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Winter 2004

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Quarterly Bulletin—Winter 2004

Markets and operations
(pages 401–13)

This article reviews developments since the Autumn 2004 *Quarterly Bulletin* in sterling financial markets, UK market structure and the Bank's official operations.

Research and analysis
(pages 414–69)

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.

British household indebtedness and financial stress: a household-level picture (by Orla May, Merxe Tudela and Garry Young of the Bank's MacroPrudential Risks Division). This article summarises the main results of a survey carried out for the Bank in September 2004 about household borrowing, housing wealth and attitudes to debt. The survey was designed to provide a comprehensive, up-to-date picture of household indebtedness. It found significant differences between homeowners and renters: renters are more likely to have debt problems, but their share of total household debt is small. The vast majority of debt is owed by homeowners, very few of whom (by historical standards) show signs of having problems at present. While 40% of total outstanding household debt is owed by those spending more than a quarter of their gross income on servicing their debts, the share of debt owed by those currently with debt problems is lower than a decade ago.

The new sterling ERI (by Birone Lynch and Simon Whitaker of the Bank's Structural Economic Analysis Division). This article explains proposals for a new sterling trade-weighted effective exchange rate index. The existing index is based on trade patterns in manufactured goods in 1989–91. The proposed new index would reflect more recent trade patterns, incorporate services trade and a broader set of countries, including those in Asia. We are inviting comments on the proposed method with a view to publishing the new index on a regular basis from Spring 2005.

Using option prices to measure financial market views about balances of risk to future asset prices (by Damien Lynch and Nikolaos Panigirtzoglou of the Bank's Monetary Instruments and Markets Division and George Kapetanios of the Bank's Conjunctural Assessment and Projections Division). Probability density functions (pdfs), implied by prices of traded options, are often used by the Bank to examine financial market expectations about future levels of different asset prices. This article examines how information about one aspect of such expectations — views on balances of risk — for future asset prices may be inferred from the degree of asymmetry of an implied pdf. We first look at the general issue of choosing a statistic to summarise the degree of asymmetry of any pdf. The choice of units when measuring changes in the underlying asset price is then considered. Finally, we examine empirically the implications of using various asymmetry measures when relating the information from option-implied pdfs to market views about balances of risk to future asset prices.

Reports
(pages 470–94)

The foreign exchange and over-the-counter derivatives markets in the United Kingdom (by Peter Williams of the Bank's Monetary and Financial Statistics Division). In April this year, the Bank of England conducted the three-yearly survey of turnover in the UK foreign exchange and over-the-counter (OTC) currency and interest rate derivatives markets, as part of the latest worldwide survey co-ordinated by the Bank for International Settlements (BIS). The results show that the volume of foreign exchange activity in the United Kingdom has increased by nearly 50% since April 2001. Turnover in OTC derivatives has more than doubled in the same period. This article presents the main results of the UK survey and highlights the effects of developments in foreign exchange and OTC derivatives markets on volumes of activity. It also provides detailed breakdowns of UK survey data and a comparison with global survey results.

The external balance sheet of the United Kingdom: recent developments (by John Elliott and Erica Wong Min of the Bank's Monetary and Financial Statistics Division). The United Kingdom's external balance sheet currently records assets and liabilities of more than £3.5 trillion. Both sides of the external balance sheet grew sharply during 2003, continuing the marked expansion that has been recorded since the early 1990s. This article examines recent trends within the balance sheet components with reference to the associated financial flows and income. There is a particular focus on data reported by monetary financial institutions. The article discusses some of the problems involved in compiling an external balance sheet, examining two key issues through the estimation of a breakdown of revaluations to outstanding stocks and a discussion of foreign direct investment data. We also report on current domestic and international initiatives aimed at further improving the quality of external statistics.

Markets and operations

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

- *Short-term nominal interest rates fell, reflecting falls in both implied inflation expectations and real interest rates. In effective terms, sterling depreciated.*
- *Real interest rates also fell in other countries, notably in the euro area and the United States. This could be consistent with financial market participants having perceived weaker near-term global economic activity.*
- *However, UK (and global) equity prices increased over the review period. Some of this increase may have reflected lower real interest rates, but such a marked increase is difficult to reconcile with investors having perceived weaker economic activity and commodity price pressures having remained strong.*
- *Longer-term market-based measures of inflation expectations remained well anchored in line with the Monetary Policy Committee's target of 2.0% for CPI inflation.*
- *The Bank of England issued a second consultative paper on fundamental reform of its operations in the sterling money markets. The paper set out detailed proposals for the new framework.*

Short-term sterling market interest rates have fallen since the Autumn *Quarterly Bulletin* (Table A). Such declines could have occurred in response to global factors — for example, a slowing of world activity in the wake of persistently high oil prices. Weaker-than-expected outturns for output growth in the third quarter in a number of countries may have increased market participants' perceptions that the recent slowdown in the global recovery might persist for longer than previously thought. At the same time, domestic factors also seem to have played a part — some of the biggest falls in short-term sterling interest rates followed UK-specific data releases. For example, investors in sterling assets may have revised downwards their expectations for domestic consumption growth as a result of data showing a slowdown in the UK housing market.

Table A
Summary of changes in market prices

	3 Sep.	26 Nov.	*Change*
Three-month sterling Libor (per cent)			
December 2004	5.10	4.85	*-25 bp*
June 2005	5.21	4.73	*-48 bp*
Sterling nominal forward rates (per cent)(a)			
Three-year	5.03	4.53	*-50 bp*
Ten-year	4.84	4.53	*-31 bp*
Equity indices			
FTSE 100	4551	4742	*4.2%*
FTSE All-Share	2256	2362	*4.7%*
Exchange rates			
Sterling effective exchange rate	103.4	101.8	*-1.5%*
€/£ exchange rate	1.47	1.43	*-3.1%*
$/£ exchange rate	1.78	1.89	*6.6%*

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 daily on the Bank of England's website at www.bankofengland.co.uk/statistics/yieldcurve/main.htm.

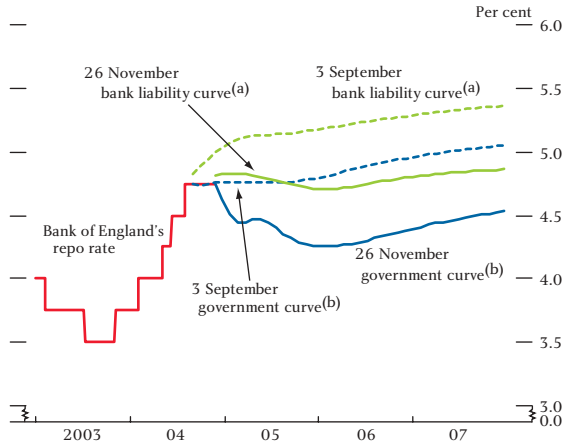
Short-term interest rates

The United Kingdom's Monetary Policy Committee (MPC) maintained the official repo rate at 4.75% over

(1) This article focuses on sterling markets. The reader is referred to 'Risks in the international financial system', Chapter 2 of the Bank of England's *Financial Stability Review* (December 2004) for a broader review of international financial markets. The period under review in this article is 3 September (the data cut-off for the previous *Quarterly Bulletin*) to 26 November.

the review period. Market participants revised downwards their views about the future path of sterling interest rates, with short-term forward rates falling by around 45 basis points at the one and two-year horizons (Chart 1).

Chart 1
Sterling official and forward market interest rates

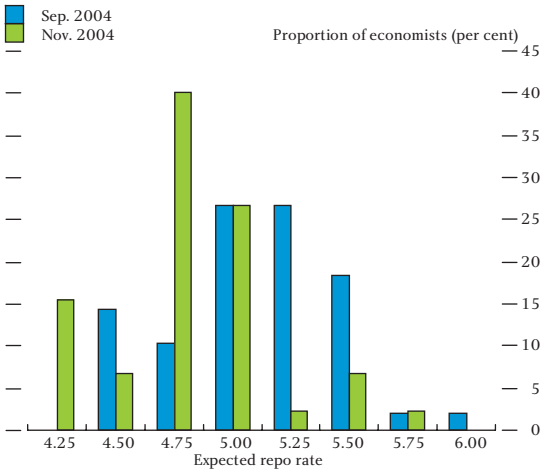


Sources: Bank of England, Bloomberg and LIFFE.

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

A downward revision to the path of expected short-term interest rates was also evident in survey data. According to a regular survey of UK economists' views conducted by Reuters, the mean expectation for interest rates at end-2005 fell from 5.10% at the time of the September poll to 4.81% in November.(1) Over the same period, the proportion of economists reported as expecting the policy rate to remain unchanged or decrease during 2005 had risen (Chart 2).

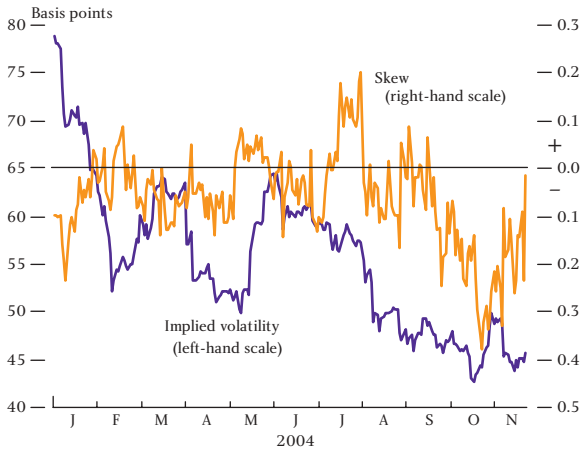
Chart 2
Economists' forecasts for the Bank of England repo rate at end-2005



Source: Reuters.

Information from options prices suggests that the perceived risks to near-term sterling interest rates returned to being broadly balanced, having been skewed to the downside for much of the review period (Chart 3). At the same time, implied volatility from interest rate options fell slightly, consistent with reduced uncertainty surrounding market participants' expectations of the future path of short-term interest rates.

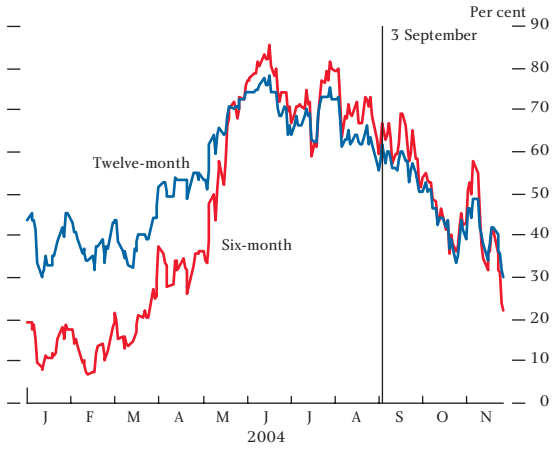
Chart 3
Six-month implied volatility and skew from sterling interest rate options



Sources: Bank of England and LIFFE.

The combined effect of the fall in the implied path of short rates and lower implied uncertainty suggests that, by the end of the period, the market attached a significantly lower probability to increases in policy rates over the coming year than had been the case during the middle of 2004 (Chart 4). Indeed, the forward curve implied by interbank liability rates inverted slightly at short horizons (Chart 1). This suggests that market participants perceived a higher probability of interest

Chart 4
Risk-neutral probability that three-month Libor will lie at or above 5% at different horizons



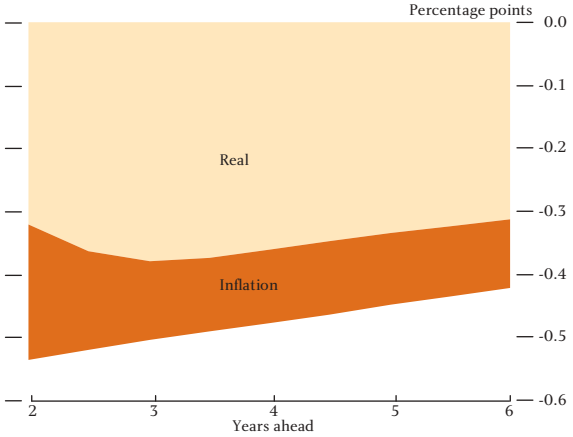
Sources: Bank of England and LIFFE.

(1) The September Reuters poll was conducted between 31 August and 2 September; the November survey was conducted between 26 and 28 October.

rate reductions during 2005 than had been the case at the time of the previous *Quarterly Bulletin*. The inversion was more pronounced in the Bank's government liability curve, but there are good reasons to believe that this curve does not provide a clear guide to near-term policy rate expectations at the current time (see the box on pages 404–05).

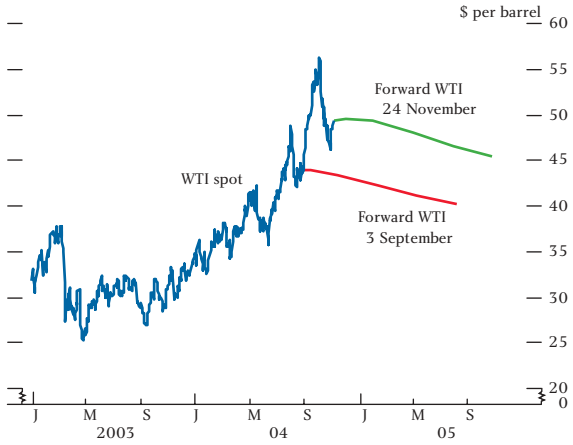
The fall in sterling nominal forward rates can be decomposed into its real and inflation components using yields on index-linked gilts. Chart 5 shows that some of the falls appear to be attributable to lower inflation expectations and/or inflation risk premia. This occurred despite the further increases in oil prices over the review period (Chart 6).

Chart 5
Changes in sterling forward rates since 3 September



Source: Bank of England.

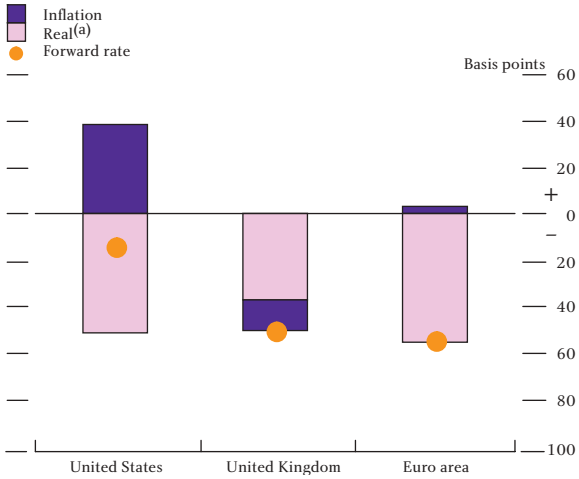
Chart 6
Crude oil spot and forward prices



Sources: Bank of England and Bloomberg.

The decline in nominal sterling forward rates also reflected falls in real interest rates. Part of the fall could be attributed to global factors. Chart 7 decomposes the recent changes in three-year dollar and euro nominal forward rates into their inflation and real components. The euro decomposition is based on data from the growing inflation swaps market; the dollar decomposition is based on information from the market for US Treasury Inflation-Protected Securities (TIPS).(1)

Chart 7
Changes in three-year forward rates since 3 September



Sources: Bank of England and Bloomberg.

(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.

As in the United Kingdom, real forward rates also fell in the euro area. US real rates were also lower than at the time of the Autumn *Quarterly Bulletin*, although they picked up a little towards the end of the review period. Overall, these developments would be consistent with financial market participants having perceived a prospective weakening in global economic activity, possibly related to the persistently high level of oil prices. Rising oil prices create upward pressures on costs and prices in net oil-importing countries, which would tend to reduce real incomes and profits, thereby reducing aggregate demand in those countries. And any increase in demand in net oil-exporting countries would be unlikely to offset fully the negative impact on world activity. Increased uncertainty about the future economic outlook arising from higher energy costs might also discourage spending by households and firms.

Initial estimates of GDP growth in the United Kingdom, the United States and the euro area for 2004 Q3 were

(1) It is difficult to make precise international comparisons of inflation and real interest rate expectations embodied in bond yields. This is because country-specific features are likely to be important influences on the derived series for real and inflation forward rates. For more details see 'Markets and operations' (2004), *Bank of England Quarterly Bulletin*, Summer, pages 124–25.

Market-based measures of interest rate expectations

The Bank uses market interest rates to gauge market participants' expectations of the path of future official interest rates. There is no single traded instrument that corresponds exactly to expected future MPC repo rates. So the Bank uses forward rates from a range of different instruments that are traded.

One difficulty in inferring market expectations of official interest rates is that there are a number of factors that may drive a wedge between forward rates and underlying expectations of the path of policy rates.(1) One factor is the term premium, which may arise to compensate risk-averse lenders or borrowers for the uncertainty surrounding future interest rates. Other factors include differences in credit premia, liquidity and contract specification, which can lead to spreads between implied forward rates from different instruments.(2)

Forward rates estimated from gilt general collateral (GC) repo rates should provide the closest read on expectations of the Bank's repo rate because the Bank lends via reverse repo of high quality government bonds in its sterling money market operations.(3) But GC repo rates are available only at maturities of up to one year, so the Bank combines these rates with those implied by conventional gilts to estimate a forward curve, the Bank's 'government liability yield curve'.(4)

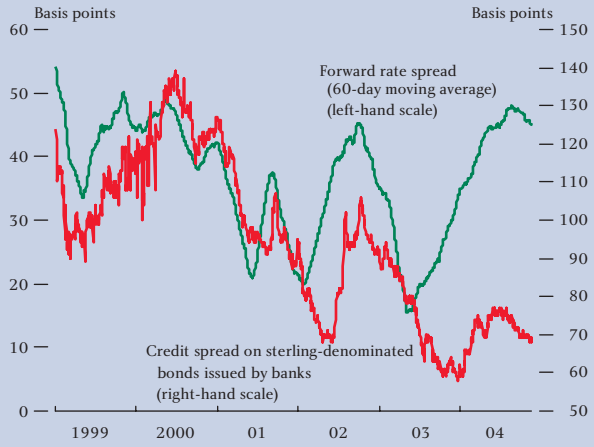
The Bank also estimates a forward curve using rates implied by various money market instruments that settle on Libor (such as short sterling futures, forward rate agreements and swaps), the Bank's 'bank liability curve' (BLC). But Libor is an interbank rate and, as such, it contains a premium reflecting the credit risk of the financial institutions that contribute to the daily Libor fixing.(5) This credit premium means that the forward rates implied by the Bank's BLC tend to lie above expectations of the policy rate, and the size of the premium is unlikely to be constant through time or across maturities.

Comparing alternative measures

Chart 1 in the main text shows that, on 26 November, the shape of the forward curve implied by government liabilities was different from that implied by interbank liabilities. In particular, the government curve suggested a forward rate of around 4.25% at end-2005, some 45 basis points below the forward rate implied by the BLC curve.(6)

To help understand whether the size of this gap is unusual, Chart A plots the spread between the two-week interest rate, one year forward, implied by the BLC and the government liability curve. It shows that the gap has been widening since mid-2003, although it currently remains below levels prevailing occasionally in the past.

Chart A
Spread between one-year forward rates implied by interbank liability and government liabilities versus credit spreads on sterling-denominated bonds issued by banks



Sources: Bank of England and Merrill Lynch.

In theory, one possible explanation for this widening gap could be that the credit standing of UK financial institutions has deteriorated. But alternative measures do not bear this out. For example, the credit spreads on sterling-denominated bonds issued

(1) For more information on term premia, see Peacock, C (2004), 'Deriving a market-based measure of interest rate expectations', *Bank of England Quarterly Bulletin*, Summer, pages 142–52.
(2) For more details, see Brooke, M, Cooper, N and Scholtes, C (2000), 'Inferring market interest rate expectations from money market rates', *Bank of England Quarterly Bulletin*, November, pages 392–402.
(3) Differences in contract specification between Bank and GC repo agreements mean that GC repo rates tend to be slightly lower than the Bank's repo rate, see Brooke, M *et al* (2000), *op cit*.
(4) Estimates of the UK yield curves are published daily on the Bank of England's website at www.bankofengland.co.uk/statistics/yieldcurve/main.htm.
(5) The British Bankers' Association calculates a daily fixing for sterling Libor based on quoted interbank rates from a panel of 16 banks.
(6) The projections published in the November *Inflation Report* were based on the Bank's BLC, with an adjustment to account for the credit premium.

by commercial banks have not increased markedly since early 2003 (Chart A).[7] Furthermore, at very short maturities, GC repo rates do not appear unusually low relative to Libor, consistent with no significant credit developments.

According to market contacts, a more likely explanation is that high demand for short-dated gilts has pushed up the price (thereby reducing the yield) on these instruments. Much of this demand has come from institutional investors, such as pension funds, whose benchmark investment portfolios require them to hold a certain amount of short-dated assets that are free from credit risk. These investors tend to hold the gilts until maturity. Compounding the price effects of high demand, low gilt issuance a few years ago means there are currently relatively few gilts available with maturities of less than two years.

Are low short-dated gilt yields likely to persist?

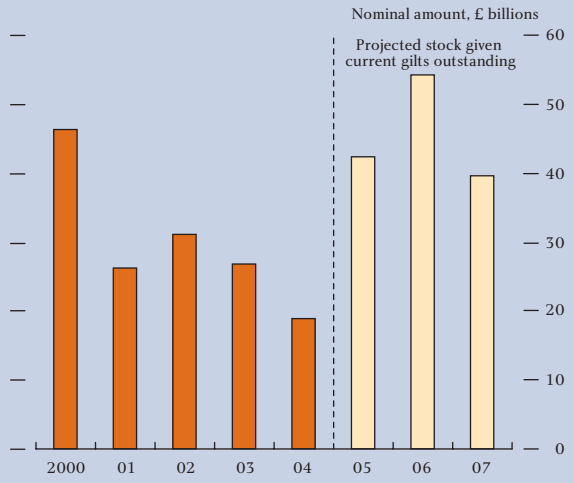
Not all short-dated gilts are being held to maturity by institutional investors. This suggests that bond traders could make positive returns by short-selling expensive gilts that are being actively traded. The usual way a bond trader would execute such a strategy would be to borrow the expensive gilt in the repo market and sell it, expecting to buy it back for a lower price at maturity of the repo agreement.

High demand to short-sell a specific gilt stock can push the cost of borrowing it significantly above the cost of borrowing gilts in general (in the GC repo market). When repo rates on a specific gilt fall significantly below GC repo rates in this way, the gilt is said to be trading 'special' in the repo market.[8] Contacts suggest that repo rates for certain short-dated gilts (for borrowing periods longer than overnight) have been well below equivalent GC repo rates, ie these gilts have been trading 'special'. This increases the cost to dealers of shorting these gilts by reducing the interest earned on the cash leg of the repo trade. At the same time, from the point of view of the holder of the 'special' gilt, the opportunity to borrow cash at a reduced rate may compensate for the lower yield on the gilt.

One reason why the short-horizon forward rates implied by the Bank's government liability curve have recently been low relative to other measures of market expectations for the future path of interest rates is that the Bank's estimation technique takes gilt prices as given.[9] If the prices of a number of gilts around a specific maturity are affected by factors other than interest rate expectations, such as differences in the cost of financing them in the repo market, these factors will be reflected in the implied forward rates.

If institutional demand for short-dated gilts remains strong and bonds remain special in the repo market, yields on short-dated gilts may remain low. However, based on the current stock of outstanding gilts, the nominal value of gilts with less than two years to maturity is set to increase over the coming years, in turn increasing the available supply (Chart B).

Chart B
Stock of conventional gilts with less than two years to maturity[(a)(b)]



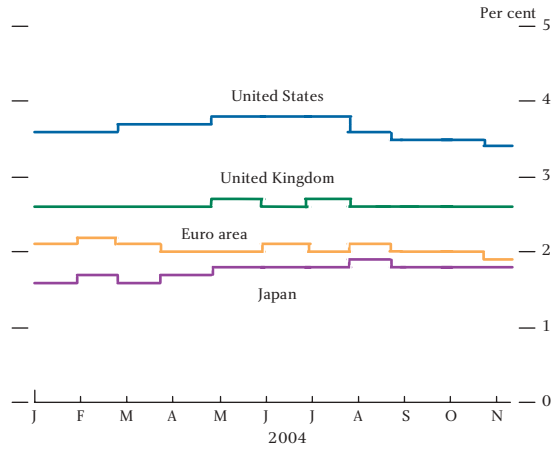
Source: DMO.

(a) Totals exclude issues where nominal amounts outstanding are less than £1 billion.
(b) Stocks outstanding at end-November of each year.

(7) The coverage of the credit spread index is wider than the 16 banks contributing to the Libor fixing. As a result, the comparison should be seen as purely indicative.
(8) For more information on bonds trading 'special' in repo markets, see 'Markets and operations' (2002), *Bank of England Quarterly Bulletin*, Winter, page 360.
(9) For more details, see Anderson, N and Sleath, J (1999), 'New estimates of the UK real and nominal yield curves', *Bank of England Quarterly Bulletin*, November, pages 384–92.

lower than had been expected by market participants. And Consensus forecasts for GDP growth in 2005 were revised down slightly for the United States and the euro area, although they remained largely unchanged for the United Kingdom (Chart 8).

Chart 8
Expected real GDP growth for 2005



Source: Consensus Economics.

But these global factors were not the only influence on short-term sterling interest rates. Indeed, some of the biggest falls followed UK-specific data releases, including the publication of the *Minutes* from the September and October meetings of the MPC, the publication of the November *Inflation Report* and data releases relating to the UK housing market.

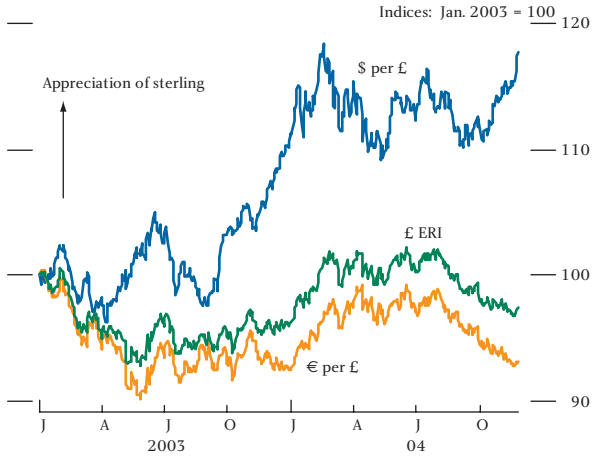
Even though the association between house prices and consumption may have been weaker over recent years than in the past,(1) financial market investors may nonetheless have placed weight on a sharp slowdown in the UK housing market adversely affecting future consumption growth.

Exchange rates

Lower sterling interest rates were accompanied by a 1.5% decline in the sterling effective exchange rate index (ERI) over the review period (Chart 9). Much of this decline was accounted for by a sterling depreciation against the euro.

Sterling's recent depreciation against the euro could be related to investors responding to a potential slowdown in the UK economy — sterling appeared to have fallen in response to indicators of weaker domestic demand. Market participants might also have become more

Chart 9
Sterling exchange rates



Sources: Bank of England and Bloomberg.

concerned about the sustainability of the UK trade deficit, which has averaged more than 3% of GDP during the first three quarters of 2004.

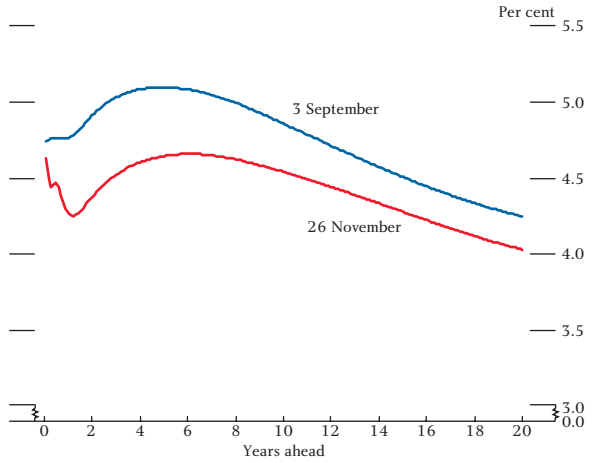
Sterling, along with other freely floating currencies, appreciated against the US dollar. The depreciation of the dollar seems to have reflected investors focusing on the long-run sustainability of the US current account deficit.

