994–95. Little action followed. A second push was made by the official sector in 2002, following crises in Turkey, Brazil and most prominently Argentina. Again under the auspices of the Group of Ten, a working group was set up to draft model CACs. The aims of the Group of Ten working group were twofold. First, to examine a range of potential contractual clauses that could be included in sovereign bonds and to recommend which ones to include. Second, to set a new market standard. These clauses specified a majority voting threshold of 75% for changes in a bond's financial terms.

In February 2003, Mexico made a policy decision to include collective action clauses in its sovereign bonds issued under New York law, contrary to market convention. The bonds issued by Mexico followed closely the G10 model clauses, including a 75% threshold. But some subsequent issues by other countries — Brazil, Belize, Guatemala and Venezuela — opted for higher, 85%, thresholds. Some within the official sector have taken a dim view of these developments. First, because these higher thresholds take us closer to a 100% unanimity bond, thereby increasing the risk of holdouts. And second, because different voting thresholds risk a splintering of the market standard.

One contribution of this paper is to use a theoretical model of financial crisis to examine what factors might determine the choice of voting threshold — is lower always better? — and whether there are valid reasons why different issuers may want to set different, but country-specific, thresholds. We find that individual countries may wish to set different thresholds because of differing risk preferences and creditworthiness. Strongly risk-averse debtors put much greater weight on pay-offs during crisis periods than during non-crisis periods and are therefore more likely to choose lower CAC thresholds than less risk-averse debtors. The worse the creditworthiness of risk-averse debtors, however, the more likely they will want to issue bonds with high collective action clauses.

A second contribution of this paper is to develop a model that nests both liquidity runs and debt restructuring following a solvency crisis. Typically, the two are treated separately. In practice, however, it is rarely straightforward to partition crises in this way. Liquidity crises affect prospects for solvency; and expected recovery rates for creditors following a debt restructuring will in turn affect short-term decisions on liquidity. These interactions mean that most crises lie in the 'grey zone' between pure liquidity and pure insolvency. The model presented here is one such 'grey-zone' model, which allows behavioural interactions between short-term liquidity and debt restructuring following a solvency crisis.

Asset price based estimates of sterling exchange rate risk premia

Working Paper no. 250

Jan J J Groen and Ravi Balakrishnan

Many structural exchange rate models, as well as open-economy policy models, use uncovered interest rate parity (UIP) as a building block, despite the fact that UIP is strongly violated for floating currencies. Several explanations for this phenomenon have been put forward, including the presence of time-varying risk premia. Existing empirical models of the foreign exchange rate risk premium, however, are not able to generate risk premium estimates that are sufficiently variable to explain the variability in deviations from UIP.

In this paper we attempt to estimate the risk premium for several bilateral sterling exchange rates as well as the sterling effective exchange rate index (ERI). Within intertemporal utility optimisation models, the foreign exchange rate risk premium equals the conditional covariance between the future exchange rate change and the future marginal rate of substitution of the representative investor. In conventional models the marginal rate of substitution equals a linear function of future consumption growth, which is often proxied by the future real return on a stock market portfolio. This motivates the use of an unconditional (or otherwise known as static) linear factor model for this marginal rate of substitution, with either consumption growth or the real stock return as a factor. In this paper we allow for habit persistence in the consumption behaviour of a representative international investor when we derive our measure of the marginal rate of substitution. This derivation can be used to motivate the use of a conditional linear factor model for the marginal rate of substitution in which it still is related to the future real return on the agent's stock portfolio, but the model parameters are time-varying and this time variation is related to movements in the slope of the term structure of interest rates. The slope of the term structure is used, as this variable has predictive power for future turning

points in the real return on the stock market portfolio. Another novel feature relative to the existing literature is that our risk premium measures are related to a representative investor who operates on a global level instead of a representative investor from a particular country.

Our estimates of unconditional and conditional factor models for the global representative investor show that, in contrast to the unconditional factor model, the conditional factor model is accepted on a monthly 1987–2001 sample of nine major sterling exchange rates. We combine the resulting conditional estimates of the marginal rate of substitution for the global investor with the covariance between the relative change in a particular sterling rate and the real return on a 'world' stock portfolio to proxy the risk premium in the effective sterling exchange rate, the sterling/DM rate and the sterling/dollar rate. The resulting sterling risk premia exhibit large swings and seem especially important for the sterling/DM rate. A graphical analysis of the estimated sterling risk premia shows, however, that the impact of the risk premium movements on sterling exchange rates seems to be limited to the short to medium run.

The foreign exchange risk premium is unobservable, and it therefore is difficult to assess whether our estimates of the foreign exchange risk premium are accurate. However, our estimates of both the marginal rate of substitution and exchange rate risk premia indicate that our approach has some empirical validity. Risk-adjusted UIP test regressions indeed indicate that relative to the major European currencies the usage of our estimated sterling exchange rate risk premia improves the parameter estimates slightly in favour of UIP, albeit not significantly so.

The stock market and capital accumulation: an application to UK data

Working Paper no. 251

Demetrios Eliades and Olaf Weeken

Estimates of the capital stock derived from National Accounts investment data suffer from a number of potential shortcomings. These are related to the difficulty in measuring investment in intangible assets and frequent data revisions. Provided that they are fairly valued, financial markets measure the value of firms' productive assets, ie their capital stock. Being less prone to revisions and arguably better suited to measure intangible assets, such market-based estimates address some of the shortcomings of National Accounts estimates. In his influential work, Robert Hall provides such market-based estimates for the US capital stock and shows that they differ substantially from National Accounts based estimates. His model is based on the well-known result that, under the assumptions of constant returns to scale in technology and in the adjustment cost function and the firm being a price taker, *marginal q*, as derived from the first-order condition of the market value maximising firm, equals *average q*. In this framework, and under certain assumptions about adjustment costs, the volume of the capital stock can be derived by equating *marginal q* to *average q*. This paper applies Hall's model to the United Kingdom to provide a market-based estimate of the UK

business sector capital stock. Qualitatively, the results for the United Kingdom mirror those of Hall for the United States, with substantial discrepancies between the market-based and National Accounts based estimates. In particular, market-based estimates of the UK business capital stock were higher in the late 1990s than National Accounts based estimates. These results are robust across a range of different depreciation rates and starting values, and for all but the largest adjustment costs. These differences could reflect financial markets better capturing intangible assets than the National Accounts. However, they could also reflect an asset price bubble or economic rents that the model would mistakenly interpret as intangible assets. The results differ from Hall, in that they show a prolonged period of 'negative intangibles' for the United Kingdom. The sensitivity analysis suggests that this result is qualitatively robust throughout a wide range of adjustment costs, depreciation rates and starting values. In spite of the possible explanations for periods of 'negative intangibles', the length and magnitude of 'negative intangibles' in the United Kingdom are puzzling.

Real-Time Gross Settlement and hybrid payment systems: a comparison

Matthew Willison

This paper considers the issue of payment system design. Real-Time Gross Settlement (RTGS) has become the foremost system for the settlement of high-value payments in developed economies. The rationale behind the trend towards RTGS has been the perceived need to reduce the risk potentially found in deferred net settlement (DNS), the predominant system for settling high-value payments previously. RTGS entails payments being settled on a gross basis in real time. As a consequence, credit risk and settlement risk between settlement banks are eliminated. But RTGS does not dominate DNS in all respects. With payments settled on a gross basis, settlement banks' liquidity needs under RTGS are greater than those under DNS. This could induce settlement banks to delay payment activity in order to wait for incoming payments that can then be used as liquidity. Central banks have mitigated these problems to an extent by providing intraday liquidity. Of course, lending liquidity generates credit risk for the central bank. Thus, this lending is collateralised to remove this risk. Yet, the benefits from reducing the risk associated with DNS systems are considered to exceed the costs of greater liquidity needs; hence, the number of RTGS systems has grown.

The debate surrounding the optimal basis for settling payments has shifted of late with the advent of so-called hybrid payment systems. A hybrid, as the name suggests, combines features of both RTGS and DNS. More precisely, a hybrid typically takes one of the designs and augments it with features associated with the other design. Given that RTGS is the prime payment system design, recent debate has mainly concentrated on the benefits of complementing RTGS with a liquidity-saving feature called payment offset. A payment is offset when it is settled simultaneously with a set of other payments rather than being settled individually like in RTGS. When payments are settled simultaneously, the payments are self-collateralising, to the extent that their values are alike. Settlement banks only need liquidity equal to the net value of their payments in the set to settle these payments. An important design feature of any hybrid is that payments can be placed in a central queue. While

payments are in this queue, the system operator searches for offsetting payments. Otherwise, payments can still be settled by RTGS without necessarily entering the central queue. The benefit of complementing RTGS with a payment offset facility is that liquidity needs can fall and the incentive to delay placing payments into the system is reduced, relative to RTGS; but offset does not necessarily reintroduce the risk present under DNS.

In this paper, we examine the issue of optimal payment system design. We compare the performance of an RTGS system against six hybrid systems based on payment offset. We assume that, when payments are offset, they are considered legally to be final and irrevocable. So the hybrid systems introduce no credit risk relative to the RTGS benchmark. We compare the system designs based on two criteria: their liquidity demands and the speed with which payments are settled. The second criterion captures the potential impact of operational risk, since any operational event will have a larger effect the more payments still remain to be settled when the event occurs. There is a trade-off between liquidity efficiency and exposure to operational risk.

We assume that some payments are time-critical. Hence, if a settlement bank delays payment settlement it faces a cost. Each settlement bank faces a trade-off between the costs of obtaining liquidity from the central bank and the costs of delaying payments when choosing how many payments to settle in certain periods of the day. We assume that the existence of payments is common knowledge but the time-criticality of payments is not publicly known. This particular kind of information asymmetry enables us to focus on the problems settlement banks face in co-ordinating their usage of the central queue and how certain features of hybrid systems could potentially affect their ability to overcome these difficulties. We analyse the effects that the frequency at which payments are offset can have. We find that, when payments can only be offset late in the day, a hybrid will not offer improvements on RTGS according to either criterion. However, when offset occurs early or all day the first-best outcome is obtained.

Decomposing credit spreads

Working Paper no. 253

Rohan Churm and Nikolaos Panigirtzoglou

Corporate credit spreads are important indicators for both monetary policy and financial stability purposes. The Bank of England therefore regularly monitors movements in such spreads, both domestically and internationally. Credit spreads contribute to the cost of external debt financing for the corporate sector, which forms part of the cost of capital that affects firms' investment decisions. Spreads also reflect perceptions about the financial health of the corporate issuers, and can thus indicate potential stress in specific sectors in the economy.

This paper addresses the factors behind credit spread movements. We know that compensation for expected default is only one component of credit spreads. Another component can also be related to credit risk, that is, compensation for the uncertainty about the probability of default. The final component is due to non-credit risk factors, which are driven by differences between government and corporate bonds and the markets in which they are traded, such as liquidity, regulation and tax. The implications for policy of an increase in spreads driven by higher expected default are different from those due to an increase driven by changes in liquidity.

The technical issue raised in this paper is the quantification of the above components. In particular, we perform two exercises. The first is to calibrate a structural model of credit risk to firms' historical default frequencies, both investment-grade and high-yield. We choose the Leland and Toft model developed in 1996 because of its simplicity and intuition, and use US data, as default frequency data for UK companies are insufficient for this purpose. UK data are available for a much shorter period and a smaller sample of companies. The purpose of this exercise is to assess the ability of the model to match firms' historical default behaviour by not only examining the fit of the model to historical default frequencies, but also the plausibility of the derived estimates of asset volatility and risk premium. In addition, this exercise allows us to calculate an average historical compensation for credit risk and compare it with the average observed spread.

The second exercise involves the use of contemporaneous forward-looking information for the equity risk premium and equity volatility, along with the Leland and Toft model, to generate time-series decompositions for the observed credit spreads of UK and US investment-grade companies, as well as US high-yield companies.

The results from these two exercises are as follows:

- The historical estimates generated for US investment-grade companies are around 20.6% for asset volatility and an asset risk premium just above 4%. This is equivalent to an equity volatility of 35% and an equity risk premium of 6.3%. The estimates for high-yield firms are 25.4% for asset volatility and 7.5% for the asset risk premium. This is equivalent to an equity volatility of 78% and an equity risk premium of 11.5%.

- These parameters imply that the average compensation for credit risk factors is 72 basis points for investment-grade firms, 55% of the average observed spread of 136 basis points. We conclude that a large part of the investment-grade credit spread is due to non-credit risk factors. The corresponding numbers for high-yield firms are 430 and 523 basis points. We therefore find that a higher proportion, 82%, of the spread is explained by credit risk for riskier (high-yield) debt.

- The contemporaneous decomposition shows that, on average, a significant proportion of the observed credit spread is due to non-credit risk factors. This is consistent with the historical decomposition. The actual spreads and the compensation for credit risk we calculate are highly correlated. The component that compensates investors for expected default, which is the only credit risk compensation risk-neutral investors would require, is significantly more stable than the spreads we observe.

- The non-credit risk component is closely related quantitatively to swap spreads for our investment-grade decomposition. Previous studies have found that a small proportion of variation in swap spreads is due to credit risk. This provides support for identifying the residual of our decomposition with the non-credit risk component. For high-yield companies, the non-credit risk component is significantly higher than swap spreads, although they follow similar patterns. This may reflect higher liquidity premia required in the high-yield corporate bond markets.

The above results imply that the information content of credit spreads as a macroeconomic indicator or predictor of corporate sector default rates would depend on the source of the shock. However, data availability restricts the available history of the decomposition. As more data become available we would be able to test the predictive ability with respect to both default rates and future growth. Another avenue for future research would be to quantify the possible determinants of the non-credit risk component of credit spreads by closely examining the structure of the different markets.

On the consumption-real exchange rate anomaly

Working Paper no. 254

Gianluca Benigno and Christoph Thoenissen

One of the well known puzzles in international finance is the so-called consumption-real exchange rate anomaly. Most international business cycle models predict that, under the assumption of perfect financial markets along with supply disturbances, consumption should be higher in the country where its price, converted into a common currency, is lower. This feature of the models is in sharp contrast with the empirical evidence, which suggests that the consumption differential across countries does not comove in any systematic pattern with its relative price (ie the real exchange rate). The removal of the assumption of perfect financial markets is not sufficient in replicating the observed evidence: indeed, recent research shows that the same anomaly in the behaviour of consumption and the real exchange rate does continue to hold. This paper explores the extent to which the introduction of non-traded goods, along with a limited international financial market structure, might account for the aforementioned anomaly. Our results suggest that the combination of these two factors is a promising avenue for understanding the behaviour of consumption across countries as well as the real exchange rate. Indeed, in our model, the calibrated moments are close to reproducing the observed behaviour of the data for a wide range of plausible

parameter values. Two key features are important in accounting for our results. By assuming that international asset trade is limited to a riskless bond we break the link between the real exchange rate and relative consumption that would arise under perfect financial markets. Whereas by introducing non-traded goods, we allow for the possibility that, depending on the origin of the shock (ie traded versus non-traded), the real exchange rate and relative consumption across countries can move in opposite directions. In particular, following a positive shock to the traded goods sector in the home economy, home consumption increases with respect to consumption abroad. On the other hand, the real exchange rate appreciates if the effect coming from the relative price of non-traded to traded goods (the so-called Balassa-Samuelson effect) outweighs the terms of trade effect that would imply a depreciation of the real exchange rate. The first effect will be stronger the more dominant the shocks to the traded goods sector relative to the non-traded goods sector, while the second effect will be stronger the higher the degree of home bias in preferences. More generally, the structure of the disturbance and the specification of preferences determine the overall cross-correlation between real exchange rate and relative consumption.

Inside the MPC

In this article, Richard Lambert explains what life is like as a member of the MPC.

Decisions made by the Bank of England's Monetary Policy Committee affect the lives of everyone in the country. The return that savers make on their investments; the cost of mortgages for homeowners; the outlook for jobs and inflation: all these and more are directly influenced by the Committee's decisions every month about the right level of interest rates for the United Kingdom.

It's no wonder that the business pages often seem preoccupied with what it might do next.

Yet most people only have a vague idea about how the Monetary Policy Committee (or MPC) goes about its job. Opinion polls show there is a general awareness that the Bank of England — not the politicians — is now responsible for setting UK interest rates. They also show people have come to believe that inflation in this country is likely to continue at a low and stable rate — a far cry from the 1970s and 1980s, when prices rose by more than in the previous 200 years combined.

But few people understand how the MPC goes about its business — or how its decisions get translated into the economy. Professionals in the financial markets know exactly how the MPC operates, and spend a lot of time trying to anticipate its judgements. This guide is not for them. Instead, the aim is to give a wider audience an insider's view of the MPC at work.

The overriding goal of monetary policy is to secure low and stable rates of inflation over the very long term. That job is made much easier if the public trusts the judgement of the people who are setting the policy and knows how they go about their work.

The Committee

Start with the make up of the Committee. Chaired by the Governor of the Bank of England, it has nine members — five full-time Bank executives (the Governor and two Deputy Governors, the Chief Economist and the Markets Director) and four external members, who are appointed for a three-year term by the Chancellor of the Exchequer.

A number of central banks around the world use some form of committee structure when managing monetary policy, and there are good reasons for this. Placing total control for setting interest rates in the hands of a single unelected official would seem like a very risky proposition to most politicians. And there is evidence to suggest that groups of experts make better decisions than individuals when dealing with technical issues such as monetary policy. They can share information and learn from each other, and they can change their minds in the face of sound arguments.

The argument for including external members is that they bring in a wider range of expertise and experience than would be available if the MPC could draw only on the Bank's own staff. And they bring fresh thinking to the Committee since they are only there for a limited period.

The crucial point is that all nine members of the Committee are individually held to account for their decisions. Their separate votes are recorded and published. And they are not there to represent any particular interest — such as business, trade unions, or consumers. They have been chosen for their particular expertise — mostly, but not exclusively, in the field of economics. And their responsibility is to the country as a whole, rather than to any sectional interest.

The Committee's objective is set each year by the Chancellor of the Exchequer. From 1997 through to the end of 2003, the target was an inflation rate of 2.5% a year as measured by the retail prices index excluding mortgage interest payments (the RPIX). From 2004, the target was changed by the Chancellor to the Consumer Prices Index, or CPI, and set at 2%. Thanks to the way it is constructed, the RPIX has tended to rise over the long

term by a little over half a percentage point a year more than the CPI, so in practical terms the changeover has made little difference to the MPC's work.

Subject to the overriding importance of maintaining price stability, the Committee must also support the Government's economic policy, including its objectives for growth and employment.

If the only concern were to keep down inflation, the temptation would be to increase interest rates to a level that would hold down prices — but could also damage growth and throw people out of work. So the rules are set in a way that ensures the MPC is not encouraged to push rates up any higher than would be healthy. The essential point is that the inflation target is symmetric, which means that the MPC has to be just as concerned about aiming too low as it is about overshooting the mark.

If the rate of increase in the CPI turns out to miss the target of 2% by more than 1 percentage point in either direction — down as well as up — the Governor has to write a public letter to the Chancellor explaining what has happened, and the steps that the MPC plans to take to put inflation back on track.

The MPC has only one instrument with which to achieve this target, which is its ability to change short-term interest rates (see page 64), and this only works with a delayed action. A shift in interest rates has to ripple through the financial markets and out into the economy, and it can be as long as two years before the full impact is felt on the rate of price inflation.

In other words, you can't fix today's problems by changing today's interest rates. Instead, the approach has to be forward looking. The MPC has to do its best to anticipate inflationary pressures over the following couple of years or so, and lean against them by adjusting interest rates in whichever direction seems appropriate in order to meet its target of long-term price stability.

The Committee's credibility is all important if it is to influence public expectations. If people believe that it can be trusted to maintain low and stable inflation over a long period of time, they will behave in a different way than they would if they thought that it was not up to the job. Businesses will not feel they have to allow for the risk that prices could run amok. Pay negotiators will be

more willing to accept long-term deals. Savers will be confident that their assets are not going to be destroyed by the ravages of inflation.

Credibility takes years to build up, and could be lost in a few months. This thought is always at the front of the MPC's mind. It is the reason why the Committee is anxious to be as open and transparent as possible about the way it comes to its decisions. And it explains why public communication is a critical part of the MPC's role, and something to which it pays an enormous amount of attention.

The MPC meeting

All this comes together in the monthly meetings to set interest rates.

It is early on a Friday morning, and the Bank's economists are gathering for coffee along with the members of the MPC and some of the Bank's regional Agents from around the United Kingdom for the big briefing session which is known as the pre-MPC meeting. In all, there may be as many as 100 people in the room.

The monthly meetings to set interest rates take place on the Wednesday and Thursday following the first Monday of every month, and the pre-MPC meeting is held on the preceding Friday. The idea is to draw out all the important economic news of the previous month and to put it into context. All Committee members attend, so that they can prepare for the following week's policy meeting on an equal footing.

Throughout the weeks since the previous meeting, Committee members will have received scores of emails from the Bank's staff, analysing the latest economic news from around the world. They will also have been sent studies from Bank analysts on topical issues: the outlook for growth and employment; what's happening to wages; growth in the euro area and so on. On the Thursday night before pre-MPC, they will have received a pack of around 500 charts and tables which are updated every month to give a consistent picture of the economic world.

The pre-MPC meeting starts at 8.45 am, and takes place in a small lecture theatre — the Committee sitting in a row at the front facing the people who are going to make the presentation and the rows of their colleagues behind them. In some ways, this is the most daunting moment of the month for Committee members: all those

numbers, all those intelligent faces. It is hard to imagine what it must have been like in the early days of the MPC, when the meetings lasted throughout the day. Now, at least, they are over by lunchtime.

The meeting takes the form of a series of set-piece presentations by senior Bank staff, each illustrated by dozens of graphics which are projected on to large screens around the room. Each presentation covers a different aspect of the economic landscape, building up a broad picture of the big economic and financial developments over the previous month and concentrating on those elements which are most important to the UK economy.

For a newcomer to the MPC, this is often the first exposure to the scale and quality of the Bank's economic engine room. Graphics fly across the screens. Occasional questions by Committee members are fielded by the presenter or, if he or she wishes to bring in a colleague, a turn of the presenter's head will bring in a swift response from the back row.

As well as economic analysis, this meeting also provides the Bank's regional Agents with an opportunity to report on what they have picked up in recent weeks from their business contacts around the country. There are twelve Agents in all, who are in contact with a total of roughly 8,000 businesses large and small. The Agents usually have two slots at the Friday meeting. In one, they give an overview of their discussions with hundreds of business people over the previous month. Key regional and sector differences are highlighted, and comparisons are drawn with what the official data are showing.

In the other, the Agents report back on the special survey which they undertake most months at the request of the Committee. At the end of each rate-setting meeting, the MPC identifies a topical issue about which it would like to learn more: what's happening to profit margins; how tight are conditions in the labour market; what's the outlook for investment? The Agents discuss the month's topic with their business contacts in the next few weeks, and report their findings back to the pre-MPC meeting.

The days immediately after the pre-MPC meeting provide time for further preparation ahead of the big meeting which is to start on Wednesday afternoon. Committee members receive notes from the Bank staff answering questions raised at the pre-MPC meeting, and

analysing the latest economic news. The external members will also consult their own researchers, who are there to help with topical questions and to prepare speeches as well as to work on longer-term analysis.

It is important to approach the policy meeting every month with an open mind: there can be no foregone conclusions when it comes to setting the interest rate. Members can and do develop their own views about where rates may need to go in the future in order to reach the inflation target. But those views will change in the light of new information, fresh research, a new set of forecasts, perhaps a different view of the risks. And members are influenced by each other's arguments.

Early in the week of the policy meeting, MPC members receive an email from Charlie Bean, the Chief Economist. In this he sets out his proposed agenda for the Wednesday afternoon discussion. It is not meant to be an exclusive list of topics for discussion. Instead, it provides a framework for discussing all the main components of the economy in an orderly fashion.

The rate-setting meeting starts at 3 pm on the Wednesday afternoon. The setting is suitably impressive: an elegant committee room dominated by a magnificent portrait of Montagu Norman, one of the great Governors of the past, who was painted by Augustus John. It is said that Norman always disliked the picture, and it certainly makes him look somewhat saturnine. The present Governor, Mervyn King, sits in front of the portrait, with Rachel Lomax — the Deputy Governor responsible for Monetary Policy — on his right, and Sir Andrew Large, the Deputy responsible for Financial Stability, on his left.

In all, there are 14 people in the room facing each other at tables set out in the form of a square. Along with the nine members of the Committee, there are four senior Bank staff, responsible for taking the minutes and preparing the quarterly *Inflation Report*, together with a senior representative of HM Treasury — either Gus O'Donnell, the Permanent Secretary, or one of his colleagues.

The Treasury person is not there to discuss monetary policy or to vote. Instead, he fields the occasional questions about tax and spending matters and otherwise sits silently, noting the different arguments and no doubt taking private bets with himself about the outcome of the discussion.

Everyone sits in the same place each month: newcomers to the Committee take the space vacated by their predecessor.

The Governor calls the meeting to order, and invites Charlie Bean, the Chief Economist, to update the meeting on any relevant economic news since the previous Friday morning, and to report on what the financial markets are expecting from the meeting. That done, the Committee works its way through the agenda. Each topic is led off by Charlie Bean, who summarises that month's news, offers his interpretation of what may be happening and — where relevant — gives different sides to the story. The Governor then chairs a general discussion on that theme, which lasts until he feels it is time to move on to the next one.

Members talk about what has happened in the previous month that might have changed their views about the outlook for inflation. They discuss the latest economic data and business surveys, and they report what they have heard from their own contacts about business conditions around the country. They debate longer-term issues: is the economy in the euro area finally beginning to pick up? Could the housing market be on the turn? And they brood about how much weight they should attach in their thinking to a particular piece of information. Can they trust the latest export figures, or are they likely to be revised? How much notice should they take of the surprising weakness in retail sales? Where could things be going badly wrong?

The tone of the discussion depends on the personalities in the room. Tales are told about heated clashes in the past, but the mood these days is rather courteous and earnest. There's the occasional joke along with the serious talk, but not much in the way of verbal violence.

Wednesday is not a time for actually discussing the interest rate decision itself. Rather, it is the moment for exploring the different issues which will help to shape each member's decision the following day. Members never talk to each other at any time about what they are likely to do when the votes are cast on Thursday morning. Instead, they reach their decision in their own way, and in their own minds.

The meeting has generally talked itself out by about 6 pm. There is a dinner in the Bank for those MPC members who wish to attend it: the only rule is that monetary policy is not to be discussed.

And so to 9 am on Thursday morning. The present Governor handles the meeting in exactly the same way as did his predecessor, Sir Edward (now Lord) George. He speaks first, summarising the previous day's discussion in a balanced and neutral way. He may emphasise a couple of questions which he thinks members ought to address in their own presentations, but he does not attempt to direct the outcome of the meeting.

He then asks Rachel Lomax, as the Deputy Governor responsible for monetary policy, to speak first and to give her view. She will talk for roughly ten minutes, highlighting the issues that she has thought most relevant in the previous weeks and explaining the thinking that has led her to make her decision on the rate, which she announces. The Governor then goes at random around the table and asks each member to give a similar presentation of his or her views followed by their decision on the rate, again lasting for about ten minutes or so, and usually working from prepared notes. Occasionally members will say that they would prefer to hear other people's views before they cast their vote, and so will hold their final judgement until the end of the discussion. After each person has spoken, the Governor invites questions: he himself speaks, and votes, last.

The decision goes to the majority and there is no attempt to arrive at a consensus: members are individually accountable for their decisions. When everyone has voted, the Governor formally presents the majority verdict to the meeting, and the outcome is confirmed.

There are no rules about whether the Committee then issues anything more than a brief press release. But the general practice is that a somewhat fuller statement is made if the rate has been changed, or has *not* been changed at a time when the markets were strongly expecting a move. Without some kind of guidance from the MPC, the pundits would be left to speculate about what had happened until the minutes were published 13 days later.

If the Committee decides that it does make sense to publish something more than just a bald announcement of the decision, the staff passes around one of the drafts which have been prepared earlier against just about all possible outcomes. The Committee then goes through this word for word, adding and subtracting as it thinks appropriate. It knows that the tone of the financial

markets and the press coverage for several days to come will in good measure be set by these few sentences, and it is anxious to avoid any words that could be misinterpreted.

Very occasionally, this can be quite a fraught process. The announcement has to be made at noon precisely, which is when the markets are poised to receive it. This does not give much time to distil the essence of the debate into a couple of paragraphs.

Finally the Committee turns to its last task for the morning, which is to agree on the special topic that the Agents will be asked to explore ahead of the next month's meeting.

The minutes

But a critical part of the process has still to get under way in the following few days. The minutes of the meeting provide the mechanism by which the Committee explains its thinking to the financial markets and the public at large. They are essential to the MPC's goals of openness and transparency, and thus to the credibility of the system. And since the decision is the result of individual members exercising their own judgements, every member has a real interest in ensuring that the minutes fairly represent his or her views.