Longer-term interest rates

Further along the yield curve, sterling forward rates also fell, though the most pronounced falls were at short to medium horizons (Chart 10). At horizons between three and ten years, sterling forward rates fell by between 30 and 50 basis points.

Long-term inflation expectations have remained well anchored around the target rate. The forward-looking

Chart 10
Sterling nominal forward rates

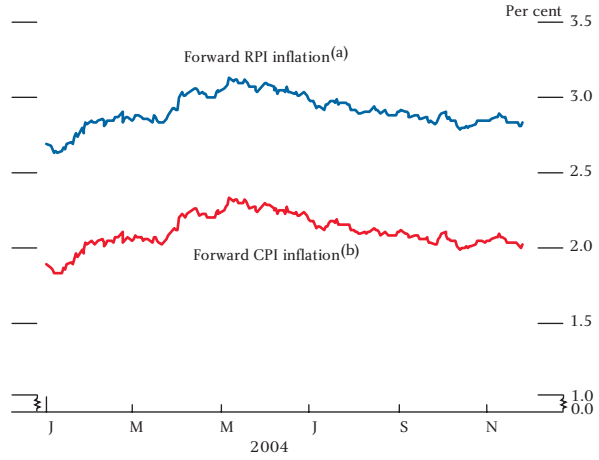


Source: Bank of England.

(1) This issue is discussed in the box 'House prices and consumer spending' in the November 2004 *Inflation Report*, pages 12–13.

measure of implied inflation, derived from the difference between yields on nominal and index-linked gilts, corresponds to changes in the UK RPI. Adjusting these implied inflation rates to derive an estimate closer to the CPI measure indicates that inflation expectations remained close to 2% (Chart 11).

Chart 11
Sterling ten-year forward inflation rates



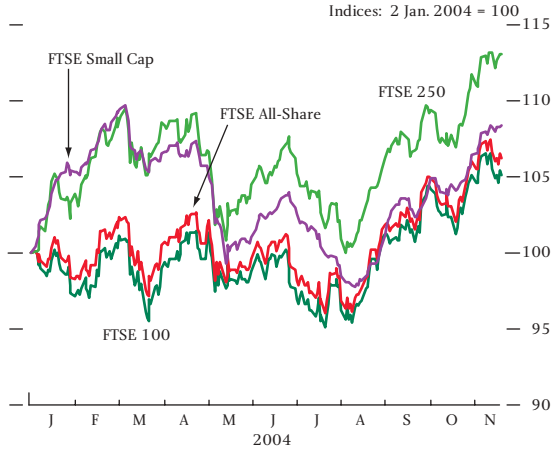
Source: Bank of England.

(a) Ten-year (instantaneous) forward RPI inflation rate derived from the difference between yields on conventional and index-linked gilts.
(b) Ten-year forward RPI inflation rate adjusted by average difference between RPI and CPI inflation outturns since 1989.

Equity markets

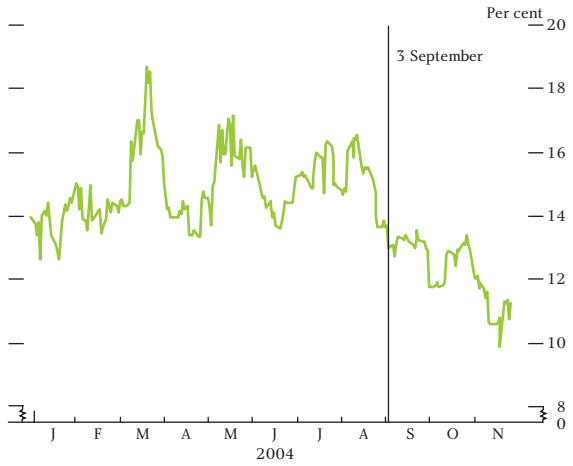
Equity prices increased over the period (Chart 12); the FTSE All-Share increased by 4.7%, at one point reaching its highest level since June 2002. This rise occurred against a backdrop of stronger international equities; in local-currency terms, the Euro Stoxx and S&P 500 rose by 6.3% and 6.2% respectively.

Chart 12
Selected domestic equity indices



Source: Bloomberg.

Chart 13
Six-month FTSE 100 implied volatility

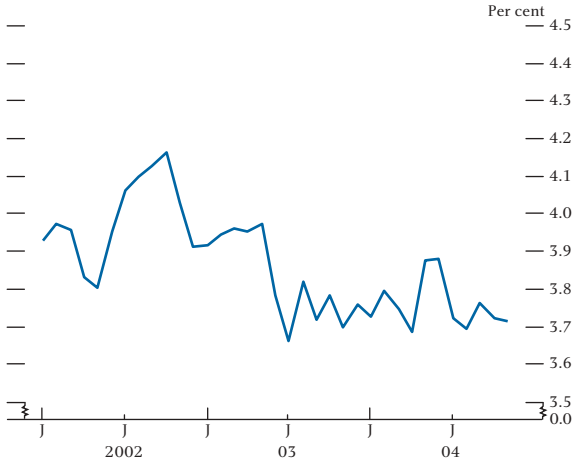


Source: Bank of England.

In principle, equity prices should reflect the discounted value of expected future earnings streams. So the rise in equity prices could be explained by an increase in expected future profit growth. But it is difficult to reconcile this with investors having perceived weaker prospective global activity and commodity price pressures having remained strong. Indeed, IBES survey data did not suggest any significant increase in expectations of long-term growth of earnings per share for FTSE 100 companies.

The rise in equity prices could also be consistent with lower real interest rates, which influence the rate at which investors discount expected future income streams. Alternatively, there may have been a fall in the equity risk premium. Over short horizons, information from options prices suggests that there was a decline in equity price uncertainty, as measured by implied volatility (Chart 13). This fall in expected volatility

Chart 14
Survey-based global equity risk premium(a)



Source: Merrill Lynch.

(a) Based on global survey of fund managers' views of appropriate risk premium with which to assess equity valuations.

might mean investors seeking to smooth their income required a lower risk premium.

The level of implied volatility, however, need not reflect changes in long-term equity risk premia which would affect the long-term discount rate. Indeed, evidence from survey data indicates that investors' perceptions of the appropriate equity risk premium changed little over the review period (Chart 14).

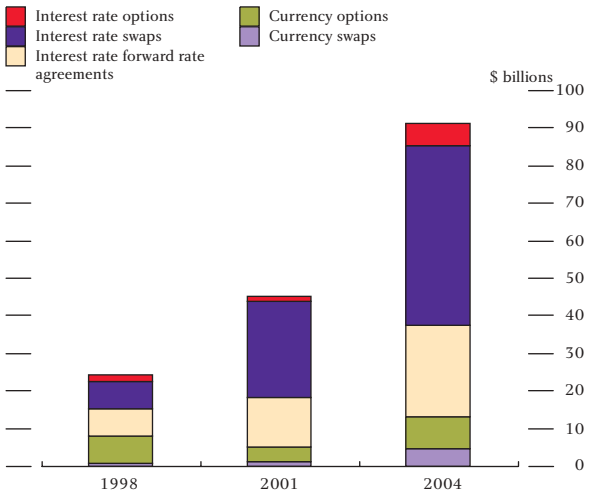
Developments in market structure

BIS survey of foreign exchange and derivatives: sterling markets

The 2004 triennial survey of foreign exchange and over-the-counter (OTC) interest rate and exchange rate derivatives markets showed that foreign exchange turnover involving sterling in the United Kingdom had risen by 71% (in US dollar terms) since the previous survey in 2001.(1) This increase occurred against the background of a 49% rise in total foreign exchange turnover in the United Kingdom. Sterling was involved in 28% of all transactions in the United Kingdom. Average daily turnover of spot transactions involving sterling increased by $17 billion, to $45 billion, and outright forward business rose by $9 billion. Sterling foreign exchange swaps turnover increased by $60 billion, accounting for 68% of foreign exchange activity involving sterling.

Turnover of OTC currency and interest rate derivatives in the United Kingdom more than doubled compared with the previous survey. Average daily turnover of currency swaps involving sterling increased by $3 billion. In percentage terms, this was a similar increase to that for dollar-denominated swaps, but lower than that for euro-denominated swaps. Average daily turnover of currency options involving sterling increased to $8 billion, from $4 billion in 2001, a rate of increase greater than for either dollar or euro options. Total turnover of sterling OTC interest rate derivatives rose by $38 billion, compared with $54 billion and $211 billion for dollar and euro-denominated instruments. Interest rate swaps and forward rate agreements (FRAs) were the main OTC derivative instruments; both have increased significantly over the past few years (Chart 15).

Chart 15
Average daily sterling over-the-counter derivatives turnover by transaction type



Source: Bank of England.

Trading in decimals in the sterling money markets

Following discussions at the Sterling Money Markets Liaison Group, participants at the very short end of the sterling money market (overnight to three-month maturity wholesale loans and deposits) have switched from trading and quoting market interest rates in fractions to trading on the basis of decimals (eg 4.75%).(2) At maturities beyond three months, market interest rates have been quoted in decimals for some time — the gilt market moved to quoting prices in decimals in 1998.

UK Debt Management Office consultation on ultra-long and annuity gilts

Following the Pre-Budget Report published on 2 December 2004, the UK Debt Management Office (DMO) issued a consultation paper seeking views on the possible introduction of:

- ultra-long (around 50-year) conventional and index-linked gilts; and
- ultra-long (around 50-year) conventional and index-linked annuity-type gilts.

Pension funds and life assurance companies had made requests for such instruments during informal consultations with the DMO during 2004.

(1) For a full review of the survey see Williams, P (2004), 'The foreign exchange and over-the-counter derivatives markets in the United Kingdom', in this *Bulletin*, pages 470–84.
(2) The Sterling Money Market Liaison Group provides a forum for the Bank to maintain regular contact with market practitioners. The minutes from the September meeting, where the switch to decimals was discussed, are available from the Bank's website at www.bankofengland.co.uk/markets/mmlgsep04.pdf.

Bank of England official operations

Changes in the Bank of England balance sheet

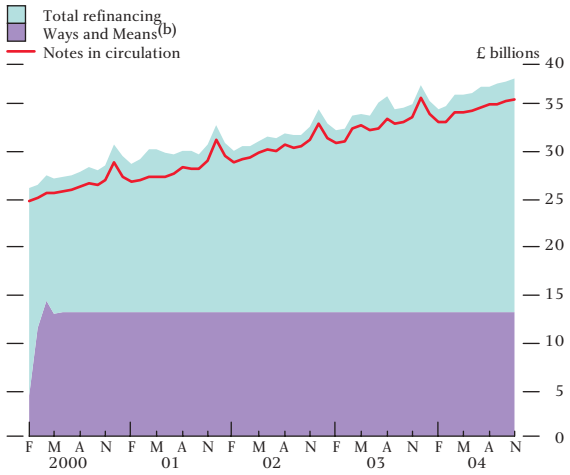
There was little change in the sterling value of the foreign-currency components of the Bank's balance sheet over the review period (Table B). The Bank maintained the value of its three and six-month euro-denominated bills outstanding at €3.6 billion by renewing maturing bills. The average indicative spread to Euribor of three-month issuance widened to 9.8 basis points below Euribor, compared with 8.7 basis points over the previous review period (June-August); for six-month bills, the average issuance spread was little changed at 10.1 basis points below Euribor.

The sterling components of the Bank's balance sheet also remained broadly unchanged. As described in the Autumn *Quarterly Bulletin*, the Bank has changed the way it manages its sterling bond portfolio. Gilt purchases were made on three occasions during the current quarter in accordance with the screen announcement made on 1 September 2004; £16 million of 5% Treasury 2014, £16 million of 4¾% Treasury 2015 and £16 million of 5% Treasury 2012. The screen announcement made on 2 December 2004 detailed purchases to be made in the coming quarter; £16 million of 5% Treasury 2014 and £16 million of 4¾% Treasury 2015.

Bank notes in circulation (the largest sterling liability on the Bank's balance sheet) grew steadily following seasonal effects over the August Bank Holiday period (Chart 16). The part of the stock of refinancing provided by short-term open market operations (OMOs) moved broadly in line with the level of notes in circulation.

The Bank lends against high quality sterling and euro-denominated debt both intraday, in its lending to settlement banks in the sterling RTGS system, and in its

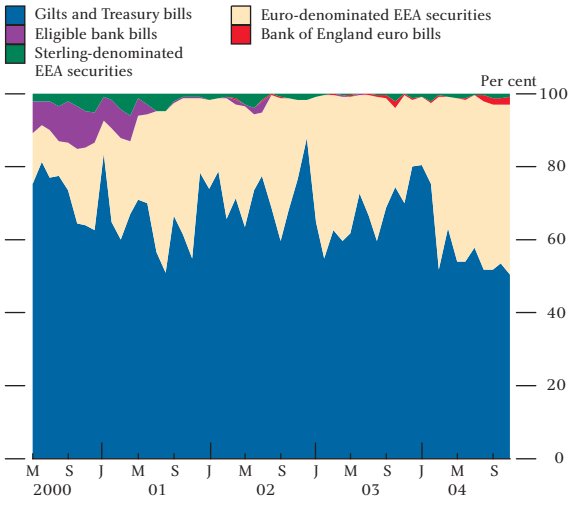
Chart 16
Bank notes in circulation, the stock of OMO refinancing, and 'Ways and Means'(a)



(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.

OMOs. Counterparties participating in the Bank's OMOs continued to make significant use of euro-denominated collateral; the proportion of euro-denominated collateral increased slightly (Chart 17), perhaps reflecting a fall in its relative cost

Chart 17
Instruments used as OMO collateral(a)



(a) Monthly averages.

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

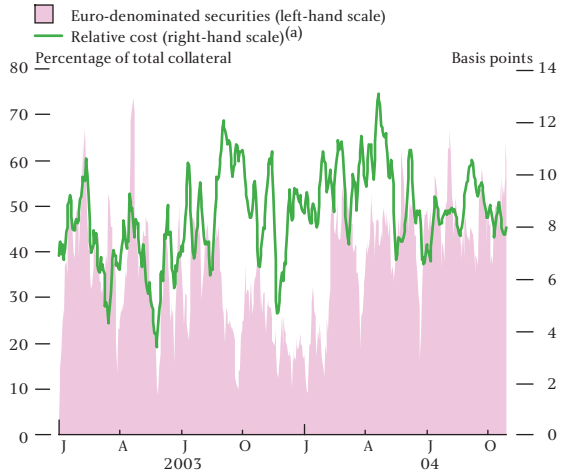
£ billions

Liabilities	26 Nov.	3 Sep.	Assets	26 Nov.	3 Sep.
Bank note issue	40	39	Stock of refinancing	28	27
Settlement bank balances	<0.1	<0.1	Ways and Means advance	13	13
Other sterling deposits, cash ratio deposits and the Bank of England's capital and reserves	8	8	Other sterling-denominated assets	5	4
Foreign currency denominated liabilities	13	11	Foreign currency denominated assets	14	14
Total(c)	**61**	**58**	**Total(c)**	**60**	**58**

(a) For accounting purposes the Bank of England's balance sheet is divided into two accounting entities: Issue Department and Banking Department. See 'Components of the Bank of England's balance sheet' (2003), *Bank of England Quarterly Bulletin*, Spring, page 18.
(b) Based on published weekly Bank Returns. The Bank also uses currency, foreign exchange and interest rate swaps to hedge and manage currency and non-sterling interest rate exposures — see the Bank's 2003 *Annual Report*, pages 53 and 73–79 for a description.
(c) Figures may not sum to totals due to rounding.

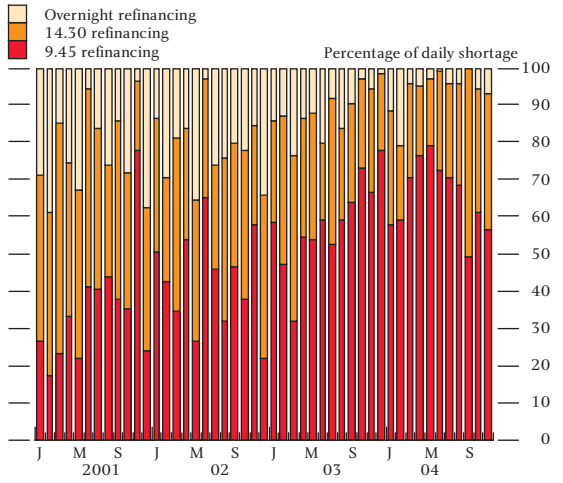
(Chart 18). The majority of OMO financing continued to be provided at the Bank's repo rate (at a two-week maturity) in the 9.45 and 14.30 rounds, rather than at a penalty interest rate in the overnight lending facilities (Chart 19).

Chart 18
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.

Chart 19
Refinancing provided in the Bank's open market operations(a)

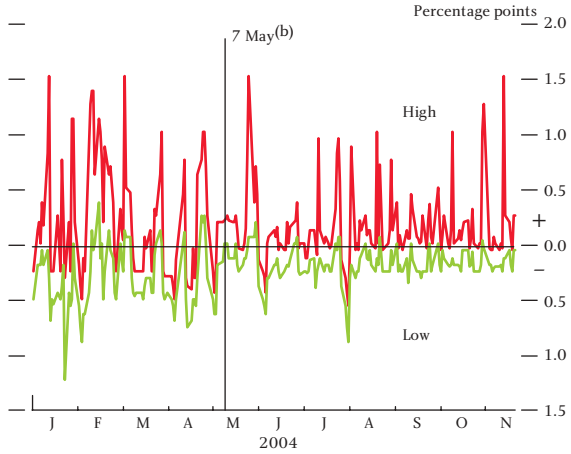


(a) Monthly averages.

Short-dated interest rates

The size of the spread between daily highs and lows in sterling overnight interest rates has tended to stabilise. Volatility in overnight interest rates has remained at the lower level prevailing since the Bank announced in May its objectives for reform of its operations in the sterling money markets (Chart 20). The Bank has since published a second consultative paper setting out the details of the proposed new system (see the box on page 411).

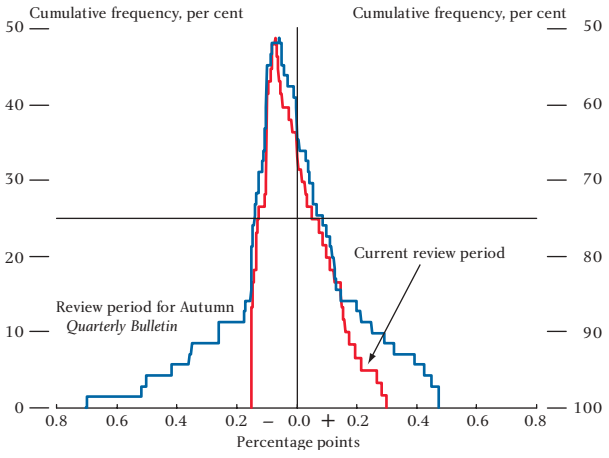
Chart 20
Volatility of sterling overnight interest rate(a)



(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.

Chart 21 shows that the distribution of the spread between the sterling secured (gilt GC repo) overnight rate and the official Bank repo rate has narrowed. This narrowing in part reflected the absence of significant rate pivoting ahead of meetings of the MPC. In contrast, pivoting had been significant ahead of the June and August meetings during the previous review period. 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*.

Chart 21
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.

At the same time, although the distribution of secured rates relative to the official rate was positively skewed, the size of the upper tail decreased, consistent with a

Second consultative paper on money market reform

In October 2003, the Governor announced a review of the Bank of England's operations in the sterling money markets. As part of this review, the Bank consulted extensively with market participants, and studied the operational frameworks of many overseas central banks. In July 2004, the Bank announced that it would adopt a new system, based on averaging of voluntary reserves, with a narrow interest rate 'corridor' formed by standing lending and deposit facilities on the final day of a maintenance period lasting from one scheduled MPC announcement date to another.

On 25 November 2004, the Bank issued a second consultative paper, setting out the new framework in detail, and inviting comments from interested parties.

The Bank believes that it is most likely to achieve its objectives, including primarily for sterling overnight rates to be in line with the MPC's repo rate, with a system in which:

- A wide range of banks and building societies hold reserves at the Bank and/or have access to the standing facilities.
- Aggregate reserve holdings across the banking system are sufficiently large and well distributed, helping to ensure that the averaging mechanism can work effectively to smooth out fluctuations in supply and demand in the money markets over the maintenance period, so that overnight market interest rates remain stable.
- The Bank's arrangements for refinancing the banking system work smoothly so that, in aggregate, the banking system as a whole expects to be — and *ex post* is — able to meet its reserve average target without needing to use the standing facilities, with overnight market interest rates therefore remaining stable and in line with the MPC's repo rate.

The November paper describes the proposed details of the new system, listing the firms that will be eligible to participate and describing the maintenance requirement, open market operations, standing facilities, and end-of-day arrangements. Among the features of the new framework are:

- Settlement banks will automatically become part of the averaging scheme, while all banks and building societies that are required to place cash ratio deposits at the Bank will be eligible to access remunerated reserves and the standing facilities.
- In order to ensure that aggregate reserves are not excessively high, and that reserves are widely distributed across the banking system, each participating bank will have a ceiling on its voluntary reserve target (the higher of a lump-sum or a fixed proportion of its sterling eligible liabilities).
- The Bank is minded to specify reserve targets as narrow bands rather than point targets, in order to absorb errors in the Bank's forecast of the banking system's net liquidity need on the final day of the maintenance period.
- Other than on the final day of the maintenance period, the Bank currently intends that the rates on the standing facilities will be at a spread of +/- 100 basis points to the prevailing repo rate.

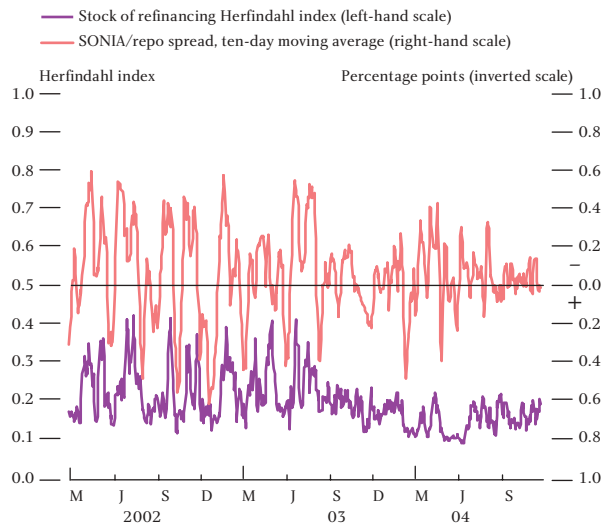
The paper seeks comments from interested parties on a number of specific issues. In the light of comments on this paper and continuing dialogue with market participants, the Bank will issue a further paper outlining its final plans and its timetable for implementation.

high provision of liquidity at the repo rate in the two-week rounds, as opposed to the penal overnight rounds.

Chart 22 shows the spread between the sterling overnight indexed average rate (SONIA) and the official repo rate, and a Herfindahl(1) index that measures the concentration of the stock of refinancing between counterparties. The chart shows that the SONIA/repo spread has narrowed over time and this may have encouraged participation in Bank operations, as evidenced by a decrease in the concentration in

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

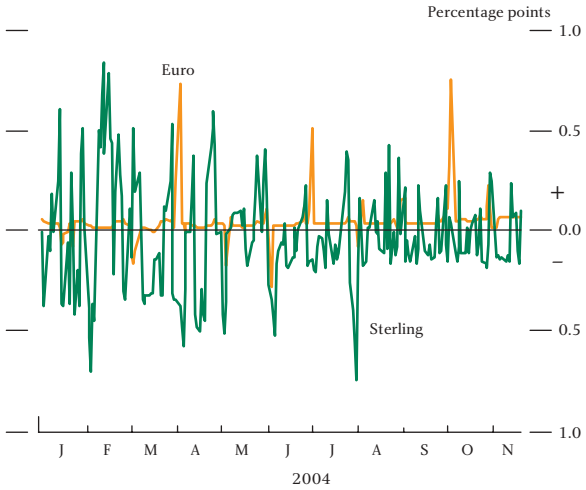
Chart 22
Stock of refinancing Herfindahl index and spread between SONIA and Bank repo rate



holdings of the stock of refinancing (ie more counterparties are participating in operations).

Over recent years, sterling overnight interest rates have tended to be more volatile than euro overnight rates, although this has become less pronounced over recent months. Chart 23 shows that the spread between SONIA and the Bank's official repo rate has exhibited fewer large spikes over recent months, excepting the instances of pivoting in June and August mentioned previously. The spread between the euro overnight index average (EONIA) and the European Central Bank's (ECB's) refinancing rate has remained stable — the relatively few spikes that occurred were generally at the end of the ECB's maintenance period.

Chart 23
Spread between overnight and official interest rates



Forecasting the liquidity shortage

During 2004 Q3, there was an improvement in the accuracy of the Bank's liquidity forecast, despite seasonal volatility attributable to the August Bank Holiday (Table C). During October and November the forecast errors were in line with those observed over previous quarters.

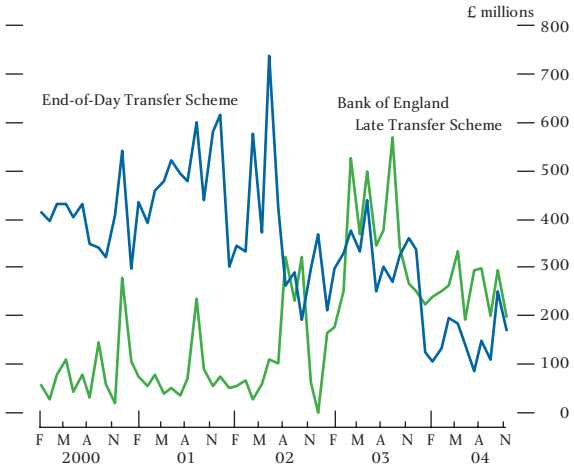
Table C
Intraday forecasts versus actual liquidity shortages

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)
Oct.-Nov. 2004	101 (114)	74 (86)	52 (63)

Flows in the end-of-day schemes for settlement banks were little changed, suggesting little change in settlement banks' forecasting accuracy. But average daily flows in the Bank of England Late Transfer Scheme (BELTS) fell during the period, as did the volatility of these flows. At the same time, both average flows and volatility increased a little in the End-of-Day Transfer Scheme (EoDTS), possibly consistent with counterparties substituting from one scheme to the other (Chart 24).

Chart 24
Bank of England Late Transfer Scheme and End-of-Day Transfer Scheme(a)



(a) Monthly averages.

Operational notice

On 23 November 2004, the Bank published amendments to the Operational Notice that governs its OMOs. The main revisions were as follows:

- With effect from 1 March 2005 there will be a limit on the amount, by market value, of collateral from a single issuer (excluding HM Government and the Bank of England) that a participant can hold with the Bank at any one time. If, at any time, the total collateral provided by a single institution exceeds £1 billion, the institution must ensure that the securities of any single issuer comprise no more than 25%, by market value, of the total securities delivered to the Bank.
- In exceptional circumstances, involving for example stressed conditions in or affecting markets, infrastructure or a counterparty, the Bank will be able to receive marketable US Treasury securities as collateral in its operations, in addition to other securities on its current list of eligible collateral.
- Local authority bills have been removed from the list of eligible securities.

British household indebtedness and financial stress: a household-level picture

By Orla May, Merxe Tudela and Garry Young of the Bank's MacroPrudential Risks Division.