Although individual votes are recorded, comments and viewpoints are not attributed by name to particular members in the minutes. The view is that such attributions would change the tone of the debate, making it more constrained and less free-flowing. But even though they are anonymous, members do want to see their particular ideas captured in the record.

The staff usually sends out the first draft of the minutes, running to about a dozen pages (excluding a summary of the previous month's economic data) by the Tuesday after the meeting. This is a demanding timescale. Summarising several hours of discussion, some of it quite discursive in character, can be a real challenge for the minute writers. MPC members then have a couple of days to suggest changes to the style and content of the document.

The following Monday, the Governor chairs a meeting of all members, at which the proposed changes and the final draft of the text are discussed in great detail. Do

the minutes capture the overall shape and tone of the discussion? Do they contain adjectives or adverbs that might be misinterpreted? Could the argument be expressed more simply or clearly? These words will be read with an eagle eye in the financial markets, and an ill-judged word or phrase could damage the Bank's hard-won credibility.

So the minutes meeting can last for quite a time, and nothing is changed in the text after it has concluded. On Wednesday morning at 9.30 am the text is available for everyone on the Bank's website.

One endless source of fascination for outside commentators when the minutes are published is to see which way individual members have cast their votes. Are they hawks, who want to take no risks with inflation and so are prepared to drive interest rates higher, or are they doves, who are more inclined to keep interest rates down? Can we guess which way particular votes are likely to go under particular circumstances?

Sitting on the Committee, however, it does not seem so easy to categorise colleagues in this way. Several of the longer-serving members have in their time been identified in the press as both hawks and doves — willing to push rates up at one stage and down at another. The fact is that each member of the Committee has the same objective, and will be held personally accountable for his or her judgement about the level of interest rates necessary to meet the inflation target. Members learn from each other and from their own experience as time passes. It makes no sense to believe that a judgement made in one set of circumstances will be repeated at a very different time.

One thing that is clear, however, is that the MPC does seem to prefer small incremental moves in interest rates to larger, bolder steps. Interest rates have been changed on 30 occasions since the Committee was established in 1997. Of these changes, 26 came in the form of quarter-point changes in either direction, and the rest were half-point changes. The MPC has never raised rates by more than a quarter of a percentage point: its cuts of half a point came in November and December of 1998, February 1999 and November 2001.

There are several reasons why the MPC likes to take small steps in the same direction, as opposed to making a leap. One is to do with uncertainty. Despite all the staff work, members are aware that their knowledge of the economy is far from perfect. The data are often

subject to revision, and new information is coming in all the time. There is also room for doubt about how much a particular interest rate change will impact on the economy going forward. Members tend to feel that by moving in small steps they have a better chance of assessing their action, and perhaps refining their views about how much further rates might have to move in the future.

On top of this, there is a quite a strong feeling on the Committee that sharp movements which will surprise the public are to be avoided unless they are essential. Better to signal and to explain the need for change than to spring it on to a startled world. There may be moments when the MPC will decide that a larger move in either direction is necessary — maybe as the result of some kind of economic shock, or because the Committee has changed its collective view of the outlook. But where possible, its instinct is to try to manage public expectations rather than to shock people into changing their behaviour.

The MPC and the financial markets study the same economic news and data at roughly the same time, and the predictability of the MPC's response to news developments is important. If the markets felt that the Committee was prone to springing surprises, they might feel the need to insure themselves against this risk by pushing market interest rates higher than would otherwise be the case.

In an ideal world, the financial markets would understand the MPC's thinking so well that they would react to the economic news as soon as it was announced, rather than waiting for the MPC's subsequent action. In other words, they would be so confident about the Committee's response to the news that surprise decisions would be few and far between. Of course outsiders will never know for sure exactly what nine people on the Committee will make of a particular set of economic data. But consistency and predictability are qualities that the MPC values.

The *Inflation Report*

One of the Committee's most important tools for explaining its thinking about the economy and the outlook for inflation is a document that it publishes every three months: the quarterly *Inflation Report*. The Bank started to produce this back in 1993, shortly after sterling had been ejected from the Exchange Rate Mechanism and inflation targeting had first been introduced. It remained a central part of the system after the Bank was granted independence in 1997, and it serves a double purpose.

First, the period leading up to publication is when the Committee discusses most intensively how the various pieces of the economic jigsaw all fit together. It builds these discussions around forecasts for growth and inflation which it updates every three months, and which provide the framework for its forward-looking policy decisions. The quarterly round is thus an opportunity to stand back from the daily news agenda and think about longer-term trends. It is for this reason that interest rate changes in the past have often come in the month when the *Inflation Report* has been published: members of the Committee have spent many hours thinking together about the outlook for inflation, during the course of which they may have decided to modify their views.

The second role of the *Inflation Report* is as a communications tool — a full and detailed explanation of the thinking behind the interest rate decisions. Some critics have complained that the *Report* contains everything but the Bank's kitchen sink, but a lot of detail is necessary when it comes to spelling out the outlook for the years ahead.

The *Report* publishes forecasts for both economic growth and inflation over a three-year period, in order to help set the context in which interest rate decisions are made. But there are two important caveats to emphasise here.

The first is the enormous amount of uncertainty which surrounds any attempt to forecast the future. Business conditions change, exchange rates rise and fall, consumers feel more or less confident about spending their money. Because of the time lag between a change in interest rates and its impact on the economy, the MPC is obliged to peer into the fog of the future and do its best to capture the broad trends as they appear at any particular moment. But it is always aware that what seems likely today may look way out of line tomorrow.

This is why it publishes its view of the future not as a simple forecast but in the form of a broad spread of probabilities — the so-called fan charts (Charts 1 and 2). It's also why the news is reappraised every month, and the projections are drawn up afresh every three months. Forecasts are made to be adjusted.

Chart 1
CPI inflation projection in the February 2005
Inflation Report **based on market interest rate**
expectations

Percentage increase in prices on a year earlier
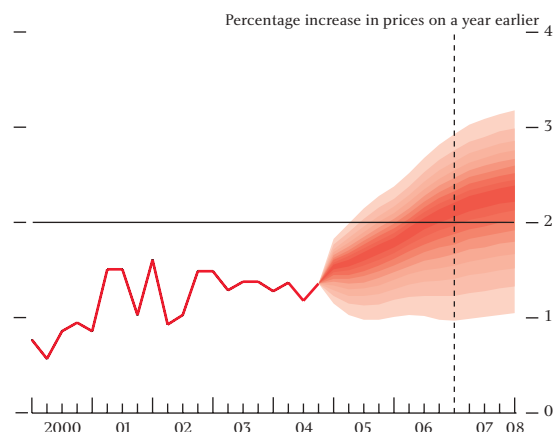
The fan chart depicts the probability of various outcomes for CPI inflation in the future. If economic circumstances identical to today's were to prevail on 100 occasions, the MPC's best collective judgement is that inflation over the subsequent three years would lie within the darkest central band on only 10 of those occasions. The fan charts are constructed so that outturns of inflation are also expected to lie within each pair of the lighter red areas on 10 occasions. Consequently, inflation is expected to lie somewhere within the entire fan chart on 90 out of 100 occasions. The bands widen as the time horizon is extended, indicating the increasing uncertainty about outcomes. See the box on pages 48–49 of the May 2002 *Inflation Report* for a fuller description of the fan chart and what it represents. The dotted line is drawn at the two-year point.

Chart 2
GDP projection in the February 2005
Inflation Report **based on market interest**
rate expectations

Percentage increase in output on a year earlier
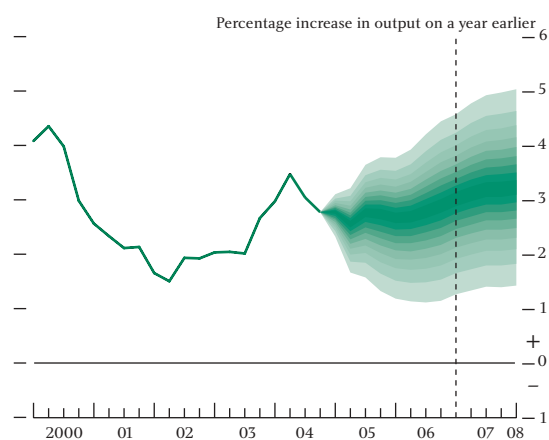
The fan chart depicts the probability of various outcomes for GDP growth in the future. If economic circumstances identical to today's were to prevail on 100 occasions, the MPC's best collective judgement is that GDP growth over the subsequent three years would lie within the darkest central band on only 10 of those occasions. The fan chart is constructed so that outturns of GDP growth are also expected to lie within each pair of the lighter green areas on 10 occasions. Consequently, GDP growth is expected to lie somewhere within the entire fan chart on 90 out of 100 occasions. The bands widen as the time horizon is extended, indicating the increasing uncertainty about outcomes. See the box on pages 48–49 of the May 2002 *Inflation Report* for a fuller description of the fan chart and what it represents. The dotted line is drawn at the two-year point.

The second caveat is that the fan charts are not themselves a mechanism for setting interest rates: they are simply intended to help the MPC form its judgements. In other words, there is no mechanical link between the central projection as published in the *Report* and the level of interest rates. For example, there could be circumstances in which the Committee decided that it would make sense to let the central

projection stray above the 2% target for a while, allowing the economy some extra time to get back into balance.

It is easy for commentators to assume that if the central projection for inflation is in line with the target, the MPC is going to be relaxed about the outlook for interest rates. But that's not how it feels on the Committee at all. Instead, the MPC constantly worries about uncertainties and risks, and is ready to move at any time if it feels that things are not working out as expected.

A number of central banks around the world produce economic forecasts to help them come to a decision about policy. But what is different about the Bank of England process is that the forecasts are the direct responsibility of the Committee itself. They are not projections that are produced by the staff for the MPC to think about: instead, they are the result of active debate by the Committee members themselves. The whole process runs on over a couple of months, and involves a great deal of discussion and paperwork.

Around eight weeks before publication date, the Bank's staff report to the MPC about research that has been commissioned at the end of the previous forecast round. The Committee agrees on how the results of this work should be taken into account in constructing the forecast during the following few weeks.

Around four weeks before publication, the staff presents what it calls its benchmark forecasts for both the world and UK economies, and explains how the analysis might have changed since the previous *Inflation Report*. This benchmark forecast is drawn out of a range of economic models, which are managed and calculated both inside and outside the Bank.

On the basis of the benchmark, the Committee agrees on the key issues which it wants to discuss in more detail in subsequent meetings. It seeks to identify topics about which members have different views — there is no point in debating something about which everyone agrees. And it is looking for issues that might make a significant difference to the projections. Rather than wasting time with peripheral matters, the Committee wants to focus on the big stuff.

Next comes a series of key issue meetings, each usually lasting for about three hours. The staff provides detailed

background notes on each issue ahead of the event, and presents the possible range of choices to the meeting in the form of graphics. Chaired by the Governor, the Committee decides what judgement to take on each issue, and considers the risks involved. The aim is to reach a view that represents the thinking of most, if not all, of the Committee. If that is not possible, a vote may be taken — and there is space in the *Inflation Report* to record the views of dissenting members.

These judgements of the majority are then incorporated in a revised set of projections, known as the draft forecast, which is presented to the Committee a few days before that month's MPC meeting. Up to this point, the forecast has been put together on an issue-by-issue basis, looking at the individual influences on the economy and seeing how they all add up. But now the time has come to take a look at the big picture, and to judge if what is being put forward seems to make sense.

To help with this exercise, the staff presents the draft forecast alongside detailed comparisons with the work of outside analysts, and invites the MPC to take an overview of what has been put together. Does it really believe that house price inflation is going to slow down as quickly as implied in the forecast? Are the forecasts for US growth just too optimistic? Is it plausible that inflation will hit the target so neatly?

Depending on this discussion, further adjustments may be made in order to arrive at the Committee's best collective judgement. That final view will have been the result of six or seven substantial MPC meetings, normally all chaired by the Governor. And the MPC has this analysis at its fingertips by the Wednesday afternoon when it has to start the discussion on that month's rate decision.

The quarterly forecast round is now drawing to a close. The final step is to approve the text of the *Inflation Report* itself. There is not usually much debate about the first five sections, which are produced by the staff and give a detailed perspective on money and asset prices; demand; output and supply; costs and prices; and monetary policy decisions in the previous quarter.

But the introductory overview, and the final section describing the Committee's latest assessment of the outlook for growth and inflation, are another matter. These are meant to capture the MPC's latest thoughts about policy, and it is enormously important to be as

clear and straightforward as possible — and to avoid careless phrases.

Chaired by the Governor, the Committee picks its way through every line. Sometimes, the process breezes along. Occasionally, it can last for many hours.

The *Inflation Report* is finally ready for publication. On the Wednesday morning following the MPC's monthly meeting to set interest rates, the Governor holds a press conference at the Bank for economic journalists who take the opportunity to probe him about all aspects of monetary policy. Accompanied by the Chief Economist and the Markets Director, Mervyn King seeks to provide as full and as clear a set of answers as he can to everything that gets thrown his way. The questioning is usually polite but firm, and quickly gets into matters of fine detail.

It's all very different from the time, not so long ago, when the stated objective of the Bank's press officer was to keep the Bank out of the press, and the press out of the Bank.

The quarterly press conference is a very important moment for holding the Bank accountable to the public — but there are others.

Accountability

The Treasury Select Committee of the House of Common holds a watching brief over the MPC, which it exercises with vigour. Newly appointed members are quizzed by the Select Committee, which has not always been above using a little rough stuff on the hapless appointee. The Select Committee also invites the Governor and three or four other MPC members to a public meeting every three months to discuss monetary policy developments.

In addition, MPC members spend time travelling around the United Kingdom, visiting companies and talking to business people and others about how the economy is doing. These visits, which usually include interviews with local newspapers and broadcasters, are set up by the Bank's regional Agents and are typically spread over a couple of days. In all, about 60 or so of them are undertaken in any given year.

They serve two purposes. The first is to find out what is actually going on at the coal face of economic life. You can read all the data in the world and still not fully

<div style="border: 1px solid green; padding: 10px;">

How the Bank sets interest rates

When the MPC decides to change the official interest rate, it is attempting to influence the overall level of activity in the economy. If the demand for goods and services rises at a faster rate than the economy can supply them, inflationary pressures begin to build. But if for some reason the level of demand falls to a point where unemployment starts to rise and businesses start to close, the economy may slip into reverse and inflation may start to weaken.

By changing the rate of interest, the MPC seeks to keep a healthy balance between supply and demand across the UK economy. A reduction in interest rates makes savings less attractive and borrowing more so — and thereby helps to stimulate spending and investment. This will eventually feed through into the level of output, employment and inflation. Lower rates may also leave sterling less attractive to foreign investors, thereby lowering its value relative to other currencies. This will make it easier for British businesses to export goods and services, but will also tend to push inflation higher over time as the prices of imported goods start to rise.

Increases in interest rates, of course, have the opposite effect. All this takes time to unfold, which is why the Committee always has to peer into the future in its approach to monetary policy.

The MPC sets the interest rate at which the Bank of England is prepared to lend short-term money to financial institutions — the so-called official repo rate. That in turn affects the whole range of short and longer-term interest rates set by commercial banks, building societies and other institutions for their own savers and borrowers. In addition, it tends to affect the prices of shares and bonds, as well as the exchange rate.

If investors and borrowers believe that inflation is going to be low and stable for years ahead, the MPC's decisions will also have an impact on long-term interest rates. Twenty years ago, people were very unwilling to lend money to UK businesses for the long term because they feared that the value of their repayments would be eaten away by inflation.

Today, the picture is very different. Companies can borrow money for the long term at a rate not much higher than they have to pay for short-term borrowing. This is a sign that the markets are prepared to trust the MPC to do its job.

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understand the issues which are keeping business people awake at night.

The second is to explain why the Committee has acted in the way that it has, and to give people a chance to express their views about the way that monetary policy is being managed. To build their credibility, its members need to get out and about and pay serious attention to the views of as wide a slice of the community as possible.

Finally, the Committee is also accountable to the governing body of the Bank of England, which is called the Court. It's the Court's job to make sure that the process is working effectively, to check that the MPC has collected the regional, sectoral and other information necessary to formulate policy, and to see that the MPC has the resources it needs to do its job.

What all this shows is that setting interest rates is not just a question of meeting once a month, and sticking a finger in the air. It takes a significant slice of time for the Governor and his executive colleagues. And the external members of the Committee are usually committed to three or four days work a week.

Chart 3
UK inflation experience
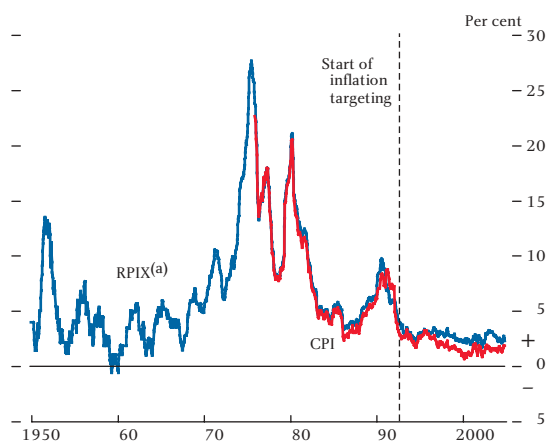
(a) Based on RPI before 1975.

Track record

The track record so far has been impressive. Chart 3 shows the rate of inflation in the United Kingdom over the past 50 years. The years of inflation targeting, which started after sterling left the Exchange Rate Mechanism in 1992 and was institutionalised when the Bank became independent in 1997, stand out as a

period of low inflation. Inflation has also been much less volatile than in previous decades, and inflationary surges have died away more quickly than they did in the past.

This performance cannot be explained simply by the adoption of an inflation target, or by the work of the MPC. Big changes in the labour and product markets were carried out first by the Conservatives under Mrs Thatcher, and then consolidated in the following years by both political parties. And the rate of inflation has declined throughout the world as other countries have managed sound monetary policies and the impact of globalisation and increasing competition has made its mark on prices everywhere.

Improved price stability has brought broad benefits to the British economy. The long-term cost of borrowing has fallen relative to that in other countries. Output growth in the economy has picked up a little relative to its long-term average, and has been much more stable both than it was in the past and than it has been in most other developed countries in recent years. And alongside this sustained growth, unemployment has fallen to much lower levels.

In a speech back in 1992, Robin Leigh-Pemberton — then the Bank's Governor, and now Lord Kingsdown — argued that it was vital 'to demolish the image of the UK as a second-rate, inflation-prone economy.' Arguably, that job has now been done.

So far, inflation has come out very close to the MPC's target. Between 1997 and 2003, the average rate of inflation as measured by the RPIX came out at an annual rate of 2.4%, compared to the 2.5% target. The Governor has not yet had to write a letter to the Chancellor explaining why the target has been missed by more than a percentage point.

No doubt that will be necessary at some point. If, for example, something happened to push inflation way off target — a huge increase in the oil price, for example — the MPC could decide that it would be better to get inflation back on track in a measured fashion rather than slamming up interest rates in a way that could threaten stability, growth and jobs. The open letter would allow the MPC to explain this approach, and the Chancellor publicly to endorse it.

In other words, missing the target might be the result of a deliberate decision rather than a policy error.

Two things are critical for the MPC to be able to achieve its mission. One is a shared understanding across the country of the value of low and stable inflation. As memories of the 1970s and 1980s start to fade, it will be all the more important to get this message across.

The other is for the MPC to be as clear and as open as possible about why and how it goes about making its decisions. It needs to be trusted to do a good job of managing the nation's monetary policy. And it has to go on earning that trust — every day.

The role of central banks in payment systems oversight

By Andrew G Haldane and Edwin Latter of the Bank's Market Infrastructure Division.

Payment systems are essential to the functioning of monetary economies. This article explains the Bank's role in overseeing UK payment systems to ensure their robustness, including the role of the Bank's recently published first Oversight Report. *It also sets out some future priorities for payment systems oversight in the light of international consolidation and technological innovation.*

The rationale for payment systems oversight

What is a payment system?

A payment is a transfer of value. A payment system can then be defined as any organised arrangement for transferring value between its participants. So defined, it is clear that payment systems are fundamental to the functioning of all economies. If transactions are the lifeblood of market economies, then payment systems are the circulation system for these transactions.

This circulation system is as vast as it is important. In 2003, the value passing through UK payment systems was around £130 trillion, about 120 times UK annual gross domestic product (GDP).[1] Or, put differently, an amount equivalent to almost 50% of GDP flows through UK payment systems on an average business day. Chart 1 plots the nominal and real (inflation-adjusted) daily value of payments passing through the UK high-value payment system (CHAPS Sterling) since 1991.

The size of these payment flows reflects the variety of transactions which they support, for goods and services as well as financial assets. Some of these transactions involve high-value transfers, typically between financial institutions. These are vital for wholesale financial market activity. For example, they may reflect transfers of funds between banks in response to lending between them, or their customers. Or they may reflect settlement of transactions involving foreign exchange, equities, bonds, money market instruments and other financial assets.

A separate set of transactions, greater in number but typically smaller in value, reflects transfers between

Chart 1
Average daily value of payments processed in CHAPS Sterling
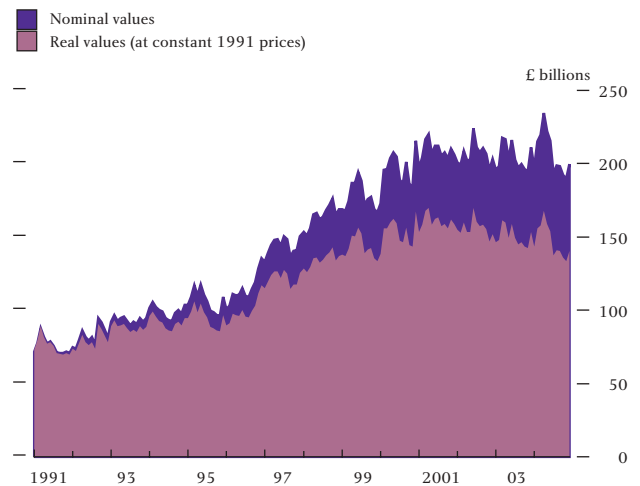
Sources: APACS and ONS.

individuals and/or companies. These too are vital for the functioning of the economy. For example, they include the payment and receipt of wages, salaries and government benefits, Direct Debits, cheques and debit and credit card payments. If any of these circulation systems failed, the functioning of large and important parts of the economy would be affected.

What is oversight?

Why might such systems fail — or why might the circulation system stop? A payment system is, in essence, a network. All networks are susceptible to two distinct types of risk. One is the risk that the failure of one agent spills over to other agents in the network, potentially resulting in gridlock in that system. The large interlocking exposures which arise naturally

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(1) These figures are based on the value of flows through CHAPS (Sterling and Euro), BACS, the Cheque and Credit Clearings (C&CC), Visa, MasterCard, LINK and the embedded payment arrangements supporting CREST and LCH.Clearnet Ltd.

between participants mean that this risk is often a significant one for payment systems.

The second potential source of risk in a network arises from the dependence of all the network participants on a single supplier. Again, this risk has a particular resonance in a payment system context. Often, payment networks are highly dependent on an agent supplying the infrastructure for payment processing or the exchange of payment information. In both cases, the risks facing the network are systemic — the aggregate risk facing the network is greater than the sum of the risks of each participant were they to operate in isolation.

Individual participants may have neither the ability nor the incentive to mitigate fully these systemic risks. Or, put differently, without outside intervention, payment system participants will tend to underinvest in systemic risk mitigation. Systemic risk in payment systems has, in effect, the characteristics of a 'public bad': it is in no one individual's interest to mitigate systemic risk, but it is in everyone's collective interest that it is mitigated. In these circumstances, there is a clear rationale for some third party to provide directly, or secure indirectly, the public good of systemic stability in payment systems.

This is where public policy comes into the picture. One possible means of seeking to secure the public good of systemic stability of payment systems is for the public sector to build and operate these systems itself. Historically, this has been the case in a number of countries, with the central bank owning and/or operating at least the high-value payment system.

An alternative approach is for payment services to be provided by the private sector, but with a public authority ensuring systemic risk objectives are met through regulation — or oversight — of the system and/or its participants. This is the direction a number of countries have taken in the recent past. It is this second approach which provides the overarching rationale for payment system oversight from an economic welfare perspective.

What is the role of central banks?

In practice, the role of payment systems overseer has been assigned to central banks in many countries. In

part, this reflects the fact that there is a natural symbiosis between central banks and payment systems. The liabilities of the central bank ('central bank money') are the apex of the payment system as, being risk free, they represent the ultimate means of discharging obligations between parties. Notes and coin can play this role directly in respect of the general public, while central bank settlement accounts play this role in respect of the banking community. The central bank becomes the *settlement agent*, and its liabilities the *settlement asset*, for the economy.

In the United Kingdom, the Bank of England's liabilities first became a settlement asset in the 18th century in respect of notes, while the Bank's role as settlement agent emerged in the mid-19th century with the advent of settlement accounts for the banking sector. This settlement agent role has continued ever since. Out of this role emerged, with time, a concern with what are today acknowledged as the core functions of central banks — monetary stability and financial stability.

So payment systems are the foundation on which central banks' core functions are built. They are also the bridge between them, for a breakdown of the payment system would inevitably disrupt both monetary and financial stability. In continuing to meet its core objectives, therefore, the Bank has a key role to play in overseeing these systems to ensure their robustness.

This role and the Bank's responsibilities in respect of payment systems were formalised in the Memorandum of Understanding (MoU) with HM Treasury and the Financial Services Authority (FSA) agreed in 1997. For many other central banks, responsibilities for oversight of payment systems are defined in statute. Accompanying these responsibilities are, in some cases, statutory powers of certain kinds — for example, the power to require information or set rules for the system. The UK regime is to some extent unusual as neither responsibilities nor powers for payment systems oversight are defined in statute.[1]

Payment systems oversight in practice[2]

The objectives of payment systems oversight

The main objective of oversight is to assess and, if necessary, mitigate systemic risk in payment systems. At

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(1) See Table 1 from the Bank of England's recently published *Payment Systems Oversight Report 2004*, which is discussed below.
(2) A fuller account is given in Bank of England (2000), *Oversight of Payment Systems*, available at www.bankofengland.co.uk/fsr/ops.pdf.

the same time, efficiency considerations need also to be weighed to some degree. For example, it would be counter-productive to create a risk-proof payment system which was so expensive no one participated in it.

Table A provides a summary of the systems the Bank currently oversees and describes some of their key characteristics. The intensity of the Bank's oversight is broadly proportional to the systemic importance of a payment system. Several factors are weighed in gauging systemic importance, including the values and volumes processed by the system, the design of the system from a risk perspective and the availability of substitute payments media should the system fail (Table A).

The Bank focuses most attention on 'wholesale' payment systems. For example, it oversees CHAPS Sterling and CHAPS Euro, the United Kingdom's large-value interbank payment systems, and the embedded payment arrangements supporting CREST, the settlement system for many UK-issued securities. The Bank's oversight also covers the embedded arrangements for transfer of funds between LCH.Clearnet Ltd — the United Kingdom's central counterparty for certain financial and commodity market transactions — and its members.

Of the UK 'retail' payment systems, the Bank focuses on BACS (which processes Direct Debits, Direct Credits and standing orders) and the Cheque and Credit Clearings (C&CC). While the values processed by these systems are far less than for the wholesale systems, their numbers of transactions are very large and the failure of these systems would in consequence cause widespread disruption to the economy.[1]

In addition, the Bank has oversight relationships with a number of core infrastructure suppliers to the payment schemes — in particular, SWIFT, which provides messaging services supporting CHAPS, CREST and many other market infrastructures; Voca, which operates the infrastructure that supports BACS payments; and also the Bank's own Banking Services area, which operates the RTGS infrastructure which is at the heart of CHAPS and CREST.

The Bank's oversight responsibilities are discharged within its Financial Stability area. There is a clear organisational separation between staff responsible for oversight and those responsible for the operation of the CHAPS system. This separation is intended to avoid conflicts of interest and ensure that the Bank's oversight activities are independent.

Assessing payment systems

The foundation for the Bank's oversight is an analysis of risks in UK payment systems. It assesses these risks against the internationally recognised benchmark of the *Core Principles for Systemically Important Payment Systems*.[2] These Core Principles provide a set of minimum standards for payment systems, covering legal risks (Core Principle I), financial risks (Core Principles II to VI) and operational risks (Core Principle VII), as well as efficiency (Core Principle VIII), access criteria (Core Principle IX) and governance (Core Principle X).

The Bank may not seek full compliance with all of the Core Principles for a particular system. Rather, the expected degree of compliance is broadly proportional to the systemic importance of the system. For the most systemically important systems, the Bank may seek compliance with a more specific or higher standard than the Core Principles.

Earlier this year, the Bank published its assessment of the main UK payment systems against the Core Principles in its first *Payment Systems Oversight Report*.[3] This *Report* aims to promote transparency and accountability about the Bank's role in payment systems oversight — indeed, it aims to extend international best practice in this area. This is important to other public policy authorities in the United Kingdom (in particular HM Treasury and the FSA), to the payment system operators themselves and, ultimately, to the public at large.