This article summarises the main results of a survey carried out for the Bank in September 2004 about household borrowing, housing wealth and attitudes to debt. The survey was designed to provide a comprehensive, up-to-date picture of household indebtedness. It found significant differences between homeowners and renters: renters are more likely to have debt problems, but their share of total household debt is small. The vast majority of debt is owed by homeowners, very few of whom (by historical standards) show signs of having problems at present. While 40% of total outstanding household debt is owed by those spending more than a quarter of their gross income on servicing their debts, the share of debt owed by those currently with debt problems is lower than a decade ago.

Introduction

Lending to the UK household sector has been growing substantially faster than household incomes in recent years. The amount of debt outstanding now exceeds £1 trillion, equivalent to around 140% of aggregate household income (compared with around 105% ten years ago). This rapid accumulation of debt has raised questions about the ability of people to repay what they owe, especially in the event of a sudden change in economic circumstances; for example, if interest rates were to increase substantially or if households' income expectations proved to have been too optimistic. This could have implications for both *monetary policy*, if the combination of high debt levels and a worsening economic outlook were to cause a slowdown in spending by households, and *financial stability*, if an increasing number of households were to default on their debts.

Such issues are normally explored with reference to aggregate measures of household debt and its affordability, in part because the necessary data are relatively easy to obtain. But these aggregate measures can only tell us about the position of the household sector as a whole or of some notional 'average' household — they apply to no household in particular. While that may be suitable for some purposes, it is less obviously so for the analysis of issues like financial stress — which is most acute, and therefore most likely to manifest itself in arrears or default, or sharp changes in consumption, for those with the highest levels of debt in relation to their income.

In recent years, the Bank has made increasing use of household level surveys to analyse the financial position of the household population. These confirm that debt is distributed very unevenly across households. The richest regular source of such information for the United Kingdom is the British Household Panel Survey (BHPS):(1) each year since 1991, the same set of people has been asked about their economic and social circumstances, including about their secured debt. Every five years, starting in 1995, these individuals have also been asked about their unsecured debts.(2) The BHPS is not very timely, though — the latest available data relate to 2002. A more timely data source is the Survey of Mortgage Lenders (SML), though this only provides information on the flow of *new* mortgages. The SML data were analysed in detail in the previous issue of the *Quarterly Bulletin*.(3)

Between them, the BHPS and the SML provide a substantial amount of information about the distribution of household debt in the United Kingdom. Nevertheless, there are some issues for which their lack of timeliness (in the case of the BHPS) or their coverage

(1) The BHPS data used in this article were made available through the UK Data Archive. The data were originally collected by the Economic and Social Research Council Research Centre on Micro-social Change at the University of Essex, now incorporated within the Institute for Social and Economic Research. Neither the original collectors of the data nor the Archive bear any responsibility for the analyses or interpretations presented here.
(2) The BHPS was analysed in detail in Cox, Whitley and Brierley (2002).
(3) See Hancock and Wood (2004).

(in the case of the SML) leaves gaps in our knowledge. A particular issue at present is why personal bankruptcies, mainly involving unsecured debt,(1) have risen to record levels, while mortgage arrears are, by recent standards, extremely low. This suggests a sharp distinction between financial stress currently faced by those who own their homes or have a mortgage, and those who live in rented accommodation.

This in turn prompts questions about unsecured debt: are more people borrowing in this way? How affordable is it? How much of this borrowing is currently interest free? Are these borrowers vulnerable to financial stress? And is debt placing an increasing burden on household finances?

There are also questions about secured debt that deserve investigation at the household level, especially given the rapid increases in house prices in recent years: by how much does the value of a borrower's home exceed the value of their mortgage? How affordable is their mortgage? How would their financial position be affected in the event of lower house prices?

Furthermore, there are issues regarding the overlap between secured and unsecured borrowing: are homeowners able to consolidate their unsecured debts by remortgaging? Are new entrants to the housing market topping up their mortgage borrowing with unsecured debt? How affordable is the overall debt of people with both secured and unsecured debt, and how does it compare with the value of their house?

In order to address these issues, the Bank commissioned a new survey from NMG Research. In September this year, around 2,000 people were asked questions about their unsecured and mortgage borrowing, the value of their housing assets and their attitudes to debt. A similar survey in October 2003 focused only on unsecured debt.(2) Where possible, we have integrated the findings of the new survey with those of earlier surveys (the October 2003 NMG Research survey and the BHPS) to draw comparisons over time.

The evidence from the latest survey suggests that, while the vast majority of debt is owed by homeowners with mortgages, debt problems are concentrated among renters. For the most part, homeowners are currently comfortable with the amount they owe: only 4% of them admit to having problems paying for their accommodation, and only 5% say that their unsecured debt is a heavy burden. This may partly be because homeowners have been able to take advantage of house price inflation to remortgage and consolidate their debts: around 25% of those remortgaging in the past year have done so for this reason. A significant number of homeowners are using more than a quarter of their gross income to service their debts and these households account for around 40% of total outstanding debt.

The remainder of the article is organised as follows. We first briefly outline the key features of the survey. We then present the main findings about the proportion of households that have debt according to their income and housing tenure. We go on to examine how average amounts of debt differ by household characteristics and which types of households hold the largest proportions of the debt. This leads us on to study the overall amount of debt held by homeowners and how it compares with the value of housing assets and the extent of remortgaging. We then study the affordability of debt for homeowners and renters, making use of both financial and attitudinal information, and look at changes in the burden of debt over time. We conclude with a summary of the main findings.

The survey

In September 2004, NMG Research conducted a survey on household debt commissioned by the Bank, interviewing 1,838 individuals throughout Great Britain. The respondents were all adults aged 18 years or over and were asked about their household's debt commitments (both secured and unsecured), income and housing wealth, together with questions about their attitudes to debt and demographic characteristics. Where possible, the questions were aligned with those in the BHPS to allow comparisons with it and so make it possible to analyse trends in household debt.(3)

A common feature of household surveys is that the amount of unsecured debt reported by survey respondents falls well short of that implied by aggregate

(1) The Insolvency Service estimates that only around 10% of bankrupt individuals have secured debt arising from mortgaged property.
(2) The results of this survey were reported in Tudela and Young (2003).
(3) See the appendix for details of the survey method. A full copy of the survey questionnaire is available at www.bankofengland.co.uk/qb/nmgsurvey.pdf.

data.(1) The new survey is no different in this respect: on the basis of the latest NMG Research survey, aggregate unsecured debt totals £57.1 billion, whereas official statistics show that consumer credit outstanding at the end of September 2004 was £180.6 billion.

Some of this discrepancy can be accounted for by differences in the basis on which the statistics are calculated. For example, the survey asked respondents to exclude balances which would be paid off in full at the end of the month, whereas the official statistics include all consumer credit balances outstanding at a particular date, including balances that do not bear interest. This alone could account for around £17 billion of the discrepancy.(2) It is unclear whether the remaining gap is a result of deliberate understatement by respondents, ignorance of debts they or other members of their household (on whose behalf they are responding) owe, or misunderstanding of what constitutes a debt: for example, some may not consider borrowings as a 'debt' if they are up to date with repayments. Nor do we know the extent to which the debts unaccounted for in the survey are owed by people claiming that they have no debts at all or by those who refuse to take part in surveys. We therefore do not attempt to 'gross up' the household-level data to bring them into line with what is implied by the aggregate totals.

The survey figures on secured debt, by contrast, match up much better with the aggregate statistics. Outstanding secured debt at the end of September 2004 was £852.5 billion, according to the official statistics, whereas the survey responses gross up to £679.5 billion — 80% of the aggregate. This pattern is also a characteristic of the BHPS.(3) It may reflect the fact that mortgagors receive regular statements which keep them informed about their amount of outstanding debt, or that the amounts involved change less rapidly than unsecured debts or that they are simply more memorable. Alternatively, it may be that mortgagors are more financially aware than other households and so are more conscious of their financial position. Taken together, the unsecured and secured debt reported in the survey amounts to 72% of what one would expect on the basis of the aggregate data.(4)

Participation in the debt markets

Table A records the proportion of households who had secured and unsecured debt outstanding in September 2004 and compares this with the equivalent rates observed for 1995 and 2000 in the BHPS — the two years for which the BHPS includes information on both secured and unsecured debt. The bottom panels of the table show participation rates by household income for homeowners and renters separately.

There has been no clear change recently in the proportion of households with secured debt. About 41% of households report having secured debt in the 2004 NMG Research survey, compared with 40% in the 2002 BHPS and an average of 41% over the twelve years of the BHPS.(5)

A key question is whether there is any evidence that more households now have unsecured debt than in the recent past. According to the NMG Research survey, around 45% of households have some unsecured debt. This is similar to the estimated 42% of households (34% of individuals) that have any type of unsecured debt according to the previous NMG Research survey in 2003 and an average of 45% in the 1995 and 2000 waves of the BHPS. It seems therefore that there has been little change over this period in the overall participation of households in the unsecured debt market.(6)

But that does not necessarily mean that the types of household with unsecured debt have not changed. The proportion of renters who have unsecured debt, for example, has increased significantly in recent years — in the 1995 BHPS, 39% of renters reported having some unsecured debt; but by 2004, that proportion had increased to 46%.(7) This difference is statistically

(1) See the box in Tudela and Young (2003) for discussion in relation to the 2003 NMG Research survey and Redwood and Tudela (2004) for discussion of grossing up BHPS data. A comparison across a range of different household surveys is provided by Oxera (2004, page 25).
(2) Calculated by subtracting an estimate of credit card balances that do not bear interest from the aggregate total. This estimate is provided by the British Bankers' Association.
(3) See Redwood and Tudela (2004).
(4) Household income in the survey grosses up to represent 73% of that reported by the Office for National Statistics (ONS) for the household sector. The difference partly reflects the definition of income used in the survey and that constructed by the ONS (which also includes the income of non-profit institutions serving households).
(5) A statistical test for the equality of the proportion of households with secured debt between the 2002 BHPS and 2004 NMG Research survey indicates that the null hypothesis of both proportions being equal cannot be rejected.
(6) A statistical test that the proportion of households with unsecured debt in the 2004 NMG survey is significantly different from the proportion of households with unsecured debt in the 2000 BHPS indicates that the proportions are not significantly different.
(7) The increase is broadly similar for private renters and those living in accommodation provided by local authorities or housing associations.

Table A
Participation rates by selected household characteristics

Per cent

	Share of survey population	Secured	Unsecured	Secured only	Unsecured only	Both	None
Whole sample (NMG 2004)	100	41	45	15	22	24	39
Homeowners (NMG 2004)	63	62	45	23	8	38	31
Renters (NMG 2004)	37	2	46	1	47	1	51
Whole sample (BHPS 2000)	100	39	45	13	20	26	41
Homeowners (BHPS 2000)	70	56	47	19	9	37	34
Renters (BHPS 2000)	30	3	43	1	41	2	57
Whole sample (BHPS 1995)	100	40	44	14	19	26	42
Homeowners (BHPS 1995)	67	61	47	21	8	39	32
Renters (BHPS 1995)	33	2	39	1	38	2	60
Homeowners (NMG 2004)							
Household income							
Up to 4,499	1	56	14	49	6	7	37
4,500–9,499	8	13	23	8	18	5	69
9,500–17,499	18	52	48	14	11	38	37
17,500–24,999	9	75	63	15	4	61	20
25,000–34,999	9	81	61	24	6	57	13
35,000–59,999	12	88	63	24	1	63	12
60,000+	5	83	57	34	7	49	10
Renters (NMG 2004)							
Household income							
Up to 4,499	3	–	38			–	61
4,500–9,499	14	1	37			1	62
9,500–17,499	12	2	51			–	46
17,500–24,999	3	6	72			6	25
25,000–34,999	1	8	70			8	31
35,000–59,999	2	11	70			11	33
60,000+	1	–	57			–	49

– indicates no observations.

Notes: Housing tenure relates to the main home in which the respondent lives. Homeowners are those households who own their main home outright or have bought it with a mortgage. Renters include households living in local authority and private rental accommodation and those living in housing association accommodation. Income is gross household income. Figures may not sum to 100 due to rounding.

Sources: BHPS, NMG Research and Bank calculations.

significant and has been offset by a small fall in the proportion of homeowners with unsecured debt, from 47% in 1995 and 2000 to 45% in 2004.

There is also evidence that the types of unsecured debt have changed since the mid-1990s. In the latest survey, credit cards are the most commonly cited type of unsecured debt, with 26% of households owing money on credit cards (Table B).(1) Personal loans (15%) and overdrafts (12%) were the next most common forms of borrowing. The categories of unsecured debt covered by the NMG survey were slightly broader than those included in the 1995 and 2000 BHPS surveys (in part, to try to achieve more comprehensive reporting of unsecured debt), so participation rates may not be strictly comparable. Nonetheless, comparing the results of the different surveys does give us an idea of broader trends in debt participation: the proportion of households holding credit card and overdraft debt is higher in the latest survey, and this has been offset by reduced use of hire purchase agreements and mail order borrowing. So households appear to be making increasing use of more flexible forms of unsecured borrowing.

Table B
Participation rates by types of unsecured debt instrument

Per cent

Debt instrument	BHPS 1995	BHPS 2000	NMG 2004
Hire purchase agreement	15	12	8
Personal loan	18	20	15
Overdraft	n.a.	5	12
Credit card	19	22	26
Store card	n.a.	n.a.	5
Catalogue or mail order agreement	15	13	9
Student loan	n.a.	1	4
DSS social fund loan	1	2	2
Other loans	3	11	1
Any unsecured debt	44	45	45

n.a. indicates that this type of debt was not covered by the survey.

Note: The proportion of households holding each type of unsecured debt does not sum to the proportion of households holding any unsecured debt, as some households hold more than one type.

Sources: BHPS, NMG Research and Bank calculations.

In 2004, there is no difference in the proportion of homeowners and renters who have unsecured debt. But for any given income level, renters are more likely than

(1) In a separate question, the NMG Research survey also asked individuals if they have a credit card — independently of their actual use of it for transactions or to obtain credit. This found that 60% of those that have a credit card use it for transactions purposes only. A similar question for store cards revealed that 93% of households use store cards for transactions purposes.

Table C
Average debt of debtors and share of total debt by household characteristics

Per cent

			Households		Secured debtors		Unsecured debtors		For those with secured and unsecured debt	
	Share of survey population	Share of income	Mean total debt (£)	Share of total debt	Mean secured debt (£)	Share of secured debt	Mean unsecured debt (£)	Share of unsecured debt	Mean total debt (£)	Share of total debt
Whole sample	100	100	20,780	100	63,484	100	4,860	100	79,102	78
Homeowners	63	77	33,415	95	62,958	98	5,501	70	77,923	76
Renters	37	23	3,389	5	82,012	2	3,852	30	117,556	2
Homeowners										
Household income										
Up to 4,499	1	0	13,730	1	24,380	1	290	0	35,050	0
4,500–9,499	8	2	2,540	1	19,090	1	2,370	2	43,170	1
9,500–17,499	18	11	15,000	11	31,520	11	4,050	14	45,820	11
17,500–24,999	9	8	45,440	15	63,910	15	3,770	8	72,210	14
25,000–34,999	9	12	50,110	17	58,990	17	6,360	14	66,760	13
35,000–59,999	12	23	58,160	25	64,020	26	7,510	22	71,630	20
60,000+	6	21	134,330	26	161,700	27	8,630	10	169,230	17
Renters										
Household income										
Up to 4,499	3	0	1,360	0			3,830	2		
4,500–9,499	14	4	1,020	1			2,580	6		
9,500–17,499	12	7	1,600	1			2,780	8		
17,500–24,999	3	3	25,980	3			4,730	5		
25,000–34,999	1	2	5,080	0			7,230	3		
35,000–59,999	2	4	4,470	0			5,770	4		
60,000+	1	4	1,110	0			6,060	2		

Note: Figures by household income group rounded to nearest £10.

Sources: NMG Research and Bank calculations.

homeowners to have unsecured debt — especially at low incomes.(1) While most renters, for obvious reasons, only have unsecured debt, 38% of homeowners have both unsecured and secured debt. So it is important to look at both types of debt together.

Amounts of debt

Table C shows simple averages of the amounts of money owed by those with debt, according to their income and housing arrangements. A key feature is that debt is strongly associated with homeownership. While homeowners account for 63% of households, they owe 95% of the debt identified in the survey, including 70% of the unsecured debt.(2)

The average amount of *secured* debt owed by households with mortgages is £63,484 (or £58,975 if we restrict the sample to only households with a mortgage on their main home). By comparison, according to the BHPS in 2002, the average mortgage was £56,040. The average amount of *unsecured* debt owed by households with unsecured debt is £4,860. This compares with £2,872 and £4,375 in 1995 and 2000 respectively, according to the BHPS.(3) The average amount owed by those that have both secured *and* unsecured debt is £79,102, and this group of debtors accounts for 78% of total debt.

Higher income households owe a disproportionate amount of total debt compared with their share in the population. For example, homeowners in the highest income group (£60,000 and over) make up only 6% of the survey population but they owe 26% of the debt. Their share of debt is more in line with their share of income, at 21%. At the other extreme, the small number of low income households who have debt have the highest levels of debt in relation to *their* incomes. But this accounts for a negligible proportion of overall debt. Many of these households are unemployed and it seems plausible to infer that in many cases these debts were built up when their incomes were higher. While the average level of unsecured debt is increasing with income for both homeowners and renters, there is no clear pattern in the difference between the amount owed by homeowners and renters at any given level of income.

(1) The measure of income used throughout is *gross* annual income. In the NMG Research survey, only those respondents who were the chief income earner or main shopper for the household were asked their income. They were asked to report the 'total annual income of the household, before any deductions were made for tax, National Insurance, pension schemes and so on'.

(2) There are a small number of renters in the survey who have secured debt (housing tenure relates to the main home in which the respondent lives, so it is possible for households who live in rental accommodation to hold secured debts against other properties in which they are not living). We do not report the characteristics for those households in this article, because there are too few such households for these to be calculated reliably.

(3) The 2000 BHPS is the latest survey for which we can obtain averages at the household level — the 2003 NMG Research survey related to individuals rather than households.

There are important life-cycle influences on household indebtedness which mean that it is more likely that younger households, particularly those entering the housing market for the first time or raising a family, will be in debt, whereas older households, who will be building up savings for — or be enjoying — retirement, will not. These influences can clearly be seen in the data.

Table D illustrates this by showing the distribution of the total amount of debt held relative to household income — the debt to income ratio — by age, for homeowners and renters. In each table, the categories in the left-hand column relate to quintiles of the debt to income distribution. Those in the top quintile of the homeowner debt to income distribution are predominantly in the 25–44 year old age group, while those without debt are mostly over 55. There is a similar life-cycle pattern for renters, except that a higher proportion of the most indebted are aged between 18 and 24.

Table D
Debt to income ratios by age (per cent)

Homeowners

	Age groups							
	18–24	25–34	35–44	45–54	55–59	60–64	65+	All ages
No debt	0.4	–	1.2	2.3	5.1	5.7	19.4	34.1
Debt to income ratio quintiles								
Up to 50%	0.2	0.2	2.6	3.9	1.6	1.2	3.9	13.5
50%–120%	0.5	1.5	3.8	4.5	1.6	0.8	0.6	13.2
120%–190%	0.8	2.6	4.5	4.1	0.8	–	0.1	13.0
190%–330%	0.4	4.6	3.7	2.6	1.2	0.6	–	13.1
Over 330%	0.8	3.6	5.6	1.5	1.1	0.4	0.1	13.1
All	3.1	12.4	21.4	18.9	11.3	8.6	24.1	100.0

Renters

	Age groups							
	18–24	25–34	35–44	45–54	55–59	60–64	65+	All ages
No debt	4.3	9.6	8.5	7.0	3.4	4.2	18.1	55.2
Debt to income ratio quintiles								
Up to 2.6%	1.5	3.0	2.6	1.5	–	–	0.5	9.0
2.6%–6.8%	1.6	1.9	2.4	1.5	1.2	–	0.4	8.9
6.8%–17%	1.7	1.5	2.8	0.2	1.1	0.7	1.4	9.3
17%–54.1%	1.9	2.1	2.4	1.9	0.4	0.2	0.2	9.1
Over 54%	2.5	2.2	2.2	0.8	0.5	–	0.3	8.5
All	13.4	20.3	20.9	12.8	6.6	5.1	21.0	100.0

– indicates no observations.

Notes: Debt to income ratio calculated as all household debt divided by annual gross household income. Quintiles are the four values that split the debt to income distribution into five groups each containing one fifth of the population (such that the one fifth of households with the lowest debt to income ratios lie in the bottom quintile).

Sources: NMG Research and Bank calculations.

Also, some households have very high levels of debt in relation to their income. For homeowners this is largely associated with recent house purchases. For example, the most indebted 20% of homeowners with debt owe more than 330% of their annual income, and the most indebted 20% of renters with debt owe more 54% of their income.

Debt and housing wealth

While a few people have very high debts in relation to their income, many homeowners have an asset — their home — that is more valuable than their debts. This cushion can help them to weather financial shocks. In a recent survey, around 40% of households agreed with the statement that 'My house value has risen so much that I do not worry about other debts I may have'.(1) Sustained house price inflation has clearly raised the value of most homes relative to the original mortgage that financed their purchase. But it is not clear to what extent this has been offset by remortgaging and other unsecured borrowing. Indeed, there is some evidence that house price inflation has encouraged some homeowners to take on more unsecured debt.

The results of the NMG Research survey allow us, for the first time since the 2000 BHPS, to compare the overall debt of homeowners, including unsecured debt and the effects of remortgaging, with the value of their house(s).(2) Table E shows the distribution of the total debt (secured and unsecured) to housing wealth for the homeowners in our sample. These figures indicate that the vast majority of homeowners have a substantial equity stake in their homes. For just over three quarters of homeowners with debt, the amount of debt outstanding is less than half the value of their house.

Table E
Distribution of debt to housing wealth for homeowners with debt

Per cent

Debt to housing wealth	Frequency	Accumulated frequency	Share of total debt	Accumulated share of total debt	Share of unsecured debt	Accumulated share of unsecured debt
100+	1.7	1.7	4.4	4.4	5.7	5.7
90–100	1.5	3.2	1.8	6.2	2.5	8.2
80–90	2.3	5.5	4.6	10.8	4.4	12.5
70–80	3.7	9.2	6.7	17.5	4.7	17.2
50–70	12.9	22.1	26.0	43.5	14.9	32.1
25–50	32.1	54.2	37.7	81.2	22.9	55.0
0–25	45.8	100.0	13.6	94.8	15.0	70.0

Note: Debt to housing wealth calculated as ratio of all household debt to value of all properties owned (outright or with a mortgage) by the homeowner.

Sources: NMG Research and Bank calculations.

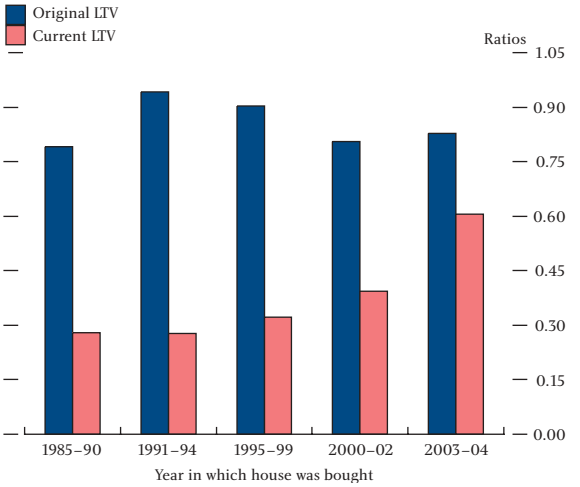
(1) From a survey conducted by NMG Research in March 2004 on behalf of Bradford & Bingley. The survey asked 2,000 individuals — aged between 18 and 75 who had bought their main home with a mortgage and were solely or jointly responsible for financial matters in their household — about their mortgaging behaviour and their attitudes towards mortgages.

(2) Of course, to capture fully the balance sheet of households we would also need information about their financial wealth. The NMG survey did not cover this, but we know from the BHPS that housing wealth represents over 90% of the total wealth of mortgagors.

This group with substantial housing equity has expanded markedly since the mid-1990s when, according to the 1995 BHPS, 52% of debtors were in this position. At the other extreme, 9.2% of homeowners with debt have debts that amount to more than 70% of the value of their housing wealth. Many of those with little housing equity are first-time buyers. These households owe over 17.5% of total debt and tend to hold both secured and unsecured debt. Their financial position would be the most vulnerable to any fall in house prices. But the number of households in this position is considerably lower than in 1995 or 2000, when 32% and 24% respectively had similar debt levels in relation to their housing assets.

The decline in the number of households with low levels of housing equity has clearly been influenced by rising house prices, but this is not the only factor. It is normal for homeowners to have high levels of debt relative to the value of their assets when they enter the housing market, and for this ratio to be reduced over time as the mortgage is paid off and house prices increase. This is confirmed by Chart 1, which plots households' original and current loan to value ratios (LTVs) according to the year of house purchase. The former is defined as the original mortgage relative to the purchase price of the house, the latter as mortgage outstanding to current value of the house — both as reported by the household.(1) As we would expect, current LTVs are highest for those who have recently entered the housing market.

Chart 1
Original and current loan to value ratios (mean values)



Notes: Original loan to value ratio (LTV) calculated as the original mortgage taken relative to the cost of the house. Current LTV is outstanding mortgage relative to current value of the house as reported by households.

Sources: NMG Research and Bank calculations.

In line with evidence from the SML, the average original LTV has declined since the early 1990s from 0.94 to 0.83. This may partly reflect supply factors — lenders may have tightened their lending criteria or, if lenders have limits on the loan to income ratios they are prepared to advance, then rising house price to income ratios may have constrained LTVs. It may also reflect demand factors — households may be more cautious about taking on high LTV loans following the experience of the early 1990s, or may be responding to the fact that the relative cost of lower and higher LTV loans has changed.(2)

We also know from SML data that average LTV ratios for first-time buyers, in particular, have declined in recent years. This means that lending institutions are less exposed to the risk that the value of the property might subsequently fall short of the value of the loan. But at the same time it implies that buyers must be financing a greater proportion of the purchase price by other means. As the NMG sample was chosen to be nationally representative, it inevitably contained only a small number of first-time buyers.(3) And of these, just 20 had raised a deposit to buy their first property. The most common source of their deposit was savings — only two households said that they had used unsecured debt for this purpose.

Despite this general pattern of loan to value ratios declining over the life of the mortgage, a number of homeowners are taking advantage of house price inflation to increase their borrowing by remortgaging. Indeed, the survey found that 11% of mortgagors had taken out an additional mortgage in the twelve months prior to interview. The average value of this loan was £20,000; a quarter of additional loans taken out were under £7,500, while 11% were for £50,000 or more.

The survey results also indicate that mortgagors are generally not taking on additional mortgages for direct consumption purposes. Instead, most say that they used the extra money for home improvements (Table F).(4)

(1) We show LTV ratios from 1985 onwards only given the small sample size for properties bought before 1985.
(2) See Hancock and Wood (2004).
(3) Those respondents who had bought their property with a mortgage in 2002 or subsequently were asked whether their current mortgage was their first-ever — 55 responded that it was their first-ever mortgage.
(4) This is consistent with results from the Survey of English Housing, which show that half of households taking further advances do so in order to make home improvements. See Benito and Power (2004).

Table F
Reasons for taking an additional mortgage

	Percentage of those taking an additional mortgage
Home improvements	59
New goods for property	12
Holiday/car	7
Consolidated debts	25
Bought second property	5
Money into own business	7
Invested or saved money	4
Other	9

Note: Respondents could give more than one answer.

Sources: NMG Research and Bank calculations.

Table G compares the amount of secured debt that mortgagors report they currently owe with the amount of secured debt when they first arranged a mortgage on their property. It shows that three quarters of mortgagors have an outstanding mortgage that is less than or equal to the one they originally took out. For nearly one in four mortgagors, the value of their current mortgage is less than 75% of their original mortgage. But 25% of mortgagors now owe more than when they originally took out their mortgage: through remortgaging or consolidating other debts into their mortgage.(1) Households that have increased the value of their mortgage tend to be those that have benefited from the largest capital gains on their houses.

Table G suggests some association between taking on mortgage debt and cumulative house price inflation: the proportion of mortgagors that took on an additional mortgage (in the twelve months prior to the date of the interview) increases broadly in line with the extent to which their house value has increased.

Affordability

In this section, we analyse the affordability of debt — both in terms of the amount of household income that is devoted to servicing debts (known as income gearing) and households' perceptions of whether their debts are a problem. Information on how much each household spends on servicing its debts each month is provided by the households themselves. This includes their spending on servicing their unsecured debts and takes account of their use of 'interest-free' deals on unsecured debt. More information on the take-up of these deals is provided in the accompanying box on pages 422–23.

Table H shows the distribution of income gearing for homeowners and renters. It shows that about a quarter of all households (and 38% of debtors) have income

Table H
Income gearing

Homeowners

	Percentage of all households	Share of total debt (per cent)	Mean total debt (£)	Mean income (£)
No debt	19.8	–	–	–
Income gearing				
Positive but less than 5%	4.9	5.0	29,090	40,450
5%–10%	6.8	7.9	32,920	36,220
10%–15%	7.2	10.7	42,420	36,940
15%–20%	5.5	15.0	77,930	34,890
20%–25%	5.3	13.5	72,200	29,500
25%–30%	4.7	17.4	105,630	40,230
30%–35%	2.0	4.4	62,870	26,360
35%–40%	2.0	9.8	143,290	33,000
40%–50%	2.3	4.8	59,780	17,540
50%–100%	1.6	4.8	85,920	13,940
100% or more	0.9	0.8	27,070	1,440

Renters

	Percentage of all households	Share of total debt (per cent)	Mean total debt (£)	Mean income (£)
No debt	19.0	–	–	–
Income gearing				
Positive but less than 5%	8.1	4.5	15,940	24,220
5%–10%	2.8	0.3	2,830	16,240
10%–15%	2.9	0.5	4,480	13,270
15%–20%	2.5	0.3	4,000	13,460
20%–25%	0.4	0.1	4,130	8,920
25%–30%	0.4	0.1	4,440	5,250
30%–35%	0.3	0.1	12,720	7,750
35%–40%	0.1	0.0	1,450	7,280
40%–50%	0.2	0.0	3,670	9,200
50%-100%	0.2	0.0	2,340	4,560
100% or more	–	–	–	–

– indicates no observations.

Notes: Income gearing is calculated for each household as previous month's payments on all debt held multiplied by twelve and divided by annual gross household income. All figures rounded to nearest £10.

Sources: NMG Research and Bank calculations.

Table G
Remortgaging and changes in house valuations

Ratio of current value of house to original cost	Ratio of mortgage outstanding to original mortgage					Percentage of sample	Percentage that took an additional mortgage in the past twelve months
	≤0.5	0.5–0.75	0.75–1	1–1.5	>1.5		
Less than 1	–	26	74	–	–	3	6
1–1.25	–	10	78	12	–	7	11
1.25–2	6	16	56	12	10	21	12
2–2.5	7	11	53	9	21	13	22
More than 2.5	12	14	45	9	20	55	15
Proportion in each column	9	14	52	9	16	100	

– indicates no observations.

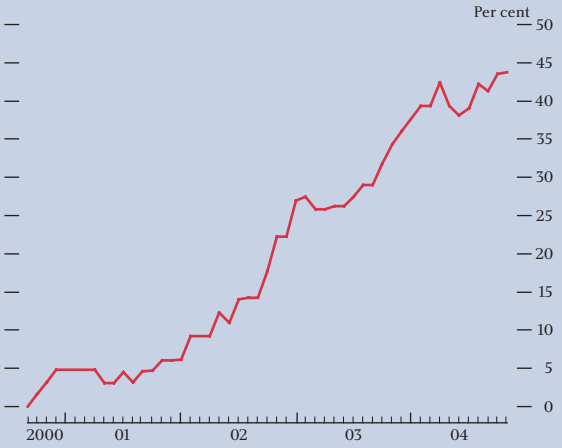
Sources: NMG Research and Bank calculations.

(1) In some cases, this may reflect recall error in replying to the survey — respondents may confuse the amount of debt they originally took out with what they currently owe, or may not remember the size of their mortgage. As we have no way of validating the survey responses, we do not know how large this effect might be.

Interest-free unsecured debt

One current feature of the unsecured credit market is the prevalence of so-called 'zero interest rate' deals — particularly on credit cards. Five years ago, no major institutions offered such deals on credit card borrowing, but now more than 40% of lenders advertise the availability of such deals (Chart A). But little is publicly known about the amount that is borrowed interest free, how it is distributed across households, or what characterises those households with interest-free credit. For this reason, we included a question in the NMG Research survey that asked households with certain types of unsecured debt (credit cards, personal loans, hire purchase agreements, overdrafts and store cards) how much of that debt was interest free.

Chart A
Percentage of credit card issuers offering 0% deals

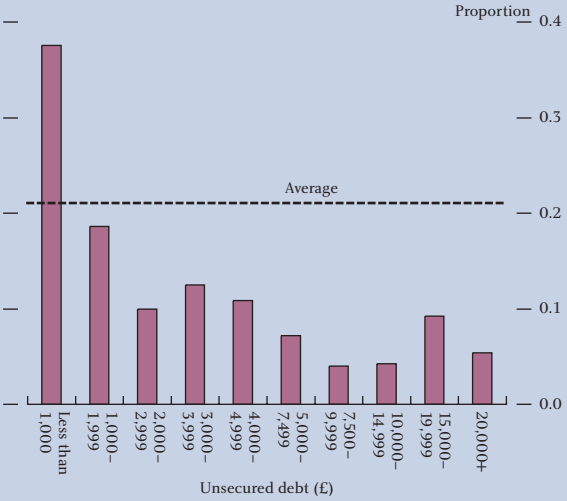


Source: Bank of England.

In total, 7% of all unsecured debt reported in the survey is interest free. But the survey suggests that the proportion of unsecured debt that is free of interest varies significantly across households. Overall, 36% of households with unsecured debt hold some that is interest free. This proportion is higher among homeowners (40%) than renters (30%); it increases with household income; and it is greatest among those in employment. So interest-free credit seems to be targeted at — or more accessible to — households who are likely to represent better credit risks.

Among those households who have some interest-free credit, on average around 20% of their total unsecured debts are interest free. This proportion varies substantially with the amount of unsecured debt: it is highest for those with small amounts of unsecured debt (Chart B). This may reflect supply constraints on interest-free credit: lenders may offer interest-free credit up to certain limits, so for those with larger amounts of unsecured debt their interest-free credit 'allowance' will represent a smaller proportion of their debts.

Chart B
Proportion of unsecured debt that is interest free by amount owed

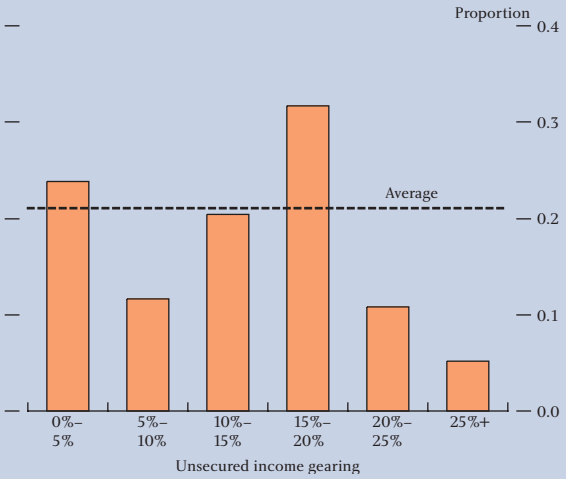


Sources: NMG Research survey and Bank calculations.

But is interest-free credit being used disproportionately by borrowers wanting to alleviate their debt burden? And how much would households with interest-free credit be affected by these special offers being withdrawn? Chart C shows the proportion of unsecured debt that is interest free for debtors with different levels of unsecured income gearing (the ratio of repayments on unsecured debt to gross household income). It shows a bipolar distribution — both households with very low gearing (positive but less than 5%) and those with higher gearing (15%–25%) are more likely than others to hold interest-free credit.

One way to assess the vulnerability of households is to look at the extent to which unsecured income gearing would change if zero interest rate deals were to expire: for example, by assuming that the household would then pay the same rate of interest as on that part of its unsecured debt that is not interest free. This is likely to provide an upper bound on the possible

Chart C
Proportion of unsecured debt that is interest free by unsecured income gearing



Note: Unsecured income gearing calculated as previous month's payments on unsecured debt multiplied by twelve divided by annual gross household income.

Sources: NMG Research survey and Bank calculations.

impact, because on some forms of unsecured credit (for example, some hire purchase agreements) it would not be contractually possible for the lender to increase the rate. Using this simple calibration, we find that the impact would be largest at the top end of the unsecured gearing distribution: for households at the 90th and 95th percentiles of the gearing distribution, unsecured gearing would rise by around 3 percentage points (around 10%), whereas for the median household the impact would be just 0.4 percentage points (Table 1). So removing zero per cent deals would indeed have the largest impact upon those households with high levels of unsecured income gearing.

Table 1
Impact of removing zero interest deals upon unsecured income gearing

Unsecured income gearing	Current position	Without 0% deals
Mean	9.2	10.8
5th percentile	0.4	0.4
10th percentile	0.6	0.7
Median	5.9	6.3
90th percentile	20.7	22.8
95th percentile	28.0	31.4

Note: Unsecured income gearing calculated as previous month's payments on unsecured debt multiplied by twelve divided by annual gross household income.

Sources: NMG Research survey and Bank calculations.

gearing that is positive but less than 10%. But these households account for less than one fifth of the total debt. At the other extreme, only 15% of all households (or 23% of debtors) spend 25% or more of their gross income servicing their debts, but they owe 42% of total debt.

Among homeowners, there is no clear relationship between income and income gearing except among the most highly geared households, whose incomes are well below average. Among renter households, it is those with the lowest incomes who spend the highest proportion of their income on servicing their debts. These households typically have much lower incomes than homeowners and many of them are unemployed.

The survey asked all households whether they had had problems paying for their accommodation over the past twelve months (though the survey did not ask renters about their rent payments, so we do not know what proportion of their income those payments represent). Households with unsecured debt were also asked whether it was a heavy burden, somewhat of a burden or not a problem. Table I shows households' attitudes towards their housing payments and unsecured debt. It shows that problems paying for accommodation and unsecured debt are more prevalent among renter households — 11% of renters reported problems paying for their accommodation, compared with 4% of homeowners,(1) and 46% of renters reported that their unsecured debt was a heavy burden or somewhat of a burden, compared with 32% of mortgagors.(2)

Because the NMG survey used the same questions as the BHPS to ask about debt problems, we can draw comparisons between the latest results and those from earlier surveys. Taking unsecured debt first, such a comparison suggests that the proportion of households having problems meeting their debt obligations is lower than a decade ago. The proportion of debtors reporting that unsecured debt is not a problem has increased slightly, from 58% in 1995 to 62% in 2004 (Chart 2), despite the increase in its average amount. As discussed in Tudela and Young (2003), this may reflect the fact that the interest rates households

(1) This is likely to reflect the fact that renters typically have higher housing payments in relation to their incomes than do homeowners. The BHPS confirms that, on average, rental payments represent a larger fraction of renter households' incomes than do mortgage payments for mortgagors.
(2) This figure probably overstates the difference in problems between homeowners and renters, as it includes households who own their home outright — (not surprisingly) very few of these report problems paying for their accommodation. Nonetheless, the proportion of renters reporting problems (11%) is substantially higher than the proportion of mortgagors reporting problems (6%).

Table I
Attitudes to debt

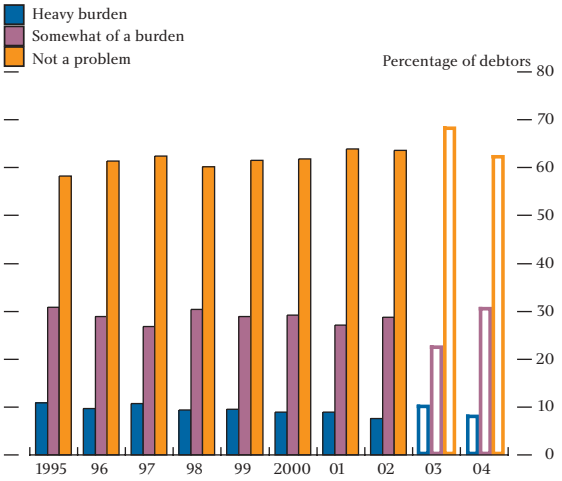
	Problems paying for accommodation				Unsecured debt is a burden			
	Percentage of households with problems	Mean total debt of those with problems (£)	Mean total debt of those without problems (£)	Share of debt of those with problems (per cent)	Percentage of those with unsecured debt that have problems	Mean unsecured debt of those with problems (£)	Mean unsecured debt of those without problems (£)	Share of unsecured debt of those with problems (per cent)
Whole sample	7	22,591	20,719	7	38	6,331	4,001	49
Homeowners	4	63,821	32,084	7	33	8,235	4,265	34
Renters	11	2,716	3,488	1	46	4,299	3,480	15
Homeowners								
Household income								
Up to 4,499	11	35,000	10,800	0	–	–	290	–
4,500–9,499	–	–	2,540	–	20	10,370	670	1
9,500–17,499	4	520	15,260	0	37	7,680	2,170	9
17,500–24,999	1	85,000	44,860	0	30	4,990	3,340	3
25,000–34,999	6	70,060	48,720	1	35	10,980	4,030	8
35,000–59,999	9	92,170	55,450	3	46	9,650	5,710	12
60,000+	6	207,360	128,160	2	15	7,450	8,830	1
Renters								
Household income								
Up to 4,499	11	11,720	440	0	68	5,170	1,140	2
4,500–9,499	7	4,990	690	0	47	2,560	2,600	3
9,500–17,499	17	1,190	1,550	0	50	2,910	2,640	4
17,500–24,999	10	3,930	28,220	0	50	3,640	5,580	2
25,000–34,999	19	–	6,090	–	21	18,380	5,110	2
35,000–59,999	8	5,370	4,380	0	41	6,190	5,480	2
60,000+	7	–	1,110	–	25	16,250	2,630	1

– indicates no observations.

Notes: Households with unsecured debt problems are those who say that their unsecured debt is somewhat of a burden or a heavy burden. Figures by household income groups rounded to nearest £10.

Sources: NMG Research and Bank calculations.

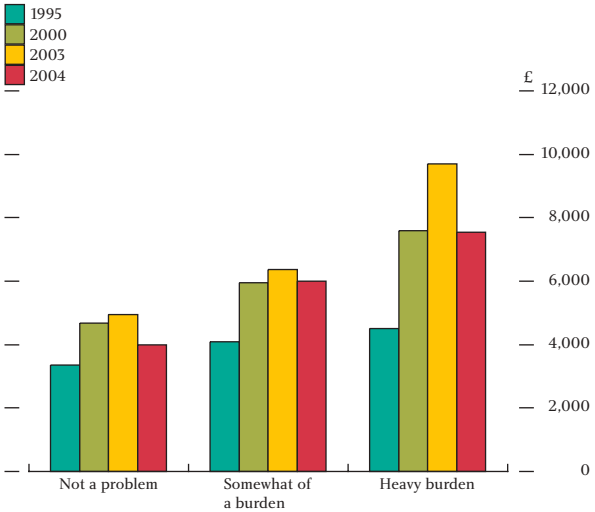
Chart 2
Trends in the burden of unsecured debt



Note: Figures up to 2002 are calculated using the BHPS, 2003 and 2004 figures are from the NMG Research surveys.

Sources: BHPS, NMG Research and Bank calculations.

Chart 3
Average unsecured debt by unsecured debt burden considerations



Note: Figures for 1995 and 2000 are calculated using the BHPS, 2003 and 2004 figures are from the NMG Research surveys.

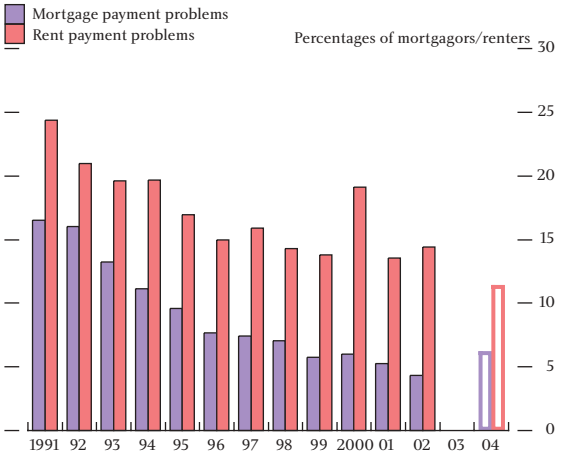
Sources: BHPS, NMG Research and Bank calculations.

pay on their unsecured debt have fallen over that period and the fact that, in aggregate, unsecured debt remains small in relation to household wealth. But the average unsecured debt of those who report it to be a burden has increased by more than for those households who do not consider it a problem (Chart 3). This suggests that the level of unsecured debt at which households consider it to be a problem has increased since 1995.

Compared with the 2003 NMG Research survey, a slightly smaller proportion of debtors reported unsecured debt was a heavy burden in the 2004 survey (8%, compared with 10% in 2003), and a slightly higher proportion reported their debt to be somewhat of a burden (30% in 2004 compared with 22% in 2003). These differences are not statistically significant and therefore inconclusive about broader trends. When we compare the results of the 2004 survey with those of the 2002 BHPS, the proportion of debtors with unsecured debt problems is also little changed.

Turning to reported problems paying for accommodation, Chart 4 shows that the proportion of mortgagors who have problems has fallen from 17% in the 1991 BHPS to 6% in 2004.(1) This may be because mortgage rates have fallen over this period, although the proportion of renters reporting a problem paying rent has also fallen, albeit to a smaller extent — from 24% in 1991 to 11% in 2004.(2) It may also reflect a change in households' perceptions of their mortgage debt burden.(3)

Chart 4
Trends in problems paying for accommodation



Note: Figures up to 2002 are calculated using the BHPS, 2004 figures are from the NMG Research survey.

Sources: BHPS, NMG Research and Bank calculations.

BHPS data confirm that renters are consistently more likely to report problems servicing their unsecured debt than homeowners. Between 1995 and 2002, on average 34% of homeowners with unsecured debt reported that it was somewhat of a burden or a heavy burden, compared with an average of 49% of renters with unsecured debt.

Among homeowners, households who are unemployed are most likely to report problems. So the low level of (and inflows into) unemployment in recent years could help to explain why relatively few homeowners report payment problems and why mortgage arrears are currently at historically low levels.(4) As noted in the introduction, bankruptcies (which mainly involve unsecured debt and those living in rented accommodation) have risen to record levels in recent years. This rise has been common across all types of job status.(5) The survey results are consistent with this — among renters, there is no clear relationship between working status and debt problems.

The affordability of debt is likely to be affected by many factors, among them how large debts are in relation to housing wealth. The previous section showed that there are now relatively few households with high levels of debt in relation to the value of their house(s). Table J cross-tabulates this against income gearing. It shows that those with both high levels of income gearing and high debt in relation to housing assets are more likely to face debt problems. For example, 56% of those with income gearing greater than 25% and capital gearing above 60% (including non-homeowners whose capital gearing is by definition infinite) have some problem paying their debt. At present, only around 9% of debtors (or 5.6% of households) are in this position, but they hold 20% of the stock of debt.

Table K shows the share of secured and unsecured debt that is accounted for by those debtors who report problems paying it. The share of *secured* debt held by those with problems paying their mortgage has fallen from 15% in 1993(6) to 7% in 2004, consistent with the fall in the proportion of mortgagors who report problems. The share of *unsecured* debt accounted for by those who consider unsecured debt to be a burden for their household has fallen from 47% in 1995 to 42% in 2004.

The survey asked those households who say they have problems paying for their accommodation whether they have cut back on consumption or borrowed more as a result of those problems.(7) Among mortgagors, 42% of those with problems had cut back on consumption, while 29% had borrowed more. A slightly higher proportion of renters with problems cut back on consumption (51%), but the proportion that borrowed more is the same.(8)

(1) The differences in the proportions of mortgagors having problems paying for their mortgage between the 2002 BHPS and the 2004 NMG Research survey are not statistically significant.
(2) This would depend on the relationship between interest rates, house prices and rents. The BHPS confirms that mean mortgage payments fell 1% between 1991 and 1995, whereas mean rental payments rose by 10% (in nominal terms). Between 1996 and 2002 both mortgage payments and rental payments rose by 5% at the mean.
(3) Since 1993, mortgagors have become less likely to report problems for a given level of mortgage income gearing. See discussion in the *Financial Stability Review* (December 2004), page 20.
(4) A number of research papers also highlight the links between unemployment and mortgage payment problems. For further details see Cox, Whitley and Windram (2004) and the references therein.
(5) See the discussion in the *Financial Stability Review* (June 2004, Chapter 1.1).
(6) The earliest year for which the BHPS contains information on amounts of secured debt.
(7) Households were also allowed to state that they had used other means to make the payments without specifying what these were. These could include working more, using savings, selling their home and renting out a room for example.
(8) This is not significantly different from the proportion of mortgagors who borrowed more.

Table J
Income gearing, debt to housing wealth and debt burdens

Percentage of debtors

	Income gearing			
Debt to housing wealth	0–25%	25%–35%	35%–100%	100%+
0%–20%	18	1	1	1
20%–40%	13	4	3	1
40%–60%	8	3	1	–
60%–80%	5	2	2	0
80%+	2	1	2	–
Renters	31	2	1	–

Percentage of households

	Income gearing			
Debt to housing wealth	0–25%	25%–35%	35%–100%	100%+
0%–20%	11	1	1	0
20%–40%	8	2	2	1
40%–60%	5	2	1	–
60%–80%	3	1	1	0
80%+	1	0	1	–
Renters	19	1	1	–

Percentage of total debt

	Income gearing			
Debt to housing wealth	0–25%	25%–35%	35%–100%	100%+
0%–20%	6	1	0	0
20%–40%	15	5	5	1
40%–60%	17	8	2	–
60%–80%	10	5	6	0
80%+	8	2	7	–
Renters	2	0	1	–

Percentage of debtors with problems paying debt

	Income gearing	
Debt to housing wealth	0–25%	25%+
0%–20%	19	n.a.
20%–40%	15	35
40%–60%	25	53
60%+	21	56
Renters	51	n.a.

– indicates no observations.

n.a. indicates that the number of debtors in this category is too small for the percentage to be sensibly calculated.

Notes: Problems paying debt refer to both secured and unsecured debt problems. Figures include only those households who have debt.

Sources: NMG Research and Bank calculations.

Table K
Share of debt held by debtors with problems

Per cent

	Share of secured debt	Share of unsecured debt
1993	15	
1994	13	
1995	10	47
1996	7	
1997	9	
1998	7	
1999	7	
2000	6	45
2001	6	
2002	4	
2003		
2004	7	42

Notes: The share of secured debt held is by those reporting difficulty paying their mortgage. The share of unsecured debt held is calculated for those reporting unsecured debt to be a heavy burden or somewhat of a problem. The 2004 results are taken from the NMG Research survey, those for other years are from the BHPS.

Sources: BHPS, NMG Research and Bank calculations.

Conclusions

This article has explored the distribution of debt across British households and its affordability. It finds that the vast majority of debt is owed by homeowners with mortgages, who appear to have few difficulties at present in servicing it. This may be because the background economic conditions of low interest rates and a strong labour market, together with a buoyant housing market, have been favourable to them. Indeed, those homeowners who might otherwise have experienced some debt-related problems have probably been able to take advantage of the equity in their homes and interest-free borrowing on some unsecured debt to ease what could otherwise have been pressing financial difficulties. At present, the proportion of people with limited housing equity who are also devoting a high proportion of their income to servicing their debts is low compared with the mid-1990s. This is consistent with the very low level of mortgage arrears.

The position of renters is rather different. There is evidence that a somewhat higher proportion of renters borrow money than was the case a decade or so ago. As with homeowners, there is also a clear trend towards more flexible forms of borrowing, with credit cards and overdrafts appearing to be taking the place of credit acquired through catalogues and mail order. This has not resulted in an increase in the proportion of renters having problems with their debt, although the amount borrowed by those in difficulty is higher than in the past. Moreover, renters who borrow unsecured are more likely to have problems than homeowners. This may be partly because they do not have the safety valve of housing equity to help them relieve short-term financial pressures.

The overall conclusion to be derived from the survey evidence is that household debt remains affordable. While circumstances can change suddenly, the survey evidence suggests that, by the standards of the past decade, relatively few households are currently close to a stressed position. This partly reflects buoyant house price inflation in recent years, but also appears to be due to fewer households borrowing at very high loan to value ratios.

Appendix
Survey method

In September 2004, the Bank of England added a set of questions to the monthly omnibus survey, MarketMinder, carried out by NMG Research. In total, 24 questions were added. These asked how the household organised its finances, its holdings of debt (secured and unsecured) and the value of housing assets.(1) Interviews were carried out in the respondents' homes using Computer Assisted Personal Interviewing (CAPI). Fieldwork was conducted between 24 and 30 September 2004.

NMG Research uses a two-stage random location sample design to select sampling points, which are then Acorn stratified to provide a balanced sample. NMG Research then applies quotas to each interview assignment, to ensure a good spread of interviews across demographics. NMG Research uses the National Readership Survey (NRS) to calculate these weights. The NRS is based on the latest census information.(2)

Only those households where the interviewee was the chief income earner or main shopper in the household were asked for their income, so we lack information on income for around 10% of households for that reason. A further 38% of households refused to provide (29%) or did not know (9%) their household income. Respondents who did not know their income tended to be those who were not responsible for looking after the household's money (apart from the respondent's personal money). Refusals were more evenly distributed across the different ways of organising the finances within the households.

Nearly 13% of households refused to answer if they had unsecured debt. These households were mostly those that also refused to declare their household income. Households with incomes in the range of £17,500 to £35,000 had a slightly higher rate of response to the unsecured debt questions; we did not reweight the answers to account for this. The refusal rate for holdings of secured debt was much lower: only 0.7% of interviewees refused to reveal their housing status.

(1) The specific structure and wording of the questions are available at www.bankofengland.co.uk/qb/nmgsurvey.pdf.
(2) Where possible, we compared the survey results against other data sources to assess the robustness of the results. Our analysis indicated that the survey was nationally representative in terms of (among other things): age; housing status; house valuations; and mortgage payments. Results are available upon request.

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The new sterling ERI

By Birone Lynch and Simon Whitaker of the Bank's Structural Economic Analysis Division.

This article explains proposals for a new sterling trade-weighted effective exchange rate index. The existing index is based on trade patterns in manufactured goods in 1989–91. The proposed new index would reflect more recent trade patterns, incorporate services trade and a broader set of countries, including those in Asia. We are inviting comments on the proposed method with a view to publishing the new index on a regular basis from Spring 2005.

Introduction

The Bank of England has traditionally used trade weights derived by the IMF to calculate and publish a sterling effective exchange rate index — the value of sterling against a basket of other currencies. These weights were last updated in 1995[1] and are based on trade patterns for manufactured goods in 1989–91. Inevitably, trade patterns change over time, and this article explains a new approach that the Bank of England intends to use to calculate sterling effective exchange rates. The key new features are: to update weights each year and therefore to produce an annually chain-linked index; for the country coverage to evolve over time based on changes in trade patterns; and to include trade in services.