The Bank's *Oversight Report* sets out those areas where the Bank believes there are systemic risks in payment systems which may warrant some further mitigating action. One example is the work to introduce a *Liquidity Funding and Collateralisation Agreement* in BACS and the C&CC, to facilitate settlement in the event of one of these systems' participants failing to meet its obligations. A second example is work to reduce the

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(1) LINK (the ATM network operator) and the debit and credit card systems operated by Visa Europe, MasterCard Europe and S2 Card Services (which manages the Maestro, formerly Switch, and Solo debit card schemes) are also overseen by the Bank.

(2) The full text of the Core Principles and guidance on their implementation are available on the BIS website (CPSS (2001), *Core Principles for Systemically Important Payment Systems*, available at www.bis.org/publ/cpss43.htm).

(3) Available at www.bankofengland.co.uk/financialstability/paymentsystems/oversight/psor2004.pdf.

Table A
Volumes, values and main payment types (daily averages, 2004)[a]

	Volume	Value (£ millions)[b]	Important payment types	Most likely short-term substitutes
Payment systems				
CHAPS			● Settlement of financial market transactions	● CHAPS Sterling bypass Mode
Sterling	111,502	206,093	● House purchases	● Manual procedures for making a small number
Euro	25,750	153,493	● Other time-critical payments	of payments
			● CLS pay-ins and pay-outs	● Possible use of correspondent banking
			arrangements for some other payments	
BACS	18,120,354	11,352	● Salary and benefit payments	● Perhaps limited scope for switching to other
			● Bill payments by Direct Debit	instruments in the short term — eg cheques or
				cash
C&CC[c]	8,234,419	5,046	● Payments for goods and services by	● BACS
			consumers and businesses	● Card networks
			● Bill payments and small financial transactions	● Cash
			(eg payments into savings accounts)	
			● Person to person payments	
Visa (credit and debit cards)[d]	14,909,000	806	● Payments for goods and services by consumers and businesses	● Cheques
			● Cash	● Other card networks
MasterCard[e] **(credit and debit cards)**[d]	13,743,000	685	● Payments for goods and services by consumers and businesses	● Cheques
			● Cash	● Other card networks
LINK	6,126,030	201	● Withdrawal of cash using an ATM not operated by the customer's own bank	● Own bank's ATMs
				● Other cash withdrawal channels
Embedded payment arrangements				
CREST[f] **(embedded payment arrangements)**			● Settlement of gilts, equities and money market instruments (including in respect of OMOs and	● Increased free-of-payment transfers could be accommodated within CREST but with
Sterling		267,497	repo market transactions more generally)	increased principal risk
US dollar		731		
Euro		1,222		
Total CREST	252,652	269,450		
LCH.Clearnet (PPS)[g]			● Settlement in respect of cash margin payments	● If disruption does not prevent calculation of
Sterling	182	401	● Payments for commodity deliveries	settlement obligations, contingency payment
US dollar	155	670	● Cash settlements	procedures may be invoked
Euro	126	506	● Default fund contributions	● Contingency algorithms can be used to
Other	244	87		calculate obligations if usual mechanisms are
Total LCH	707	1,664		unavailable
Foreign exchange settlement system				
CLS			● Settlement of foreign exchange trades	● Correspondent banking arrangements in the
All currencies	62.000	395,000		relevant countries but with increased principal
Sterling[h]	10,000	92,000		risk

Sources: APACS, Bank of England, CLS Bank International, CRESTCo, LCH.Clearnet Ltd, LINK Interchange Network Ltd.

(a) Except where indicated.
(b) US dollar, euro and 'other' figures are shown as sterling equivalent.
(c) Volumes include items drawn on other branches of the same bank. Values only include those drawn on other banks.
(d) Data for 2003 are shown.
(e) Includes UK Maestro and Solo transactions.
(f) Value figures refer to cash movements within CREST (and will therefore include the value of transactions settled between CREST members who use the same settlement bank). The comparable volumes figure is only available at an aggregate level.
(g) Figures for LCH.Clearnet Ltd refer to the sum of all (net) payments between LCH.Clearnet Ltd and its members through the PPS. Volume figures are for August 2004.
(h) Trades in which one leg is denominated in sterling.

amount of 'tiering' in the UK high-value (CHAPS and CREST) payment systems, by encouraging wider membership of these systems. And a third example is the work of the Bank to become LCH.Clearnet Ltd's 'concentration bank' — in effect, settlement agent — for sterling and euro payments, thereby eliminating the risk of the financial failure of the settlement agent.

While the Bank aims to identify risks in payment systems and propose remedial action, it cannot enact this remedial action because of the absence of statutory powers over payment systems or their participants. Under the *Financial Markets and Insolvency (Settlement Finality) Regulations* (1999),[1] the Bank does have the statutory power to 'designate' UK payment systems. Such designation protects settlement in these systems from legal challenge should a participant become subject to insolvency proceedings.[2] But payment systems do not require designation in order to operate and the Bank cannot oblige payment systems to seek it. So the Bank's powers under these regulations do not amount to statutory oversight authority.

Co-operation with other public authorities

In promoting safe and efficient payment systems, the Bank co-operates with a number of other public authorities, both in the United Kingdom and internationally.

Domestically, the embedded sterling payment arrangement supporting CREST settles a higher aggregate value of payments than any other UK payment system, while the smooth functioning of LCH.Clearnet Ltd's Protected Payments System (PPS) helps underpin the United Kingdom's key central counterparty. For that reason, oversight of these embedded payment arrangements is an important part of the Bank's oversight responsibilities.[3] The Bank's oversight of the payment arrangements for CREST and LCH.Clearnet Ltd must, however, dovetail with the work of the FSA, which is responsible for ensuring that these firms comply with the recognition requirements laid down under the *Financial Services and Markets Act* (2000).

The Bank also works closely with the Office of Fair Trading (OFT), which chairs a Payment Systems Task

Force comprising payment system operators, trade associations and consumer and business groups.[4] The Task Force offers an opportunity to improve the efficiency of the main UK payment systems — for example, by looking at the governance, level of innovation and criteria for access to these systems. The Bank is participating in the Task Force as an observer.

As a growing proportion of the United Kingdom's systemically important infrastructure is located in, operated or managed from foreign countries, the Bank also co-operates with a number of overseas central banks and regulators. Recently, these co-operative oversight arrangements have been extended to cover Euroclear, which owns the UK securities settlement system CREST; LCH.Clearnet Group, of which the United Kingdom's central counterparty is part; and SWIFT, which provides messaging services to, among others, CHAPS and CREST. To reinforce the robustness of these arrangements, over the past year MoUs have been agreed among the authorities involved in the oversight of Euroclear group, LCH.Clearnet and SWIFT. The Bank is also involved in the co-operative oversight of CHAPS Euro (together with others central banks which are part of TARGET (the 'Trans-European Automated Real-Time Gross Express Transfer System')); and the Continuous Linked Settlement (CLS) system, which connects RTGS (or equivalent) systems in 15 countries.

Future priorities for payment systems oversight

The nature and scale of risks affecting UK payment systems is changing. The payments agenda over the past decade or so has focused principally on mitigating the credit and liquidity risks which arise from the failure of a single system participant. This is reflected in initiatives to introduce in payment and settlement systems Real-Time Gross Settlement, Delivery versus Payment and/or Payment versus Payment mechanisms, which help ameliorate such risks.

There is further to go in reducing these settlement-related risks in UK payment systems. For example, interbank settlement risks can still arise for banks which are not members of CHAPS; there are

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(1) Which implemented the EU *Settlement Finality Directive* (1998) in the United Kingdom.
(2) The Bank designated CHAPS Sterling and CHAPS Euro in May 2000 and CLS in August 2002. The Bank also advised the FSA on the designation of CREST in August 2001 and LCH.Clearnet Ltd in July 2003.
(3) It also contributes to fulfilling the Bank's responsibility to take an overview of the stability of the UK financial system as a whole.
(4) See www.oft.gov.uk/Business/Payment+systems+task+force/default.htm.

residual settlement risks in BACS and the Cheque and Credit Clearing which are not RTGS systems; and settlement arrangements for US dollar transactions in CREST are not as robust as those for sterling and euro transactions. The Bank is seeking to address these risks through its oversight activities. But thereafter this settlement risk-related agenda may be nearing completion.

Looking ahead, the greater risk challenges to UK payment systems may come from key operational dependencies on technology platforms or messaging services which may support multiple payment systems or financial markets, sometimes in many countries. The prime movers behind this shift in risks are the increasing consolidation, international integration and technical sophistication of the key systems.

For example, operational risks to infrastructures have become more acute over recent years as a result of the increased complexity of payments technology and some new interlinkages between different infrastructures. Standards for operational risk management have evolved rapidly over recent years, especially for financial institutions. So too have standards for business continuity planning to guard against single points of failure. UK payment systems need to be assessed against these evolving best practices standards and, if necessary, further action prioritised.

A second area where best practice standards have evolved rapidly over recent years is corporate governance. At present, many market infrastructures are mutually owned and governed. It is questionable whether such an ownership structure adequately protects the public interest, given the widespread consequences for the general public of the failure of some key infrastructures. Independent or public-interest representation on the board of payment systems might plug that gap.

A third area of further work is international co-operative oversight arrangements, given the large and growing share of UK infrastructure which is owned or managed overseas. A patchwork of MoUs has been drawn up with overseers in other countries. To date, however, the practical implementation of these co-operative oversight arrangements has yet to be fully tested.

The Bank needs to ensure these changing risks are adequately monitored and quantified. To that end, it intends to do further work to establish a risk-based framework for its oversight activities, to help determine where oversight resources should be directed. It also intends to host an international conference in May of this year on 'The Future of Payments' at which these changing risk dynamics can be assessed. The Bank's next annual *Oversight Report* will discuss progress on both fronts.

The Governor's speech[1] to the CBI Dinner in Manchester

Now that the Christmas celebrations are over, and the decorations have been taken down, it is time for a much-loved New Year tradition — speculating on how much we all spent over the Christmas period. With over 200 coaches bringing shoppers from all round the country to the Trafford Centre over the weekend before Christmas, New Trafford seems to be as popular and entertaining as Old Trafford. Tonight, though, I want to look beyond the immediate prospect for consumer spending and ask whether the level of saving in this country is adequate to provide for our future needs. But, first, a few words on the immediate outlook.

Tomorrow the ONS will publish its first estimate of retail sales in December. Among the more lurid headlines reporting sales over the holiday period was 'Retail Festive Slump', followed shortly by reports of 'Record Levels of Sales'. To interpret the experience of a few retailers — whether positive or negative — as a national trend is highly misleading. Of course, exactly the same happens each year. Last year newspapers reported 'Confirmation of a Disastrous Christmas' and 'Shoppers Played Scrooge in December'. A week later the ONS said that the volume of retail sales in December rose at a rate more than double the increase expected by City economists, and the headlines became 'Spending Spree Signals Rate Rise'.

The most important lesson from past experience is that, whatever the number turns out to be, it is foolish to put much weight on any one month's figure, especially at Christmas. There are two reasons for being particularly careful about the interpretation of data for retail sales in December. First, the figure that will be published by the ONS tomorrow will be dwarfed by the seasonal adjustment that is applied to the recorded data. That adjustment changes from year to year, often leading to revisions of the figures for earlier years. Typically retail sales in December are around 20% higher than in November. So even small errors in the estimate of the seasonal pattern of sales imply large errors in the estimate of the seasonally adjusted figure. As a result the monthly data can be volatile and little economic

significance should be attached to the number for any one month.

Second, retail sales are only part of household spending, around 40% or so. It is quite possible, indeed likely, that spending on services, such as leisure and holidays, behaves rather differently from sales of goods on the high street. So retail sales are not always a good guide to movements of consumer spending as a whole.

For those reasons we should recognise that the true meaning of the Christmas story will not be revealed until Easter — or possibly much later. The Monetary Policy Committee is more concerned to discern the meaning of the path of consumer spending over a longer time horizon. For some years the volume of consumer spending rose much faster than its post-war average. From 1997 to 2001 it rose at an average annual rate of about 4%, and calendar year growth was last below 2% in 1995. We are not so much a nation of shopkeepers as a nation that keeps shopping. Behind this growth was a steady rise in real incomes, driven by increases in employment and falls in the prices of imported goods. Those price falls followed the rise in sterling in the second half of the 1990s, and the increase in cheap imports of manufactured goods, such as textiles, toys and electronic goods, from China and other emerging market economies. Over the past three years, however, consumer spending has decelerated and its growth has fallen to a more sustainable rate, close to its post-war average.

The slower pace of consumption growth was the result of real income growth returning to a normal rate. It is striking, as the Monetary Policy Committee has said before, that for a number of years, and despite the volatility of house price inflation, the saving ratio of households has been rather stable. Some commentators are exercised by the possibility of a rise in household saving and hence a further slowing of consumer spending. Their concern is that since consumption is the largest component of total demand, the path of consumer spending is crucial to the outlook for output

and inflation. Such concerns about the short run are indeed analysed carefully each month by the Monetary Policy Committee, and the results of that analysis feed into our monthly interest rate decisions. Visits like this give me the chance to listen to you and learn from you and other businesses about what is happening on the ground — not just in the retail sector but in manufacturing and services more broadly. And my visit is the tip of an iceberg because we have a permanent Agency in the North West — staffed by members of the Bank who live and work here.

But I want to step back from the immediate conjuncture and look further ahead. More relevant for our future prosperity is the question not of whether we might save too much but whether we are saving too little. The level of income that will sustain us in the future depends critically upon how much as a nation we set aside today. In other words, what is happening to the national saving rate — the proportion of the net national product that is not consumed by either the private or public sector?

Since the late 1960s the national saving rate has been declining fairly steadily, from over 10% to around 5%. Although saving rates elsewhere in the G7 have also fallen, they were higher than in the United Kingdom for most of the post-war period. Recently the gap between saving rates in the United Kingdom and the rest of the G7 has narrowed considerably, not as a result of higher saving in the United Kingdom but lower saving elsewhere. In large part this reflects changes in fiscal policy. There is ample empirical evidence that higher government borrowing lowers national saving. And for 20 years or more the G7, while lecturing each other and the rest of the world on the need for fiscal discipline, has continued to borrow more and more. The ratio of net public debt to GDP in the G7 has more than doubled since 1980 from around 25% to around 60%. The United Kingdom is the only member of the G7 in which the ratio is lower than in 1980.

The United Kingdom has a clear framework for fiscal policy. Although rules and frameworks cannot guarantee that governments will pursue sustainable fiscal policies, as the large deficits in the early 1990s illustrated, they make deviations from medium-term sustainability more transparent. But in the rest of the G7 the absence of a clear framework, as in Japan and the United States, or the lack of credibility in the stated framework, as in the failure to enforce the Stability and Growth Pact in the euro area, has made it easier to let the fiscal position slip. As a result, the G7 fiscal deficit is now close to its

25-year peak, and the average national saving ratio has halved.

At home, the Government's fiscal rules constrain the path of fiscal deficits. They limit borrowing, over the economic cycle, to the level of public investment and place an upper limit on the debt to GDP ratio of 40%. In assessing the fiscal position it is important to look forward and not just backward at the realised deficits over the past cycle. Of course, it is also important to recognise the many uncertainties surrounding the future path of the public finances.

Central bankers probably talk too much about fiscal policy. Certainly, there are politicians, especially in Europe, who believe central bankers confuse the deficits which dot the fiscal landscape with all manner of economic evils, rather as Don Quixote confused the windmills which dotted the landscape of La Mancha with the terrible giants sent by some evil force. So I do not want to overstate the case and tilt at windmills, especially in the light of the fact that this month sees the 400th anniversary of the publication of Cervantes' great novel. But it will clearly be important that the prudent approach to fiscal policy that has served the United Kingdom so well in recent years is continued — over the next cycle and beyond. In that way our national saving rate can be maintained or even raised.

The market response to inadequate saving is higher real interest rates. Since the United Kingdom is a part of an open international capital market, long-term real interest rates in this country reflect the balance between investment and saving, including the stance of fiscal policy, not just at home but throughout the world economy. Surprisingly, in the light of the fall in G7 saving, UK long-term real interest rates — as measured by the forward rates implied by the yields on index-linked gilts — are near their lowest levels for 20 years. US and euro-denominated rates are also low relative to past experience. There may be other factors that have offset the effect of fiscal policy on real interest rates, such as demographic developments and higher saving and more open capital markets outside the G7. But there remains a risk, as discussed in the Bank's recent *Financial Stability Review*, of an unwinding of low long-term real interest rates as the stimulus from highly accommodative monetary policies across the G7 economies is gradually withdrawn.

What do these arguments mean for monetary policy today? They imply, I believe, three main challenges for

central banks. First, the factors that affect the level of real interest rates in capital markets around the world also determine whether a given official interest rate is an expansionary or restraining influence on demand. When driving a car we normally know whether our foot is on the accelerator or the brake. That is less obvious in the case of monetary policy — hence the debate among economists about the level of the so-called neutral interest rate. Uncertainty about the extent to which monetary policy is applying the accelerator or the brake justifies central bankers' continued interest in the monetary and credit aggregates which contain information about the pace of nominal activity and hence future inflation.

Second, over the next few years the transition to a higher national saving rate is likely to imply a switch of resources from consumption in the private and public sectors to investment and net exports. It will not be easy to achieve that while keeping inflation on track to meet the target and maintaining steady growth in output. It is very likely that, when the ONS publish next week their first estimate of economic growth in the final quarter of last year, it will show that the UK economy has now had 50 consecutive quarters of positive economic growth. No other G7 economy avoided falls in output over that period. But we should recognise, as I hope the English cricket team does tomorrow, that reaching a half-century is no time for complacency but for renewed concentration.

Third, the ability to buy goods from abroad at ever lower prices has kept down inflation at home and sustained faster growth in real incomes and consumption — just as Richard Cobden and John Bright, and the other founders of the Manchester School, argued more than 150 years ago. And it is not just consumers who are paying less for these items. Retailers are too. But the inflation rate of goods and services produced in the

United Kingdom has been rising modestly for two years or so. That has been offset in large part by a fall in import prices. Although we can influence the former we have little control over the latter. There would be risks to output and inflation in the medium term if we were to allow inflation of domestically produced output to rise above target unless we were confident that falls in import prices would indeed continue for some years.

The lesson that we should not place excessive weight on one month's figures is as true of inflation as it is of retail sales. In December CPI inflation was 1.6%. Three months ago it was 1.1%. Six months ago it was 1.6%. Yet the broad outlook for the economy — a central view of continuing steady growth with low inflation — changed rather little during the period. The MPC cannot fine tune short-run movements in output and inflation.

When the MPC published its *Inflation Report* in November, some commentators said that inflation was seemingly stuck at around 1%, and that if growth were to continue at around trend then it was difficult to see why the Committee's central view was that inflation would pick up to the 2% target looking ahead around two years or so. Since then inflation has risen by half a percentage point in only three months. Stating the point in that way shows how silly it is to place so much weight on small changes in inflation and small deviations of inflation from target.

The appropriate response by central banks is to examine all the economic data, and to focus on the outlook for inflation in the medium term. That is exactly what the MPC will continue to do. And by keeping inflation on track to meet the 2% target, the MPC will be making its contribution to future prosperity, both in the Trafford Centre and the country as a whole.

The Governor's speech[1] on the International Monetary System

Later today the G7 finance ministers and central bank governors meet in London. Markets are speculating on what the communiqué will or will not say about exchange rates. On such matters a private exchange of views might serve us rather better than a public statement. What is a matter for public discussion, however, is the mix of exchange rate regimes we see in the world today, and the consequences for international monetary stability.

The current international monetary system comprises three large currency blocs: the dollar, the euro, and an Asian bloc of currencies that are to varying degrees fixed against the dollar. These blocs, of broadly comparable size, produce more than two thirds of world output in total. Given their size, the choice of exchange rate regime of one bloc has a significant effect on the options available to the others.

Countries have always faced constraints in choosing their exchange rate regime. Any country can have only two out of the following three — an independent monetary policy, a fixed exchange rate and an open capital account. At various times countries have tried — and failed — to have all three. But in a world of large currency blocs decisions about exchange rate policies are interdependent. A monetary stimulus in the United States will have a different effect on the euro area if, say, Asian countries have flexible exchange rates rather than fixed rates against the dollar. So the choice of exchange rate regime by any one bloc both depends on and affects the choices of the others.

How did we end up in this position? Under the gold standard of the late 19th and early 20th century, exchange rates were fixed and capital flowed freely internationally. Domestic monetary policy was subordinated to the demands of the gold standard, except in time of extreme crisis when the need for flexibility overcame the desire to adhere to the standard. From the end of the Second World War until 1971, the member countries of the Bretton Woods system had a formal commitment to fixed but adjustable exchange

rates, and capital accounts were largely closed to give members the flexibility to operate independent monetary policies. Since the breakdown of the Bretton Woods arrangements, countries have been free to make quite different choices of exchange rate regime, and have not hesitated to do so. As international financial markets have developed, there has been a general movement to flexible exchange rates supported by credible domestic monetary policies. That is a sensible use of the price mechanism to respond to complex and unpredictable shocks.

Two particularly important exceptions have been the gradual fixing of the exchange rates between members of the European Union, culminating in monetary union, and the more or less formal policies of the newly industrialised Asian countries and Japan to keep the value of their currencies stable against the dollar. Moreover, the Asian central banks have been accumulating large dollar reserves. For most of the post-war period, the quantity of central bank reserves held by Asian central banks was of the same order of magnitude as the reserves held by the G7. Over the past 15 years, both Japan and non-Japan Asia have rapidly increased their reserves, which are now nearly ten times as large as the combined reserves of the rest of the G7. Two thirds of these reserves are in dollars, a much larger proportion than the US share of world output.

The counterpart to the Asian bloc's current account surpluses and acquisition of dollar reserves has been large current account deficits in the United States. There is nothing inherently wrong with such 'imbalances'. In principle, they reflect the use of financial markets to allocate savings from around the world to the most profitable investment opportunities. But there is likely to be a limit to the amount of debt that one country can issue as a result of persistent deficits before investors start to worry about its ability or willingness to repay. When the country in question is also the issuer of the reserve currency, the rapid build-up in the assets denominated in the reserve

currency contributes to the potential instability of the international monetary system. That might result in nominal exchange rate movements that are far larger than those needed for an orderly rebalancing of asset positions.

It is easy to see how each bloc can view this possibility as the responsibility of the others.[1] But that misses the point: the current global imbalances are the natural result of policy decisions by all three blocs. They are, in the language of economists, a general equilibrium outcome. It is therefore meaningless to try to identify the culprit, and blame any one bloc's woes on another.

So where does this analysis leave us? Let me identify three challenges for the future.

First, do we still need a reserve currency as a source of global liquidity? In a world of free capital movements, and developed financial markets, there is no obvious need for an official asset to provide international liquidity, as shown in the decline in the relevance of the SDR. But since the Asian financial crisis in the late 1990s, a number of central banks in that part of the world have increased their dollar reserves in order to protect themselves from possible future crises by creating what I have termed a 'DIY lender of last resort' facility in dollars. Is the dominance of the dollar in world reserves a reflection of historical factors that are less and less relevant today? Or are there fundamental reasons for the world's central banks to continue using one main currency as a source of liquidity?

Second, given that each bloc's policy choices reflect domestic objectives, what could be achieved through international meetings? The starting point is the need to find a common analysis. Domestic policies should at least be based on mutually consistent assumptions. Only when there is agreement on the nature of the risks inherent in current international monetary arrangements will there be the possibility of a co-operative outcome that is an improvement for all, not just for some.

Third, how might we arrive at such a common analysis? The G-7 arose out of an earlier episode of concern about exchange rate movements in the 1980s. Most smaller countries can choose their exchange rate regime without worrying about its impact on the rest of the world. But the large countries — especially the three blocs I identified at the outset — cannot ignore their interdependency. That is why it is important to expand the group of countries that discuss these issues beyond the G7 to include those, such as China and India, whose actions increasingly have global economic consequences.

My main conclusion is that the international monetary system should be seen not as a series of bilateral relationships, but as a multilateral arrangement, albeit one where a small number of the key players can usefully communicate with each other. I believe that we need to rethink the role of the IMF in the international monetary system. I encourage the Fund to articulate a positive vision for the management of the international monetary system in its forthcoming strategic review. I am not convinced that the future of the Fund is primarily as an occasional international lender of last resort for middle-income countries suffering financial crises.

At this conference the emphasis is naturally on ways to promote productivity and enterprise. Monetary stability at home is now widely recognised as a necessary condition for a successful economy. It provides, as I said at last year's conference, a springboard for enterprise. But international monetary stability is no less important if trade is to prosper. In *The Importance of Being Earnest*, Cecily is instructed by her tutor, Miss Prism, to read her political economy. But Miss Prism continued, 'The chapter on the Fall of the Rupee you may omit. It is somewhat too sensational. Even these metallic problems have their melodramatic side.' What would poor Cecily have made of the recent melodrama surrounding the values of the dollar, the euro and other paper currencies? It is clear that the aim of central banks to make monetary policy less exciting and more boring needs to be complemented by a collective effort to bring boredom to the international monetary stage.

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(1) Over the past year, senior policymakers from within the G7 are reported to have claimed that 'It's awfully important that the euro zone adopt policies that will allow them to grow faster. Their slow growth is hurting our growth' (John Snow, AFX news 24/03/04), and that 'Our American friends need to put in place a determined policy to control their deficits and so that their currency does not distort commercial trade' (Nicolas Sarkozy, AFX news 25/11/04), or indeed that China's exchange rate policy 'has become a destabilizing force in the world economy, has led to major international exchange rate and trade imbalances throughout the world' (Open letter from US senators Schumer, Bunning, Durbin, Graham, Dodd and Bayh to Vice-President Richard Cheney, 22/01/04).

Why monetary stability matters to Merseyside

In this speech,[1] *Rachel Lomax, Deputy Governor responsible for monetary policy, discusses how monetary stability can benefit an area like Merseyside, which has faced major structural problems following the decline in its traditional industries. Low inflation and low nominal interest rates are now providing a sound foundation for the long term decisions needed to regenerate the area. Discussing the short term economic outlook, she identifies risks to world demand, and uncertainties about the strength of consumer spending and inflationary pressures within the United Kingdom. The MPC needs to balance the need for well grounded analysis against the importance of acting pre-emptively to keep inflation low.*

It is a great pleasure to be back in Merseyside, as the guest of the Mersey Partnership. This is my first visit as a member of the Bank of England's Monetary Policy Committee (MPC). The Bank and Liverpool go back a very long way. Liverpool was a village when the Bank was founded. By the time we opened our first branches around the country, that village had grown into a major port, the gateway to the workshop of the world. So it was natural that the branch the Bank built in Castle Street in around 1850 was one of its grandest, the work of Charles Cockerell. We still have Agents in the City — Neil Ashbridge and John Young. And only three years ago the Bank's Court held its annual out-of-London meeting in Liverpool's imposing Town Hall.

I am particularly pleased to launch this, the third edition of the *Merseyside Economic Review*. The Partnership had its origins in a Daily Post campaign over a decade ago ('who speaks for Merseyside?'). It broke new ground then and it has been breaking new ground ever since. The *Economic Review* was the first of its kind for any UK City Region. And the Partnership's report on 'the Gender Agenda: Women in the Merseyside economy' is another first.

The value of the Partnership's approach is clear. Economic regeneration is a highly complex long term business which has to bring together many different bodies and initiatives — at local, regional, national, European and even international levels. It's only too easy to lose sight of the big picture. But successful partnership rests on shared goals and clear expectations.

This *Review* charts the way: it sets out in clear and simple terms what the Partnership is seeking to achieve and it assesses progress against measurable objectives. It has the credibility that comes from being grounded in serious analysis of the issues confronting Merseyside. And it has benefited from the advice of an independent panel of distinguished experts.

There is no doubt that the performance of monetary policy has benefited greatly from setting clear objectives and measuring progress in a transparent and open way. The United Kingdom first adopted specific targets for inflation over a decade ago, and at the same time the Bank launched a new quarterly *Inflation Report* to share its thinking about the economic prospect. In 1997, that approach was developed, and its credibility significantly enhanced, when Gordon Brown gave responsibility for setting interest rates to an independent Monetary Policy Committee, consisting of outside experts as well as Bank of England officials.

By any past standards, the period since 1992 has seen a quite remarkable degree of stability, with low and stable inflation and a record period of sustained positive output growth and steadily improving employment. Better monetary policy is not the whole story; but it can share some of the credit for that success.

How does monetary stability like this benefit an area like Merseyside?

The Bank of England's job is to control inflationary pressure in the country as a whole. What we do is set

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interest rates to keep the total demand in the economy in line with the economy's productive capacity. We don't — and can't — favour any section of the economy, or the country.

Merseyside is a region facing deep seated economic and social challenges, stemming from the decline in its traditional industries. In recent decades, many well-paid jobs have gone for ever, and in the new world, earning good money has required a very different set of skills. That kind of change wasn't just a challenge to individuals and their families; it threatened the viability of whole communities.