The rest of this article is organised into four main sections. First, we explain the purpose of an effective exchange rate, and, second, we look at how that influences its design. Next, we explain the new features of the proposed index and examine the impact of the changes. Finally, there is a summary. We would like to invite comments on the proposed method before the Bank begins publishing the new index on a regular basis in Spring 2005.

What is an effective exchange rate?

The UK economy is affected by movements in sterling against many different currencies. Sterling's value against any one of these currencies is known as a bilateral exchange rate. An effective exchange rate index distils the information contained in bilateral exchange rates into one single series. And to construct an effective exchange rate index one first has to decide which bilateral exchange rates to include and, second, to decide how much importance to attach to each bilateral rate, ie the weight to attach to movements in each of the bilateral rates included in the index.

How should one weight together the different bilateral exchange rates? It all depends upon why the effective exchange rate is constructed. The proposed new Bank of England index — like the existing one — is designed to measure the influence of exchange rates on trade in UK goods and services. So the weights need to reflect the relative importance to the United Kingdom of different trading partners. Other types of effective exchange rates could be calculated for different purposes.

It is worth emphasising that, to assess changes in price competitiveness and hence trade volumes, we need to combine nominal exchange rate *and* relative price movements across different countries. In other words, we need to look at *real* trade-weighted effective exchange rates to capture changes in the price competitiveness of UK goods and services. Exchange rates are available at a much higher frequency, and are typically much more volatile, than aggregate prices for goods and services. So in the short run, in particular when they include countries with similar inflation rates, nominal effective exchange rates can act as a proxy for movements in real effective rates and hence competitiveness. But over longer periods of time, or when the set of countries includes those with very different inflation rates, looking at nominal effective exchange rates alone will give a distorted picture of competitiveness.

(1) See 'Revisions to the calculation of effective exchange rates' (1995), *Bank of England Quarterly Bulletin*, February, pages 24–25.

Designing a trade-weighted effective exchange rate index

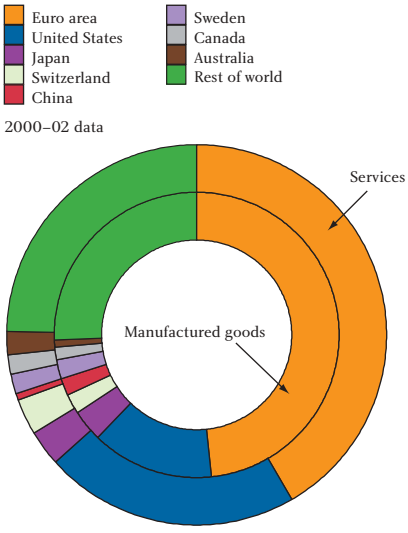
There are two key aspects to the design of a trade-weighted effective exchange rate: the type of trade included and the geographical spread of trade. This section discusses each of these in turn.

Types of trade included

There are three broad categories of trade flows: manufactured goods; commodities; and services. Traditionally, trade-weighted effective exchange rates have focused on manufactured goods and have excluded commodities and services. There are good reasons to exclude commodities trade. Commodities are largely homogeneous and so are priced in world auction markets based on global supply and demand. That means the country of origin or destination is relatively unimportant in determining how price-competitive the product is. Of course, in practice, it is difficult to know where precisely to draw the line between commodities and manufactured goods. The proposed index continues to exclude commodities trade based on standard international trade classifications.

Many tradable services are competing, differentiated products just like manufactured goods. But this type of trade has also traditionally been excluded from effective exchange rate calculations. This is because, in the past, the available trade flow information was insufficiently detailed for a wide enough range of countries. It is potentially important to include services trade where possible as the flows of trade between countries for manufactured goods are different to those for services.

Chart 1
Shares in UK trade in manufactured goods and services



For example for the United Kingdom, Chart 1 shows that the United States and other English-speaking countries are relatively more important trading partners for services than for manufactured goods. The United Kingdom does publish detailed information on its bilateral services trade flows, which the proposed new index includes. But it still will remain the case that, because comparable details are unavailable for many other countries, services trade is treated less comprehensively in the proposed index than trade in manufactured goods.

Geographical spread of trade

A comprehensive measure of competitiveness needs to take into account the different locations in which products compete. We illustrate this by looking at competition between the United Kingdom and Japan. First, UK products will compete with Japanese products in the United Kingdom via imports into the domestic UK market. We term this import competition. Second, UK products will compete with Japanese products in overseas markets. This consists of exports direct to Japan, which we will call bilateral export competition, and exports to the other markets to which the United Kingdom and Japan both export, which is called third-market competition. To get the overall competitiveness weight for a trading partner, the first step is to measure its relative importance to competition in each of these three locations.

Step one: analysing competition in different locations

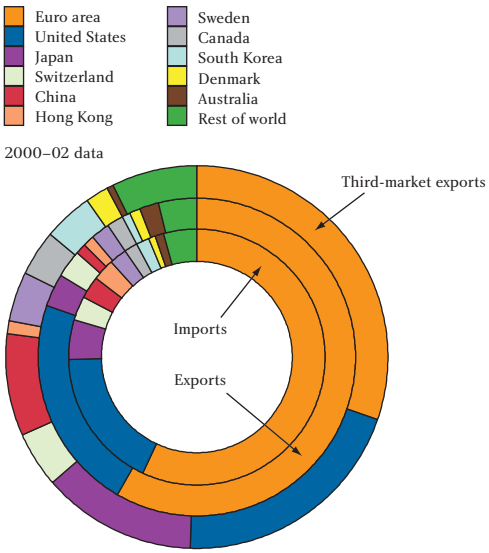
It is straightforward to calculate the importance, or weight, of each trading partner to the competition UK products face from *imports*. These weights are calculated from the share of imports from any one country —say Japan —in total UK imports. But working out the bilateral export competition and third-market weights assigned to individual countries is more complex.

The weight of a trading partner in *bilateral export competition* is not simply equal to its importance as a destination for UK exports. It is necessary to measure the share of UK exports going to that country *and* what proportion of that country's domestic market is supplied by domestic producers, rather than imports from the rest of the world. In other words, we need to know the country's degree of openness. To see this, suppose that country A and B both account for 50% of the United Kingdom's exports. In country A, the rest of its home market is supplied by domestic producers. But in

country B, domestic producers account for only a very small share of the home market, with most of the supply coming from imports from other countries. In this example, country A will be more important than country B as a direct bilateral export competitor to the United Kingdom.

The weight of a country in *third-market competition* represents the intensity of competition between that country and the United Kingdom outside their domestic markets. It is measured by multiplying that country's share in total supply in each third market by the relative importance of these markets as destinations for UK exports (see Appendix 1 for a more detailed explanation). Countries with which the United Kingdom has relatively little direct contact in its own or their domestic markets may be relatively more important as competitors in third markets in the rest of the world. For example, Chart 2 shows that South Korea, Japan and China are relatively more important as third-market competitors to the United Kingdom. But the euro area, a more closed area to trade, is more important as a direct competitor.

Chart 2
Import, export and third-market competition weights



Step two: aggregating across markets

We have described how to calculate the three types of weights that give the relative importance of each country to competition with the United Kingdom in each of the three locations. To calculate a total competitiveness weight for each country we need to aggregate these three according to the relative importance of the different locations of competition to all the markets in which the United Kingdom sells products. The relative importance of import, bilateral export, and third-market competition is represented by λ^M, λ^{BX}, λ^{TX} in the expression below. So the total competitiveness weight of a trading partner (W_i) is represented as follows:

$$W_i = \lambda^M MW_i + \lambda^{BX} BXW_i + \lambda^{TX} TXW_i \qquad \textbf{(1)}$$

where MW is its relative importance to competition in the UK home market from imports, BXW is its weight in bilateral export market competition, and TXW is its weight in third-market export competition. The location of competition weights (λ) sum to 1 and are fixed across all countries.

What determines the value of the λ weights? The weight on import competition (λ^M) indicates what proportion of the United Kingdom's total contact with trading partners across all markets takes place in the home market. This depends on what proportion of UK output is sold in the home market and how open the home market is to overseas producers. The weight on bilateral export competition (λ^{BX}) depends on the average degree of openness of the United Kingdom's trading partners, ie the extent to which they supply their home markets. The weight on third-market competition (λ^{TX}) is the average extent to which the United Kingdom's trading partners' home markets are supplied by third countries. Appendix 1 shows the algebra in detail. It turns out, as we show in the next section, that import and bilateral export competition are of approximately equal importance, with third-market competition considerably less important for the United Kingdom. So, on average, the United Kingdom mainly tends to compete with its trading partners in its own or their home markets rather than against them in the rest of the world. The box on page 432 illustrates the construction of total competitiveness weights for two countries with different characteristics.

To calculate all the necessary weights we need not only UK bilateral trade data, but also a matrix of trade flows for the whole world, and domestic production share data for all trading partners. This method was used by the IMF to construct the existing sterling ERI weights. The breadth of data needed to construct the trade weights is one reason why the IMF weights used in the current vintage of the ERI were based purely on manufactures trade in one particular period (1989–91) and have not been updated since. This means that the weights do not reflect recent changes in the importance of services

Examples of competitiveness weights

As an example of how the different components of competitiveness fit together, this box looks at the competition weights for Germany and China in the proposed new sterling ERI, estimated for 2002.

Location of competition	Importance of different locations of competition to the United Kingdom (λ)	Weight of country in each type of competition (per cent)	
		Germany	China
Import competition weight (MW)	0.44 (λ^M)	15.0 ($MW_{Germany}$)	3.3 (MW_{China})
Bilateral export competition weight (BXW)	0.44 (λ^{BX})	13.2 ($BXW_{Germany}$)	1.0 (BXW_{China})
Third-market export competition weight (TXW)	0.12 (λ^{TX})	7.6 ($TXW_{Germany}$)	10.2 (TXW_{China})
Total trade weight in sterling ERI			
$(0.44 \times MW_i + 0.44 \times BXW_i + 0.12 \times TXW_i)$		13.3	3.1

Germany is most important to the United Kingdom as a competitor in the UK domestic market via imports and competition with Germany in third markets is relatively unimportant. By contrast, despite growing trade volumes between the United Kingdom and China, direct competition in either the UK home market via imports from China, or in the Chinese home market via UK exports to China, is relatively limited. Because China exports extensively to the rest of the world, competition with China in third markets is relatively more important. However, third-market competition accounts for a relatively small portion of the United Kingdom's overall contact with trading partners (12%), against 44% for each of the direct forms of competition. So China's high share of third-market competition does not have much influence on its total trade weight in the proposed new sterling ERI.

trade relative to trade in manufactured goods, nor the increase in trade with Asia.

The proposed new Bank of England approach

The key aim of the proposed new Bank of England index is to reflect trade flows accurately in the period of interest. This requires including services trade and having the flexibility to update the weights and the country set more frequently. Our analysis suggests that the hard-to-calculate elements of the IMF approach change relatively slowly over time or form a relatively small component of the overall competitiveness weights. So we propose to adopt three core elements from the IMF approach to use in our new index:

- the three location of competition (λ) weights;
- the third-market competition weights for each competitor (TXW); and
- the domestic production share adjustments to convert simple bilateral export market shares for each competitor into bilateral export market competition weights (BXW).

We take this information and combine it with much more readily available and easy-to-update UK bilateral trade share information to create an annually chain-linked index that includes services trade and has weights and a country set that varies over time according to the evolution of trade shares. The next section describes the construction of the index in detail.

Practical implementation of the new approach

The IMF has provided us with the λ weights from its current updating exercise[1] (based on 1999–2001 trade data) and those that underpin the current published set of weights (based on 1989–91 trade data). Table A indicates that import and total export market competition make approximately equal contributions to the total competitiveness weights for the United Kingdom and that these have not changed much over a ten-year period. So we propose simply to interpolate this information between 1990 and 2000 to get an annual series. Before and after these dates the λ weights are held fixed.

Table A
The IMF's location of competition (λ) weights for the United Kingdom

	1989–91	1999–2001
λ^M (import)	0.47	0.44
λ^{BX} (bilateral export)	0.38	0.44
λ^{TX} (third-market export)	0.14	0.12

(1) Bayoumi, T, Jaewoo, L and Jayanthi, S (2004).

For the third-market competition weights (*TXW*) for each competitor, we have taken those calculated by the IMF for 1999–2001 and projected them through time in line with competitors' shares in world trade. Table A indicates that third-market competition in aggregate accounts for less than 15% of the total competitiveness weight in both periods, and so approximations such as this should lead to limited loss of accuracy.

To convert simple bilateral export market shares of competitors (*BXS*) into the bilateral export market competition weights (*BXW*) we have used the IMF degree-of-openness adjustment factors for 1999–2001 for each country (γ_i) and held them constant over time. Like the location of competition (λ) weights this is a structural factor that changes only slowly.

Making these assumptions, we can update IMF-style aggregate competitiveness weights annually, based simply on the latest data on bilateral UK trade and competitors' shares in world trade. Overall competitiveness weights for each competitor (i) to the United Kingdom can be expressed as:

$$W_i^t = \lambda^{M,t} MW_i^t + \lambda^{BX,t} \gamma_i BXS_i^t + \lambda^{TX,t} TXW_i^t \qquad \textbf{(2)}$$

where most elements now change over time (t).

Because it is relatively simple to update these series we propose to:

- update the weights annually, calculating a chain-linked series instead of a fixed-weight series; and

- allow the country set to change over time according to trade shares — addressing the criticism that the existing ERI excludes trading partners that have become important recently.

We have also taken the opportunity to include services trade. The ONS publishes data for UK bilateral services trade flows in the *Pink Book* and these can be included in the ERI calculations. So the trade shares (*MW* and *BXS*) are based on data for trade in manufactured goods and services. No third-market weights are available as many countries do not publish detailed bilateral services trade data. But Table A indicated that this element of competition is relatively small.

The index must be spliced together at every period when the weights change. Otherwise, it would not be clear if the movement in the index represented changes in the bilateral exchange rates, or changes in the weights. The old and new weight indices are spliced together by calculating the index with new weights in the base and the current period.

Broadening the range of countries

In principle, all trading partners should be included in the index. There are, however, a number of practical reasons why that is not possible or desirable. First, trade data for developing countries are available on a less timely basis and are likely to be less reliable and only available over limited periods of time. Second, as the country set is broadened, those countries that have experienced very large depreciations are included, for example Turkey, Brazil and Russia. Their exchange rate movements are large enough to have a significant impact on the effective index despite their very small weight. But these depreciations have often been associated with periods of high inflation and so movements in the nominal effective exchange rate that includes these countries will be a relatively poor indicator of changes in the real exchange rate, or competitiveness. Real versions of the broader effective index that allowed for inflation developments would not be so affected. However, information on prices for some of these countries is less timely and reliable. In contrast, for industrialised countries with similar rates of inflation, movements in nominal effective exchange rates will not be a bad approximation to short-run movements in price competitiveness.

There will always be an element of judgement as to which country set to include. The proposal is to publish two main indices, a 'narrow' and a 'broad' index. This is similar to the practice of the Federal Reserve[1] and the European Central Bank.[2] The pool of countries included will evolve over time according to whether they account for more than 1.0% (narrow) and more than 0.5% (broad) of either UK imports or exports. Table B shows the additions to the existing ERI country set during 2000–02 resulting from adopting these threshold-based inclusion criteria. Of course, other narrower indices may be necessary for use in modelling trade flows where longer runs of price data are required which may not be available for developing countries.

(1) Leahy, P (1998).
(2) Buldorini, L, Makrydakis, S and Thimann, C (2002).

Table B
Additional countries in proposed ERIs(a)

1% based (narrow) index	0.5% based (broad) index
China	*1% countries plus:*
Hong Kong	Czech Republic
South Korea	India
Malaysia	Israel
Saudi Arabia	Philippines
Singapore	Poland
South Africa	Russia
Turkey	Thailand
Taiwan	

Note: Both proposed indices drop New Zealand, which is included in the existing published ERI.

(a) Based on inclusion of countries in any of the years 2000–02.

Revisions

With the annual chain-linking approach used here, we need to decide what vintage of trade data to use for the current set of weights. There is a trade-off between having the most recent trade patterns and the extent of regular revisions to the ERI weights that implies. The full year $n-1$ trade data set only becomes available towards the end of year n with the publication of the *Pink Book* by the ONS. While ERI weights for year n are designed to be based on year $n-1$ trade data, data from year $n-2$ initially need to be used as a proxy in year n until full data for $n-1$ become available. To reduce the frequency of revisions we propose to shift from weights based on $n-2$ data to $n-1$ at the end of year n. Trade shares evolve slowly so these revisions should be small.

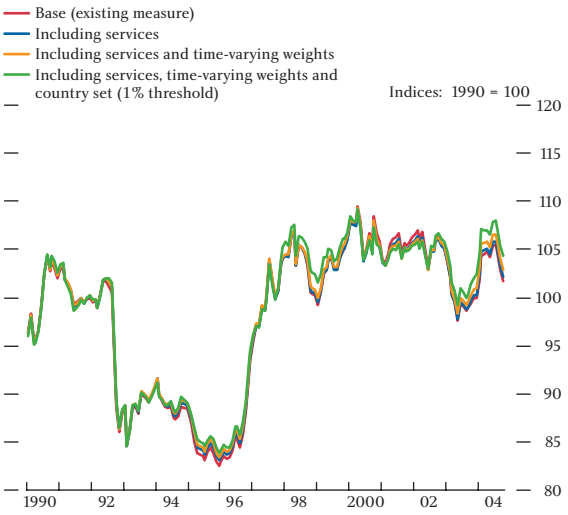
Every ten years or so, when the IMF updates its weights, new data will be available for interpolating the fixed elements of equation **(2)** (the λ and γ elements), potentially resulting in revisions to the previous ten years of data. Judging from the information we have to hand on how these have changed between 1989–91 and 1999–2001, these revisions should also be fairly small.

The impact of the proposed ERI features

The next section discusses the incremental effects, relative to the existing published sterling ERI, of each of the proposed changes to the method of calculation.

In order to create a base from which to judge the incremental effect of changes in method we need to re-create the weights from the existing technique using currently available data. This base calculation is shown by the red line in Chart 3. It is not identical to the published index because, for example, the trade data we have today will have been revised compared with the data available at the time the existing ERI weights were compiled by the IMF, though the differences are small.

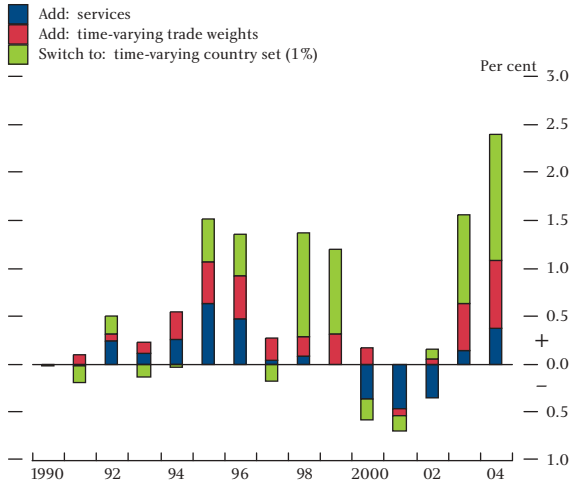
Chart 3
Sterling ERI levels(a)



(a) 2004 figures are to October.

Chart 3 also shows the levels of the ERI that follow from building in the new features. The first point to note is that, when looked at in the context of overall ERI movements over the past 15 years, the differences between the lines are relatively small. Chart 4 shows the percentage changes in the level resulting from introducing these changes in sequence. We next discuss each of these.

Chart 4
Sterling ERI changes(a)



(a) 2004 figures are to October.

Including services

We begin by including services. Compared to the base calculation, including bilateral services trade results in a reduction of the weight on the euro area (-3.2 percentage points — fairly broad-based across countries) and Japan (-0.4 percentage points). This is offset by a significant increase in the US

(+2.8 percentage points), Australian (+0.4 percentage points), and Canadian weights (+0.3 percentage points) — Appendix 2 provides further details. The small impact on the level of the index is shown by the blue bars in Chart 4.

Varying trade weights

The next step is to let the weights vary over time. Compared with the fixed-weights (using 1989–91 data) ERI discussed above, allowing the weights to vary gradually increases the US weight (by 0.8 percentage points in 1995, 2.6 percentage points in 1998 and 3.1 percentage points in 2002) and reduces the weight of Japan (by 1.4 percentage points and 2.2 percentage points in 1998 and 2002 respectively). The effect on the euro-area weight is typically a reduction of less than 1.5 percentage points, but the aggregate euro-area weight conceals a sharp fall between 1989–91 and 2002 in the weights of Germany (-3.1 percentage points), Italy (-0.8 percentage points), and the Netherlands (-0.4 percentage points), partially offset by increased weights on Spain (+1.8 percentage points), Ireland (+2.4 percentage points), and Belgium (+0.7 percentage points). Overall, introducing time-varying weights increases the level of the ERI by around 0.4% in 1995 and 1996, and by somewhat more in 2003 and 2004, but has little impact on other years (red bars in Chart 4).

Varying country set

We next let the country set vary over time. The fixed 20 country set included in the existing ERI was chosen in 1995.(1) A 1% of exports or imports threshold for inclusion results in a country set of 22–26 countries during 1989–2002,(2) with an average of 24. Table C compares the results of this process with the current ERI country set. A '1' represents an included country, and the table also gives the number of years between 1989 and 2002 in which each country is included.

Relative to the existing ERI, using a 1% threshold entails adding China (with a weight varying from 1.5% to 3.1%), Hong Kong (1.7% to 2.3%), Saudi Arabia (1.0% to 1.3%), Taiwan (1.1% to 1.4%) and South Africa (1.0% to 1.1%) for most of the 1989–2002 period, adding South Korea (1.3% to 1.5%), India (1.1% to 1.3%), and Malaysia (0.9% to 1.2%) sporadically, and Turkey (in 2002 only). China is included from 1994 onwards, Hong Kong for the whole period, while Saudi Arabia, Taiwan and South Africa drop out in the early 2000s. India is included for much of the early 1990s, Malaysia in the late 1990s, and South Korea from 1996 onwards.

Table C
Comparison of country sets

	Included			Number of years included	
	Current ERI	1.0% threshold	0.5% threshold	1.0%	0.5%
Australia	1	1	1	14	14
Austria	1	1	1	5	14
Belgium and Luxembourg	1	1	1	14	14
Brazil	0	0	1	0	3
Canada	1	1	1	14	14
China	0	1	1	9	12
Czech Republic	0	0	1	0	1
Denmark	1	1	1	13	14
Finland	1	1	1	12	14
France	1	1	1	14	14
Germany	1	1	1	14	14
Greece	1	1	1	4	14
Hong Kong	0	1	1	14	14
India	0	1	1	5	14
Indonesia	0	0	1	0	5
Ireland	1	1	1	14	14
Israel	0	0	1	0	13
Italy	1	1	1	14	14
Japan	1	1	1	14	14
Malaysia	0	1	1	4	14
Netherlands	1	1	1	14	14
New Zealand	1	0	0	0	0
Norway	1	1	1	14	14
Philippines	0	0	1	0	1
Poland	0	0	1	0	7
Portugal	1	1	1	14	14
Russia	0	0	1	0	7
Saudi Arabia	0	1	1	13	14
Singapore	0	1	1	12	14
South Africa	0	1	1	12	14
South Korea	0	1	1	7	14
Spain	1	1	1	14	14
Sweden	1	1	1	14	14
Switzerland	1	1	1	14	14
Taiwan	0	1	1	13	14
Thailand	0	0	1	0	12
Turkey	0	1	1	1	13
United States	1	1	1	14	14

The only country included in the existing ERI that does not feature in any year under a 1% rule is New Zealand, whose trade shares have typically been less than 0.5%. But Austria and Greece are included for only five and four years respectively. Denmark and Finland drop out for one and two years respectively.

Selecting the country set on a 1% rule adds 0.4% to the level of the ERI in the mid-1990s, increasing to 1.3% by October 2004 (green bars in Chart 4). The more marked appreciation since early 2003 mainly reflects the inclusion of China and Hong Kong. This analysis suggests that allowing the country set to change tends to have the most significant incremental effect.

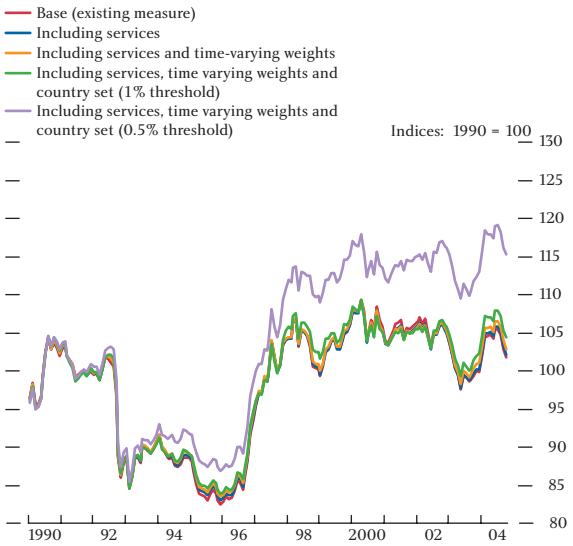
Expanding the country set

The 1% rule can be relaxed to yield a broader ERI measure with more countries. Table C, above, shows the

(1) Only countries that published unit labour cost data were included.
(2) Some of the euro-area countries have trade shares less than 1% but these have still been included.

effect of reducing the inclusion threshold to 0.5% on the country set. Turkey, Greece, Malaysia, Austria, India, South Korea, South Africa and China are included in the weights in several more years than was the case under the 1% rule. Israel, Thailand, Russia(1) and Poland are newly included in seven or more years, with Indonesia and Brazil appearing in a few years. Chart 5 below compares an ERI based on the 0.5% rule country set with the previous versions. The broad dollar effective exchange rate index published by the Federal Reserve uses a similar rule.

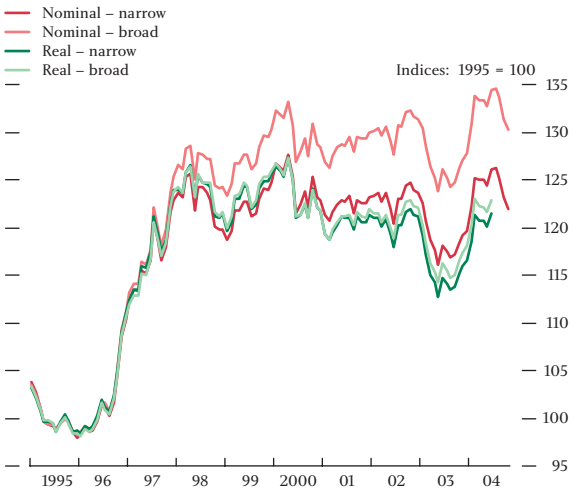
Chart 5
Broad and narrow nominal sterling ERI levels(a)



(a) 2004 figures are to October.

Chart 5 shows that the impact of this final change far exceeds any of the previous three changes. Because many of the newly included countries' nominal exchange rates have depreciated significantly, the resulting ERI is considerably higher. The levels of the 0.5% and 1.0% rule-based ERIs have diverged over time. In 1994 and 1998, however, the difference increased quite sharply — by 1½% and 2% respectively, compared with a trend average increase of around ¾% a year. In 1994 this relatively rapid widening of the wedge between the broader and narrower versions reflected depreciations of the Chinese yuan and Turkish lira.(2) In 1997 and 1998, it reflects the impact of emerging market currency crises, in particular depreciations in the currencies of Indonesia, India, Russia, Thailand, Turkey and Israel.(3) Traditionally, because these depreciations reflected very high inflation and other crises, broad indices like these have not been used for regular monitoring of competitiveness. We can, however, use consumer price data to calculate a real version of the broad and narrow indices and, as Chart 6 shows, the differences are as expected much smaller. Overall, the divergence of the broad and narrow nominal effective indices over time reflects the fact that inflation in the additional countries has been higher. There is sometimes a trade-off between trade coverage and data quality for ERIs. At the 0.5% cut-off level, countries may be included where only limited price and cost indicators are available, with a longer lag and subject to greater quality caveats, making measurement of real exchange rates and hence competitiveness less precise.