Low inflation is not in itself a solution to problems like this. But it is a pre-condition for solving them. Merseyside had bad luck to be confronted with more economic change in the second half of the twentieth century than most people could cope with at the time. Liverpool never lost its sense of humour, though there were times when it came close to losing its way. Sadly, you can't laugh your way out of economic decline.

High inflation and economic instability fostered the wrong climate for taking the long term decisions that were needed to give Merseyside a new future. The levels of economic inactivity and social deprivation that you are still grappling with today are in part legacies of the 1970s and 1980s, when the sharp ups and downs in inflation, interest rates and national output made it much harder to adapt to structural economic change at the regional level.

But more recent success in delivering low inflation and economic stability has created a much better climate for you to succeed. Economic regeneration can't get off the ground without inspired local leadership, and committed local partnerships. But even with them, it is a long haul to make the investments in infrastructure that modern businesses expect. And so called soft investments — in people, skills, and communities — are even more of a challenge.

Low inflation and low nominal interest rates matter to you because they provide a sound foundation for just this kind of long term planning. And business needs a climate of stability if it is to commit to the investment that's needed to revitalise an area. We know that it is entirely possible to transform old urban areas — there are plenty of inspiring examples from

London Docklands to Berlin and Baltimore, and if Liverpudlians ever doubted it, nowadays they need go no further than Albert Dock. But it takes long term commitment.

The key findings in today's *Merseyside Economic Review* provide convincing evidence that Liverpool has turned the corner. Increasingly, for those who acquire the right skills, the jobs are there — a picture that fits with a national labour market where unemployment is now as low as it has been in three decades.

How confident can you be that we will continue to deliver the stability that is our contribution to your future success?

Our latest *Inflation Report*, published last week, paints a favourable picture for the next few years, with continuing steady growth and low inflation. If you trust the MPC to do its job, you might feel reasonably safe in basing your decisions on that outlook. But those of us on the Committee can't afford to take it for granted. So you may be reassured to hear that we spend most of our time worrying about the risks that could throw the UK economy off course; and arguing about how to respond appropriately.

So what are the main risks facing us now?

Last year saw the fastest growth in world output in three decades. We expect growth this year to be less spectacular but still robust. But while the United States and China are still expanding strongly, growth has showed signs of faltering in Japan and, to a lesser extent, in our major overseas market, the euro area, and especially Germany. We think this weakness is likely to prove temporary, but we could be disappointed.

Unbalanced growth creates strains. The United States has a large current account deficit, which is mirrored by surpluses in the other major trading blocks. The risk is that a better balance will only come about through sharp adjustments in exchange rates and a marked increase in US savings, which may cause a slowdown in global activity.

Closer to home, there is uncertainty about the near term momentum of household spending, by far the largest influence on domestic demand. While it is difficult to be confident about the path of retail sales since the autumn, there is little evidence of much underlying

buoyancy. Retail sales are not the whole story, and our central view is that any weakness in consumer spending is likely to be temporary. But we could easily be wrong.

The other key uncertainty concerns the speed with which inflation will pick up. Consumer price inflation remains below the Government's 2% target but there are good reasons to expect it to rise over the next few years. Input cost inflation has risen sharply, and import prices are not falling as much as they were. We think there is very little slack in the economy. The labour market is certainly tight. But the growth in labour costs has been surprisingly muted, and some cost pressures have been absorbed by lower profit margins. How long can this last?

At present we think inflation is likely to rise above target sometime next year, though we judge the risks to be somewhat on the downside. But it's a difficult call, and

our judgement about the balance of risks will be influenced by the way the data shape up in the coming months.

The MPC faces a familiar dilemma, torn between the importance of well-grounded analysis and the need to act promptly. On the one hand, there is a case for waiting for more evidence on the issues that underlie these risks — as there almost always is; on the other hand, since interest rates take a year or more to affect the economy, we need to be pre emptive, to head off trouble at the pass so to speak, even at the risk of sometimes taking the wrong decision.

If we get it right — and a lot of effort goes into ensuring that we do — the outcome of our short-term deliberations should be a degree of monetary stability that will create the right climate for you to take the long term decisions on which your economic success depends.

Monetary policy in an uncertain world

In this speech,[1] *Charles Bean, Chief Economist and member of the Monetary Policy Committee, reviews and assesses the three types of uncertainty which affect monetary policy makers: uncertainty about the data; uncertainty about the nature and persistence of shocks; and uncertainty about the structure of the economy. Focusing on uncertainty about the structure of the economy, he notes the unusual stability of inflation and output growth in the past decade or so. There are a number of possible explanations, including plain good luck, structural changes in the economy and improved policymaking. Mr Bean goes on to note that the short-run trade-off between inflation and activity seems to have flattened as inflation has stabilised at low levels and he attributes this in part to improved monetary policy making. He goes on to consider some of the policy implications of this change.*

The great statesman and scientist Benjamin Franklin — who received an honorary doctorate of civil law from Oxford University in 1762 — is famous for having observed that there are only two certain things in life: death and taxes. But had he been a member of the Monetary Policy Committee (MPC), he would have realised there is certitude about something else — namely, uncertainty. For uncertainty is an ever-present feature of the economic landscape that monetary policy makers cannot escape.

Broadly speaking, there are three types of uncertainty that confront us on the MPC: uncertainty about the data; uncertainty about the nature and persistence of shocks; and uncertainty about the structure of the economy. I shall address each of these in turn, drawing out some of the implications for policy on the way. In the context of my discussion of uncertainty about the structure of the economy, I shall also have quite a bit to say about the possible explanations for the unusual stability in macroeconomic performance in recent years. But let me start with some observations on the problems posed by data uncertainty.[2]

Uncertainty about data

A former Chancellor of the Exchequer once remarked that steering the economy was like driving along a winding road looking only in the rear-view mirror. In fact there are times when it seems as if it is a great deal more difficult, for that mirror itself is misted up. We do not know where we are, or even where we have just been, with any precision. Virtually all the data we rely on are subject to measurement error, either because of sampling error or because they do not correspond exactly to the economic concepts that we are interested in. They appear usually only with a lag and can be subject to considerable revision.

As an illustration of the need to take this issue seriously, Chart 1 shows the revision pattern in the recent history of UK GDP growth, from the ONS's preliminary estimate that is available a couple of months after the end of the

Chart 1
GDP growth estimates
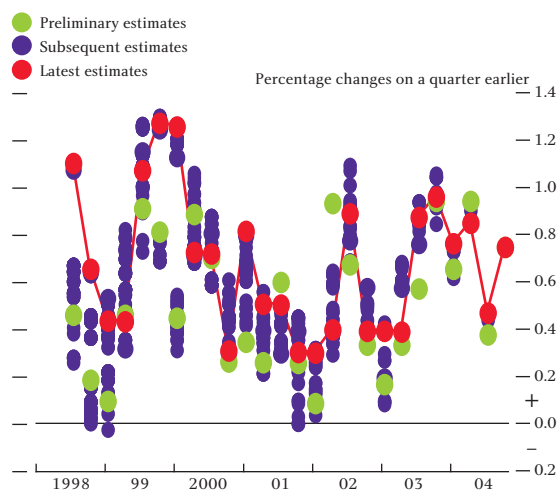
Legend:
- Preliminary estimates
- Subsequent estimates
- Latest estimates

Percentage changes on a quarter earlier

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quarter through to more recent ONS estimates. On average, first estimates of growth have been revised up by 0.1–0.2 percentage points over the period since the preliminary estimate was first published in 1998 Q3, but more striking is the relatively large variance of the revisions.[1]

I emphasise that this should not be taken as a criticism of those that collect and assemble the data. Rather it simply reflects the inherent difficulty in measuring the large and complex phenomenon that is the economy, comprising millions of households and businesses, both accurately and in a timely fashion. The ONS uses a variety of data sources in constructing, say, its measure of GDP, with more information continually accruing and being integrated into that measure. Of course, it could wait two years or more until all the underlying information is in before producing an estimate, but that would not be much good to us on the MPC.

Instead, the MPC recognises that early releases of data are prone to revision and combines it with other information that has in the past proved useful in predicting the final vintage of ONS data.[2] The various business surveys produced by the CBI, BCC, CIPS and others provide a source of such independent information. Though the samples for these surveys are typically much smaller than those that the ONS can draw on and the responses are usually qualitative, ie in the form of 'balance of ups over downs', rather than quantitative in nature, statistical tests do suggest that they have some incremental predictive content over and above the early releases of the official data.[3] In addition, sometimes one might want to 'aim off' a piece of official data because it is hard to reconcile with movements in other data series that economic theory and previous empirical work suggests ought to move together.

A particularly pernicious form of data uncertainty relates to measuring the level of aggregate demand relative to supply — a key determinant of inflationary pressure in the economy. Aside from the fact that the early estimates of GDP are subject to revision, supply potential is never directly observed but rather must be somehow estimated. A popular approach in business

cycle research is to use an appropriate statistical filter to separate output into potential supply and the output gap, ie the deviation of actual output from potential output. But there is a fundamental identification problem here. To distinguish between a change in supply capacity and a change in the intensity of use of factors requires an assumption about the way trend output changes over time. For instance, it is usually assumed that potential output grows smoothly, but it is possible that the rate of growth of technical progress actually varies from quarter to quarter. Moreover, measures obtained from statistical filters are usually subject to an 'end-point' problem whereby the absence of any data for the future makes the most recent estimates of potential output — and therefore also the associated estimate of the output gap — particularly unreliable. But, of course, it is precisely the recent past that the policymaker is most interested in!

In any case, on the MPC we prefer to build up our picture of the inflationary pressures in the economy by considering the pressure of demand relative to supply separately in the product and labour markets rather than relating inflation to a single catch-all measure of the aggregate output gap. But unfortunately neither of these is directly observed either.

As far as the product market goes, one wants to be able to compare the volume of output with that which could be produced with the inputs that are currently employed when operated at a normal, or sustainable, rate. So one can look either at business survey questions on capacity utilisation or use econometric estimates of a production function. But, on the one hand, survey-based measures are problematic. They are often only available for manufacturing — indeed it is conceptually hard even to define capacity in some service industries, let alone measure it — and there are usually doubts about exactly how the respondents interpret the questions that they have been asked. And, on the other hand, measures of utilisation based on econometric estimates of a production function are only as good as the underlying model of the production technology.

But if it is tricky estimating the margin of spare capacity in the product market, it is even harder to reliably assess

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(1) For some analysis of revisions to National Accounts data, see Castle, J and Ellis, C (2002), 'Building a real-time database for GDP(E)', *Bank of England Quarterly Bulletin*, Spring, pages 42–49.

(2) One might be tempted to argue that the ONS should use this information in constructing its own estimates. But that might involve the input of a considerable amount of economic interpretation and judgement. It is better that the MPC knows what the official data is based on and then chooses how to interpret it in the light of other indicators, rather than the ONS making those adjustments.

(3) See the articles 'Dealing with data uncertainty' and 'Indicators of short-term movements in business investment' on pages 23–29 and 30–38 respectively in this *Bulletin*.

its labour market equivalent. Much research effort has been expended over the last 25 years trying to explain the movements in the equilibrium, or natural, rate of unemployment in terms of changes in labour market institutions, etc, both in the United Kingdom and in the rest of the OECD. While substantial progress has been made, we are still a long way from having a complete story.

Moreover, the picture is muddied by the fact that people find jobs from inactivity as well as from the unemployment pool. And if employers can recruit workers easily from overseas, the whole concept of a domestic supply of labour may not even be very relevant. Measures of vacancies and survey indicators of recruitment difficulties provide a different perspective, but in the end one cannot do much more than look at all the available indicators together and try to form a balanced judgement. However, one needs to be acutely aware that judgement may be badly wrong.

The perils of real-time output gap mismeasurement have been forcefully pointed out by Athanasios Orphanides *et al*[1] and Ed Nelson and Kalin Nikolov.[2] The former conduct an *ex-post* evaluation of monetary policy in the United States through the 1970s and 1980s. They use real-time data to estimate the output gap as it might have appeared to policymakers at the time and then show how seriously an interest rate policy that reacted just to inflation and the output gap, ie a conventional Taylor rule, could go wrong as a result of mismeasurement of the output gap. They also show that a policy that reacted instead to inflation and the change in inflation, rather than the output gap, would have performed better (the reason being that the change in inflation is related to the unobservable true output gap and thus serves as a proxy for it in the policy rule).

Nelson and Nikolov adopt a similar approach for the United Kingdom, though employing the forecasts and statements of the Treasury and the National Institute of Economic and Social Research (as a proxy for official Treasury thinking) to construct measures of the output gap as it appeared at the time. They find that monetary policy errors due to output gap mismeasurement contributed 3–7 percentage points to average UK inflation in the 1970s and 1–5 percentage points to

inflation in the 1980s. So their analysis also suggests that real-time estimates of the output gap can be seriously misleading.

The bottom line of all this is that, although the output gap may be an indispensable intellectual construct for organising one's own thinking, the inherent uncertainty around any given measure means that it should always be employed with a considerable degree of caution and an appropriate degree of scepticism.

Uncertainty about shocks

The second source of uncertainty relates to the nature and persistence of the shocks hitting the economy. Sometimes the shock can be pretty obvious, but its effect may not be. For instance, the Golden Jubilee reduced the number of working days in 2002, complicating the measurement of seasonally adjusted output in the economy. In other cases, it may be not only the impact of the shock, but also its persistence, which is in question, a good example being the recent rise in the oil price. Moreover, what matters for the economy is what the private sector, not the policymaker, believes about the persistence of the shock. In the case of oil, futures prices provide some guide but even they may not coincide with the perception of economic agents.

On other occasions, even the source of the shock may not be apparent. For instance, long-term real forward interest rates around the world are currently at unusually low levels.[3] But why this should be is not immediately obvious, especially given the large budget deficits in some countries. It could be because the demand for funds to invest is low because the marginal product of capital is low — but there is no sign of the world running out of profitable investment opportunities, especially given the rapid development taking place in China and elsewhere in the Asian sub-continent. Or it could be the consequence of demographics or increased saving by households worried about their living standards in retirement. Getting to the bottom of such puzzles is the daily task of those who work in central banks.

Moreover, the econometric models that all central banks use in forecasting are estimated using long runs of past

(1) Orphanides, A, Porter, R, Reifschneider, D, Tetlow, B and Finan, F (2000), 'Errors in the measurement of the output gap and the design of monetary policy', *Journal of Economics and Business*, Vol. 52, pages 117–41.
(2) Nelson, E and Nikolov, K (2001), 'UK inflation in the 1970s and 1980s: the role of output gap mismeasurement', *Bank of England Working Paper no. 148*.
(3) See Chart 1.3 on page 4 of the February 2005 *Inflation Report*.

data that incorporate a mixture of different types of shocks. And the shocks that are impinging on the economy now may be different from the average of those that impacted on it in the past. In a first-best world, our models would be specified at a deep enough level that the differential response to different types of shocks would be properly articulated. Building such models is at the core of much modern macroeconomics, but we are a long, long way from achieving that objective. Indeed, given that the macroeconomic data that we see results from the aggregation of the decisions of millions of different economic agents, each of whom is subject to a myriad of influences, such an ideal is almost certainly unachievable.

Instead, models will inevitably remain as gross simplifications, requiring a range of more or less *ad hoc* features that help them to explain the past. In that case, when a shock occurs the policymaker needs to ask whether or not the response of agents is likely to be the same as it has been in the past. To give a particular example, consider the housing market. In the past there has been a high correlation between house price inflation and consumption growth, but that correlation appears to have weakened in the last three years or so.[1] The same phenomenon is apparent in consumption functions that include house prices as well as the usual suspects (income, wealth, etc), which typically suggest that consumption should have been stronger than it was over the last three years or so.

The natural explanation for this is that the previous occasions of rapid house price inflation have generally been associated with periods when income expectations became markedly more optimistic and/or financial liberalisation. In such circumstances one would expect to see both consumption and house prices rise together, driven by these third factors. But this time round, the household saving ratio has been pretty flat over the last three years, suggesting that these factors have not been especially important. Instead, factors more specific to the housing market seem to have been at work, including demographic developments that have raised the demand for housing set against only a moderate rate of growth in the supply of housing, as well as the impact of lower interest rates on the time profile of real mortgage repayments. Of course, that does not imply the complete absence of a structural link between house prices and consumption — housing wealth is, after all, the key source of collateral for most households — but

rather that one cannot necessarily rely on past data correlations to be maintained in such circumstances.

Uncertainty about the structure of the economy: The Great Stability

The third source of uncertainty, and that which I want to spend most time on this evening, is uncertainty about the structure of the economy. Structural changes, either real or apparent, can arise in just about any part of the economy. But a particularly pertinent question that faces the MPC — as well as central bankers in other developed economies — is whether the low inflation and unusual stability of both inflation and growth in the last decade or so betokens fundamental changes in the way our economies function or whether it is just a temporary aberration. Charts 2 and 3 illustrate this stability by displaying trailing standard deviations, calculated over successive overlapping eight-year periods, of GDP growth and inflation respectively for each of the G7 countries, excluding Japan (for which it is difficult to construct a consistent time series for GDP over a long enough period). The extent to which volatility has fallen across all the countries in the sample is striking.

The source of this 'Great Stability', which contrasts so markedly with the 'Great Inflation' of the 1970s, has been the subject of an increasing volume of research, mainly but not exclusively focused on the United States. Essentially three classes of explanation have been advanced: good luck; changes in the structure of the economy; and better macroeconomic policy.

Is it luck?

One possibility is that policymakers have just gotten lucky. According to this view, the shocks impinging on the developed economies have been smaller and less persistent than before. Moreover, they have also been less synchronised across countries. There is clearly some merit in this view, but the last couple of decades have not been entirely devoid of significant shocks, including the break-up of the USSR, German re-unification, the Iraq wars, the Mexican debt crisis, the Asia crisis, the LTCM crisis, the dotcom boom-bust, 9/11 and so on. And while there have been no major oil price shocks on the scale of OPEC I and OPEC II, the fluctuations in oil prices have nevertheless been significant from time to time, including over the past year.

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(1) See Chart A on page 12 of the November 2004 *Inflation Report*.

Chart 2
Rolling eight-year standard deviations of GDP growth

United Kingdom

Standard deviation

United States

Standard deviation

Germany

Standard deviation

France

Standard deviation
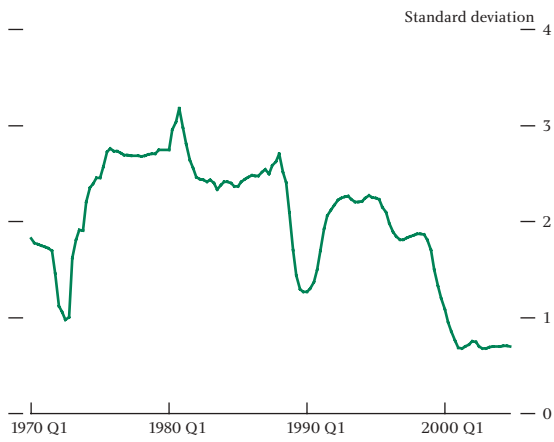
Italy
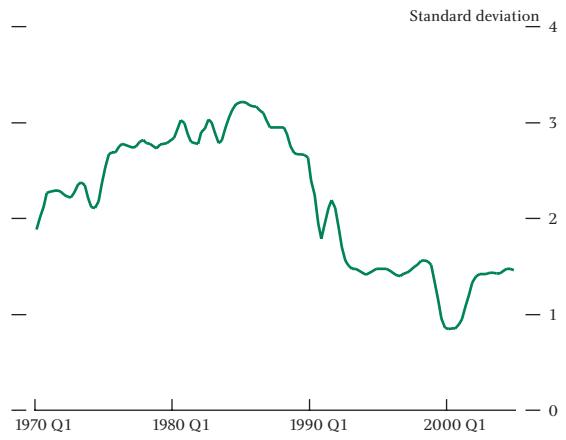
Standard deviation
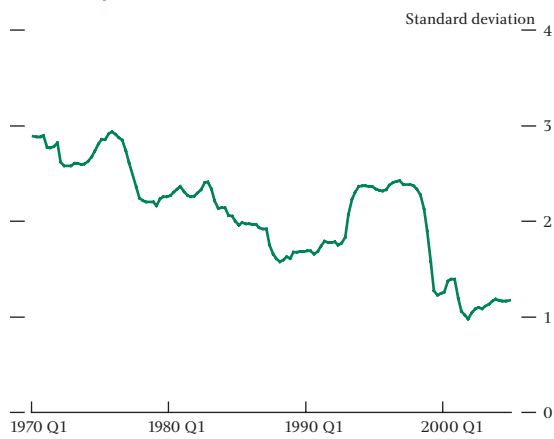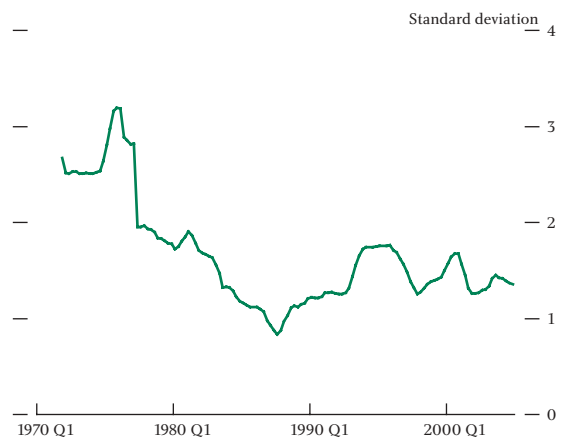
Canada
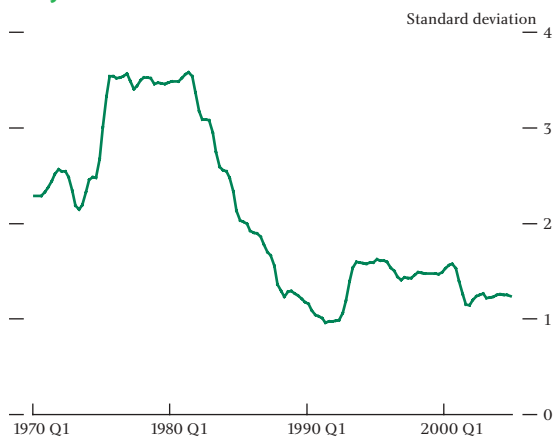
Standard deviation
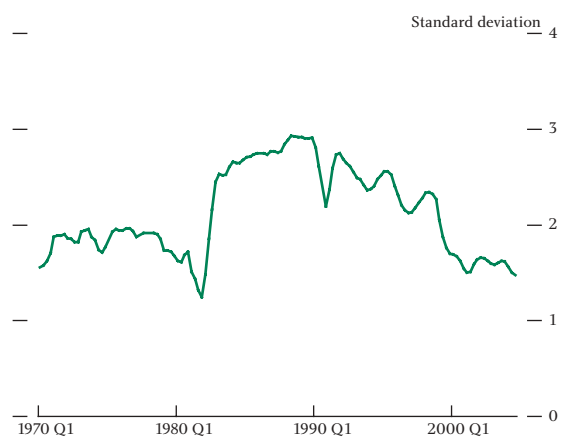
Chart 3
Rolling eight-year standard deviations of inflation

United Kingdom

Standard deviation

United States

Standard deviation

Germany

Standard deviation

France

Standard deviation

Italy

Standard deviation

Canada

Standard deviation
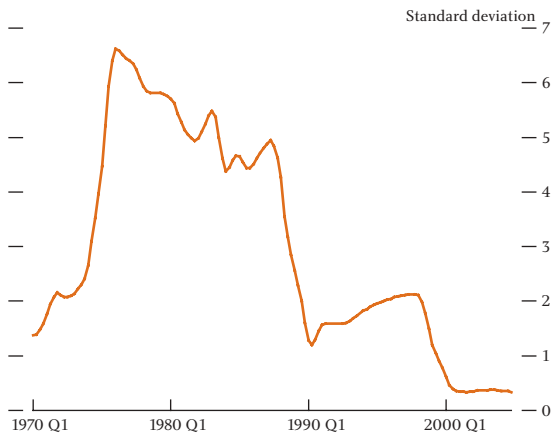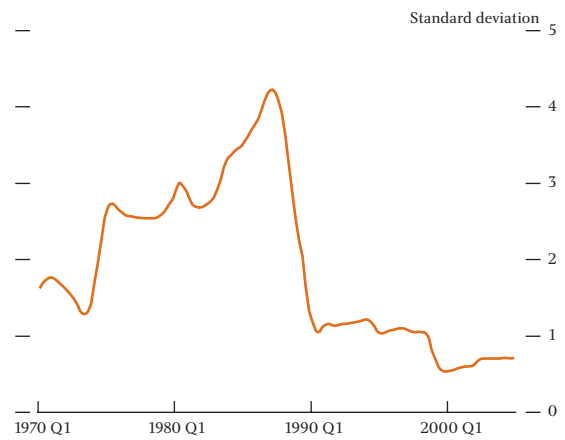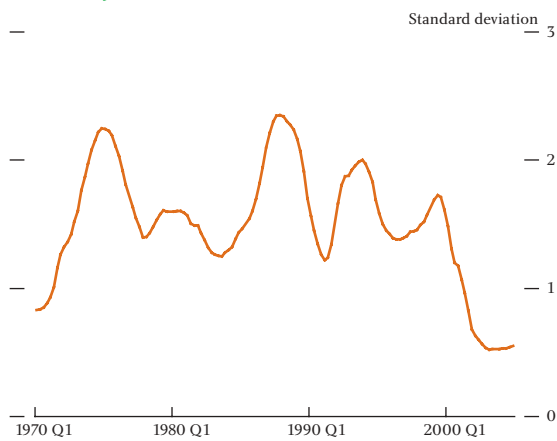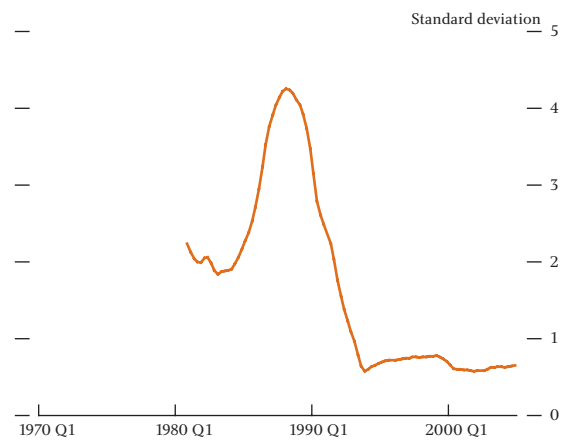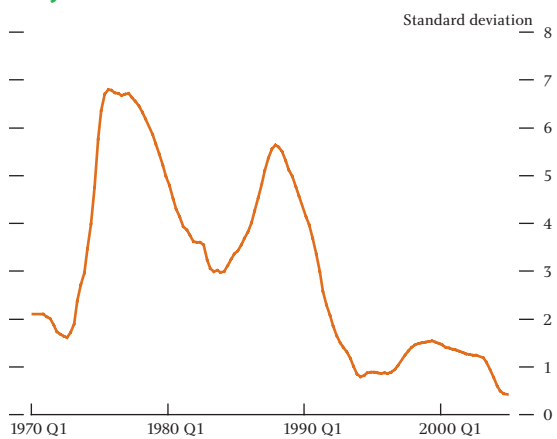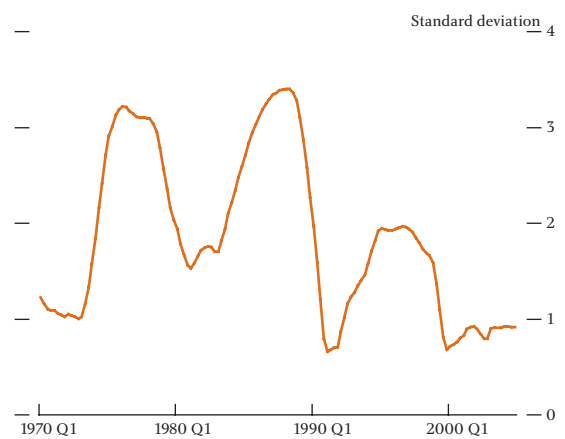
Jim Stock and Mark Watson[1] report evidence suggesting that it is indeed such good fortune that accounts for the reduced volatility of the business cycle over the last couple of decades. But other authors, such as Steve Cecchetti *et al*, find that the factors discussed below — and better monetary policy in particular — should take the lion's share of the credit. The real difficulty with assessing the relative importance of luck compared to structural changes or improved policy is that the shocks are identified with the residuals in econometric equations and there is no way of knowing whether the *size* of those shocks has been reduced as a result of structural changes to the economy or better policy.

Structural changes

Another possibility is that changes in the structure of economies mean that shocks have a smaller or less persistent effect than in the past. There are at least three reasons why this might be so. First, it may be the result of changes in the composition of output of developed economies, away from manufacturing and towards services. Because capital and durable goods are predominantly manufactured, manufacturing is typically more cyclical than services. So, other things being equal, a more service-intensive economy ought to display less cyclicality than a more manufacturing-intensive one. However, the shift in the composition of output has been so gradual in most industrialised economies that it is difficult to believe this is a major factor.

A second, and more plausible, reason can be found in the consequences of financial deregulation, innovation and integration. Greater access to credit allows households and businesses to smooth their spending when times are bad. The corollary is that the saving ratio should be more volatile than it was in the past; that appears to be the case in the United States.[2] Moreover, financial innovation has led to the development of new derivative assets that allow idiosyncratic risk to be diversified more effectively, again making the economy more resilient to shocks.[3] Finally, international financial integration enhances the scope

for risk sharing across countries, though the fact that portfolios are still heavily home-biased suggests that this last effect may be rather weak.

A third possible reason lies in the impact of information and communication technology on the inventory cycle. One might have expected that inventories would act as a damper on cyclical fluctuations as they constitute a buffer between sales and output and thus allow firms to smooth production. But in the past, inventories instead seem to have acted as an amplifying mechanism, with stock levels behaving in a pro rather than an anti-cyclical fashion. Better inventory management techniques have allowed firms to keep production more closely in line with sales, so reducing the contribution of the inventory cycle to the business cycle.[4] However, at best this only seems likely to constitute a small part of the story. Changes in inventory management have been pretty gradual. And the reduction in volatility in production is similar to the reduction in volatility in sales, not greater as would be expected if this were the correct explanation.

Better policymaking

The final explanation for the Great Stability rests on improved policymaking, in part reflecting an improved understanding by policymakers of the way the economy functions and the trade-offs that they face. So, and caricaturing only slightly, during the 1960s and early 1970s policymakers saw themselves as confronted with an exploitable Phillips curve trade-off presenting a stable menu of choices between unemployment and inflation: one could have permanently lower unemployment if one were prepared to accept permanently higher inflation. Even though Bill Phillips himself recognised that the position of the curve might be affected by the state of workers' inflation expectations, that qualification was largely ignored by policymakers.

By the start of the 1980s — partly as a result of the juxtaposition of high inflation with rising unemployment in the 1970s and partly as a result of theorising about the underpinning for the Phillips curve by

(1) Stock, J and Watson, M (2003), 'Has the business cycle changed? Evidence and explanations', Federal Reserve Board of Kansas City symposium, *Monetary Policy and Uncertainty*. Cecchetti, S, Flores-Laguna, A and Krause, S (2004), 'Has monetary policy become more efficient? A cross-country analysis', *mimeo*, presents a contrary view. The observation that it is difficult to draw any conclusion because the size of the shocks may reflect structural changes or policy improvements is due to Bernanke, B (2004), 'The great moderation', speech to the Eastern Economic Association, Washington, 15 February.
(2) See Blanchard, O and Simon, J (2001), 'The long and large decline in US output volatility', *Brookings Papers on Economic Activity*, No. 1, pages 135–64.
(3) See Greenspan, A (2004), 'Economic flexibility', speech to HM Treasury Enterprise Conference, London, England, 26 January.
(4) See McConnell, M M and Perez-Quiros, G (2000), 'Output fluctuations in the United States: what has changed since the early 1980s?', *American Economic Review*, Vol. 90, No. 5, pages 1,464–76.

Milton Friedman, Ned Phelps and Bob Lucas — policymakers had come to realise that no such trade-off existed in the long run and that ultimately monetary policy needed to focus on controlling nominal, not real, magnitudes. A by-product of this change in view was that official interest rates became more responsive to inflation and, critically, that *real* interest rates were increased when inflation rose, in order to dampen demand and so push inflation back down.[1]

Parallel to this improvement in economic understanding there has been an improvement in the institutional arrangements for conducting monetary policy, with moves towards greater independence of central banks from their political masters and greater transparency over the objectives of monetary policy. That is obviously the case in this country, with the adoption of an inflation target in 1992 and the creation of the Monetary Policy Committee in 1997, but similar trends can also be observed in a number of other countries.

That better monetary policy might be the explanation for lower and more stable inflation is perhaps not too surprising. More of a puzzle is how that connects to producing lower volatility in output. Indeed if all nominal wages and prices were flexible, monetary policy would determine inflation outcomes, but would be irrelevant to the behaviour of output.

But, of course, nominal wages and prices are not totally flexible, thus generating a short-run trade-off between inflation and activity. Moreover, the slope of that trade-off does seem to be related to the average rate of inflation. Thus Larry Ball, Greg Mankiw and David Romer[2] present cross-country evidence that suggests the short-run trade-off is flatter in low inflation countries than in high inflation ones. Moreover, time-series evidence also suggests that the Phillips curve may be flatter when inflation is low. Chart 4 plots CPI inflation against unemployment for the G7.[3] The changing character of the Phillips relationship is most marked in the United Kingdom, where it has gone from being approximately vertical in the 1970s, to downward

sloping in the 1980s, to being approximately flat in the 1990s. But a flattening also appears to be present to varying degrees in most of the other countries. Luca Benati[4] has explored the changing nature of this relationship in the United Kingdom, showing how it is related to the monetary regime in force, with a flattening taking place in the 1980s and a particularly high degree of stability about the relationship since the adoption of inflation targeting.

This flattening of the apparent short-run relationship between activity and inflation is predicted by some New Keynesian pricing models. Essentially, when inflation is low, firms are likely to change prices less frequently and this leads to a weaker short-term impact of demand fluctuations on prices.[5]

But it may also reflect the impact of greater credibility in monetary policy making, as the behaviour of wage and price-setters today will be affected by their expectations of the general level of prices over the duration for which those wages and prices are set. If prices are expected to remain stable then, say, a positive shock to demand is less likely to lead to higher wages and prices, than if it promotes expectations of a higher future price level.

That a flatter Phillips curve might help to explain why inflation has been more stable is not altogether surprising, as fluctuations in aggregate demand would have less effect on inflation. However, other things being equal, there would be a corresponding *increase* in the variability of output in contrast to what has actually happened. So how can we explain the fact that the volatility of output also fell?

There are two possibilities here. First, as I noted earlier, policymakers probably have a better understanding today of how the economy works than was the case 25 years ago. But that has been coupled with greater realism about what monetary policy can, and cannot, do as well as institutional changes that have tended to reduce the extent to which short-term political

(1) See Clarida, R, Gali, J and Gertler, M (2000), 'Monetary policy rules and macroeconomic stability: evidence and some theory', *Quarterly Journal of Economics*, Vol. 115, No. 1, pages 147–80, and Taylor, J (1999), 'An historical analysis of monetary policy rules', in Taylor, J (ed), *Monetary policy rules* for evidence on the United States and Nelson, E (2003) 'UK monetary policy, 1972–1997: a guide using Taylor rules', in Mizen, P (ed), *Central banking, monetary theory and practice, essays in honour of Charles Goodhart*, for evidence regarding the United Kingdom.
(2) Ball, L, Mankiw, N G and Romer, D (1988), 'The New Keynesian economics and the output-inflation trade-off', *Brookings Papers on Economic Activity*, No. 1, pages 1–65.
(3) The original Phillips relationship related wage growth to unemployment. The pictures are similar if nominal wage growth rather than CPI inflation is placed on the vertical axis.
(4) Benati, L (2004), 'Evolving post-World War II UK economic performance', *Journal of Money, Credit and Banking*, Vol. 36, No. 4, pages 691–717.
(5) Though this need not always be so; see Bakhshi, H, Khan, H and Rudolf, B (2004), 'The Phillips curve under state-dependent pricing', *Bank of England Working Paper no. 227*.

Chart 4
Phillips curves

United Kingdom

RPIX inflation (per cent)

1970s

1980s

1990 to present

Unemployment rate (per cent)

United States

CPI inflation (per cent)

1970s

1980s

1990 to present

Unemployment rate (per cent)

Germany

CPI inflation (per cent)

1970s

1980s

1990 to present

Unemployment rate (per cent)

Japan

CPI inflation (per cent)

1970s

1980s

1990 to present

Unemployment rate (per cent)

France

CPI inflation (per cent)

1970s

1980s

1990 to present

Unemployment rate (per cent)

Italy

CPI inflation (per cent)

1970s

1980s

1990 to present

Unemployment rate (per cent)

Canada

CPI inflation (per cent)

1970s

1980s

1990 to present

Unemployment rate (per cent)

considerations could dictate interest rate decisions. As a consequence monetary policy has itself been less of a destabilising force than in the past.

Second, as the counter inflationary credibility of monetary policy increased, so central banks found themselves better able to offset disturbances without the danger of destabilising inflation expectations. To a degree this can happen automatically through asset prices: a positive shock to domestic demand prompts an expectation of higher official interest rates in the future, leading to a rise in longer-term interest rates and an appreciation of the exchange rate, thus counteracting the original shock. In other words, credibility enhances the effectiveness of policy through its impact on expectations.

Policy credibility may enhance the effectiveness of policy not only in the face of demand shocks, but also in the face of supply shocks. When policy is credible and inflation expectations are well-anchored, then the chance of an adverse supply shock triggering a wage-price spiral is much less than when people believe that the central bank will accommodate the shock and allow inflation to rise.

The possible importance of this consideration is illustrated by the response of financial markets to the recent increase in oil prices. The spot price of oil rose by around two thirds between the beginning of 2004 and the autumn, with particularly sharp increases in July and September-October (marked with the blue bars in Chart 5). There were a number of reasons for this increase, including rapid growth in demand associated with the global expansion, low stock levels in the United States, geopolitical concerns in the Middle East and interruptions to supply in a number of countries. The increase was almost certainly unanticipated as it was not remotely signalled in the futures price which had been pointing to a modest decline in the oil price to within OPEC's $22–$28 per barrel target range.

Given the experiences of the 1970s, one might have expected the increase in oil prices to lead market participants to expect an increase in inflation and market interest rates to move higher in the expectation of monetary tightening by central banks. And neither the rise in oil prices nor the increase in interest rates could be expected to be good news for equity prices. But what happened? Inflation expectations implied from

nominal and indexed bonds hardly moved and market interest rates moved down rather than up (Charts 6 and 7). Moreover, during the September-October period

Chart 5
Brent crude oil price
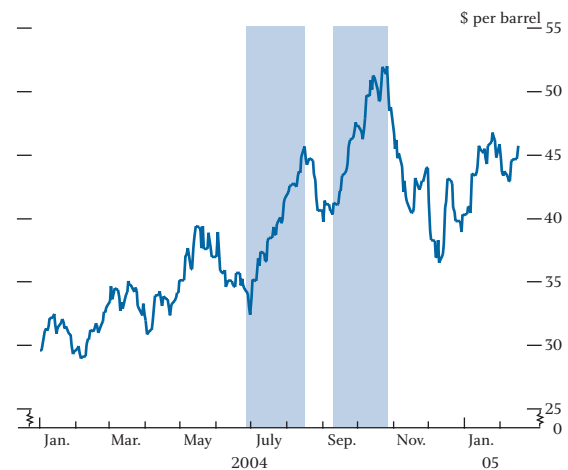
Chart 6
Three-year spot inflation rates(a)
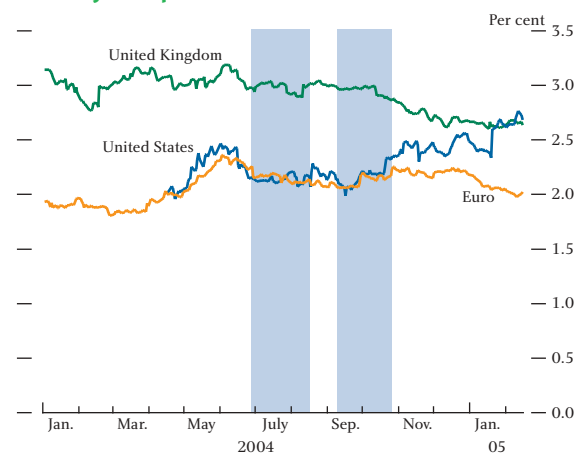
(a) UK and US figures are derived from the difference between spot yields on conventional and index-linked government bonds. Euro-area figures are derived from inflation swaps.

Chart 7
Interest rates (June 2005 three-month futures contracts)
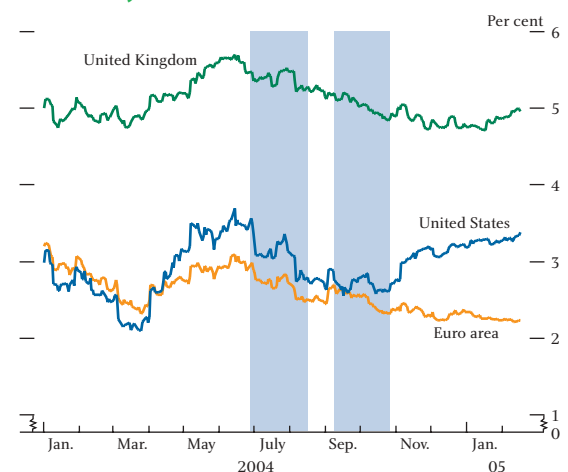
equity prices actually strengthened (Chart 8). There may be other explanations for this constellation of asset price movements, not least as other shocks might have occurred at the same time. But the natural interpretation is that with inflation under control and inflation expectations well-anchored, market participants believed that central banks would be able to pursue a more relaxed monetary policy in order to offset the adverse demand effects of the oil price increase without needing to worry about setting in train a wage-price spiral of the sort seen in the 1970s.

Chart 8
International equity indices
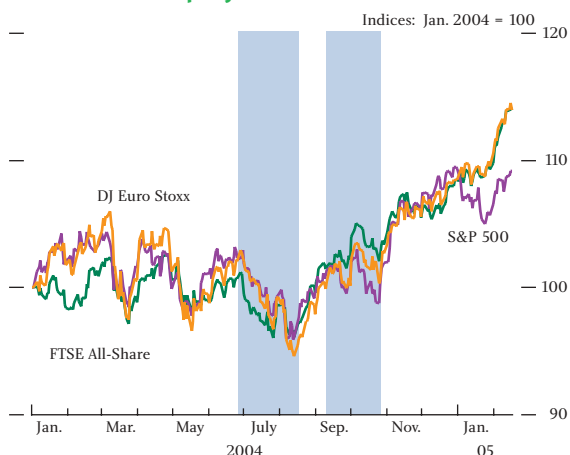
Some implications for policy

The apparently flattening Phillips curve raises a number of issues for policy. Taken at face value it appears to suggest that the policymaker could continue to push down on unemployment with minimal implications for inflation. And it also appears to suggest that if inflation is materially above (below) target then the policymaker needs to engineer a very large recession (boom) in order to bring it back, ie the so-called sacrifice ratio is large. But this would be seriously to misunderstand the nature of the beast and to run the danger of repeating the mistakes of the 1970s.

First, the Phillips curve plot for the United Kingdom in Chart 4 does not trace out a structural relationship between unemployment and inflation. The approximate invariance of inflation to the level of unemployment through the 1990s is consistent with a flat structural relationship between the two. But it is also consistent with a conventional downward-sloping short-run structural relationship between the two that has been

simultaneously shifting to the left as the natural rate of unemployment fell with monetary policy simultaneously ensuring that inflation remained stable. Now it is reasonable to believe that the structural relationship is actually flatter than in the past, for the reasons laid out earlier. But since the full effects of the labour market reforms of the 1980s and 1990s are likely to take time to work through, it is equally plausible that the natural rate of unemployment has been falling, while the operation of the inflation-targeting regime since 1992 should have helped keep inflation stable. So this is an alternative explanation, observationally equivalent to a flattening in the short-run Phillips curve.

Seen this way, it is clear that the first and third sources of uncertainty that I have talked about here interact, with uncertainty about the natural rate of unemployment making it harder to pin down the slope of the short-run trade-off between unemployment and inflation and *vice versa*. As a consequence, there is uncertainty both about the extent of the underlying pressures on inflation and about the impact of changes in interest rates on inflation and activity.

How should policy be set in such circumstances? Very cautiously, I believe. It is possible that the sustainable level of unemployment could be even lower than its current level, which is already pretty low by historical standards. But equally, if that were not the case, then continued attempts to push activity higher would at some stage be likely to generate noticeable upward pressure on inflation as supply bottlenecks become more prevalent. There are therefore good reasons to believe that the Phillips curve is indeed a curve rather than linear and there is some empirical evidence to support that belief.[1] Moreover, if the increase in inflation were substantial, there would be a potential loss to the credibility of the inflation target and a consequent de-anchoring of inflation expectations. And once credibility is lost, it can be costly to regain.

The second observation is that inflation targeting may be a particularly suitable regime when the structure of the economy is changing. Unlike a policy regime based around an intermediate target, such as the money supply, a regime described in terms of the ultimate goals of policy does not need to be changed whenever the structure of the economy changes — though the analytical processes within the central bank may need to

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[1] For some recent evidence, see Dolado, J, Maria-Dolores, R and Naveira, M (2005), 'Are monetary policy reaction functions asymmetric?: The role of non-linearity in the Phillips curve', *European Economic Review*, Vol. 49, pages 485–503, and references therein.

change substantially, of course. Furthermore, future inflation is something that agents intrinsically care about — it affects wage and price-setting behaviour and also determines the real interest rate and thus affects aggregate demand too. Even if structural change makes the policymaker less sure about his own ability to meet the target, the existence of the target should itself help to keep private agents' expectations pinned down. That might not be the case if the policy objective were stabilising, say, nominal GDP as agents would become more uncertain about the implications for inflation as a result of uncertainty about the output-inflation trade-off. So this is another reason to believe that inflation targeting may prove to be a more durable regime than some of its predecessors.

The third observation relates to the link between monetary policy and asset prices. Claudio Borio and Bill White[1] and others have argued that one of the consequences of the anchoring of inflation expectations and the flattening of the Phillips curve is that overheating tends to be manifested in asset price inflation rather than goods price inflation. According to them, the greater likelihood of asset price boom-busts also increases the likelihood of future financial instability and this should be taken account of in the setting of interest rates. Elsewhere, I[2] have argued that this concern can be satisfactorily accommodated within an inflation-targeting framework because future financial instabilities are likely to lead to a reduction in growth and a departure of inflation from target, though it does require central bankers to take the long view. There is no doubt, however, that such asset price boom-busts potentially complicate the conduct of policy.

My final observation relates not to the conduct of policy, but rather to a detail of our communication strategy. Each quarter, the MPC presents its projections for GDP growth and inflation in the form of explicit probability distributions or 'fan charts'. Reflecting the unusual stability in the economy, outturns have tended to be closer to the centre of the forecast distributions than one would have expected. For instance, 14 out of 18 of the two-year-ahead forecasts for CPI inflation made between February 1998 and May 2003 lay in the part of the distribution covering the central 50%. The equivalent figure for the GDP growth projections is 11 out of 18. Some commentators have inferred from this that the variance on our fan charts is too wide. But these fan charts portray the MPC's subjective uncertainty over economic prospects. Given that there must be at least some chance that the good performance of recent years is down to good luck rather than structural changes or better policy, it makes sense not to reflect all of the recent decline in volatility in our assessment of the degree of uncertainty about future outturns.

Let me conclude my remarks by noting that the presence of uncertainty means that it is inevitable that some monetary policy decisions will seem unwise after the fact. Wisdom with hindsight is a wonderful thing, but unfortunately it is a luxury that policymakers do not have. But we can at least strive to reduce that margin of uncertainty by continually seeking to improve our understanding of the forces driving the economy. For, as Benjamin Franklin also remarked, 'An investment in knowledge always pays the best interest'.

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(1) Borio, C and White, W (2003), 'Whither monetary and financial stability? The implications of evolving policy regimes', Federal Reserve Board of Kansas City symposium, *Monetary Policy and Uncertainty*.
(2) Bean, C (2003), 'Asset prices, financial imbalances and monetary policy: are inflation targets enough?', in Richards, A and Robinson, T (eds), *Asset prices and monetary policy*, Sydney, Reserve Bank of Australia, pages 48–76.

Why has inflation been so low since 1999?

In this paper,[1] *Stephen Nickell, member of the Bank's Monetary Policy Committee (MPC), explains why CPI goods prices have been falling in the United Kingdom since mid-1999. From 1999 to early 2001, the main factor was a squeeze on margins in the distribution sector. Since then, falling import prices have played a key role along with strong distribution sector productivity growth. Looking forward, while the latter should continue to play a role, import prices may well start to rise. This is consistent with CPI inflation moving up to the 2% target over the next two years.*

1   Introduction

Towards the end of last year, Richard Lambert gave a fascinating speech on low inflation in the United Kingdom (Lambert (2004)). This is a sequel.

Back in 2002, the MPC was criticised for undershooting the RPIX inflation target over the previous three years (Chart 1) and it was suggested that it had a deflationary bias, setting interest rates unnecessarily high. In Nickell (2002), this accusation was analysed. The overall conclusion was that the undershooting had arisen, in the main, because the MPC, along with all other forecasters, had underpredicted the sterling exchange rate over much of the period from the foundation of the MPC in 1997 to 2001 (see Chart 2 for the Consensus

Chart 1
Year-on-year retail price inflation rates

Chart 2
Sterling ERI outturns versus two-year Consensus sterling ERI forecasts
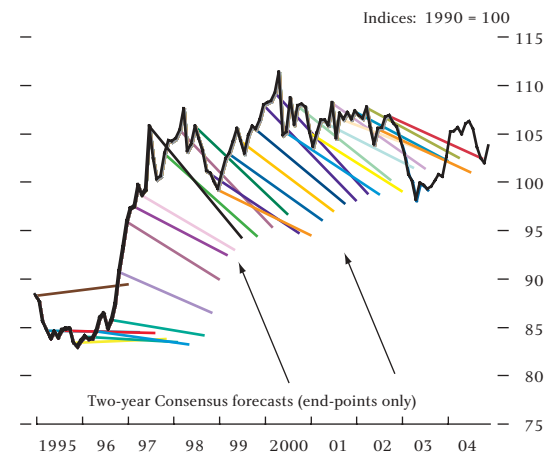
Sources: Bank of England and Consensus Economics.

forecasts of that era). This tended to generate an overprediction of import prices and therefore inflation over the same period and hence to interest rates being set marginally too high from an *ex-post* perspective. I concluded that it would be hard to convict the MPC of a deliberate deflationary bias simply on these grounds.

After late 2002, this issue went away as RPIX inflation moved above target (Chart 1) where it remained until the target was changed to 2% on the CPI measure in December 2003. However, this question of deflationary bias looks as if it is starting to make a comeback (see, for

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example, para.48 in House of Lords (2004)[1]). In fact, the House of Lords Select Committee on Economic Affairs was referring back to the old question of the pre-2003 period. However, given that CPI inflation has been well below 2% both since it assumed its target role and for many years previously (Chart 1), the issue of inflation being persistently below target is very likely to come back on the agenda.

As is well known, CPI inflation is likely to be around 0.8 percentage points below RPIX inflation in the long run (see Nickell (2003) for a detailed analysis of the switch in target). Much of this long-run difference (0.5 percentage points) is down to the different formulae used to aggregate the inflation rates of all the different goods. But the remaining 0.3 percentage points of the long-run difference is due to the exclusion of housing depreciation and Council Tax from CPI. While the long-run impact of this exclusion is relatively small, in the short run it can, and recently has had, a very substantial effect on the difference between CPI and RPIX inflation. Indeed, because of the fact that the housing depreciation element of RPIX is based on house price inflation, throughout 2003 RPIX inflation was significantly above target whereas CPI inflation was below its subsequent target. During this period the difference between the two measures of inflation was well over 1 percentage point.

The interesting fact that comes out of all this and is worth looking at in more detail is that CPI inflation, that is general consumer price inflation excluding housing costs, has been very low for most of the time since the late 1990s. Indeed, its average rate since 1999 has been 1.2%. Trying to understand why this has happened is important, particularly as the MPC projection of the most likely path of CPI inflation moves above 2% by the end of 2006.

In what follows, we first split inflation into CPI goods and CPI services, concluding that low CPI inflation since 1999 is mainly accounted for by the fact that CPI goods prices have been falling over most of the period. This is particularly unusual in the sense that over the same

period, using the same measure, average goods price inflation in the euro area has been close to 2%. This during a period when the sterling-euro exchange rate was much the same at the end of the period as it was at the beginning.

In Section 3 we analyse the factors driving the prices of domestically produced goods and in Section 4 we focus on imported goods prices. Having understood the determinants of goods prices at the factory gate and the port of entry, in Section 5 we investigate the retail distribution sector which turns goods at the port and factory gate into goods at retail outlets. These three sections give us an overview of the reasons why goods inflation has been so low. Then, in Section 6, we pursue things a little further by investigating which sectors have made the biggest contribution to falling goods prices. We conclude by asking which inflationary pressures now in the pipeline are consistent with an MPC central projection where CPI inflation moves above the 2% target in 2006?

2 CPI inflation: goods and services

If we are to understand why CPI inflation has been so low in recent years, the first step is to divide CPI into goods and services. In Chart 3, we see the significant gap between CPI goods and service price inflation. Furthermore, it is clear that the low level of inflation since 1999 is being driven by the fact that throughout most of this period, CPI goods prices have been falling. It is this fact which we shall investigate further.[2] To do this we look at the various stages from the production or import of goods to their appearance in consumer outlets. So we analyse successively, the prices of domestically produced goods at the factory gate, the prices of imported goods, and the operation of the distribution sector which buys goods from the factory gate or the port and sells them in retail outlets at prices which determine the CPI goods price index.

Starting with home-produced and imported goods, a broad overview of inflation is provided in Chart 4. What we see is that home-produced goods price inflation has

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(1) In fact, para.48 says, 'These data prompt some intriguing questions. If inflation was overpredicted until 2003, should interest rates have been lower? Moreover, did the overprediction of growth over this period lead to higher interest rates than were necessary? And was this whole situation reversed from 2003 onwards? Interest rates were above 6.75% until 2001. With the fall in the growth of GDP interest rates were then reduced. Interest rates were then raised again during 2002 when both inflation and growth were being overpredicted.' The factual details here are a bit puzzling because interest rates peaked at 6% in 2000, having risen during 1999. Furthermore, they did not rise again until late 2003. So, contrary to the statement in para.48, they were not raised during 2002.

(2) What we are, in fact, investigating is why goods prices have been falling relative to the general price level so much faster after 1999 than in previous years. It is rather casual to refer to this fact as the driving force behind the low level of CPI inflation. Ultimately inflation is the consequence of monetary policy and macroeconomic shocks. So here, we are not analysing the ultimate causal mechanisms but merely looking at why the relative price of goods has been falling so rapidly in recent years.

Chart 3
CPI goods and services

Percentage changes on a year earlier

Chart 4
UK domestic (PPIY) and imported goods prices

Percentage changes on a year earlier
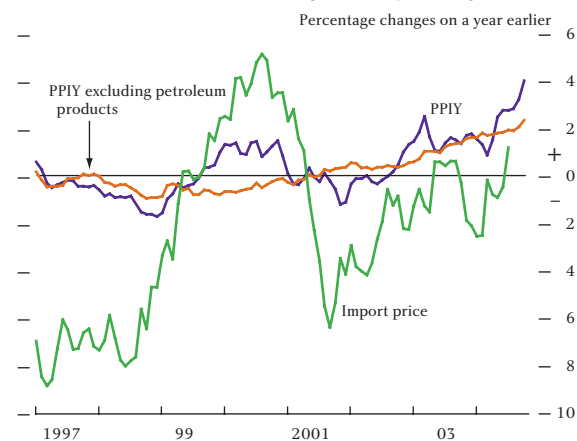
been positive for the majority of the time since 1999. Furthermore, if we remove petroleum products, which add a lot of noise to the series as oil prices fluctuate, we see in Chart 4 that home-produced goods inflation has been rising steadily since 2000, turning from negative to positive in 2001. In fact, we would have a very similar picture were we simply to look at home-produced consumer goods. Imported goods price inflation, on the other hand, has been negative for much of the period, notably since mid-2001. So we can see from this that imported goods have made a significant contribution to the low level of CPI goods price inflation in recent years. The next step is to look at domestic and imported goods price inflation in more detail.

3   Domestic goods prices

Our purpose here is to analyse the forces driving domestic production costs and hence output prices. The overall picture is summarised in Chart 5. Since the late 1990s, domestic output price inflation has broadly followed cost inflation until 2003, since when it is clear that (domestic) margins have been gradually increasing.

Chart 5
Manufactures' weighted costs and prices (domestic)

Percentage changes on a year earlier

The biggest element of production costs is labour costs and, in Chart 6, we see the broad stability of both manufacturing pay growth and pay settlements. This, despite the fact that the unemployment rate over the period from the late 1990s has been slowly falling to its lowest level for a generation. The factors underlying this rather favourable performance are discussed in Nickell and Quintini (2002) and include the following. First, the continuing decline in adversarial trade unionism in the private sector, where less than 20% of employees are now unionised. Second, increased product market competition in the manufacturing sector. Third, the increasing stability of inflation expectations, so that short-run fluctuations in the cost of living are less likely to be transmitted into pay settlements. Finally, in some sectors, notably agriculture and food processing, labour shortages are resolved by the selective use of immigrant labour rather then by increasing pay rates.