Chart 6
Nominal and real sterling ERI levels(a)



(a) 2004 figures for nominal are to October, for real they are to June. Real indices are calculated by combining exchange rates with relative consumer prices.

Charts 7 and 8 below show how the weights attributed to different regions have varied over time in the narrow and broad proposed indices. Both charts clearly show a trend increase in the weight attributed to Asia excluding Japan. But this weight drops between 2000 and 2002 in the narrow version, reflecting falls in the import and export shares of Malaysia, Singapore and Taiwan to just below the 1% threshold level, and consequent exclusion of these countries from the index in that year. That is related to the sharp slowdown in information, communications and technology trade volumes in that period.

(1) Non-availability of Russian/USSR rouble exchange rate data prior to 1992 has made it necessary to exclude the USSR from the calculations in 1989 and 1990 when it would otherwise have been included on the basis of trade shares.
(2) The Chinese yuan, with a 1.4% weight, depreciated by 34%, while the Turkish lira, with a 0.7% weight, depreciated by 64%. Neither currency was included for 1994 based on the 1% rule, so their full weight is relevant to the impact of switching to the 0.5% rule.
(3) These countries are singled out here because they are included in the 1998 weights under the 0.5% rule, but not under the 1% rule. Large depreciations in the currencies of South Korea, Malaysia, Taiwan and Australia did not contribute to widening of the gap because these countries are actually assigned smaller weights under the 0.5% rule.

Chart 7
Regional weights — narrow sterling ERI

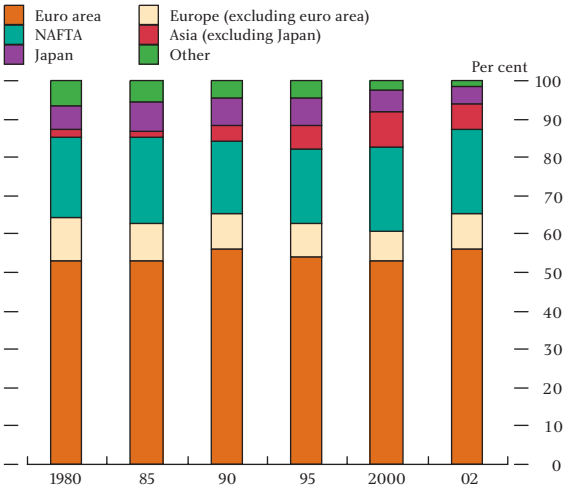
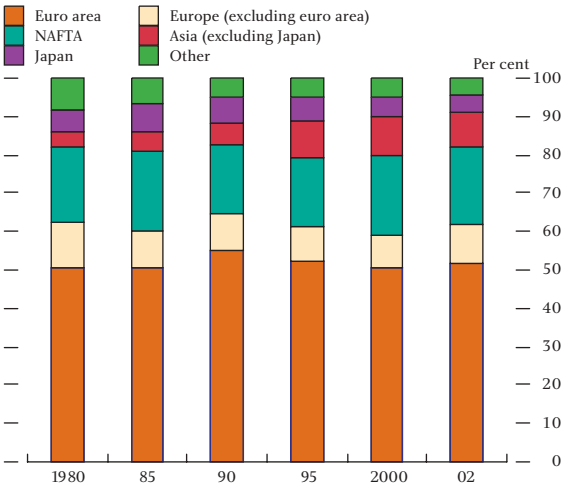


Chart 8
Regional weights — broad sterling ERI



Conclusion and next steps

Within the framework of the IMF method for trade-weighted effective exchange rates we plan to modify the existing sterling ERI weights to incorporate services trade, and allow the weights and country set to vary over time. We propose to update the weights annually to ensure that the competitiveness weights reflect recent patterns of trade. Table D below summarises how the method of the proposed Bank of England index compares with those produced by some other organisations.

Table D
Summary of characteristics of alternative ERIs

	Current IMF/Bank of England	Proposed Bank of England	ECB	Federal Reserve	Goldman Sachs	NIESR
Annual chain-linked	No	Yes	No	Yes	Yes	No
Includes services trade	No	Yes	No	No	No	Yes
Takes into account domestic production shares to weight the different types of competition	Yes	Yes	Yes	No	Partial	No

We believe the proposed method of calculating a trade-weighted effective exchange rate offers a reasonable compromise between being simple enough to allow regular updating and remaining close to the IMF method. Nevertheless, we recognise there are a range of possible alternative methods with differing degrees of complexity. We therefore invite comments prior to making a final decision on the new method to be employed. Once the consultation period has finished and a final decision on the method has been taken, we expect to publish the new sterling ERIs, in the same way as the existing ERI, beginning in the Spring of 2005.

The Bank also currently publishes ERIs for other countries on a daily basis.(1) The weights for these, just like for the existing sterling ERI, were calculated by the IMF. It would not be possible for the proposed new method for the sterling ERI to be applied to all these other countries (for example, because of lack of detailed bilateral services trade data). The alternatives would therefore be to cease publication of the other currency ERIs, or continue to publish them based on the current IMF trade weights, which will be updated by the IMF at some point. Some market participants have told us that they find the other 'Bank of England' ERIs useful, although ERIs for these countries are published by the relevant central banks, and market participants, often with more up-to-date weights. We would therefore also welcome comments about the usage of the non-sterling ERIs, published by the Bank, and on the potential usefulness of continuing to publish them using the existing IMF weights.

(1) Australia, Canada, Denmark, Japan, New Zealand, Norway, Sweden, Switzerland, United States and the euro area.

Appendix 1
The IMF ERI method

The IMF ERI weights are calculated as follows:(1)

$$W_{ij} = \lambda_i^M MW_{ij} + \lambda_i^{BX} BXW_{ij} + \lambda_i^{TX} TXW_{ij} \quad \textbf{(1)}$$

Where W_{ij} is the weight of country j in country i's ERI, MW_{ij} its weight in import competition, BXW_{ij} its weight in bilateral export market competition and TXW_{ij} its weight in third-market competition. These three types of competition are weighted together with the weights (λ) summing to 1. With s_i^k denoting country i's market share in market k, and w_i^k denoting the share of country i's output sold in market k, the components of this expression are derived as follows:

$$MW_{ij} = \frac{s_j^i}{\sum_{l \neq i} s_l^i} \quad \textbf{(A1)}$$

MW_{ij} is the share of country j in country i's imports. s_j^i is country j's share in country i's market. But country i's market includes domestic production. $\sum_{l \neq i} s_l^i$ is the sum of the market shares other than i in i's market, ie the share of imports in country i's market.

$$BXW_{ij} = \frac{w_i^j s_j^j}{\sum_{k \neq i} w_i^k s_k^k} \quad \textbf{(A2)}$$

By contrast BXW_{ij} is *not* simply the share of country j in country i's exports which would simply be $\frac{w_i^j}{\sum_{k \neq i} w_i^k}$: the share of country i's output sold in market j, divided by the share of exports in country i's total output, much as in equation **(A1)**. Before being used in equation **(A2)**, this simple share is scaled by $\frac{s_j^j \sum_{k \neq i} w_i^k}{\sum_{k \neq i} w_i^k s_k^k}$, which can be interpreted as a measure of the relative openness of country j. This is the openness adjustment coefficient referred to as γ in the main text. This is because s_j^j is country j's share in its own market — a measure of that country's openness — and $\frac{\sum_{k \neq i} w_i^k}{\sum_{k \neq i} w_i^k s_k^k}$ is the inverse of the average openness of country i's trading partners: s_k^k in each trading partner weighted by w_i^k — the share of country i's output sold in market k. So countries that are relatively open, ie their share of their own market s_j^j is small, tend to be less important for bilateral competition.

$$TXW_{ij} = \frac{\sum_{k \neq i,j} w_i^k s_j^k}{\sum_{k \neq i} w_i^k (1 - s_i^k - s_k^k)} \quad \textbf{(A3)}$$

The numerator of TXW_{ij} measures the competition between the exports of country i and j by multiplying country j's share of k's market (ie the competition from country j in that market) by market k's share in country i's output (ie the importance of country k to country i) — sometimes called double-export weights. The denominator is necessary because s_j^k is j's share of the whole of country k's market. But some of this is taken up by k's own production, and some by i's production. These need to be subtracted here because this is bilateral trade between k and i, which is taken care of in BXW_{ij}.

(1) For more details see Zanello and Desruelle (1997, page 29).

We now need to calculate the λ weights. All of these have the same denominator: $\sum_k w_i^k(1-s_i^k)$. This is the share of *i*'s output sold to country *k* times the share of *k*'s market accounted for by country *k* and third-country production summed across all countries. The intuition is that there is competition wherever country *i*'s products share a market with other countries' products, and this is more significant where the market accounts for more of *i*'s output or where the market is more open to producers other than *i*'s (giving consumers more scope to buy other country's products).

Considering the λ weights in turn, concentrating on the numerators:

$$\lambda_i^M = \frac{w_i^i(1-s_i^i)}{\sum_k w_i^k(1-s_i^k)} \quad \textbf{(A4)}$$

The weight on imports is the share of *i*'s output sold in country *i*, multiplied by the foreign share of country *i*'s market. Country *i*'s products are more subject to competition with imports the more they are sold in the domestic market (by definition), or the more open this market is.

$$\lambda_i^{BX} = \frac{\sum_{k\neq i} w_i^k s_k^k}{\sum_k w_i^k(1-s_i^k)} \quad \textbf{(A5)}$$

The weight on exports is the trade-weighted average of s_k^k — which is negatively related to the 'openness' of UK trading partners, as measured by the share of their market accounted for by their own production. The less open trading partners are on average, the more UK goods compete directly with their products (rather than with third-market output).

$$\lambda_i^{TX} = \frac{\sum_{k\neq i} w_i^k(1-s_i^k-s_k^k)}{\sum_k w_i^k(1-s_i^k)} \quad \textbf{(A6)}$$

This is the trade-weighted average of $1 - s_i^k - s_k^k$: the share of country *k*'s market satisfied by third-market production (ie production of countries other than *i* and *k*). The more, on average, trading partners' markets are accounted for by the third-market products, the more UK goods compete with these.

Appendix 2
Comparison of ERI weights

Per cent

	Existing	Reconstructed base	Including services	Time-varying weights, fixed country set			Time-varying weights and country set (1% threshold)		
				1995	1998	2002	1995	1998	2002
Australia	0.48	1.03	1.41	1.42	1.47	1.39	1.32	1.35	1.31
Austria	1.19	1.05	1.03	0.90	0.96	1.07	0.00	0.87	0.99
Belgium and Luxembourg	5.39	5.98	5.33	5.66	5.59	6.03	5.25	5.08	5.61
Canada	1.38	1.62	1.95	1.77	1.90	2.12	1.60	1.68	1.93
China	0.00	0.00	0.00	0.00	0.00	0.00	1.60	1.79	3.08
Denmark	1.38	1.64	1.62	1.46	1.47	1.52	1.34	1.31	1.39
Finland	1.41	1.39	1.24	1.19	1.16	1.13	1.10	1.05	1.05
France	12.59	11.42	11.11	10.83	10.80	10.84	10.04	9.83	10.10
Germany	22.49	19.01	17.41	16.71	14.60	14.35	15.51	13.28	13.34
Greece	0.31	0.53	0.94	0.91	0.78	0.93	0.00	0.00	0.86
Hong Kong	0.00	0.00	0.00	0.00	0.00	0.00	1.93	1.95	1.87
India	0.00	0.00	0.00	0.00	0.00	0.00	1.27	0.00	0.00
Ireland	3.08	4.64	4.33	5.07	5.50	6.74	4.71	5.02	6.32
Italy	8.27	7.02	6.40	5.79	6.16	5.58	5.37	5.61	5.20
Japan	7.00	8.23	7.80	7.83	6.44	5.60	7.09	5.66	5.04
Malaysia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.96	0.00
Netherlands	5.71	8.08	7.45	7.60	7.74	7.02	7.06	7.07	6.53
New Zealand	0.21	0.21	0.30	0.32	0.28	0.24	0.00	0.00	0.00
Norway	1.19	1.09	1.35	1.37	1.39	1.28	1.27	1.27	1.19
Portugal	0.84	1.15	1.23	1.18	1.22	1.02	1.09	1.11	0.95
Saudi Arabia	0.00	0.00	0.00	0.00	0.00	0.00	1.06	1.00	0.00
Singapore	0.00	0.00	0.00	0.00	0.00	0.00	1.55	1.26	0.00
South Africa	0.00	0.00	0.00	0.00	0.00	0.00	1.01	1.01	0.00
South Korea	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.32	1.45
Spain	3.85	3.42	3.98	4.47	4.91	5.78	4.15	4.46	5.37
Sweden	3.45	3.53	3.32	3.15	3.04	2.39	2.88	2.71	2.18
Switzerland	3.27	3.37	3.40	3.18	3.64	3.47	2.89	3.25	3.18
Taiwan	0.00	0.00	0.00	0.00	0.00	0.00	1.23	1.17	0.00
Turkey	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.08
United States	16.49	15.59	18.39	19.22	20.94	21.52	17.69	18.90	19.98
Euro area(1)	65.13	63.69	60.46	60.29	59.43	60.49	54.28	53.38	56.33

(1) Including Greece.

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Data sources

UN Comtrade database
ONS (mainly *Pink Book*)
IMF International Financial Statistics, Direction of Trade Statistics
Taiwan Statistical Data Book

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Using option prices to measure financial market views about balances of risk to future asset prices

By Damien Lynch and Nikolaos Panigirtzoglou of the Bank's Monetary Instruments and Markets Division and George Kapetanios of the Bank's Conjunctural Assessment and Projections Division.

Probability density functions (pdfs), implied by prices of traded options, are often used by the Bank to examine financial market expectations about future levels of different asset prices. This article examines how information about one aspect of such expectations — views on balances of risk — for future asset prices may be inferred from the degree of asymmetry of an implied pdf. We first look at the general issue of choosing a statistic to summarise the degree of asymmetry of any pdf. The choice of units when measuring changes in the underlying asset price is then considered. Finally, we examine empirically the implications of using various asymmetry measures when relating the information from option-implied pdfs to market views about balances of risk to future asset prices.

1 Introduction

Financial assets are usually valued as the discounted sum of expected future cash flows from holding the asset. Viewed in this way, market prices may be thought to embody an aggregate 'market view' about expected future cash flows, discount rates and any other variables used in their valuation. These views, in turn, are likely to be related to the expected future economic environment and so asset prices may provide policymakers with a source of information about market expectations of future economic prospects.

Furthermore, derivatives traded on these assets allow market participants to take views on the future values of the assets themselves. Option markets are an important example of this. Previous work published by the Bank of England has illustrated the sort of forward-looking information that options embody.(1) One useful application for policymakers is that they can use option prices to infer a set of probabilities attached by financial markets to various future asset price levels. In the jargon this is referred to as an option-implied probability density function (pdf) for the price of the underlying asset in the future. The width of the pdf will reflect uncertainty about future asset prices. And the extent to which the pdf is asymmetric can potentially tell us about market views on the relative risks that future asset prices will be higher or lower, the so-called 'balance of risks'.(2)

In inferring this sort of information from implied pdfs it is important to bear in mind that the pdfs are extracted under the assumption that investors are risk-neutral, that is, investors do not require any compensation for bearing risk. However, investors are more likely to be risk-averse and so care about risk. As a result, the risk-neutral option-implied pdfs will reflect both investor preferences toward risk and market participants' 'true' pdf.(3)

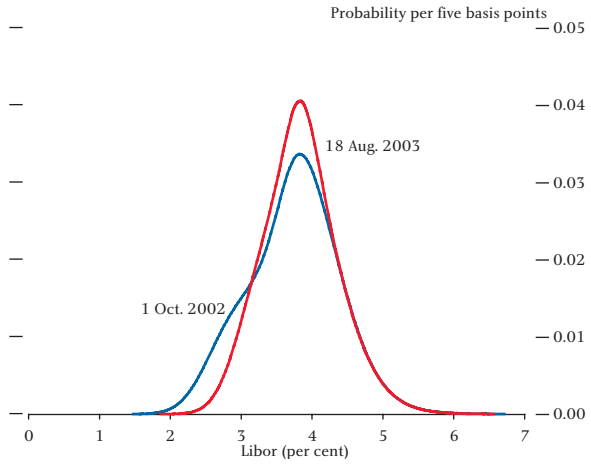
Information about the shape of implied pdfs for different asset prices forms part of the information set regularly examined by the Bank in pursuing its two Core Purposes of monetary stability and financial stability. It is primarily of use in helping policymakers to understand market expectations about a range of future asset prices — and, by extension, perhaps the economy. For monetary stability, interest rate probability distributions implied by option prices are one way of assessing market views about risks around the path of expected future interest rates. Such views could reflect market uncertainty about the monetary policy reaction function or about the nature of exogenous risks facing future interest rates and the economy. Turning to financial

(1) See Bahra (1997) and Bliss and Panigirtzoglou (2002), Clews, Panigirtzoglou and Proudman (2000) and Moessner (2001) for examples of the use of option-implied pdfs by central banks.
(2) Another example of information about market perceptions of risks to asset prices that we can potentially extract from these distributions is the probability of extreme moves in asset prices. This is reflected in the concentration of probability in the tails of the distribution.
(3) We abstract from the effects of risk preferences for the purpose of this article. For more on this issue see Bliss and Panigirtzoglou (2004).

stability, information from option prices could be useful in monitoring and assessing potential risks to the financial system. For example, concentrations of probability in the tails of the probability distributions for future asset prices may indicate growing perceptions of a risk of unusual movements in asset prices.(1) More generally, indicators from implied distributions are widely used in the *Inflation Report*, *Financial Stability Review* and *Quarterly Bulletin* in interpreting and reconciling developments in a wide range of asset prices including interest rates, exchange rates, oil and equity prices.(2)

Some examples of pdfs for short-term UK interest rates (three-month Libor) are shown in Chart 1. The relative width of the pdfs suggests that market uncertainty declined between October 2002 and August 2003. In addition, relative to 2002, the pdf became more symmetrical in 2003. This suggests that market views had moved from attaching a greater risk to lower, relative to higher, future UK interest rates in October 2002, towards a more neutral view of the balance of risks by August 2003.

Chart 1
Option-implied pdfs for three-month Libor in six months' time



Comparing how probability distributions — or market views — have changed between two dates is easily achieved by such visual inspection. But we may wish to compare the shapes of distributions on many dates to say something about how these market views of the balance of risks have changed over an extended time period. In this case, visual analysis is less useful; instead we need to be able to measure the degree of symmetry or asymmetry of a distribution and, having done so, relate this measure to market views about the balance of risks. That is, we need a statistic — a number each day — that can summarise the shape of the distribution and that can be compared across different days. How might we go about constructing such a measure?

Statistical theory can provide us with some guidance. There are a number of well established measures for evaluating degrees of asymmetry of probability distributions. Examples include the skew coefficient or a comparison of aggregate probabilities above and below a particular point in the distribution. In deciding which measure to use, there are, however, a number of issues that we must first address. This article looks at what we need to consider in terms of choosing a measure of market views about balances of risk to future asset prices. We look at the general question of choosing a statistic to summarise the degree of asymmetry of any pdf, ie not just those implied by option prices.(3) Section 2 illustrates the potential pitfalls we face when making this choice. Our goal is then to identify measures of asymmetry that are consistent with the other information that we may take from a pdf — such as a view of the most likely outcome or the expected outcome.

We begin by recognising the need to specify a reference point, around which to look at asymmetry. To this end, we employ a so-called 'loss function' which we may combine with information from a pdf to guide us in our choice. Section 3 introduces the concept of a loss function and looks at some alternative functions and what they imply for our choice of reference point. Section 4 continues with this framework in obtaining measures of pdf asymmetry that are consistent with common reference points in a pdf.

Having set out some measures of asymmetry, we look at how the choice of units when measuring changes in the underlying asset price can affect the shape of the option-implied pdfs. For example, should we look at a

(1) The usefulness of the information from option prices is subject to the liquidity of the option contracts. In particular, a lack of liquidity in contracts that are far away from the money — that is, in the tails of the implied distributions — means that reliably estimating the tails can be difficult. Liquidity also tends to diminish the longer the time to expiry of the contract. In addition, there may be liquidity differences between call and put options so that the upper and lower tails of the pdf may differ due to liquidity premia. As a result, implied pdf asymmetry can reflect factors other than market views on balances of risk. The reliability of the pdf estimates is also subject to the smoothing of prices by exchanges in calculating settlement prices and the discrete nature of both option price tick sizes and exercise prices.
(2) For examples see *Inflation Report*, August 2004, Section 6.2; *Financial Stability Review*, December 2003, pages 12–13; *Quarterly Bulletin*, Summer 2004, page 116.
(3) However, throughout our discussion we illustrate our thinking using examples with pdfs implied by option prices.

probability distribution for changes in the level of the asset price or changes in the logarithm of the asset price? This could have implications for how we relate a measure of asymmetry for pdfs to market views on the balance of risk to future asset prices. Section 5 motivates this point further and sets out our analysis.

Finally, we consider some empirical findings on the relationships between the various measures of asymmetry suggested as well as with other frequently used measures.

2 Pdfs and asymmetry — setting up the problem

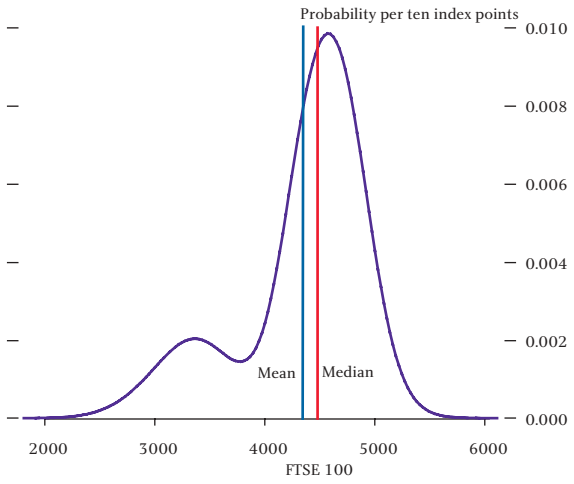
To help to understand the problem of choosing an appropriate measure of asymmetry, consider the example of someone, say a policymaker, presented with a set of probabilities for different values of a random variable occurring. In principle, this random variable could be anything — from the number of sunny days in the United Kingdom during summer to the level of the sterling/euro exchange rate in six months' time. Continuing with our asset price focus, let us take the random variable to be the level of the FTSE 100 equity index in six months' time.

As for our interest rate example above, the policymaker can plot the probability associated with each potential FTSE 100 level to get a visual idea of the distribution of probability — we do this in Chart 2. Now the policymaker, seeking to summarise the information in the distribution, would like to choose a 'point' estimate of the future level of the FTSE 100, six months hence. Such point estimates are usually chosen from the 'centre' of the distribution and are often referred to as measures of central tendency. Common examples include the outcome with the highest probability — the mode, or the 'expected' outcome — and the mean, calculated as the sum of all outcomes, weighted by their probability.

Let us suppose the policymaker chooses the mean outcome as a point estimate. Relying on a sole point estimate may not be advisable and so the policymaker will also want to know the spread of outcomes around this point and whether the risks around this point are stacked in one direction more than another (ie the 'balance of risks' mentioned earlier). How might the policymaker measure the balance of risks around the point estimate? One way might be to measure the difference between the probability, in aggregate, attached to outcomes above and below the point estimate. Alternatively, we could look to statistical theory and use the well established method of calculating the degree of skew of the probability distribution.(1) We use both and compare the results.

Chart 2 shows that the distribution has a longer lower than upper tail. Visually we would say it has negative asymmetry or that it is negatively skewed. Calculating the skew coefficient confirms this: it is around -1. From this we might infer that the risks around our reference point — the mean — are tilted towards lower, rather than higher, outcomes. However, measuring the probability attached to the outcome being above and below the mean, we arrive at a different conclusion.

Chart 2
Option-implied pdf for FTSE 100 in six months' time on 22 March 2004



To see this, Chart 2 also plots the median of the distribution: that point at which there is equal probability, in aggregate, attached to outcomes above and below it. The mean outcome lies below the median, so the probability attached to outcomes above the mean is greater than that attached to outcomes below the mean. We find that there is about 20 percentage points more probability attached to FTSE 100 outcomes above the mean than to those below the mean. So from this we might infer that the balance of risks around the mean FTSE 100 outcome is actually positive — in contrast to what the skew measure had indicated. How can we understand this difference?

(1) The skew is calculated by summing up each of the distances between potential outcomes and the mean, raised to the power of three, and multiplied by the probability attached to each outcome. This sum is then divided by the third power of the standard deviation of the pdf to adjust for any effects due to changes in the width of the pdf.

3 Pdfs, reference points and loss functions — a framework for thinking about asymmetry

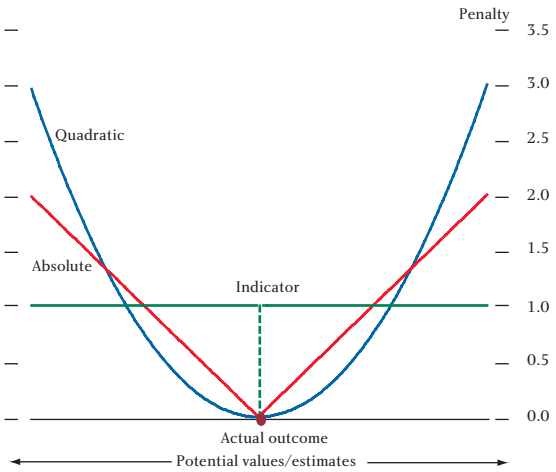
In our example above, the first step in measuring the degree of asymmetry of a pdf lay in our choice of a point estimate or a reference point in the distribution. Having suggested some points of central tendency as candidates, we arbitrarily picked the mean. We then sought to apply some well known measure of asymmetry to the distribution and to infer something about the balance of risks around this reference point. But this choice is not as innocuous as it may seem. Below we consider the choice of a reference point in a more structured framework — that is, in the context of loss functions — and show that this choice can depend, either implicitly or explicitly, on the preferences of the person making the estimate.(1) Our choice of asymmetry measure should also be consistent with these preferences. Thus we should not be surprised that simply picking an *ad-hoc* reference point and applying an *ad-hoc* measure of asymmetry around it can provide conflicting indications about the balance of risk in the distribution. So our challenge is to use this preference dimension or loss function framework to derive measures of asymmetry associated with common measures of central tendency that we might use as point estimates.

In principle, any point in a probability distribution may be used to provide a reference point. Can we set ourselves some criterion against which to judge which point is best? An obvious reference point is our best point estimate of the future value of the variable, given our preferences. So at a simple level, one criterion is to say that an estimate is 'best' when it exactly matches the subsequent outturn and that it suffers a loss of 'quality' when it differs from it. Pursuing this line, we can quantify this loss of quality by using what is termed a loss function — a mathematical function that sets out the loss or penalty incurred in picking an estimate that is not the best that we could choose.(2) In economics, loss functions are complementary to utility functions — with the former we measure a cost/dissatisfaction associated with a particular event whereas the latter measure the benefit/satisfaction associated with an event. As a result, an individual's preferences as revealed in their utility function will also be revealed in the corresponding loss function.(3)

How we measure this loss might depend on the purpose for which an individual selects a point estimate. So, for example, one individual may express a preference that puts all emphasis on getting the forecast exactly right such that incorrect forecasts are equally bad, be they incorrect by a very small margin or a very large margin.(4) Another may be more willing to accept small errors so that forecasts that are close, but not equal, to the actual outturn are valued more (or penalised less) than those that are very far away from it.