Chart 6
Manufacturing pay growth and private production wage settlements

Percentage changes on a year earlier
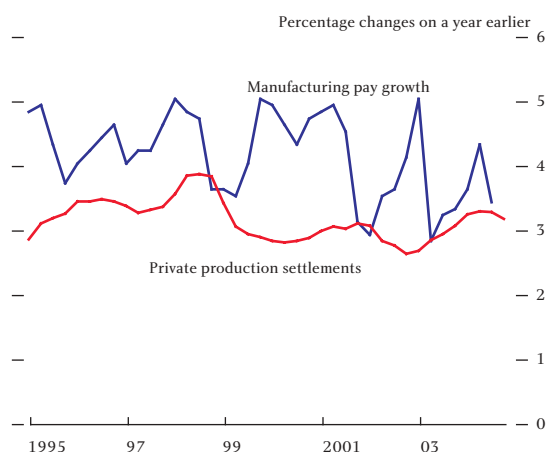
Sources: Pay growth, ONS. Settlements, Bank of England settlements database.

One further factor influencing recent pay awards is the question: which index of overall price inflation is used as the key measure of the cost of living increase when negotiating pay rises? Since the end of 2003, the CPI measure has been used by the MPC for its inflation target. So is there any evidence that private sector pay negotiators have switched to this significantly lower measure in 2004? The answer appears to be no. There is no indication that private sector pay settlements have declined over this period (Chart 6). Furthermore, in the surveys reported in the *IDS Pay Report 917* and in the *IRS Pay and Benefits Bulletin 603* (both dated November 2004), the clear result is that private sector employers are sticking to the traditional RPI measure. (See Nickell (2003) for a discussion of the labour market consequences of the switch in the MPC target measures of inflation in December 2003.)

The impact of wage inflation on labour costs depends crucially on labour productivity growth which, in the manufacturing sector, has been relatively strong since 1999. In Chart 7, we see how this strong growth in labour productivity has ensured that, on average, unit labour cost growth has been negative since 1999 (the average has been -0.3% per annum). The other main items in the costs of domestic goods production are

Chart 7
Manufacturing productivity and unit labour costs
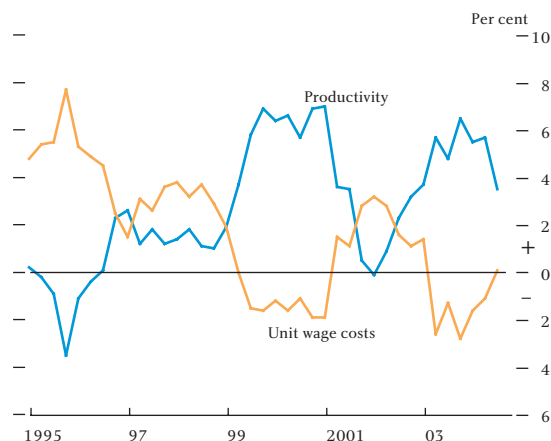
Note: Labour costs are 34.8% of gross output.

materials and fuel and business services. In Chart 8, we see that annual business services inflation has been relatively stable, fluctuating between 0% and 4%. By contrast, the annual inflation rate of materials and fuels prices ranges from -10% to +8% and the surge in the cost of materials and fuels in the period from 1999 to

Chart 8
Materials and fuels, and services inflation
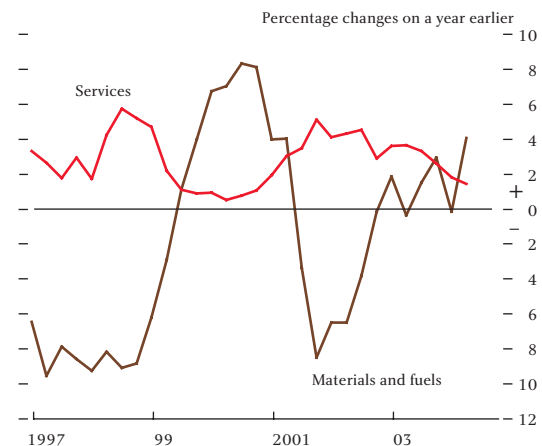
Note: Materials and fuels are 20.9% of gross output, business services are 15.6%.

2001, on the back of the world boom, was one of the main reasons for the high levels of manufacturing cost inflation in the same period.

Overall, therefore, we see that the combination of stable wage inflation and relatively buoyant labour productivity growth have helped to hold down domestic goods price inflation. On the other hand, inflation in the cost of business services and rapidly rising inflation in the cost of materials and fuels have contributed to the burst in domestic goods price inflation in 1999 and 2000 as well as its steady rise since 2002. On top of this the increase in margins has had a significant impact over the past 18 months.

4   Imported goods prices

As we saw in Chart 4, imported goods prices have been falling for much of the time since 2001. In contrast to domestic goods prices, the sterling exchange rate plays a direct role[1] in the determination of imported goods prices because the cost of producing these goods is incurred in foreign currency, so the sterling cost of production depends on the exchange rate. In Chart 9, we see that the sterling exchange rate appreciated dramatically in 1996–97 by over 20%, after which it has remained relatively stable. The initial appreciation had a significant negative impact on import price inflation for a number of years and helps to explain why import prices continued to fall rapidly until 1999. Since that time, the direct effect of the fluctuations in the sterling exchange rate has been relatively modest, although the small surge in import price inflation in 2003 and the

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(1) The sterling exchange rate has an indirect impact on the price of domestically produced goods because domestic firms are often directly competing with foreign firms in the domestic market. If sterling appreciates, the sterling cost of production for foreign firms falls and this enables them to compete more fiercely in the domestic market which may force domestic firms to cut their prices in order to maintain market share.

Chart 9
Exchange rate (ERI)

Index: 1995 = 100
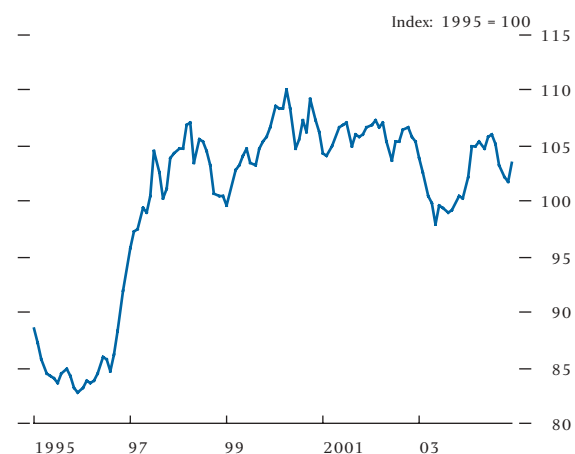
subsequent fall back in 2004 was probably driven, at least partially, by exchange rate shifts.

In order to understand what determines the price of imported goods, the starting point is the export prices of the various countries who provide UK imports. To construct an index of export prices appropriate to the United Kingdom, the standard strategy is to convert these export prices into sterling and then weight them by the share of imports from each country. So if p_{xi} is the log of the price of exports in sterling from country i and λ_i is the share of UK imports from country i, then the (log) price index would be:

$$p_x = \sum_i \lambda_i p_{xi}$$

A sterling index of UK-weighted world export price inflation, Δp_x, would be given by:

$$\Delta p_x = \sum_i \lambda_i \Delta p_{xi} + \sum_i (\Delta \lambda_i) p_{xi} \qquad \textbf{(1)}$$

where Δp_{xi} is export price inflation from country i in sterling terms and $\Delta \lambda_i$ is the change in the weight attached to country i. The reason for going through this rather tedious algebra is to bring out the simple fact that UK-weighted world export price inflation consists of two parts, the first term on the right-hand side of **(1)** which is the weighted average of the export price inflation rates of the different countries, and the second term which is the impact arising from shifts in import shares, generally towards countries which produce cheaper goods. This second term is potentially important. For example, between 1999 and 2002, UK

(1) We omit Norway and Saudi Arabia to concentrate more on non-oil imports.

imports from China and India increased their share by nearly 1.1 percentage points. This does not seem very much, but average prices in these countries are around one quarter of those from developed countries, for example. This apparent small shift in import shares is enough to reduce UK-weighted world export price inflation by around 0.5% per annum during the three-year period.

To see how this works in practice, we present in Chart 10, the series of UK-weighted world export price inflation based on the 27 main trading partners[1] and then in Chart 11, the contribution to this series made by the continuing process of switching to cheaper countries. The broad picture in Chart 10 is, not surprisingly, similar to the pattern of import price inflation shown in Chart 4. Even taking account of the fact that the former figure is based on annual data

Chart 10
Sterling world export price inflation
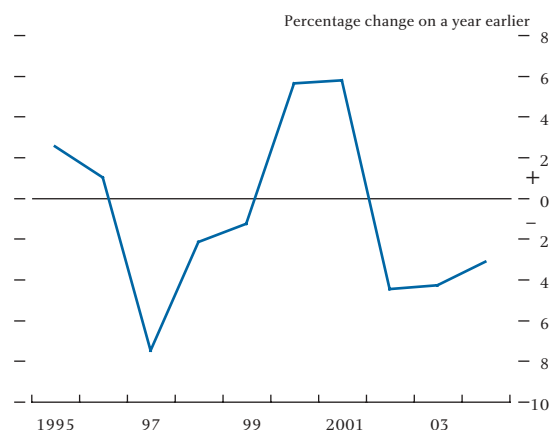
Percentage change on a year earlier

Chart 11
The contribution of 'switching' to sterling world export price inflation

Percentage change on a year earlier

whereas the latter is based on monthly data, they are not identical because the average export prices of a particular country are not the same as the prices of imports into the United Kingdom from that country. This is first, because the composition of UK imports from a given country are not the same as the average composition of exports from that country and second because, even for identical goods, exports from a given country are often sold at different prices in different countries.

We see in Chart 11 that switching to cheaper countries has reduced UK-weighted world export price inflation by an average of only 0.14 percentage points per annum in the second half of the 1990s. However, since 2000, this has risen to an average of 0.55 percentage points per annum which is a significant amount, suggesting that the process of sourcing manufactured goods from cheaper countries has intensified since the turn of the century.[1]

So far, we have only considered overall goods import prices which include raw materials and oil, among other things. In order to look at a combination of goods somewhat closer to those relevant to consumption price indices, we present in Chart 12 the inflation rate of imported finished manufactures. Again, it exhibits the same broad pattern as the import price index in Chart 4, although the annual inflation rate for finished manufactures does not go positive in 2004. So what we see is that over the period from 1999 to 2001, import price inflation for finished manufactures was positive but since that time it has been falling at an average rate of over 2 percentage points per annum.

Chart 12
The inflation rate of imported finished manufactures
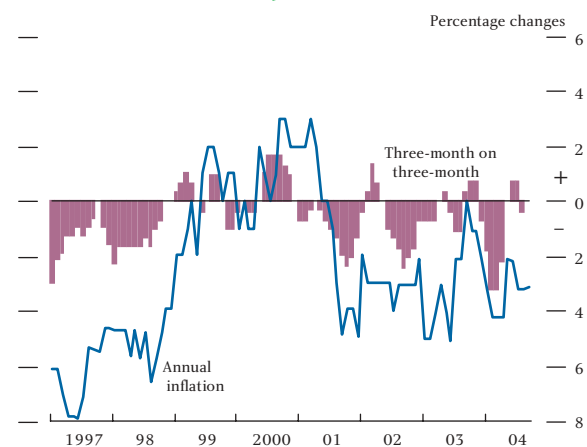
If we combine this with the inflation rate of domestically produced goods, we have the following picture of goods price inflation before they hit the retail distribution sector. From 1999 to early 2001, the annual inflation rate of both domestically produced and imported finished manufactures was positive. From early 2001 to mid-2002 both these inflation rates were generally negative. By contrast, from mid-2002 onwards, the inflation rate of domestically produced goods has been positive but this has been offset by the falling prices of imported finished manufactures. In the next section we investigate how these prices have been translated into retail goods prices by the distribution sector.

5 Retail prices and the distribution sector

Before we proceed, it is important to note that the goods prices we have been talking about so far, that is the price of domestically produced goods and imported finished manufactures, do not match precisely the goods included in retail goods price indices. The former include not only consumer goods but also intermediate goods and investment goods. Of course, ultimately even the intermediate and capital goods are used, either directly or indirectly in the production of consumer goods, so price inflation in these former goods will feed through into consumer price inflation. So, generally speaking, inflation rates in the prices of some of the domestically produced and imported goods will be transmitted into inflation in the prices of inputs into the retail distribution sector with some delay.

The retail distribution sector can be thought of as taking goods from the factory gate and from ports, transporting them to retail outlets[2] and selling them to the general public. Inflation rates of goods going in differ from inflation rates of goods coming out if trend productivity growth in retail distribution changes or if margins in retail distribution are systematically squeezed or increased. The retail distribution sector consists of wholesale, retail and the motor trade. In terms of gross output, retail expanded from about 37% of the sector in the late 1990s to around 40% in 2002 and wholesale contracted from around 45% of the sector in the late 1990s to around 43% in 2002. During this same period, retail expanded its share of the total gross operating surplus in the sector from around 48% to 57% whereas wholesale's share of the total gross operating surplus fell from around 37% to 28%. So we have a picture here of a

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(1) Computing the switching effect is not straightforward because a measure of the level of export prices is required for each country. In Chart 11 we use data from the Penn World Table and the IMF to estimate the relative price levels.
(2) These include mail order and internet outlets.

slowly expanding retail sector managing systematically to squeeze profits out of a slowly contracting wholesale sector. In Chart 13, we see how this translates into margins in the retail distribution sector, using two measures. Two facts stand out. First, margins in the wholesale sector have been falling from the late 1990s onwards. Second, if we look at the margins in the entire retail distribution sector, we see that they fell from the late 1990s to 2000 after which they have been more or less flat, at least up to 2003.

Chart 13
Margins in the distribution sector

Chart 13a
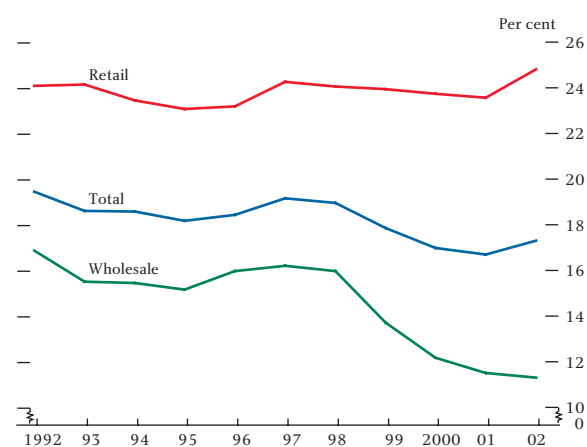
Source: ONS, Input-Output Supply and Use Tables.

Chart 13b
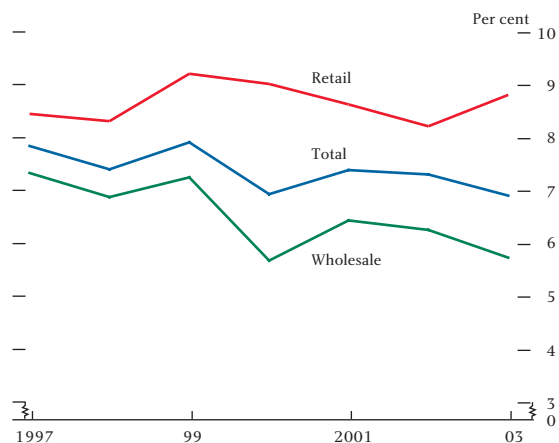
Source: ONS, Annual Business Inquiry.

Notes: (i)   The distribution sector includes the Wholesale, Retail and Motor trade industries.
(ii) Margins in the Motor trade industry have been relatively stable throughout.
(iii) Margins in 13a are defined by gross operating surplus divided by output at basic prices.
(iv) Margins in 13b are defined by gross operating surplus divided by gross output, where gross output = intermediate inputs + compensation of employees + taxes on production + gross operating surplus. The difference between output at basic prices and gross output is that in the former, goods which are not processed in any way within the distribution sector are subtracted out.

What about productivity growth in the retail distribution sector? What we see in Chart 14 is that after 1999, average labour productivity growth in both

wholesale and retail rose by a little under 2 percentage points per annum and this is reflected in the similar rise in overall productivity growth in the distribution sector as a whole.

So how does this all tie in with the information on domestic and imported goods price inflation we discussed in previous sections and the fact that CPI goods prices have been falling from 1999 (Chart 3)? In the previous section, we divided the period since 1999 into three subperiods. From 1999 to early 2001, the prices of both domestically produced goods and imported goods were rising. The reason why this translated into falling CPI goods prices was the fall in the margins in the retail distribution sector (mainly in wholesale) along with the rise in labour productivity growth. In the period from early 2001 to mid-2002, domestic and imported goods prices were generally falling and this ensured that CPI goods prices continued to fall. Finally, in the period from mid-2002 onwards, domestically produced goods prices were rising, the prices of imported manufactures were falling at an average of around 2 percentage points per annum and margins in the retail distribution sector were relatively stable, at least up to the end of 2003. So the fact that CPI goods prices continued to fall must have been due to the dominant impact of falling imported goods prices supported by the continuation of high productivity growth in distribution. This, then, is the overall explanation of falling goods prices, and hence of very low inflation over the past five years. There remain two other issues to discuss. First, it is of some interest to see which goods have made a particular contribution to falling prices and why. Second, since the MPC expects CPI inflation to rise above 2% in 2006 for the first time this century, are there any straws in the wind we can point to now which reinforce this expectation?

6   Which sectors have made the biggest contribution to falling goods prices?

In Chart 15 we present a breakdown of the goods part of the retail prices index (RPI). This is very similar to the goods part of the CPI, but since the latter data are not available for the early 1990s, we are forced to use the RPI. The basic difference between the two indices is the fact that the CPI goods inflation rate will be somewhat lower throughout because of the formula effect. The patterns over time, however, will be much the same.

The first point that emerges from Chart 15 is that overall goods price inflation was around 2 percentage points

Chart 14
Distribution sector labour productivity growth

Chart 14a
Motor trade

Percentage change on a year earlier

1996 97 98 99 2000 01 02 03 04

Chart 14b
Wholesale

Percentage change on a year earlier

1996 97 98 99 2000 01 02 03 04

Chart 14c
Retail

Percentage change on a year earlier

1996 97 98 99 2000 01 02 03 04
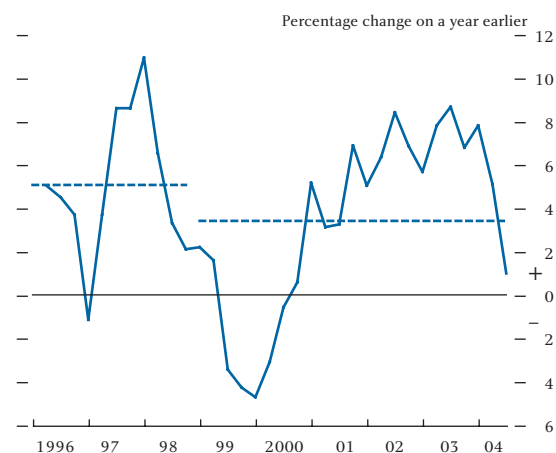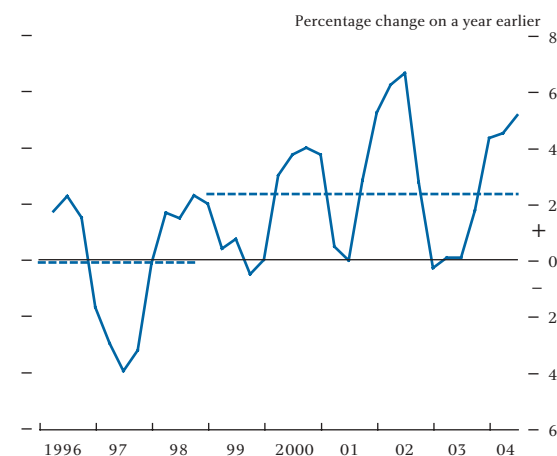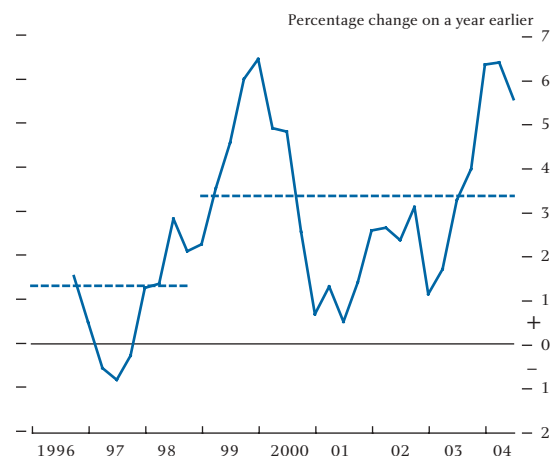
Chart 14d
Total distribution sector
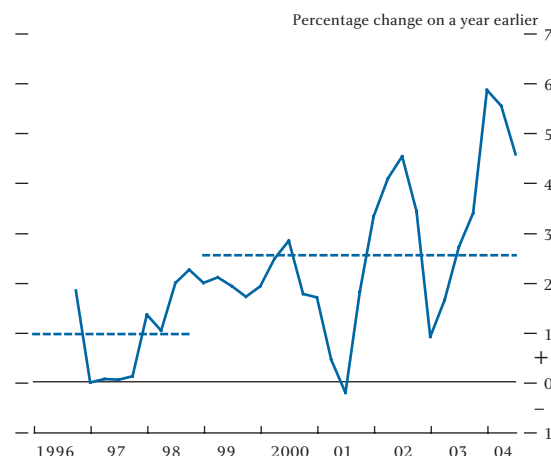
Percentage change on a year earlier

1996 97 98 99 2000 01 02 03 04
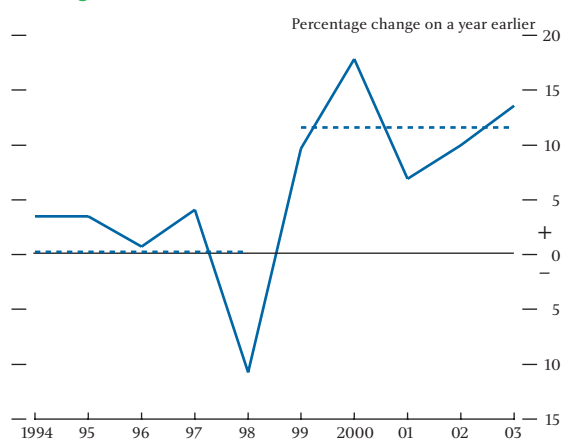
Note: Labour productivity is defined as gross value added at basic prices divided by employment. Dashed lines show averages (1996–98 and 1999–2004).

lower after 1999 than it was between 1993 and 1999. Looking at the individual sectors we see substantial differences in the fall in inflation in different sectors. Whereas food price inflation fell by less than 1 percentage point on average, clothing and footwear inflation fell by over 3 percentage points, car price inflation by over 4 percentage points and the inflation rate of TVs (including home computers) fell by a staggering 8 percentage points, although this represents only 1.9% of total goods expenditure. Altogether, however, these last three sectors make up around one quarter of all goods expenditure.

While these categories cannot be matched precisely to domestic manufacturing sectors, we set out some roughly equivalent data for domestic output price

inflation in Chart 16. The data that match up particularly well include the small fall in output price inflation in food products and the large falls in clothing and footwear (over 2 percentage points), motor vehicles (close to 4 percentage points) and TVs (close to 4 percentage points).[1] By contrast, the large fall in alcohol and tobacco output price inflation does not match up to the small fall in retail price inflation in the same sector, presumably because retail prices in this sector are dominated by excise duties. Interestingly enough, from Chart 17, we see how the three sectors with large falls in inflation noted above are also sectors which have seen significant increases in average annual labour productivity growth, namely clothing and footwear (12 percentage points), motor vehicles (around 5 percentage points) and TVs (around 15 percentage

(1) Here, the TV sector does not include personal computers.

Chart 15
Retail goods price inflation by sector

Chart 15a
All goods (weight = 100%)

Percentage change on a year earlier
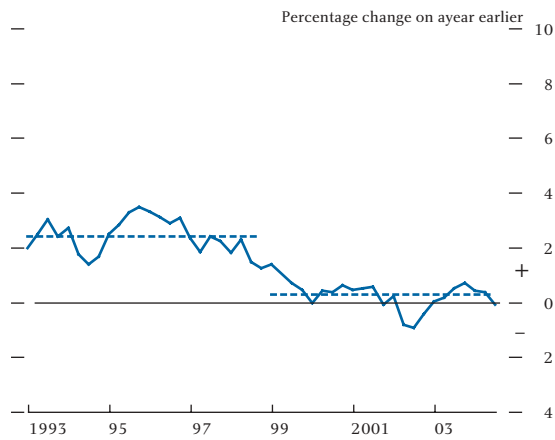
Chart 15b
New and old cars (weight = 12.2%)

Percentage change on a year earlier
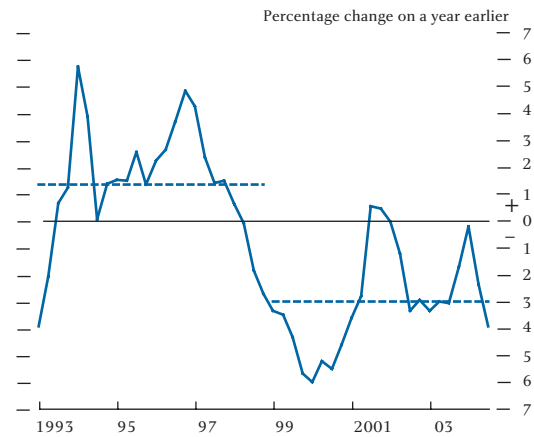
Chart 15c
Furniture (weight = 4.7%)

Percentage change on a year earlier

Chart 15d
TVs (weight = 1.9%)(a)

Percentage change on a year earlier
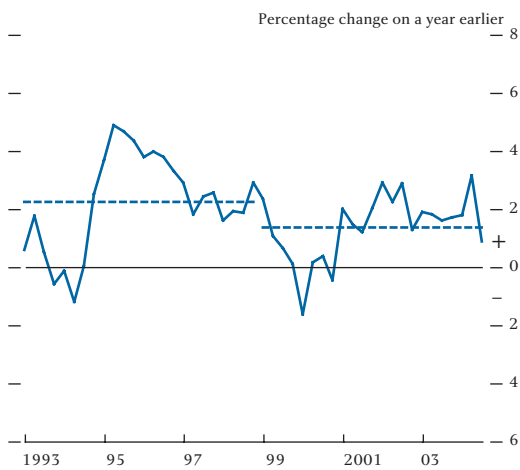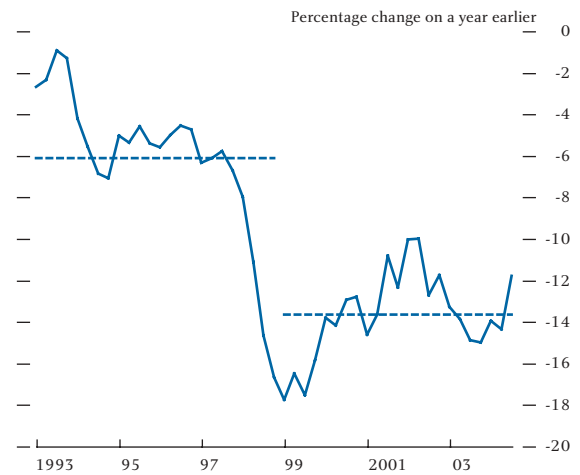
Chart 15e
Food (weight = 21.6%)

Percentage change on a year earlier
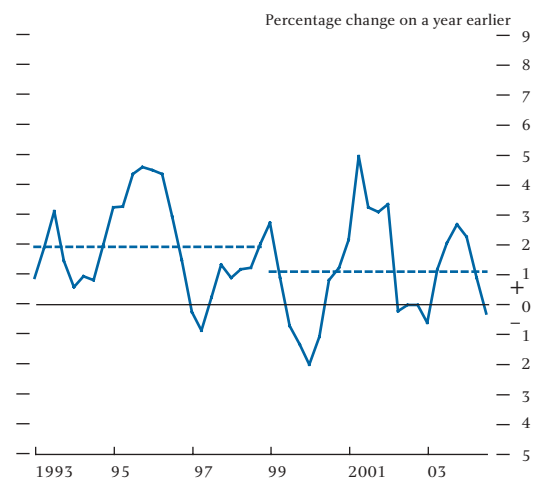
Chart 15f
Alcohol and tobacco (weight = 8.8%)

Percentage change on a year earlier
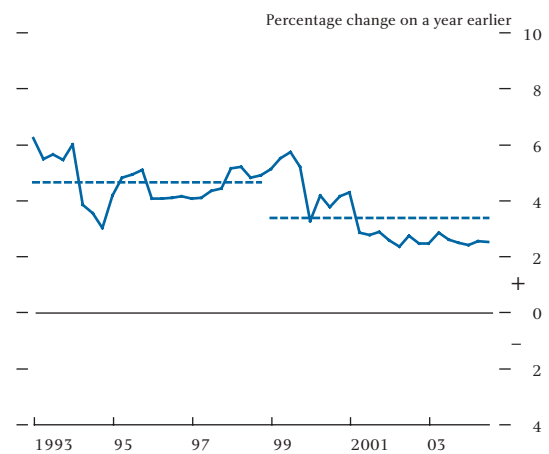
(a) TVs includes home computers after 1998, which explains the sudden fall.

Chart 15g
Clothing and footwear (weight = 9.9%)

Percentage change on a year earlier
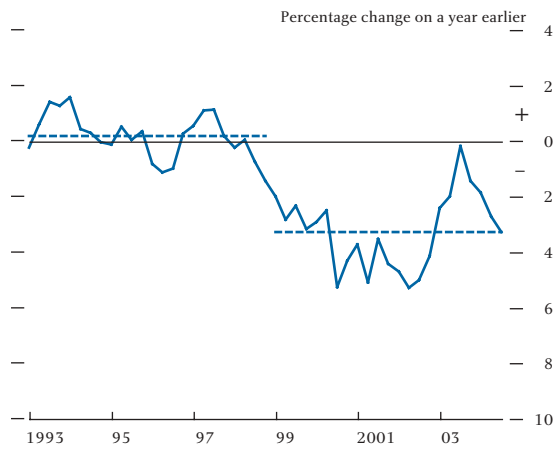
Chart 15h
Electrical appliances (weight = 1.4%)

Percentage change on a year earlier
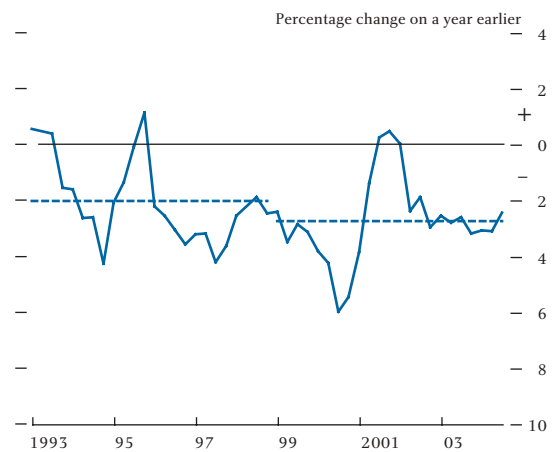
Chart 15i
Household goods (weight = 13.8%)

Percentage change on a year earlier
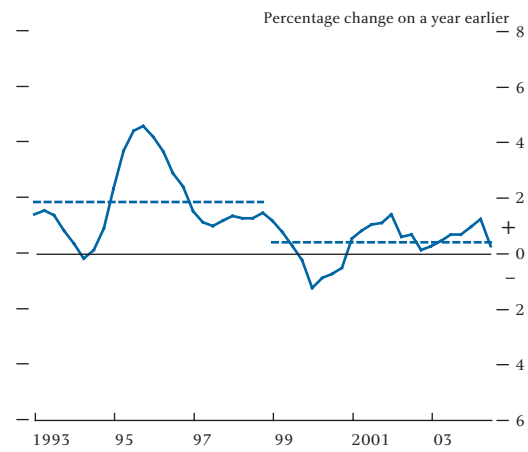
Note: Dashed lines show averages (1996–98 and 1999–2004).

Chart 16
Manufacturing output price inflation by sector

Chart 16a
All goods (weight = 100%) (excluding duties)

Percentage change on a year earlier
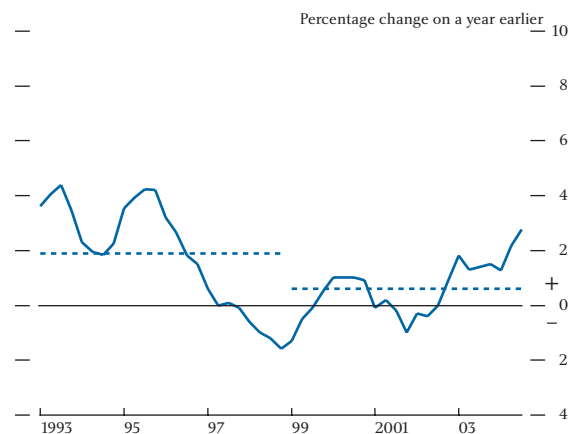
Chart 16b
Motor vehicles (weight = 7.3%)

Percentage change on a year earlier
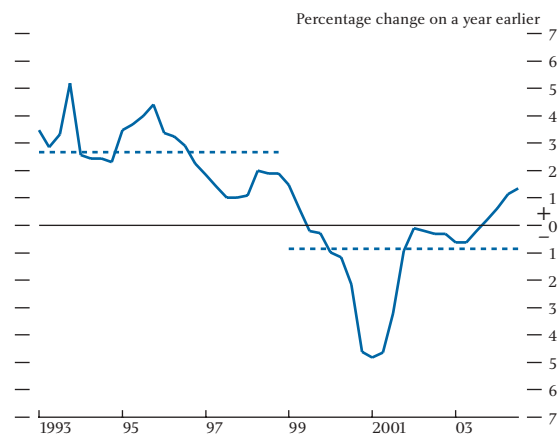
Chart 16c
Furniture (weight = 6.1%)

Percentage change on a year earlier

Chart 16d
TVs (weight = 2.0%)

Percentage change on a year earlier
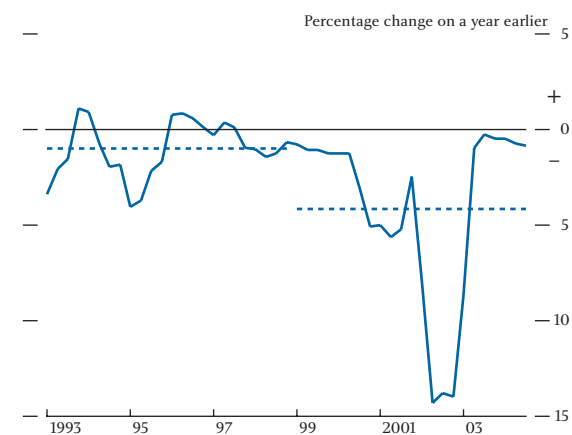
Chart 16e
Food products (weight = 16.9%)

Percentage change on a year earlier
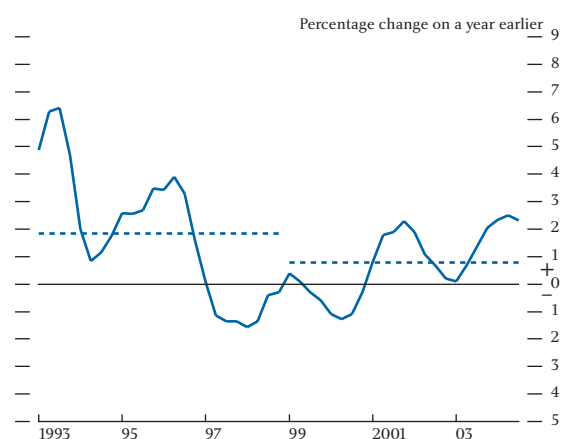
Chart 16f
Alcohol and tobacco (weight = 9.1%)

Percentage change on a year earlier
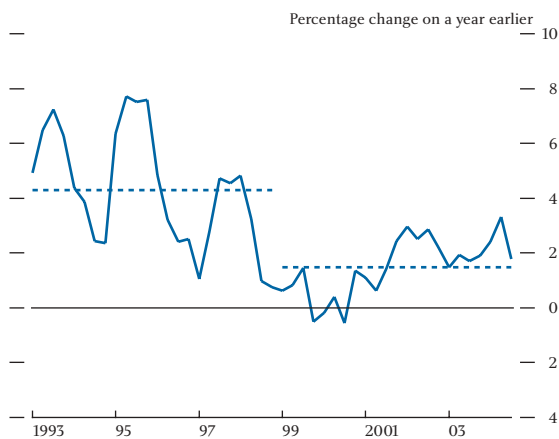
Chart 16g
Clothing and footwear (weight = 6.5%)

Percentage change on a year earlier
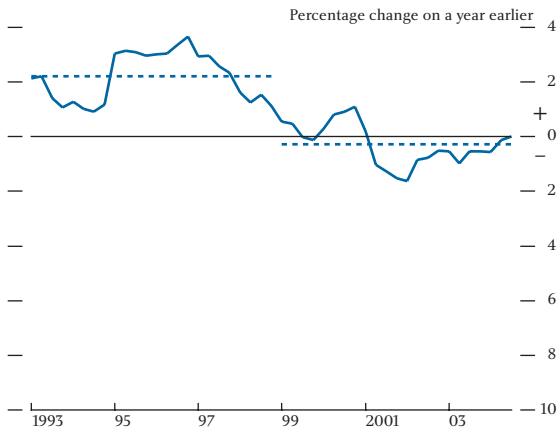
Chart 16h
Domestic appliances (weight = 0.4%)

Percentage change on a year earlier

Note: Dashed lines show averages (1996–98 and 1999–2004).
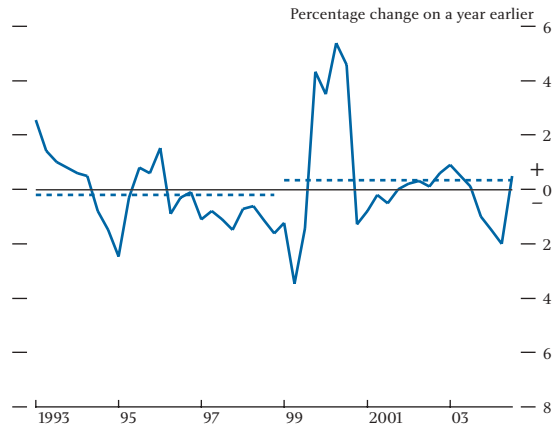
Chart 17
Manufacturing productivity growth by sector

Chart 17a
Motor vehicles

Percentage change on a year earlier

Chart 17b
Furniture

Percentage change on a year earlier

Chart 17c
TVs and radios

Percentage change on a year earlier

Chart 17d
Food

Percentage change on a year earlier
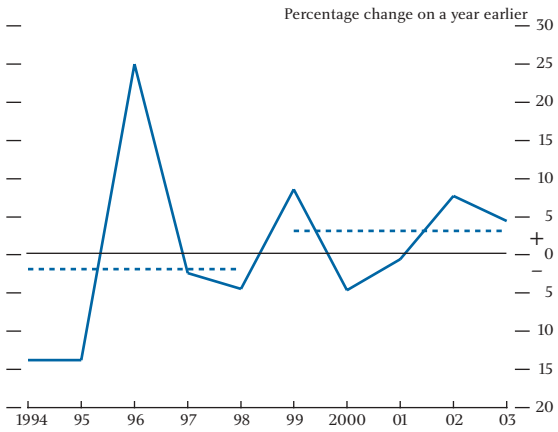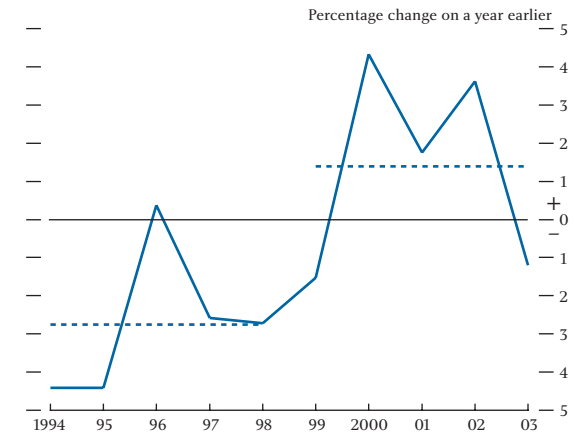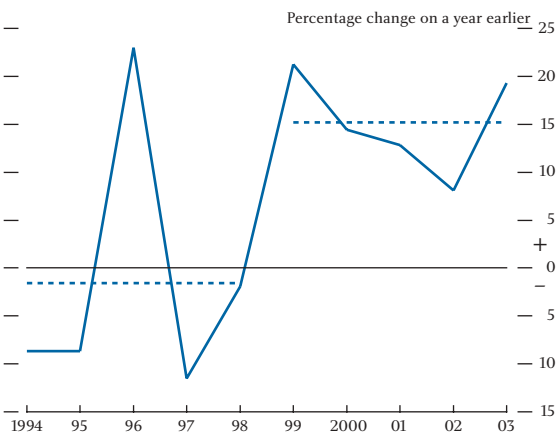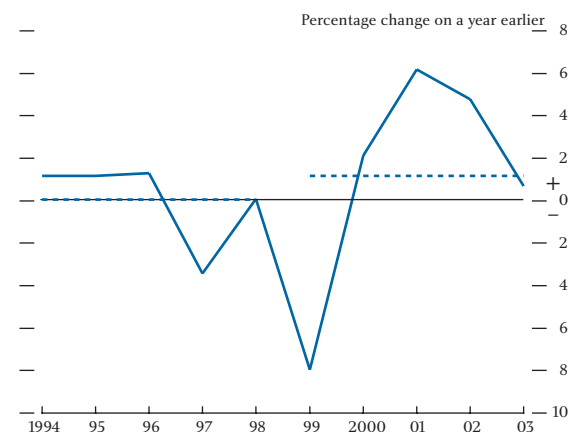
Chart 17e
Alcohol and tobacco

Percentage change on a year earlier

Chart 17f
Clothing and footwear

Percentage change on a year earlier
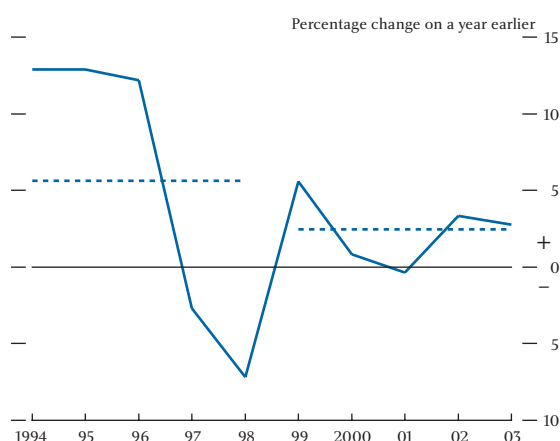
Chart 17g
Domestic appliances
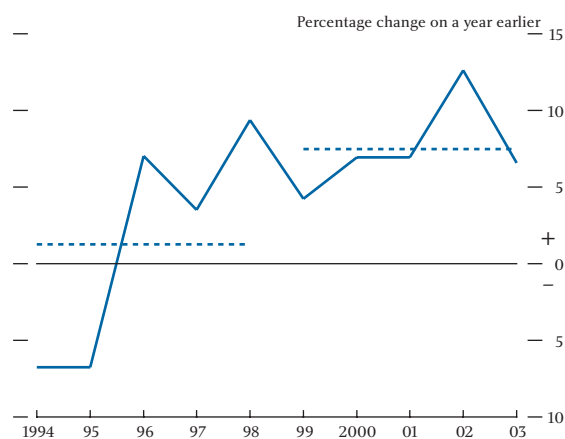
Percentage change on a year earlier

Note: Labour productivity is defined as gross value added at basic prices divided by employment. Dashed lines show averages (1996–98 and 1999–2003).

points). However, the big increases in labour productivity growth in domestic appliances and furniture do not seem to be reflected in large falls in output price or retail price inflation.

Many of these sectors have high levels of import penetration, so we should also see if the patterns of import price inflation shed more light on the overall falls in retail goods price inflation. Again, in Chart 18, we see significant falls in import price inflation in clothing and footwear (around 2.5 percentage points), new cars (6 percentage points) and TVs (around 3 percentage points) which reinforce the falls we see in domestically produced goods in these sectors. Interestingly inflation in beverages and tobacco actually rises in the period after 1999, which helps explain why retail price inflation in this sector has fallen so little.

Overall, then, we have a picture where some sectors, notably clothing/footwear, cars and TVs, which cover around one quarter of goods expenditure, have seen large falls in both domestic and imported inflation and large rises in domestic productivity growth. These are also sectors which are very open to trade, and so are highly competitive, which helps to drive productivity growth. On top of this, prices in the car market have fallen because of interventions by the UK and European competition authorities.[1]

7   Looking into the future

Over the past two years, import price deflation and high productivity growth in the distribution sector have been holding CPI goods price inflation below zero despite positive and rising domestic goods price inflation and

(1) The UK Competition Commission report on new cars was produced in March 2000 and highlighted 'a complex monopoly situation resulting from suppliers practices in distributing new cars in the UK'. The EC rules which allowed this to happen (the so-called Block Exemption) were adjusted in July 2002 but the UK car market had already changed significantly by then as a result of the investigations by the competition authorities and the consequent introduction in the United Kingdom of the Supply of New Cars Order 2000 in September.

Chart 18
Imported goods price inflation by sector

Chart 18a
All goods

Percentage change on a year earlier
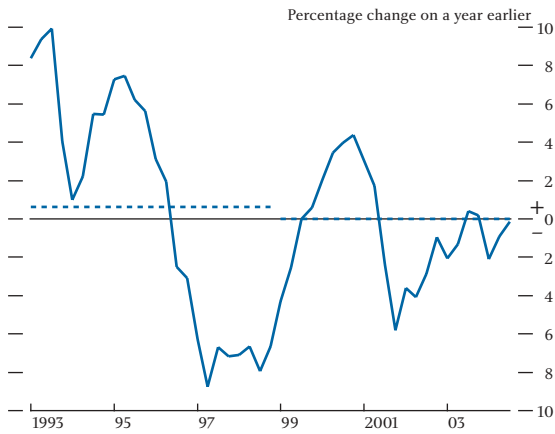
Chart 18b
Motor vehicles (import penetration = 37.9%)

Percentage change on a year earlier
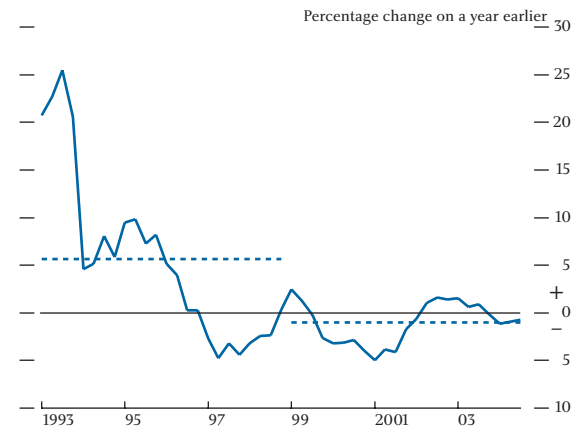
Chart 18c
Furniture (import penetration = 19.2%)

Percentage change on a year earlier
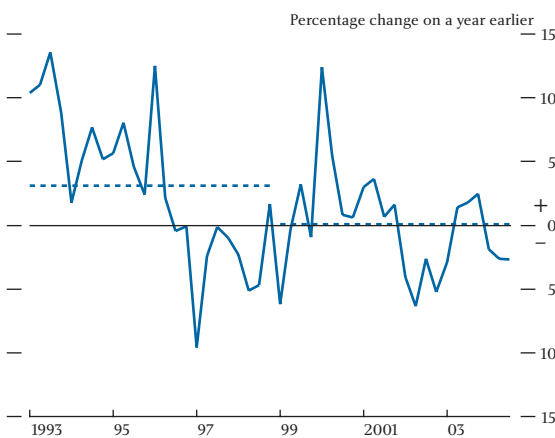
Chart 18d
TVs (import penetration = 33.0%)

Percentage change on a year earlier
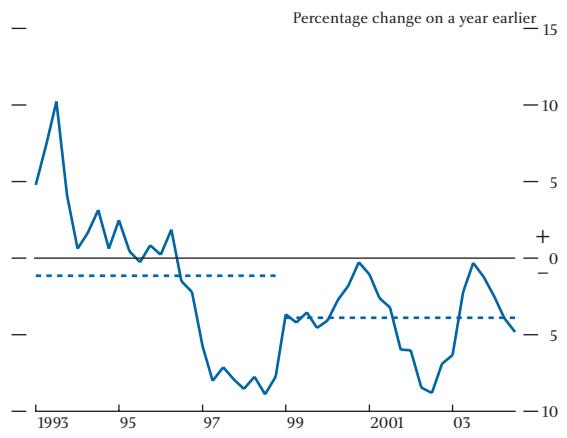
Chart 18e
Food products (import penetration = 12.3%)

Percentage change on a year earlier
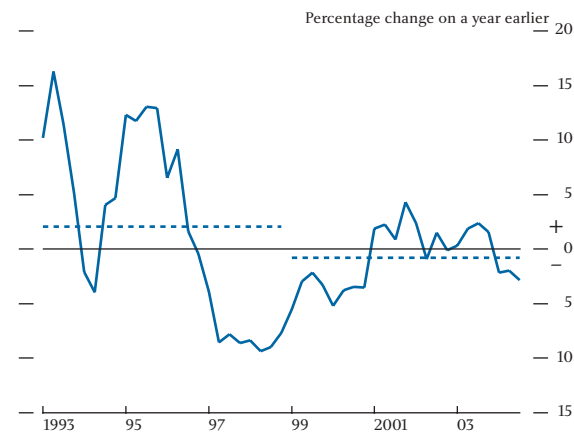
Chart 18f
Alcohol and tobacco (import penetration = 14.1%)

Percentage change on a year earlier
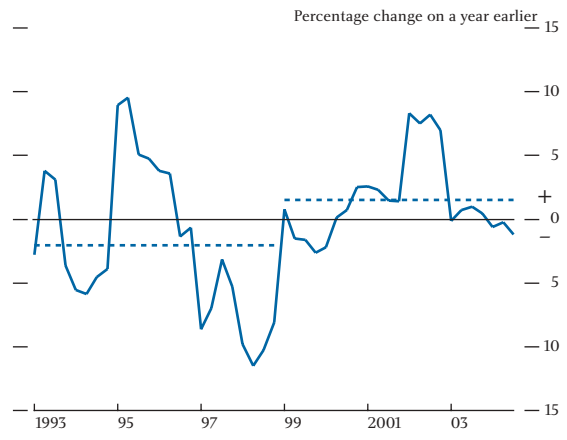
Chart 18g
Clothing and footwear (import penetration = 29.1%)

Percentage change on a year earlier

Chart 18h
Domestic appliances (import penetration = 27.4%)

Percentage change on a year earlier
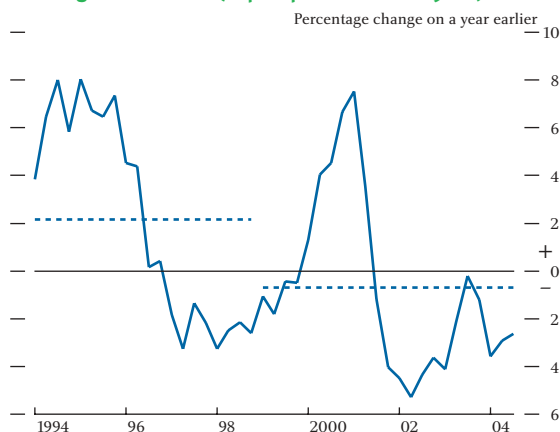
Note: Import penetration defined as imports of goods divided by total demand for goods by sector in 2004. Dashed lines show averages (1996–98 and 1999–2004).
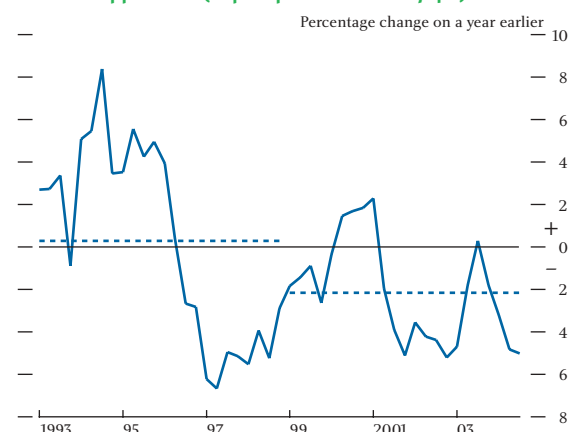
Chart 19
Private sector earnings growth excluding bonuses(a)

Percentage change on a year earlier
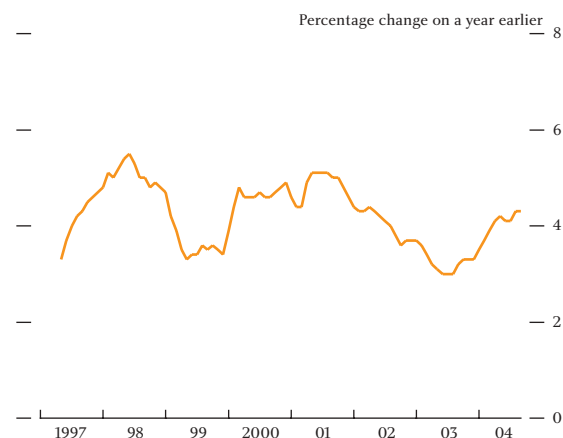
(a) The data exclude bonuses and any arrears of pay. Data are for three-month periods.

relatively stable retail distribution margins (at least until the end of 2003). Looking forward, how long can this continue?

On the domestic front, there are few factors at the moment which seem likely to reduce domestic goods price inflation, which has been rising for some years. Underlying earnings growth in the private sector has been rising over 2004 (Chart 19) and the labour market continues to be tight. While manufacturing productivity growth remains high, there seems no obvious reason why it should rise further. However, given the intensity of competition, it is quite probable that margins in manufacturing will stop rising.

Import prices are a key factor. In Chart 4, we see that overall import prices are no longer falling. However, annual inflation of the price of imported finished manufactures remains negative as we can see from

Chart 12. On the other hand, in this same figure, we see that the three-month on three-month rate has recently been positive, indicating that these import prices are no longer falling.

Looking forward, the continued strength of the world economy implies upward pressure on the world prices of traded goods. This suggests that the recent turn round in import prices will not reverse and that import prices will continue rising. With the continuing rise in domestic goods prices, this indicates that we are about to enter a period when both domestic and imported goods prices are rising. The last time this happened (1999 to 2001), the inflationary pressure was offset by falling margins in the retail distribution sector, so it was not transmitted to CPI goods prices. Given the recent stability of distribution sector margins (Chart 13), there seems no particular reason to expect a repeat of this via a further squeeze on distribution margins. So we can expect CPI goods price inflation to move into positive territory, settling down at a stable but relatively low level. This is consistent with the latest MPC central projection where inflation settles down close to the target.

Of course, there are many uncertainties. The tightness of the labour market may drive up labour costs and hence domestic goods prices faster than we expect. On the other hand, even when the world prices of traded goods are rising, more extensive switching towards cheaper suppliers can still generate falling import prices, thereby continuing to keep CPI goods price inflation in negative territory. Nevertheless, for the reasons discussed above, a projection of CPI inflation moving up towards 2% in the next couple of years is not implausible despite it having been below this level for several years.

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Nickell, S and Quintini, G (2002), 'The recent performance of the UK labour market', *Oxford Review of Economic Policy*, Vol. 18 (2), Summer.

Nickell, S (2002), 'Monetary policy issues: past, present, future', *Bank of England Quarterly Bulletin*, Autumn, pages 329–44.

Nickell, S (2003), 'Two current monetary policy issues', *Bank of England Quarterly Bulletin*, Winter, pages 504–17.

The housing market and the wider economy

In this speech,[1] Kate Barker,[2] member of the Bank's Monetary Policy Committee, discusses some of the factors which drive trends in the housing market. She notes the importance of improving the functioning of the housing market at all stages of the cycle. She discusses the uncertainties surrounding the current outlook and why the impact on consumption of a correction in the housing market is unclear. She highlights four reasons why warranted house prices may have risen recently: a front-loading effect (due to lower nominal interest rates); the fall in long-term real interest rates; the slow growth of housing supply; and a shift in household preferences towards holding more housing. In conclusion, she argues that, while understanding the housing market is important for monetary policy, the risks house prices pose are by no means the only (or even the biggest) risks to the present inflation outlook.

Introduction

When I was first invited to give this speech, the suggested title seemed to me entirely appropriate. Since March 2003, when I was invited by the Government to lead an independent review of issues around housing supply in the United Kingdom, a combination of that work and the continuation of my main role on the MPC has meant that I have spent a great deal of time thinking about issues around housing. However, since the autumn of 2004 my enthusiasm for speaking on this topic from an MPC perspective has waned, although my interest in housing is undiminished.

Why do I feel reluctant to talk about housing? Quite simply, I don't want to add credence to the view that the outlook for house prices dominates our decisions, as expressed by the following: 'monetary policy is already being set in a manner deliberately designed to take the heat out of the housing market — rising house prices being the most obvious manifestation of excessive demand in the economy'.[3] On a related, but critical, note, a recent House of Lords report said: 'we would not put the same emphasis on house price inflation and its indirect effect on general inflation, as does the MPC'.[4] At earlier times, some commentators however urged us

to put more emphasis on housing; for example Peter Spencer referred to low inflation in Spring 2004 as 'making it very difficult to raise rates in the aggressive way which in my view is now necessary to head off this massive boom in the housing market'.[5]

Not surprisingly, it is my view that the MPC's general approach to the housing market has been both consistent and appropriate, and I will reiterate it during the course of these remarks. But the monetary policy context is clearly not the only issue raised by the complex relationship between housing and the rest of the economy. Housing is firstly important as a fundamental human need, but also has wide economic significance, accounting for around 50% of UK household assets, while housing construction and improvements account for 3.7% of total output. Long-term developments in housing have significant implications for equality, both across and between generations.