Some visual examples may help to cement the idea; Chart 3 shows three loss functions that are often used in economics, engineering and other sciences: the quadratic, indicator and absolute loss functions. The horizontal axis shows the set of point estimates for the random variable that we may choose from. Also marked on the horizontal axis is the location of the actual outturn. The vertical axis measures the loss that one would incur for each point on the horizontal axis as the point forecast, given the actual outturn.(5) For all three

Chart 3
Alternative loss functions



(1) In our example, we have chosen to refer to this person as a policymaker. However, when thinking about pdfs implied by option prices we are examining the 'market's' probability distribution or forecasts so should we not be concerned with the preferences of the market? For now, we continue with our example and address this point at the end of Section 4.
(2) This is analogous to a problem in engineering where products from a production process need to be monitored/assessed to see if their quality matches the desired specifications of the product. Loss functions are often employed as tools to deal with the problem. See Joseph (2004) for more details.
(3) In a previous *Quarterly Bulletin* article (see Vickers (1998)), possible loss functions for the Monetary Policy Committee were examined in terms of theoretically describing potential preferences of the Committee in pursuing its inflation objectives as specified in the Bank of England Act 1998. For more examples of applications involving loss functions in economics, see Svensson (2004).
(4) Consider someone placing a conventional bet on a horse race: the nature of the bet will mean that picking the winner and getting the forecast right is crucial and so the punter will place no value on forecasts that are incorrect by a small (eg second place) or a large (eg second-last place) margin.
(5) To facilitate a comparison of the three loss functions, the losses calculated under the quadratic and absolute loss functions are normalised by dividing by the average loss under the respective function.

functions, a zero loss is incurred when the estimate that is picked is the same as the outturn. Picking points away from this best estimate incurs positive loss and the different mathematical functions are designed to show some alternative 'loss schemes'. The three alternative schemes imply three different 'attitudes' towards alternative point estimates.

- Beginning with the most basic loss function — the indicator loss function — all points that are different from the best estimate are deemed to incur the same penalty. In other words, all value is placed on picking the best estimate and all other potential forecasts are viewed as being of equally poor quality.

- In contrast, the quadratic and absolute loss functions penalise different points according to how far they are from the best point estimate (see the appendix for mathematical definitions). Those points that are 'close' to the best estimate incur a smaller penalty under the quadratic loss function than under the absolute loss function. But moving further away from the best estimate, the quadratic loss function gradually begins to penalise mistakes more than the absolute loss function.

The criterion set out above was based on choosing the best estimate as the one that is equal to the actual outturn. Of course, this is of little practical use to us — the reason that we are picking an estimate is because we do not know what the outturn will be. So, remaining within the loss framework, we instead need to think about the loss we would be expected to incur were we to pick a given point as our best estimate.(1) To quantify expected losses we need to use the information we have about the probabilities attached to different outcomes — the probability distribution. So we can identify the best estimate to choose as the point that we expect to result in the smallest loss, given the probability that we attach to each outcome being realised. In this sense the 'best' estimate now depends both on the probability distribution of possible outcomes, as seen by the person selecting the estimate, and on individual preferences.

We show in the appendix that the 'best' point estimate differs across the three loss functions as follows:

- For an indicator loss function, the best point estimate is the mode of the distribution (the most likely outcome). Intuitively, this makes sense; remember that our exercise is to choose the estimate that will minimise our expected loss, given the probability attached to each point actually occurring. And our loss function is such that we have an all-or-nothing character. It then follows that the logical thing to do must be to pick that point that is most likely to occur — the mode — as our best forecast given our preferences.

- The mean of the distribution (or the average of all possible outcomes) is the best point estimate under a set of preferences given by a quadratic loss function.

- Finally, the best point estimate with an absolute loss function is the median (the point in the distribution such that there is equal probability of the outcome being higher or lower than it).

4 Characterising and measuring pdf asymmetry

The previous section looked at how we could use loss functions as a tool in helping us to choose our best point estimate from our probability distribution. How can we use the concept of a loss function to arrive at measures of pdf asymmetry that are consistent with the best point estimates that our loss framework provides us with? We start by measuring asymmetry in terms of the difference between the expected losses attached to outcomes above and below the point estimate.(2) By doing so we are assessing the balance of risks around a reference point (ie making a relative assessment of the upside and downside risks).

So for a given distribution and loss function, we first need to compute our best estimate and then we may use the relative expected losses around this reference point to compute the associated asymmetry measure. Taking the three loss functions mentioned above, we can derive the asymmetry measures that are consistent with each of them; these are shown in Table A1.1 in Appendix 1. We briefly set out their key properties here:

- Taking the indicator loss function first, we mentioned earlier that the mode was the

(1) It is important to acknowledge that focusing on 'expected loss' is in itself a preference-based choice. For example, one could choose to minimise the modal loss or the median loss.
(2) We standardise the difference in expected losses by dividing by the total expected loss.

best point estimate and hence that is our reference point. Under this loss function, the difference between expected losses above and below the mode is shown to be the difference between the aggregate probabilities of the future outcome being above, and below, the mode. Put simply, our asymmetry measure is just the difference in the probability masses above and below the mode.

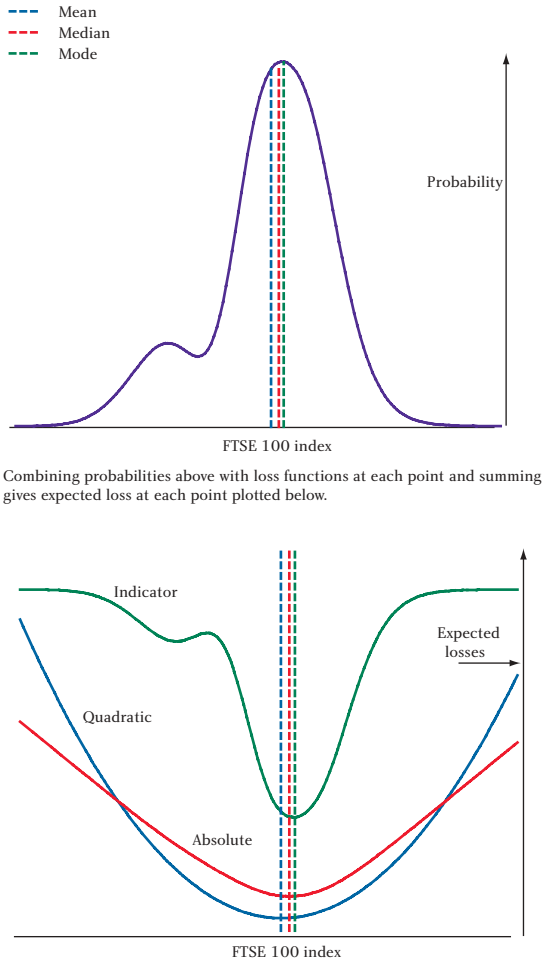
- Turning to the absolute loss function, the loss appears slightly less intuitive, with the relative expected losses now the standardised sum of probabilities weighted by the distance, in absolute terms, of each potential outcome from the reference point (the median). This has a simple form driven by the difference between the mean and the median.

- Finally, asymmetry under the quadratic loss function is measured in terms of squared distances of future outcomes from the mean outcome weighted by the corresponding probabilities. As a result, those outcomes that are further away from the mean will have a proportionately greater influence in determining the magnitude/sign of our measure. Just how much influence they have will be determined by their probabilities. In this sense, this asymmetry measure is closely related to the statistical measure of skew.

For all measures, a positive (negative) number indicates a greater expected loss attached to outcomes above (below) the central projection than to those below (above). In terms of the option-implied pdfs, the positive (negative) number would indicate that the market views the balance of risks to point to a relative upward (downward) risk to asset prices. In the case of a unimodel symmetric probability distribution, the mean, mode and median all coincide and so the best point estimate under each of the three loss functions is the same point in the probability distribution. In this case the asymmetry of the distribution will be zero, reflecting the fact that the expected losses above and below the single reference point are equal, regardless of the loss function with which they are measured. So, for example, the bell-shaped 'normal' probability curve — a frequently used symmetric distribution — has zero asymmetry under all three loss functions discussed above. This feature of the normal distribution means that it is a useful benchmark when assessing the degree of asymmetry of probability distributions.

To illustrate how the loss function combines with a pdf to produce an expected loss function we examine an option-implied pdf for the FTSE 100 equity index and the three loss functions in Chart 4. The lower part of Chart 4 illustrates the expected losses at each index level for the three loss functions, with the upper part showing the FTSE 100 pdf. That is, for each level of the FTSE 100, we evaluate the expected loss were that level chosen as our best estimate. Plotting the resulting expected losses against associated FTSE 100 levels provides the expected loss functions in the lower part of Chart 4. The expected loss for the indicator loss function is minimised on the mode; that for the quadratic on the mean; and that for the absolute on the median. The asymmetry of expected loss for projections above and below the best estimates is also evident, reflecting the negative asymmetry of the probability distribution. This negative asymmetry arises because market participants are paying more for insurance against a large fall in the FTSE 100 than they are for protection against a corresponding large rise in the index.

Chart 4
FTSE 100 pdf, expected loss functions and optimal central projections



We should now be able to understand why we obtained seemingly inconsistent measures of asymmetry for the FTSE 100 pdf in the example in Section 2. Our loss-based framework implies that loss functions, central projections and asymmetry are linked. It was the arbitrary mixing of the reference point and asymmetry measures that created the inconsistency. Recall that in Section 2, we compared two measures of asymmetry — the skew and difference in upper and lower cumulative probabilities, using the mean as our point of reference. But our analysis has shown that the mean is associated with the quadratic loss function and so neither of these measures may be fully consistent with it. Instead we should be using the measure of asymmetry appropriate for the quadratic loss function.(1) Using appropriate measures of asymmetry with different central projections should provide consistent measurement of the degree of pdf asymmetry. We demonstrate this empirically in Section 6.

Though we set out our example using a 'policymaker', we have already noted that it may be applied to anyone wishing to summarise the information in a probability distribution for any variable. But our emphasis from the start lay with the information that we can get from option prices on market views about future asset prices. And the set of probabilities that we extract from option prices are market probabilities rather than those of the policymaker.(2) This might beg the question: whose preferences should we be concerned about in choosing a loss function? Strictly speaking, if our aim is to summarise market views it should be those of the market. The views we are considering are aggregate market views — the result of many interactions of individual heterogeneous agents and we have no idea what might be a reasonable loss function. But we argue that we need not be so concerned with this point. What is important is that, in considering market views, we use asymmetry measures that are consistent with alternative central projections. The loss functions may be viewed simply as tools that allow us to identify these measures for commonly used central projections.

Until now our discussion has focused on 'how' we can measure pdf asymmetry. But before we can interpret this measure of asymmetry in terms of market views about where the risks lie, on balance, to asset prices in the future, we need to think about 'what' it is that we want to measure the asymmetry of. Our examples above used pdfs of the level of a random variable — the FTSE 100 — but is there a case to be made for looking at the pdf of future logarithmic changes in the level of financial variables instead? And does this affect our interpretation of asymmetry as an indicator of market views on the balance of risks to asset prices?

5 Asset price levels, logarithmic changes and option-implied pdf asymmetry

The shape of a pdf will depend on the units with which we choose to measure the variable; whether, for example, we look at levels of asset prices (or, equivalently, simple proportional changes in price levels) or logarithmic changes in asset prices.(3) But why might we choose to look at units such as logarithmic changes instead of asset price levels themselves?

When evaluating the performance of different investment assets — such as equities, bonds and futures contracts — logarithmic growth rates are often preferred to simple (proportional) changes in asset prices for a number of reasons:

- Asset prices cannot be negative, which means that the distribution of possible asset price levels should naturally be asymmetric. Looking at the logarithm of the underlying asset price may allow us to get around this because the logarithm of positive numbers does not have a lower bound at zero.

- In addition, for assets like exchange rates, logarithmic changes are not dependent on the way prices are quoted. That is, a given appreciation of sterling against the euro implies the same depreciation of the euro against sterling when changes are calculated in logarithmic terms. That is not true when calculated using levels.

- A further advantage of logarithms, when considering probability distributions, lies in the equivalence of pdfs in log levels and pdfs in log changes. That is, as the price today is known, the logarithmic change over some future horizon is

(1) However, we show in a later section that, empirically, the measure of asymmetry based on the quadratic loss function is strongly associated with the skew measure.
(2) As noted earlier, the risk-neutral nature of the option-implied pdfs means that the implied probabilities will reflect both market views on probabilities and compensation for risk. The latter factor means that the probabilities themselves are also likely to reflect the preferences of the person selecting the estimate.
(3) By changes in asset prices we mean the change in the asset price at some horizon relative to today's futures price for that horizon.

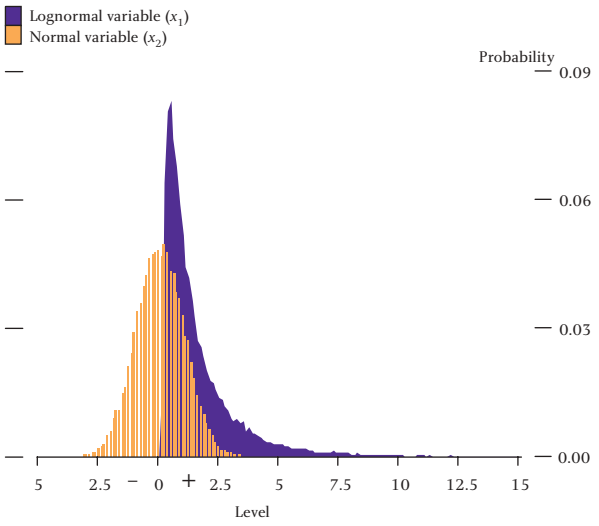
simply the logarithm of the price level in the future minus a constant.

- Finally, logarithmic changes (or growth rates) and their sum provide a better description of the actual change over a period than the sum of simple proportional changes.(1)

So how will pdfs in terms of logarithmic changes for asset prices differ from those in terms of price levels? Let us consider the special case where asset prices are assumed to be 'lognormally' distributed. What do we mean by this? A random variable, say an asset price, is by definition said to have a lognormal distribution if the logarithm of the asset price is normally distributed. And a lognormal distribution for the level of asset prices necessarily means that simple proportional changes of the asset price level will also follow a lognormal distribution. In contrast, the logarithmic price level or logarithmic price level changes would have a normal distribution.

Chart 5 illustrates the difference for two theoretical random variables – x_1 and x_2. It shows the frequency distributions for 30,000 random observations for x_1, drawn from a lognormal probability distribution. Taking the logarithm of the lognormal variable x_1, we obtain normally distributed random observations for x_2. We can see that x_2 takes both positive and negative values while x_1 observations are only positive.

Chart 5
Examples of lognormal and normal probability distributions



Furthermore, x_2 is symmetrically distributed, in contrast to the asymmetric distribution for x_1.

What significance does this have for pdf asymmetry? Suppose we are considering an option-implied pdf for asset price levels or changes. In terms of its shape, the lognormal distribution for levels or simple price changes would have a natural positive asymmetry under each of our asymmetry measures. But the pdf for logarithmic price levels or changes would be symmetric. In this sense, by looking at the asymmetry of the pdf for logarithmic changes, what we are really considering is the excess skew in asset prices — that is, how asymmetric the pdf for asset prices is relative to some 'natural' benchmark (which we take to be lognormal). A further illustration of this point in the context of option pricing and implied volatilities is provided in the box on page 450.

How realistic is this assumption? Much of the empirical finance literature has shown that probability distributions for historical logarithmic changes in asset prices, especially for equity indices, exhibit non-normal features. This is especially so for short-horizon changes such as those at the daily frequency. But we focus on pdfs for much longer horizon changes — those over three, six, nine and perhaps twelve months. For such horizons the evidence in the literature is less clear: empirically it is difficult to estimate reliably probability distributions for changes over these horizons due to insufficient numbers of independent past observations. However, at a theoretical level, the Central Limit Theorem is sometimes cited to reason that logarithmic changes at these horizons may be better approximated by a normal distribution than short-horizon changes.(2)

To illustrate the effect of using an asymmetry measure from the implied logarithmic changes pdf (or equivalently, the logarithmic level pdf) and the implied price level pdf to assess market views on the balance of risks to asset prices, Chart 6 shows time series of an asymmetry measure from each of the six months ahead implied pdfs for oil prices.

It is clear that the two series are highly correlated. The level difference between the two means that asymmetry (skew) in level space would imply a positive balance of risks most of the time. But this is not the case for

(1) Consider an asset price which changes from 100 to 150 in period 1 and back to 100 in period 2. The sum of proportional (arithmetic) changes is 0.50 – 0.33 = 0.17 while the sum of logarithmic (geometric) changes is 0.41 – 0.41 = 0. The sum of arithmetic changes is positive despite the price of the asset at the end of period 2 being the same as in period 1.
(2) See Campbell, Lo and MacKinlay (1997, page 19) for more details.

Option-implied pdfs, the Black-Scholes model and implied volatility smiles

The assumption that asset price levels (or simple proportional changes in asset prices) are lognormally distributed is frequently used in the pricing of option contracts. For example, the Black-Scholes (1973) model, a benchmark model for option pricing, is consistent with this assumption. One of the reasons it is a useful benchmark for option pricing is because the logarithmic growth rate of asset prices in the Black-Scholes model is normally distributed. In practice, however, the implied pdfs that we observe often deviate from that implied by the Black-Scholes model. Nonetheless, if we look at pdfs based on logarithmic changes then the model may still be useful as a benchmark for assessing asymmetry.

To see why this may be so, let us consider the volatilities derived from the prices of option contracts (often referred to as option premia). The Black-Scholes formula can be used to infer, from the option premium and other characteristics of the contract, the 'implied volatility' of the price of the underlying asset.(1) If the Black-Scholes model is correct then this implied volatility should provide a measure of the expected volatility of the underlying asset over the remaining life of the option contract. Plotting the Black-Scholes implied volatilities across different exercise prices is called the 'implied volatility smile'. The information that goes into a pdf is essentially the same as that on which the relevant volatility smile is based.(2) In fact it is the slope of the implied volatility smile that determines the shape, and hence the degree of asymmetry, of the implied pdf. A flat volatility smile is consistent with the assumptions of the Black-Scholes framework, and so is often used as a convenient benchmark for assessing deviations from the Black-Scholes implied distribution for logarithmic changes (ie the normal distribution).(3)

In practice, a flat volatility smile is rarely observed. Charts A and B provide an example of an (interpolated) volatility smile implied by FTSE 100 option contracts with December 2003 expiry (as of 3 November 2003), together with the corresponding implied probability density function for logarithmic changes. For comparison, the volatility smile and implied pdf under a Black-Scholes framework are also shown.(4) The observed smile for the FTSE 100 is downward sloping and thus deviates from the Black-Scholes flat volatility smile. That is, the implied volatility smile suggests that investors are paying higher premia for contracts with low FTSE 100 strike prices than suggested by the Black-Scholes model.(5) This is then reflected in the implied pdf with lower outcomes (ie more negative logarithmic changes) having relatively more probability than implied by the Black-Scholes normal pdf. Consequently the associated FTSE 100 implied pdf is not normal, in contrast to the Black-Scholes benchmark.

Chart A
FTSE 100 volatility smile and corresponding flat volatility smile

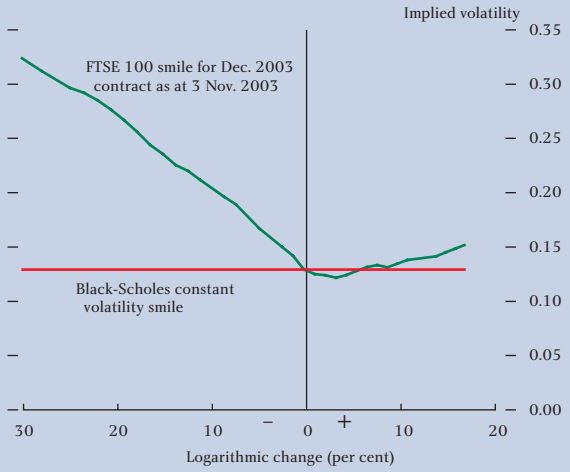
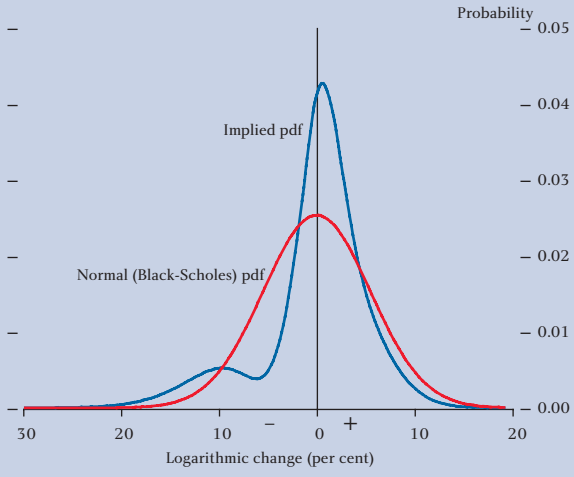
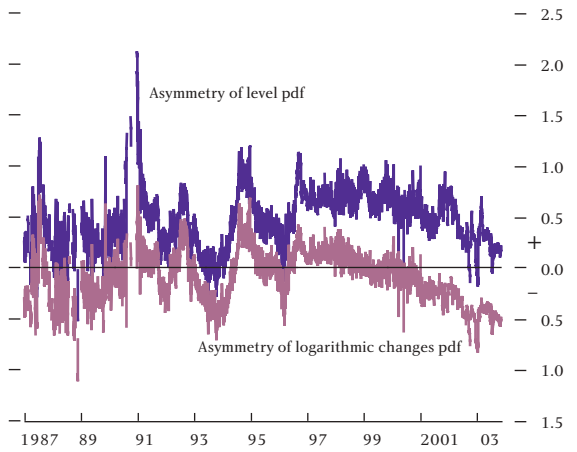


Chart B
FTSE 100 implied pdf and corresponding normal pdf



(1) The 'implied volatility' is the annualised standard deviation of logarithmic changes in the price of the underlying asset over the remaining life of the option contract.
(2) All of the techniques for extracting pdfs from option premia have as their input a set of option prices corresponding to different strike prices or equivalently a set of implied volatilities with corresponding strike prices. More information on the technique used to extract the implied pdfs in this article can be found in Clews, Panigirtzoglou and Proudman (2000).
(3) More specifically, an underlying asset stochastic process with constant volatility is consistent with the Black-Scholes framework.
(4) The normal pdf is fitted with the same mean and variance as that of the FTSE 100 implied pdf. Logarithmic change is with respect to the current futures price.
(5) There is a one-to-one positive relationship between option premia and implied volatility so one may think of implied volatility as a transformed premium.

Chart 6
Six months ahead option-implied oil price asymmetries(a)



(a) These statistics are obtained from pdfs derived from option prices on the West Texas Intermediate light, sweet crude oil contract traded on the New York Mercantile Exchange.

logarithmic changes. Asymmetry on average is very close to zero. Here we take zero to represent the benchmark level of skew for both pdfs. However, if the level pdf is naturally asymmetric then zero would not be the appropriate benchmark level of skew. On the other hand, if the distribution of longer-horizon logarithmic changes is closer to a normal distribution then we may use zero as the benchmark for the corresponding pdf asymmetry series. So focusing on the asymmetry of the logarithmic changes pdf provides a more straightforward read on asymmetry and market views about the balance of risks.

6 Empirical comparisons of alternative asymmetry measures

Thus far we have set out and considered some theoretical aspects on appropriately measuring asymmetry of option-implied pdfs and on relating this measurement to market views. We now turn to some empirical analysis to support our reasoning, using option-implied pdfs that we estimate on a daily basis. In addition, we compare the measures of asymmetry recommended above with other often-used measures of asymmetry.

Appendix 2 shows the empirical associations between our measures of quadratic, absolute and indicator asymmetry from implied pdfs for logarithmic changes, over a large sample of option-implied probability distributions. Table A2.1 shows correlations between the measures, while Table A2.2 shows the percentage of days for which the measures have the same sign. These suggest that the absolute, indicator and quadratic asymmetry measures are all very highly correlated. In addition, the percentage of days when the quadratic and absolute asymmetry measures have the same sign is high (89%). However, the percentage of days for which the indicator asymmetry measure has the same sign as either the quadratic or absolute measure is somewhat lower — around 78%–80%.

It may be surprising that the three asymmetry measures do not have the same sign for an even higher proportion of our sample. One possible reason for this is measurement error. This is especially the case with mode-based statistics, as the mode is difficult to estimate accurately relative to the other points of central tendency. In addition, most of the observations where the three asymmetry series have different signs are where the pdf is nearly symmetric.

Overall, these findings suggest that the measures are fairly consistent in measuring the asymmetry of the implied pdf, but may provide different signs for asymmetry at times when measurement error is high and/or asymmetry is close to zero.

Finally, we compare our asymmetry measures with a number of other commonly used measures:

- The skew (third central moment standardised by the standard deviation) of the logarithmic changes implied pdf. This is the preferred measure of asymmetry in analyses of balances of risk for most asset prices at the Bank and is often reported in Bank publications.

- The difference between the mean and the mode and between the mean and the median of the logarithmic changes implied pdfs standardised by the corresponding standard pdf deviation.

- The risk reversal — or the difference between the costs of insurance against increases in the underlying asset price (beyond a certain level) and insurance against decreases.(1) The risk reversal is regularly traded and quoted by investment banks in the over-the-counter foreign exchange options

(1) So a positive (negative) risk reversal suggests market participants are paying more (less) for insurance against increases in the underlying asset price than against decreases and thus suggests that the balance of risks for the underlying asset price is positive. Formally, it is the difference between equally out-of-the-money (25-delta) call and put-implied volatilities and gives an idea of the slope of the implied volatility smile (see the box on page 450). We standardise it by dividing by the at-the-money implied volatility. As a benchmark, a lognormal distribution (which is positively skewed) has a risk reversal of zero.

market for example. As a result, it is the preferred measure of balances of risk for exchange rates in analysis at the Bank.

Each of these measures is very highly correlated with the three loss-based asymmetry measures. There are strong relationships between the sign of the quadratic loss asymmetry measure (which corresponds to the mean central projection) and both the skew and risk reversal; and between the mean minus the median and the absolute loss asymmetry (which corresponds to the median central projection).

This suggests that both the skew and risk reversal are reliable measures if one chooses the mean of the implied pdf as a central projection. In addition, the difference between the mean and the median is useful when the median is chosen as a central projection. In contrast, the lower same-sign percentage statistic between the mean minus the mode and the indicator loss asymmetry measure suggests that the mean minus the mode is a less reliable indicator of asymmetry when using the mode as a central projection.

7 Conclusions

The above analysis explores many of the issues involved in measuring and interpreting probability distribution asymmetry. It is worth emphasising that much of the analysis arises out of a need to summarise how the information in a probability distribution evolves over time. To do this, it is necessary to use a framework based on loss functions in order to ensure that our measures of asymmetry are consistent with other information that we can take from a probability distribution. But if we were not interested in summarising the information in the probability distribution, an analysis of the probability distribution would not need to involve consideration of loss functions.

The article has focused on the analysis of two summary measures of a probability distribution, the central reference point/point estimate and the asymmetry. These are both shown to depend on an assumed loss function and, as a result, matching the two is important. Taking three commonly used point estimates, we derive the corresponding measures of asymmetry as the difference between expected losses above and below a decision-maker's best point estimate. For the symmetric normal distribution, the asymmetry measures are all zero under the three loss functions we consider. Given this, the normal distribution is a commonly used benchmark when examining asymmetry.