The influence of housing in inter-generational equality and inheritance is however becoming more complicated, with the increasing use of the asset value of a house by the elderly to provide annuity income (to supplement otherwise inadequate pension provision from financial

assets or as payment for long-term care). In addition, there is evidence, especially in London, of increasing reliance by first-time buyers on gifts, family loans or inheritance to fund house purchase deposits.[1] While these developments suggest that the financial market is becoming more efficient at giving opportunities to unlock asset values, they also demonstrate the influence of homeownership on a family's ability to meet financial challenges.

Strong rises (over 10% per annum in nominal terms, Chart 1) in house prices over the past three years have fostered the perception that housing is a relatively attractive investment. But over the long term both theory and past experience suggest that the returns on housing investment will be rather less spectacular, and driven by the fundamentals of income growth, real interest rates, the structure of mortgage products, taxation, maintenance costs, demographics and supply.[2] So housing assets will probably not continually yield significantly higher returns than other assets with similar risk. During periods when the demand for housing is fuelled to some extent by an investment motive (for example, if a significant number of households buy larger houses than they otherwise would) this becomes a policy concern as it conflicts with worries about the environmental costs of housing (related to the use of both land and resources). At the extreme, concerns over these externalities lead to the argument that households should not aspire to occupy a house larger than some measure of 'need'.

Chart 1
Annual house price inflation

Percentage changes on a year earlier
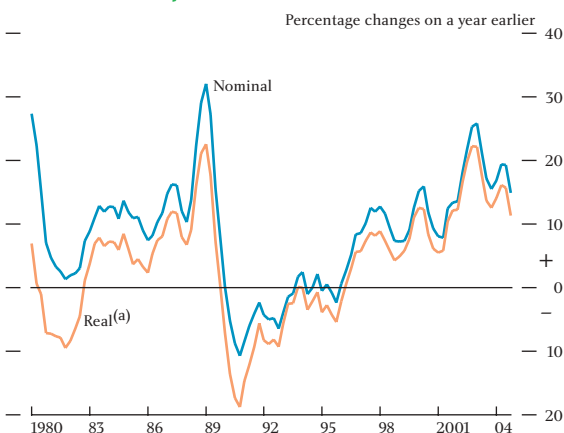
Sources: Nationwide and ONS.

(a) Nationwide index deflated by the retail prices index.

(1) Bramley (2003).
(2) See, for example, Muellbauer and Murphy (1997) for a rather fuller discussion of this topic.
(3) Henley (1998).

Structural factors such as housing tenure (in particular, the share of the private rental sector), transactions costs and the characteristics of the mortgage market affect economic performance more widely. For example, there is evidence that a high level of owner-occupation reduces labour mobility.[3] And evidence on the flow of new VAT registrations and private business registrations suggests a positive relationship with increases in the value of housing equity (Black *et al* (1996)). Interestingly, this latter paper confirms this relationship by considering the impact of increases in regional housing equity relative to the national average, suggesting one possible reason for the apparent difference in entrepreneurship between UK regions.

What, ideally, should our housing policy aims be, and how should the market element function? First, it would provide shelter for all at least appropriate to their needs (defined with reference to current decent homes and overcrowding standards), and is therefore likely to include elements of public subsidy. Second, the long-run trend of house prices would only imply a continually rising price relative to incomes to the extent that this was justified by environmental concerns. This would also mean that the relative attractiveness of investment in housing would not tend to be such that other, more productive, investment is potentially crowded out. Third, the structure of housing tenure, housing finance and transactions costs should not unduly hinder labour mobility. Fourth, the long-run cycles in the volatility of house prices would be less marked than in the past, reducing financial risks borne by owner-occupiers and also making the operation of macroeconomic policy easier. Of course, alongside this, planning regulations would continue to tackle their essential task of balancing economic benefits against environmental externalities and creating liveable places.

Trends and cycles

The factors which drive house prices over the long term, and therefore drive the user cost of housing, have already been mentioned. The forward-looking element in house price determination (since expected changes in house prices are one element of the user cost) combined with credit constraints and an inevitably sluggish supply response results in short-term movement of prices away from equilibrium following a persistent positive demand shock. So the underlying structure of the housing

market also affects the movements of prices in the short run.

Simply put, a change which increases demand for housing, such as a beneficial shift in taxation which reduced the cost of owner-occupation, would cause a jump up in house prices to restore equilibrium in the market. The rise in house prices will then enable some previously constrained owner-occupier households to move further up the housing ladder, as the equity in their existing property will increase in value significantly. Eventually the rise in prices is likely to be halted, assuming that the housing stock is expanded to meet the rise in demand, and prices may even fall back, relative to incomes, as first-time buyers find it more difficult to enter the housing market. In the United Kingdom, swings tend to be exacerbated by the dominance of short-term floating-rate finance for household mortgages,[1] and are also affected by a relatively low price elasticity of housing supply.[2]

Most of these effects are, of course, mirrored on the downside in the event of a negative demand shock. However, the fixity of housing may mean that the downward adjustment of the housing stock creates enduring local problems. It may be convenient to talk about a single housing market, but the reality is of course much more complicated. In periods of weaker demand for housing, it is likely that this will be felt more acutely in areas with a poorer housing stock, inadequate public infrastructure, or weak local economic conditions. These areas may then cease to be part of effective supply more permanently. So, unless there is specific policy intervention to stimulate demand in these areas, when general housing demand strengthens there is pressure for new stock despite the existence of vacant dwellings.

Both the recent review of the UK mortgage market by David Miles, and the review of UK housing supply which I led, were aimed at improving the functioning of the market. The key focus of the former was reducing house price volatility and (through better understanding and a wider choice of products) the risks run by individual mortgagees. The latter took a long-term view, proposing that it would be desirable in the United Kingdom to have a slower upward trend in real house prices — though leaving to Government the decision about how far to balance these benefits against environmental costs. An improved supply side could also

have beneficial effects on volatility, if a more explicit government commitment to ensuring market housing affordability over the long term reduces the expected capital gains from housing investment. This is not the place to reiterate the arguments and proposals in these reviews. It is clear however that while, taken together, their policy proposals could improve the functioning of the market, they did not add up to a review of the full complexity and range of housing policy questions.

A general issue which arises when considering policy interventions is that of distinguishing the longer-term trend in house prices from cyclical changes, and ensuring that the underlying policy framework will endure across all stages of the cycle. For example, peaks in the housing market obviously mean that the price of housing land is also high, and that land profits could potentially, to a greater or lesser extent, be diverted from landowners and developers into support for public infrastructure and social housing. But it cannot be assumed that this source of finance will be so plentiful over the whole cycle.

Considerations about peaks and cycles are particularly relevant at the present time, when most approaches to establishing the underlying equilibrium level of UK house prices agree that it is significantly below the present level. (Although it could be pointed out that these estimates have themselves tended to rise over the past two or three years, alongside the search for explanation of the continuing actual house price increases. Further, the estimates of overvaluation relative to household incomes cover a wide range — some think there is little or no overvaluation, others that it could be up to 50%.) The policy conclusions of the two recent reviews are directed at ameliorating the scale and impact of future housing cycles, rather than at resolving the present one, and will not affect the present risk of a decline in the general level of house prices. In the rest of my remarks, I want to consider the nature of the present housing cycle, and the relevant issues for monetary policy.

The present UK house price cycle

In recent *Inflation Reports*, the MPC as a whole has stressed three key uncertainties about the housing market as it relates to monetary policy. These are: uncertainty about where the present equilibrium in

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(1) Miles (2004).
(2) Swank *et al* (2002).

house prices is, uncertainty over the timing and extent of any correction with the attendant risk of overshooting, and uncertainty about how household consumption would respond in the event of sustained outright house prices falls.

In seeking to address these uncertainties, the first step is to consider why the rise in house prices (which have roughly doubled in nominal terms over the past five years),[1] has been so rapid. The fact that household consumption has not responded to the rise in house prices in line with historical experience (had the MPC forecast house prices accurately, we would, over the past two years, have overpredicted consumption) suggests that the reason for the increase may be different on this occasion. The previous periods of rapid house price increase, in particular the experience of the late 1980s, seem to have been linked to increased household optimism about their own income growth. The subsequent downturns were therefore, at least partly, driven by the realisation that at least part of this optimism was unwarranted.

There are four potential reasons for the recent increase in house prices. The most obvious is the front-loading effect — the fact that lower nominal interest rates ease the ability to pay at the start of a mortgage. The lower proportion of household income taken up by interest payments means that those with good employment prospects are able to take full advantage of their long-term capacity to borrow. (In future years, of course, as their debt is eroded less rapidly by inflation, the burden of payments will be relatively greater and their real disposable income after housing costs will rise more slowly.) The constraint, in terms of affordability, on first-time buyers is increasingly the ability to fund the initial capital payment, especially as loan to value ratios for new borrowers with high debt-servicing costs are generally lower than at the previous housing market peaks.

The second support for higher prices over recent years is the fall in long-term real interest rates. In a recent speech, Steve Nickell[2] drew on the asset-pricing framework described by Weeken.[3] The basic insight here (see the appendix, which sets this out and indicates its limitations) is that the equilibrium house price is related to the discounted value of future rents, and an

unobservable housing risk premium. Nickell pointed out that the risk-free real rate has fallen from 4% in the mid-1990s to around 2% since 1999 (Chart 2) and suggested that, if rents are expected to grow in line with incomes, then this fall in real interest rates could justify a rise of around two thirds in real house prices relative to real rents. So this is potentially a significant factor, although the estimate is very sensitive to both the risk premium on future rents and to the expected growth in rents relative to incomes.

Chart 2
Ten-year real interest rates(a)

Source: Bank of England.

(a)   Real interest rates implied by index-linked gilts.

The third reason for higher house prices is the slow growth of housing supply relative to demand. It is difficult to reach a firm estimate of just how big the gap between potential household growth and actual supply has been over the past five years or so (a comparison of the 2001 and 1991 Censuses does not adequately answer this point, mainly because an estimate of the number of concealed households is not yet available for 2001).[4] However, the most recent (and preliminary) ODPM estimates[5] of household growth in England over the next 20 years is 189,000 new households per year. Between 2000 and 2003, gross new housing completions in England averaged just 136,000 per year. Although 2004 saw some pickup in completions, the total is still likely to fall short even of just keeping pace with new demand.

If evidence of ongoing inadequate new supply raises expectations of future growth in rents, then this would be an additional factor raising the equilibrium level of

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(1) Average of Halifax and Nationwide indices.
(2) Nickell (2004).
(3) Weeken (2004).
(4) Barker (2004).
(5) ODPM Interim 2002-based Household Projections.

house prices. Although new supply is less than 1% of the stock, and therefore unlikely to have more than a minor effect, using similar assumptions to those above, an expectation of rents increasing 0.1% more quickly per year would raise equilibrium house prices by around 3.5%.

A fourth explanation is that effective demand has risen by more than would have been expected, based purely on household growth, because of an increased preference by households for investment in housing, rather than equity or other financial markets, since the sharp falls in equities between 2000 and 2003. This might occur either through elderly households delaying down-sizing in order to accumulate more capital gains, or more households acquiring additional properties — either earlier purchase of homes intended for retirement, or individual buy-to-let properties.

It is difficult to find very convincing evidence on the first of these, although a recent Council of Mortgage Lenders survey indicated that 40%–50% of 45 to 64 year olds intended to use housing wealth to finance consumption post-retirement. Use of housing equity as savings might also be consistent with the evidence that consumer spending has increased by less in response to rising house prices in the present upswing than was previously the case.[1] On the second, there has been some recent indication of a rise in second property ownership, but the absolute number remains very small (although the estimates may not be fully reliable). And although buy-to-let mortgages have risen from 1% of new mortgages in 1998 to nearly 6% in the first half of 2004, data for the size of the private rented sector (available up to 2003) does not indicate that there has been a significant shift from owner-occupation to the private rented sector (which has remained pretty stable at around 10%). One possible explanation for this would be that private landlords have been taking share in the rental market from the corporate sector, given the failure to date of policies intended to increase the involvement of the corporate sector in the private lettings market.

Putting these factors together, an account of the recent past might be that the fall in real interest rates was potentially a source of a very large rise in the equilibrium house price to income ratio. However, even with the reduced burden from front-loading, lack of access to capital for larger deposits could have reduced

this effect, as the implied increases in deposits and payments presented problems for some potential first-time buyers. Estimates suggest that in fact a smaller proportion of newly-forming households has been able to afford to enter owner-occupation than during the last house-price cycle.[2] It is likely that this has been due to the weak response of supply to demand arising both from strong household formation, and, to an uncertain but probably lesser extent, from increased investment demand.

Outlook for house prices and consumption

The many uncertainties surrounding the various possible explanations for the recent strength of house prices mean that the present equilibrium value of house prices is also highly uncertain. According to this analysis, over the next two or three years, the main factors affecting prices are likely to be movements in short-term interest rates, or in long-term real rates (where the reasons for the recent fall are not clear), and changes in perception of the relative investment potential of housing. (Changes in supply may be important over the longer term, but it is highly unlikely that the rate of new supply could be increased sufficiently in the short term to make a significant impact. The prospect of improved supply responsiveness might however have some impact in the short term if changes in the longer-term price trend are fully anticipated.)

So it remains unclear if the level of UK house prices is at or above equilibrium today, and, if above, how far. The MPC's central assumption in the November *Inflation Report* was that house prices might fall modestly for a period. But this remains only one of a wide range of possibilities, especially given the potential of asset prices to experience significant, and sometimes prolonged, overshooting of fundamental values in either direction.

The remaining key issue is the response of consumption, and perhaps the economy more widely, to developments in the housing market. The above analysis suggests that the explanations for the price upswing do not lie in an over-optimistic view about future consumer income growth (which led to the past correlation between house prices and consumption), but rather in a combination of factors related to changes in the financial market and in the housing market itself. This supports the argument

(1) *Inflation Report*, November 2004, Bank of England.
(2) Bramley (2003).

that there may be a lesser impact on consumption from declining house prices than appeared to be the case in the past, when sharply rising unemployment led to a reassessment of consumers' income prospects, and a fall in house prices.

One potential challenge to this view is that the impact on consumption is rather greater in the event of house price falls than for increases. There are some possible reasons why this might be the case. For example, there is a risk that increased concerns about the future course of house prices could lead to a sharp tightening of lending criteria by financial institutions.

Further, if the argument that housing is increasingly being used as an investment vehicle has some substance, there is scope for a greater reaction of consumption, other things (primarily changes in equity prices in this case) being equal. This would suggest that, having not raised consumption in response to rising housing equity, households will nevertheless consume less as prices decline, due to concern over the implied fall in the value of their savings. While, as discussed above, the evidence on how far housing has been used as a savings vehicle in recent years is not clear-cut, there is some risk that this mechanism could generate a negative wealth effect in these circumstances. This would be different from previous UK experience, where it has more normally been found that simple wealth effects from house prices on consumption cannot be consistently identified.[1] (There is, however, a potential offset to this. If it is correct to argue that first-time buyers are saving more for deposits, and there is some tentative evidence from the Family Expenditure Survey that the consumption ratio of renters under 35 has fallen in recent years relative to other groups, then for this group consumption might increase if house prices fell.)

However, other potential downsides seem less likely to occur. Widespread negative equity might be expected to result in a sharp decline in labour mobility, but with lower loan to value ratios than at the previous market peak, only a major fall in nominal prices would result in significant negative equity.

It might also be possible that the impact of (rather more nebulous) consumer confidence effects might be greater for falling prices. The fact that there has been no evidence of surprisingly weak consumption, or any fall in consumer confidence itself (Chart 3) in recent months is

Chart 3
Consumer confidence(a)(b)
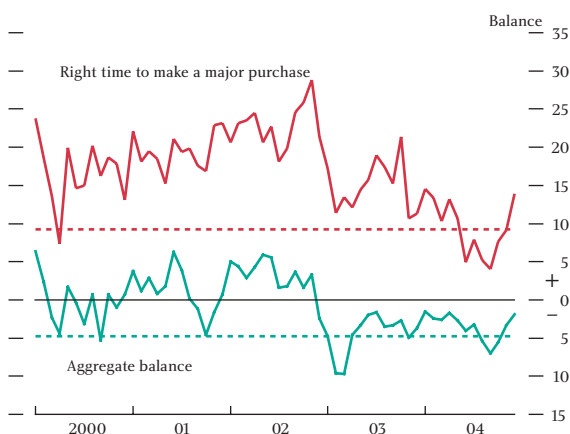
Source: Martin Hamblin GfK.

(a) Dashed lines indicate averages of series from 1988.
(b) These data have been seasonally adjusted. See box in Berry, S and Davey, M (2004), 'How should we think about consumer confidence?', *Bank of England Quarterly Bulletin*, Autumn, pages 282–90.

not conclusive either way in this debate, as there has not yet been any significant nominal declines in house prices overall.

Conclusions

The importance of housing could hardly be overstated: it is a necessity — good housing is vital to individuals' prospects for health and even education. It is a major factor in household balance sheets, an important economic sector and one which raises significant environmental concerns. It has many links to the wider economy, affecting the overall supply capacity and the success of regional and local economies. In these remarks it has only been possible to focus on some aspects of the broad canvas offered by the title.

Both in the long run and the short run there are reasons for policy interest. The Government has rightly recognised the importance of tackling house-price volatility and the issue of inadequate housing supply. However, the measures now being proposed are aimed at reducing future volatility in the market, not at dealing with the consequences of the present cycle.

From the standpoint of the MPC, the questions raised are rather different. In previous speeches I and other MPC members have set out why it is generally undesirable to target asset prices when setting interest rates — particular reasons being the wide range of uncertainty around the equilibrium for any asset price,

(1) For example, see Miles (1997).

and the dangers to credibility of diverting policy from the goal of achieving the Government's inflation target.

Nevertheless, the outlook for house prices and its potential effect on household consumption (and therefore demand pressures and inflation) remains one of the major issues confronting the MPC at the present time. I have argued that there are a number of factors which could have contributed to the rise in house prices in recent years; falls in short-term interest rates, lower long-term real rates, constrained housing supply and increased investment demand. Pretending to have any degree of confidence in predicting asset prices is notoriously foolish. But in view of the evidence on affordability, and the balance of arguments about overvaluation, the likelihood of some decline in house prices, at least relative to earnings, seems now to be much greater than that of a further significant increase. There is however a plausible case to be made that this will be associated with less downward pressure on consumption than appeared to have been the case in previous cycles, even when possible asymmetries have been considered.

But to go back to where I started, the housing market is far from being the dominant issue. It is perhaps not even the most important asset price, in the light of the significant decline in the dollar's effective rate in the fourth quarter of last year. And it is in some sense easier to react to. Past experience suggests that house-price movements in one direction over a quarter

are more often than not followed by a further change in the same direction. So it can be clearer how account should be taken of news in this series, whereas exchange rate changes are likely to contain more noise (Chart 4).

Chart 4
Quarterly asset price changes
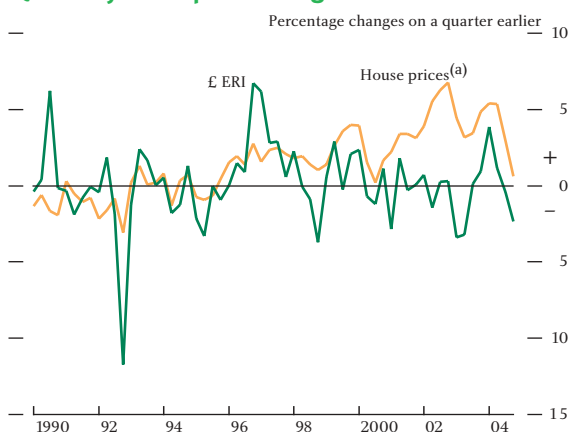
Sources: Bank of England, Halifax and Nationwide.

(a) The average of the Halifax and Nationwide indices.

In considering the MPC's decisions over the coming months, it is vital to remember that our decisions are affected, as always, by a wide range of factors. In particular, I am interested in understanding better the factors behind, and the possible significance of, the recent improvement in private sector productivity. House prices may be one indicator, but there are many other questions, puzzles and surprises which are also likely to pre-occupy us.

Appendix
Pricing houses using an asset price formula

The relationship between equilibrium real house prices and the discounted present value of the real expected future pay-off on housing can be written as:

$$P_h = D/(r_f + \rho - g)$$

where P_h is the real price of houses, D is the real pay-off on housing, r_f is the real risk-free interest rate, ρ is the risk premium on housing and g is the expected growth rate of real housing dividends. Assuming that the real pay-off on housing grows in line with real wages implies that this formula can also be used to look at the house price to earnings ratio. It can be seen from this that a fall in the real risk-free rate will lead to an increase in the equilibrium house price to earnings ratio. For example the discussion in Nickell (2004) shows that if g is 2% and the long-run risk premium averages 3%, then a fall in the real risk-free interest rate from 4% to 2% would imply that the equilibrium real house price to earnings ratio should rise by roughly 67%.

Although illustrative of the sort of mechanisms that may exist in the housing market, this is clearly a simplified framework. Weeken (2004) discusses the theoretical limitations of the model in more detail. These limitations arise among other things from: the lumpiness of housing, which makes it difficult to make small adjustments to a housing portfolio; limitations on people's ability to take advantage of arbitrage opportunities, for example because of borrowing constraints; and taxes and regulation which create a wedge between the post-tax returns on property and other investments such as shares. Planning restrictions and the slow response of the housing stock to demand mean that returns on housing investment may exceed the cost of finance for considerable periods of time; see Weeken (2004) on this point.

Therefore although the formula is useful as an illustration of the possible mechanisms at work in the market, in practice the calculated level of house prices to earnings from the formula should not be treated as an exact measure of equilibrium. This is true not only because the theoretical assumptions may be violated, but also because of the difficulties of precisely measuring the data (such as the real pay-off on housing and the housing risk premium) used in the formula; again see Weeken (2004).

The real pay-off on housing can be proxied by the real housing dividend or the amount of net rentals that is actually retained rather than being spent on new housing investment. Weeken (2004) cites evidence suggesting that historically the ratio of the housing dividend relative to net rentals has been close to one, so the difference between a formula based on the housing dividend and one based on net rentals will be small. Net rentals are given by rents after subtracting maintenance and management costs and the distinction is important because typically the difference between net and gross rental income can be large; see Weeken (2004).

The risk premium, ρ, will depend on the covariance between expected returns on housing and expected consumption growth and will reflect whether housing provides returns when it is needed most (in other words in bad times). The risk premium will therefore be positive if there is expected to be a strong positive correlation between housing returns and consumption growth. In contrast, if housing provided a degree of insurance against bad times, so returns on housing are expected to be strongest when consumption growth is expected to be low, then consumers would be prepared to pay a premium, so ρ would be negative.

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Bank of England speeches

Speeches made by Bank personnel since publication of the previous *Bulletin* are listed below.

A matter of no small interest: real short-term interest rates and inflation since the 1990s.
Speech by Marian Bell to The Institute of Directors and Milton Keynes Chamber of Commerce at Cranfield University on 2 March 2005. www.bankofengland.co.uk/speeches/speech241.pdf.

Monetary policy, stability and structural change.
Speech by Paul Tucker at the Confederation of British Industry in Guildford on 1 March 2005.
www.bankofengland.co.uk/speeches/speech240.pdf.

Why monetary stability matters to Merseyside.
Speech by Rachel Lomax at the launch of the Merseyside Economic Review 2005 in Liverpool on 24 February 2005.
www.bankofengland.co.uk/speeches/speech239.pdf. Reproduced on pages 77–79 of this *Bulletin*.

Monetary policy in an uncertain world.
Speech by Charles Bean at the Oxonia Distinguished Speaker seminar in Oxford on 22 February 2005.
www.bankofengland.co.uk/speeches/speech238.pdf. Reproduced on pages 80–91 of this *Bulletin*.

The International Monetary System.
Speech by Mervyn King, Governor, at the Advancing Enterprise 2005 Conference in London on 4 February 2005.
www.bankofengland.co.uk/speeches/speech237.pdf. Reproduced on pages 75–76 of this *Bulletin*.

Why has inflation been so low since 1999?
Paper by Stephen Nickell given on 27 January 2005. www.bankofengland.co.uk/publications/sninflation050127.pdf.
Reproduced on pages 92–107 of this *Bulletin*.

The housing market and the wider economy.
Speech by Kate Barker at The Institute for Economic Affairs, State of the Economy Conference in London on 24 January 2005.
www.bankofengland.co.uk/speeches/speech236.pdf. Reproduced on pages 108–16 of this *Bulletin*.

The Governor's speech to the CBI Dinner in Manchester.
Speech by Mervyn King, on 20 January 2005. www.bankofengland.co.uk/speeches/speech235.pdf. Reproduced on pages 72–74 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/qbcontents/index.html.

Articles and speeches (indicated S)

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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.

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No.	Title	Author
220	Does job insecurity affect household consumption? *(May 2004)*	Andrew Benito
221	Female labour force participation in the United Kingdom: evolving characteristics or changing behaviour? *(May 2004)*	Maria Gutiérrez-Domènech Brian Bell
222	The roles of expected profitability, Tobin's Q and cash flow in econometric models of company investment *(June 2004)*	Stephen Bond Alexander Klemm Rain Newton-Smith Murtaza Syed Gertjan Vlieghe
223	Real exchange rates and the relative prices of non-traded and traded goods: an empirical analysis *(June 2004)*	Jan J J Groen Clare Lombardelli
224	The informational content of empirical measures of real interest rate and output gaps for the United Kingdom *(July 2004)*	Jens D J Larsen Jack McKeown
225	Exploring the relationship between credit spreads and default probabilities *(July 2004)*	Mark J Manning
226	Corporate capital structure in the United Kingdom: determinants and adjustments *(July 2004)*	Philip Bunn Garry Young
227	The Phillips curve under state-dependent pricing *(July 2004)*	Hasan Bakhshi Hashmat Khan Barbara Rudolf
228	The UK labour force participation rate: business cycle and trend influences *(August 2004)*	Mark Schweitzer David Tinsley
229	On the resolution of banking crises: theory and evidence *(August 2004)*	Glenn Hoggarth Jack Reidhill Peter Sinclair
230	Financial interlinkages in the United Kingdom's interbank market and the risk of contagion *(September 2004)*	Simon Wells
231	Real exchange rate persistence and systematic monetary policy behaviour *(October 2004)*	Jan J J Groen Akito Matsumoto
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 David Vines
234	Intertemporal substitution and household production in labour supply *(October 2004)*	Guillermo Felices David Tinsley
235	Rule-based monetary policy under central bank learning *(October 2004)*	Kosuke Aoki Kalin Nikolov
236	The effects of stock market movements on consumption and investment: does the shock matter? *(October 2004)*	Stephen Millard John Power
237	Forecasting with measurement errors in dynamic models *(November 2004)*	Richard Harrison George Kapetanios Tony Yates

238	Estimating time-variation in measurement error from data revisions; an application to forecasting in dynamic models *(November 2004)*	George Kapetanios 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 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 Anne Vila Wetherilt
242	Core inflation: a critical guide *(November 2004)*	Alan Mankikar Jo Paisley
243	Long-term interest rates, wealth and consumption *(November 2004)*	Roy Cromb Emilio Fernandez-Corugedo
244	Long-horizon equity return predictability: some new evidence for the United Kingdom *(November 2004)*	Anne Vila Wetherilt Simon Wells
245	Horizontal and vertical integration in securities trading and settlement *(November 2004)*	Jens Tapking Jing Yang
246	Competitiveness, inflation, and monetary policy *(January 2005)*	Hashmat Khan Richhild Moessner
247	The exposure of international bank loans to third-country risk: an empirical analysis of overdue claims *(January 2005)*	Drew Dahl Andrew Logan
248	Concepts of equilibrium exchange rates *(January 2005)*	Rebecca L Driver Peter F Westaway
249	Optimal collective action clause thresholds *(February 2005)*	Andrew G Haldane Adrian Penalver Victoria Saporta Hyun Song Shin
250	Asset price based estimates of sterling exchange rate risk premia *(February 2005)*	Jan J J Groen Ravi Balakrishnan
251	The stock market and capital accumulation: an application to UK data *(February 2005)*	Demetrios Eliades 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 Nikolaos Panigirtzoglou
254	On the consumption-real exchange rate anomaly *(March 2005)*	Gianluca Benigno Christoph Thoenissen

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/mpc/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 Brian Jackson 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 Edward Nelson
12	Measuring the UK short-run NAIRU *(April 2003)*	Nicoletta Batini Jennifer Greenslade
13	UK consumers' habits *(May 2003)*	Ryan Banerjee Nicoletta Batini

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/mfsd/latest.htm.

Further details are available from: Mark Thompson, Monetary and Financial Statistics Division, Bank of England: telephone 020 7601 5358; 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/mfsd/current/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 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/fsr/index.htm.

Economic models at the Bank of England

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