Turning to the units in which we measure changes in asset prices, we show that this choice will affect the shape — and thus the degree of asymmetry — of a probability distribution. For example, under the popular metric of logarithmic changes in asset prices, the normal distribution benchmark coincides with that implied by the Black-Scholes option-pricing model.

Taking these general considerations into account, the article finally turns to the specific task of relating the information in probability distributions implied by option prices to market views about the asymmetry or balance of risks to future asset prices. Empirically, we found the loss-based asymmetry measures to be fairly consistent in measuring the asymmetry of option-implied pdfs, but they may provide different signs for asymmetry at times when measurement error is high or when asymmetry is close to zero. Other well known measures of asymmetry were found to be reliable indicators. That is, the risk reversal and implied pdf skew are useful when the mean is used as a point estimate, while the difference between the mean and the median is useful when the median is used as a point estimate.

Appendix 1: Loss functions and associated central projections and asymmetry measures

Table A1.1

Loss function	Central projection(1) $(\hat{x})$	Asymmetry
Indicator $L(x,\hat{x}) = (1 - I(x - \hat{x}))$	Mode: $x_{mode} = \max_{x} f(x)$	$Prob\ (x \geq x_{mode}) - Prob\ (x \leq x_{mode})$
Absolute $L(x,\hat{x}) = \lvert x - \hat{x} \rvert$	Median: x_{50} where $\int_{-\infty}^{x_{50}} f(x)dx = 0.5$	$\dfrac{Mean - Median}{\int_{-\infty}^{\infty} \lvert x - x_{50} \rvert f(x)dx}$
Quadratic $L(x,\hat{x}) = (x - \hat{x})^2$	Mean: $\bar{x} = \int_{-\infty}^{\infty} xf(x)dx$	$\dfrac{\int_{\bar{x}}^{\infty} (x-\bar{x})^2 f(x)dx - \int_{-\infty}^{\bar{x}} (x-\bar{x})^2 f(x)dx}{Variance}$

(1) Where $f(x)$ refers to the probability distribution of x.

Appendix 2: Relations between alternative measures of asymmetry for option-implied pdfs for logarithmic changes in oil price(1)(2)

Table A2.1: Correlations

	Absolute asymmetry	Quadratic asymmetry	Indicator asymmetry	Risk reversal	Skew	Mean-mode	Mean-median
Absolute asymmetry	1.000						
Quadratic asymmetry	0.953	1.000					
Indicator asymmetry	0.813	0.848	1.000				
Risk reversal	0.952	0.999	0.849	1.000			
Skew	0.951	0.999	0.845	0.999	1.000		
Mean-mode	0.883	0.923	0.986	0.923	0.921	1.000	
Mean-median	1.000	0.952	0.814	0.951	0.951	0.885	1.000

Table A2.2: Percentage of observations with same sign

	Absolute asymmetry	Quadratic asymmetry	Indicator asymmetry	Risk reversal	Skew	Mean-mode	Mean-median
Absolute asymmetry	100.0						
Quadratic asymmetry	88.8	100.0					
Indicator asymmetry	79.6	78.3	100.0				
Risk reversal	88.3	97.5	76.5	100.0			
Skew	88.8	99.4	77.9	98.0	100.0		
Mean-mode	85.6	84.3	94.0	82.5	83.9	100.0	
Mean-median	100.0	88.8	79.6	88.3	88.8	85.6	100.0

(1) These statistics are obtained from pdfs derived from option prices on the West Texas Intermediate light, sweet crude oil contract from 1987–2000, traded on the New York Mercantile Exchange.
(2) See Section 6 for definition of risk reversal, mean-mode and mean-median asymmetry measures.

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Real exchange rate persistence and systematic monetary policy behaviour

Working Paper no. 231

Jan J J Groen and Akito Matsumoto

This paper focuses on the relationship between real exchange rate persistence and cross-country differences in the way in which national central banks interact with their respective economies. We use a two-country dynamic stochastic general equilibrium (DSGE) model of the 'new open economy' strand that has no cross-country and cross-sector differences in price stickiness, and a real sector that is identical across countries. However, the monetary policy rules, ie the feedback mechanisms of the central bank in response to the rest of the economy, are allowed to be asymmetric across countries. We first estimate the monetary policy rules as statistical representations of systematic monetary policy, albeit that this is not intended to suggest that central banks actually followed the estimated rules in setting their policy rates. Next, we calibrate the real side of our model and estimate the persistence and variance of productivity shocks. Finally, we analyse how the real exchange rate behaves in the face of a common productivity shock, a relative productivity shock and policy shocks. One implication of the use of asymmetric monetary policy rules is that the real exchange rate will react to a common productivity shock, which would not have been the case under symmetric monetary policy rules.

The emphasis of the analysis is on the real exchange rate between Germany and the United Kingdom in the period 1979–98. During this period German systematic monetary policy behaviour was broadly stable. In the United Kingdom, on the other hand, the feedback mechanism of monetary policy underwent some significant changes. We identify three phases in the systematic conduct of UK monetary policy. The first is the period 1979–90, in which the United Kingdom tried several frameworks to stabilise inflation. During 1990–92 the United Kingdom participated in the Exchange Rate Mechanism (ERM), thereby fixing its exchange rate to the Deutsche mark. In the period 1992–98, inflation targeting was introduced and inflation came down to low and stable rates.

Under a credible fixed exchange rate regime the degree of real exchange rate persistence should in theory be low, as in this case domestic monetary policy is implicitly used to ensure purchasing power parity (PPP) holds. But there is a great deal of uncertainty in the academic literature on what causes the observed high degree of real exchange rate persistence under flexible exchange rates. We therefore focus on the experience during the first and the third UK monetary policy regime, during which the exchange rate was more or less flexible. Thus, we estimate a German monetary policy rule over 1979–98 and UK monetary policy rules over the periods 1979–90 and 1992–98. We feed the estimated policy rules across different regimes into the DSGE model and analyse how the general persistence of the real exchange rate is affected by this, *ceteris paribus*: in particular, by holding constant the preference parameters and the production technology processes. The results of our analysis confirm what we find in the historical data. Although the DSGE model generates a high degree of real exchange rate persistence under both the inflation-targeting regime and the pre-ERM regime, the degree of real exchange rate persistence is slightly higher under the former UK policy regime. This was mainly due to the fact that common productivity shocks were transmitted differently across the two regimes. Under the inflation-targeting regime UK monetary authorities reacted almost identically to the German authorities, and as a consequence the nominal exchange rate did not counteract the effect of the common productivity shock.

Evolving post-World War II UK economic performance

Working Paper no. 232

Luca Benati

This paper uses tests for multiple structural breaks at unknown points in the sample period and frequency domain techniques to investigate changes in UK economic performance during the post-WWII era. Empirical evidence suggests that over the past decade the UK economy has been, in a broad sense, significantly more stable than during previous post-WWII years. The paper identifies structural breaks in real GDP growth, and in three alternative measures of inflation (RPIX, the GDP deflator, and the personal consumption expenditure deflator) around the time of the introduction of inflation targeting. For all four series, the estimated volatility of reduced-form shocks over the most recent subperiod has been the lowest of the post-WWII era.

Results from band-pass filtering confirm the greater stability of the most recent period compared with previous post-WWII decades. The volatility of the business cycle components of macroeconomic indicators has been, after 1992, almost always lower than either during the Bretton Woods regime or the 1971–92 period, often — as in the case of inflation and real GDP — markedly so.

Based both on band-pass filtering and on cross-spectral analysis, the Phillips correlation between unemployment and inflation at the business cycle frequencies appears to have undergone significant changes over the past 50 years. It showed some evidence of instability during the Bretton Woods era, exhibited quite remarkable instability in the 1970s, and slowly stabilised from the beginning of the 1980s. Under the inflation-targeting regime, the Phillips correlation has exhibited, by far, the greatest degree of stability during the post-WWII era.

Finally, the correlation between inflation and at least one monetary aggregate (the monetary base) at the business cycle frequencies appears to have experienced equally marked changes over the post-WWII era. In particular, the high inflation of the 1970s seems to have 'traced out' the correlation within this frequency band, while, by contrast, the most recent years seem to have been characterised by a weaker correlation.

Although such reduced-form, purely statistical evidence is open to several alternative interpretations, empirical evidence clearly suggests that the behaviour of the UK economy has changed markedly over the most recent period. The paper discusses several policy implications.

The efficient resolution of capital account crises: how to avoid moral hazard

Working Paper no. 233

Gregor Irwin and David Vines

This paper presents a model of capital account crises to evaluate alternative mechanisms for their resolution. The model is constructed to enable the analysis of two very different problems. Solvency crises can happen, in which firms in crisis countries have profitable opportunities for investment, but these are not viable because the potential profits are insufficient to cover interest payments on an overhang of debt. As a result, bankruptcies occur and efficient investment projects are terminated early. But beyond this, liquidity crises can take place, even when the borrower is solvent and there is no debt overhang. If all lenders roll over their loans, profitable investment can take place, but if they do not, firms will be unable to meet their obligations and default. So in the presence of profitable investment opportunities, and without any debt overhang, there is nevertheless a possibility of default, which is self-fulfilling.

As problems at the level of the firm translate into countrywide crises, policy intervention at a national (government) or international (IMF) level becomes necessary. The paper uses the model to evaluate the effectiveness of different forms of intervention to deal with each type of crisis and explores not only the impact of the alternative interventions *ex post*, but also their impact on the *ex-ante* incentives facing potential investors. Specifically, the paper considers whether the moral hazard problem will affect the amount of investment undertaken and the way in which it is financed.

The paper reaches two major conclusions. The first is a criticism of a lender of last resort regime. If there is a lender of last resort, which not only resolves liquidity crises by the provision of finance, but also resolves solvency crises by subsidised lending at sufficiently reduced interest rates to avoid bankruptcy, there will be incentives to borrow excessively, and too little equity will be invested in projects. This makes solvency crises more likely in the first place. In addition, firms might make the initial investment in circumstances where it is inefficient to do so, encouraged by the subsidy. These problems provide a clear argument in favour of the resolution of solvency crises by debt write-downs rather than by subsidised IMF lending.

The second conclusion is in support of a lender of last resort regime, but only for liquidity crises and as part of the response necessary to deal with them. Debt write-downs are an inappropriate response in this situation as the problem is not one of solvency. IMF financing can and should play a part. This need not result in moral hazard as no subsidy is required in these circumstances. But the practical reality is that IMF lending is limited, and so the best policy is a combination of standstills, which prevent a co-ordination failure among creditors, and IMF lending into arrears, which ensures that new financing is available where necessary.

The paper underlines the importance of being able to distinguish between solvency and liquidity crises, given that the optimal response to each is different.

Intertemporal substitution and household production in labour supply

Working Paper no. 234

Guillermo Felices and David Tinsley

Estimates of the intertemporal labour supply elasticity obtained from standard life-cycle models may be subject to a downward bias, because the standard intertemporal optimisation approach assumes that individuals adjust only their leisure in response to changes in wages. This neglects the potentially important substitution of hours of work in the market for hours of work at home. Ignoring this extra margin of adjustment will result in smaller responses of market hours to changes in wages.

The balance between labour supply and demand has implications for inflationary pressure. Therefore, establishing the true size of the elasticity of substitution will be important to policymakers, as it will be one of the key factors in determining how labour supply may change over any forecast horizon.

Distinguishing between hours of work at home and hours of work in the market delivers a labour supply relationship augmented by hours spent in 'home production'. Recent research using cross-sectional US survey data has used this result to estimate the 'true' relationship between hours worked and wages. The results confirm that ignoring home production leads to a large downward bias in the estimated wage elasticity.

This paper applies a similar approach to the United Kingdom, using the British Household Panel Survey (BHPS), to see whether there may be similar biases in UK labour supply elasticity estimates. The BHPS has a large sample, which leads to accurate estimates of the labour supply elasticity.

The paper finds convincing evidence for a downward bias in estimates of the UK labour supply elasticity if home production is not included. When home production is incorporated, estimates of the labour supply elasticity at least double (although they remain fairly low in absolute size). The approach is extended by estimating separately by marital status, skill levels, and by testing for cyclical effects. The bias is present in every case, but is less obvious for married men. The elasticity is not affected by controlling for cyclical or time-related effects, and skills do not seem to affect it in a predictable manner. The paper also finds that the elasticity for single women is very similar to that for single men.

Rule-based monetary policy under central bank learning

Working Paper no. 235

Kosuke Aoki and Kalin Nikolov

The monetary policy literature has reached a near-consensus that committing to a monetary policy rule can improve stabilisation policy. But in a practical situation, where there is considerable uncertainty, it is difficult to commit to a 'mechanical' rule, which may turn out to be a bad rule '*ex post*'. This paper offers a way to reconcile commitment with flexibility for the central bank under imperfect information. It offers some ideas as to how the conduct of monetary policy under commitment should be modified when the central bank and private agents are learning about the structure of the economy. The key point of the paper is that price level targeting turns out to be a robust policy in a world in which the central bank is learning about the structure of the economy. This is because price level stabilisation implies a commitment to reverse the effects of past target misses on the price level. The paper shows that such a policy anchors inflation expectations effectively under a multitude of shocks. These include cost-push shocks as well as monetary policy mistakes, which may arise due to imperfect knowledge of the structure of the economy.

Many studies have shown that, when agents are forward-looking and everybody (the central bank and the private sector) understands the structure of the economy, there are substantial benefits from responding to past as well as current economic conditions. This is because some shocks (for example 'cost-push' shocks like an oil price hike or a rise in trade union militancy) force the central bank to choose whether to maintain full employment or to stabilise inflation. And the nature of this output/inflation trade-off depends on the type of policy pursued by the central bank. For instance, when the oil price increases, the central bank can raise interest rates and stabilise inflation by creating a recession. Alternatively, the central bank can make a binding promise to raise interest rates in the future as well as in the current period. If agents are forward-looking, this will reduce their inflation expectations, and hence reduce actual inflation in the current period, without a severe recession.

This paper shows that, when agents have perfect knowledge of the structure of the economy, there is a multitude of such 'promise-making' monetary policy rules that can stabilise inflation without generating a large recession. Two examples of such 'optimal' promise-making policies are what we call the 'optimal history-dependent rule' and the 'optimal price level targeting rule'. The first rule responds to lagged values of the output gap or adjusts the current policy rate gradually relative to its level in the previous period. The second rule is a price level targeting rule, which responds to the entire history of past deviations of inflation from target. The paper shows that, when knowledge is perfect, these two policies perform equally well in terms of their ability to stabilise output and inflation.

But when the central bank and the private sector have imperfect information about the structure of the economy, the performance of the history-dependent policy rule deteriorates substantially. In contrast, the price level targeting rule continues to perform well. The simple intuition behind this result is as follows. In a world of perfect information, agents and policymakers never make mistakes and they can make precise promises, without fearing that they would regret them in the future when their information improves. In such a world, it does not matter whether the central bank commits to adjust its policy stance gradually (which is what the history-dependent rule implicitly does) or whether it promises to correct the price level for any past inflation overshoots (which is what a price level targeting rule does). Both imply a binding commitment for future policy which creates a favourable output/inflation trade-off in the present.

But in a world where the central bank's knowledge of the economy is changing through time because it is learning, the precise nature of promise-making becomes vital. In particular, the history-dependent rule has the implication that, when a mistake is made in setting the interest rate, this mistake will continue to affect the policy stance for a long time. In contrast, the price level targeting rule implies a commitment to reverse past inflation overshoots. Hence, far from allowing policy mistakes to have persistent effects, the price level targeting rule implies a strong commitment to reverse their effect on the price level completely in the next period.

The effects of stock market movements on consumption and investment: does the shock matter?

Working Paper no. 236

Stephen Millard and John Power

This paper examines the impact of equity prices on consumption and investment. In particular, it considers whether the impact of any given movement in equity prices on consumption and investment depends on the source of the shock that caused the equity price movement. Clearly this is an important topical issue given the sharp falls witnessed in the stock markets a few years ago. In the United Kingdom, for example, the FTSE All-Share index fell by about 40% between September 2000 and the end of 2002. However, much of the literature on consumption and investment equations largely ignores the source of the underlying shock in determining the consumption and investment response; typically, relationships are estimated using equity prices as right-hand side variables without any effort to distinguish the source of the shock to equity prices. In the context of the consumption function, this leads researchers to present estimates of the 'marginal propensity to consume out of wealth'. It would be better to ask the question 'How large are the changes in consumption and wealth following a shock of a particular type?' If the shock does matter and it is not adequately captured in macroeconometric models, this could detract from their forecast performance or give a misleading view about the outlook for consumption.

To answer the above question, it is important first to know what sorts of shocks move equity prices. Theory suggests that asset prices represent the present value of future income to be derived from the underlying asset. So equity prices might move when either expected future income or dividend growth changes, or when the discount factor applied to them changes. The discount factor, in turn, will be the sum of the equity risk premium and the risk-free interest rate. Alternatively, of course, equity prices might not be accounted for by any of those 'fundamental' reasons, but rather reflect irrational responses to market sentiment, or noise.

The paper then approaches the problem from two angles: theoretical and empirical. It develops a simple general equilibrium model that links equity prices to consumption and investment for a small open economy. It then analyses the link between consumption and equity prices and explains why the consumption response is likely to be different depending on the source of the shock. Importantly, the response to a risk premium shock is likely to differ from that to an interest rate shock. Indeed, there are cases where risk premia movements will have no effect on consumption. Next the focus is on the links between investment and equity prices. Unlike consumption, the model suggests that investment will always respond to movements in equity prices irrespective of the source of the shock. But this might not be true in the real world. In particular, movements in equity prices that are unrelated to fundamentals are likely to have a much smaller effect on investment (if any) than those related to fundamentals. Finally, the paper presents some empirical evidence from a vector autoregression model to identify whether the source of the shock matters in the data. That analysis suggests that it does matter for consumption and, contrary to the simple predictions from the model, for investment too.

This paper has still left some questions unresolved. In particular, it would be good to model more explicitly the sorts of shocks that drive the economy and their stochastic processes. Then it would be interesting to investigate whether or not it makes sense, in a more complicated model for shocks to equity price volatility to have no effect on consumption volatility. To do this, one would have to examine the links between the equity risk premium and the volatilities of fundamental shocks. In turn, that would mean considering models that are able to explain the magnitude of observed equity risk premia, something that is not the case in the simple model presented here. It would also be interesting to investigate whether there are any shocks (or specifications of the model) under which investment would respond more or less to equity price movements than in the baseline case.

Forecasting with measurement errors in dynamic models

Working Paper no. 237

Richard Harrison, George Kapetanios and Tony Yates

This paper explores a trade-off that confronts forecasters and monetary policy makers when they use data that are measured with error (as surely, in reality, they are forced to do). On the one hand, observations on recent data give valuable clues as to the shocks that are hitting the system and that will be propagated into the variables to be forecast (and that will ultimately inform monetary policy). But on the other, those recent observations are likely to be those least well measured. Older data may have been revised a number of times, as more survey returns on the data or other kinds of corroborative evidence have been collected by the statistics agency.

We begin by illustrating and proving how, faced with a choice between either using or not using the most recent observations in forecasting, if measurement error is sufficiently large it can be optimal not to use them. We move on to consider a case where measurement error is larger the more recent the data observation: this captures the idea that older data will have been revised and corroborated with information that came after they were first released. We derive conditions under which a many step ahead forecast, (based on older data) will be a better forecast (in fact, the optimal forecast) than a one step ahead forecast. The noisier recent data are, the more likely this is to be true. And the more persistent the data-generating process, the more likely this is to be true: more persistence means that shocks contain more information for the values of variables in the immediate future. We generalise these results further, by allowing the forecaster to 'aim off' the coefficients in the true model, to improve forecasts still further.

Finally, we derive the optimal forecasting model from the class of linear autoregressive models. These forecasts are optimal subject to the constraint that the forecaster uses as many lags to forecast as are present in the data-generating process itself. It is not surprising that the optimal weighting scheme differs from the weighting scheme that characterises the data-generating process. The greater the signal about the future in a particular data point, the greater the weight in the optimal forecasting model. More recent, and therefore more imprecisely measured, data have a smaller weight. This effect is greater, the more persistent is the data-generating process. We conclude with an application to UK business investment growth, and illustrate the improvement in forecasting performance that can be obtained using our procedure, an improvement that turns out to be statistically significant.

Estimating time-variation in measurement error from data revisions; an application to forecasting in dynamic models

Working Paper no. 238

George Kapetanios and Tony Yates

Over time many sources of data that are relevant for estimating the current state of the economy are refined. This means that at any one time policymakers will be faced with data that are measured with different amounts of measurement error. Typically, more recently released data will be less well measured than revised data. How measurement error varies across data series and across vintages will affect optimal forecasts: these will, of course, put less weight on data that are less well measured. The problem is that, by construction, the amount of measurement error in any series is never observed. A popular choice of researchers has been to assume that the final or latest release of an observation on some variable is the truth, and then to proxy the variance of the measurement error in earlier releases by the variance of earlier releases around the final release. The drawback of this method is that the final release is itself measured badly.

This paper offers an alternative. The idea is to model the process by which the statistics agency publishes and then revises data. A hypothetical agency is constructed that conducts a series of independent random 'surveys' on a data point. Each time the agency conducts a new survey, the original estimate is revised based on its knowledge of the sampling error in the earlier and latest surveys. Using this assumption, we can describe how the variance of revisions to data between one vintage and any other will be related to the variance of the measurement error in the underlying surveys. We can therefore use something we observe — the variance of revisions in real-time data — to infer what we do not observe — the variance of measurement error. This paper applies the method to a real-time data set for the United Kingdom. We derive estimates of the variance of measurement error in vintages of the quarterly growth rates of private consumption and imports. We find that measurement error in the first release of imports is about six times that in the first release for consumption. We apply our estimates of the variance of measurement error in different vintages in a forecasting environment. We find that forecasts that are adjusted for our model-based estimates of measurement error outperform those that are not.

From tiny samples do mighty populations grow? Using the British Household Panel Survey to analyse the household sector balance sheet

Working Paper no. 239

Victoria Redwood and Merxe Tudela

The economic situation of British households can be assessed using both aggregate (macro) and disaggregated (micro) data. One of the main sources of information for disaggregate data is the British Household Panel Survey (BHPS). The BHPS is the only regular survey that provides information on households' balance sheet positions, which are very important for evaluating concerns about financial and monetary stability. Essentially, the use of the disaggregated data contained in the BHPS allows us to analyse the distribution of debt and assets among UK households: what types of households are accumulating debt and to what extent; is most of the debt being accumulated by households with high current (income) and/or potential earnings (high qualifications), who are also building up wealth?

At the macro level, National Accounts and Bank of England statistics are widely used to assess the sustainability of the upward trend in household debt. The conclusions derived from a macro approach are limited in the sense that they cannot answer questions on the distribution of debt and balance sheet positions; hence the need for disaggregated data. But to what extent are the disaggregated data (BHPS) consistent with the aggregate data derived from the National Accounts? Can we use the disaggregated data from the BHPS to explain and understand the growing trend in household debt shown in the National Accounts?

This paper compares the grossed-up BHPS data with the national aggregates. We use the National Accounts as our benchmark given the extensive use of those figures in policy considerations. We are interested in the match between the BHPS data and the national aggregates, and whether that match has remained broadly stable over the years covered by the BHPS.

The general conclusion is that the match between the BHPS and the national aggregate data has remained broadly stable, but with sufficient variation to make the correlation of growth rates of disaggregated and aggregate data very weak. The ratio of the BHPS grossed-up figure to the national aggregate varies according to the variable of interest.

Labour income is very well recorded in the BHPS, with a ratio to the aggregate figures of 94% on average between 1991 and 2001. Non-labour income is recorded less well, with only a 56% ratio, resulting in a ratio for total income of 80%. Housing wealth is systematically over-recorded in the BHPS. Unsecured debt is substantially under-recorded at 53% and 45% of the aggregate figure for 1995 and 2000 respectively. The degree of under-recording of financial assets is even greater at 39% and 25% of the aggregate data for 1995 and 2000 respectively.

Price-setting behaviour, competition, and mark-up shocks in the New Keynesian model

Working Paper no. 240

Hashmat Khan

Recent research and policy discussions have noted that the potentially increased competition among firms since the 1990s may affect inflation and economic activity. Deregulation, globalisation and reduction in trade barriers are often discussed as drivers underlying this structural change. Although direct evidence on increased competition is not available, some indirect measures do corroborate the view that competition among firms may have become more intense since the 1990s.

While there is broad agreement that an increase in the degree of competition among firms should put downward pressure on the price level, its implications for inflation dynamics and the assessment of shocks are unclear. For example, a one-off or steady-state increase in the degree of competition may mean that firms adjust their prices more often. This would amplify short-run inflationary pressures. On the other hand, it may mean that firms stand to lose market share and are therefore less willing to adjust their relative prices; this would dampen inflationary pressures.

The paper uses the standard New Keynesian framework, based on optimising behaviour of monopolistically competitive firms which face constraints on nominal price adjustments. In this framework, the elasticity of substitution between goods captures the degree of competition among firms. A rise in this elasticity implies that goods in the economy are relatively closer substitutes for each other, indicating more intense competition between firms.

This paper considers two specific price-setting assumptions: quadratic costs of nominal price adjustments and probabilistic price adjustment. Both are commonly used in small structural monetary policy models and have the same reduced-form Phillips curve specification. Under the former, however, increased competition among firms unambiguously increases price flexibility. Under the latter, increased competition either has no effect or decreases price flexibility. Price flexibility unambiguously decreases in the latter model when real rigidities in the goods and labour markets are considered. The paper finds that 'cost-push' or mark-up shocks to inflation are substantially dampened under the probabilistic price adjustment model with real rigidities, relative to the quadratic cost of adjustment model.

The main implications of the findings are as follows. First, assumptions about firms' price-setting behaviour determine how increased competition among firms affects the short-run dynamics of inflation. In particular, it determines how the slope of the New Keynesian Phillips Curve and the impact of shocks on inflation and output depends upon the price-setting behaviour. Second, models with microfoundations map out explicitly the relationship between the parameters in the reduced-form equations and the underlying structural or 'deep' parameters. This feature can help to avoid pitfalls and to clarify the different channels through which price-setting behaviour and structural changes may affect inflation and output. At several central banks micro-founded models are increasingly being used to inform policy. To the extent that assumptions about firms' price-setting behaviour are key aspects of these models, it is important to highlight transmission channels that these assumptions may or may not capture. Third, testing the predictions of the two models may help to choose the relevant model to examine the implications of potentially increased competition since the 1990s.

Anticipation of monetary policy in UK financial markets

Working Paper no. 241

Peter Lildholdt and Anne Vila Wetherilt

Monetary policy directly affects the shortest interest rates in the market. But if market participants are forward-looking, then their expectations of future policy actions, and hence future short-term interest rates, will affect longer-term rates. This is a crucial aspect of the transmission of monetary policy. If monetary policy is stable and well understood, then market participants might be able to anticipate future policy decisions. Consequently, we would expect market interest rates to contain information about future policy rate changes.

This paper examines whether the ability of UK market interest rates to predict future policy rate changes has changed markedly over the period 1975–2003. It starts by reviewing the theoretical ideas supporting monetary policy predictability. Theory shows that this predictability could increase as a result of central banks' commitment to gradualism in their rate-setting, or as a result of increased transparency (though this is by no means guaranteed). But increased predictability could also simply reflect reduced macroeconomic uncertainty unrelated to monetary policy. Theory is less clear, however, on the nature of the relationship between the monetary policy regime (eg money supply versus inflation targeting) and predictability.

Empirically, we can test the degree to which market rates anticipate future policy rate changes by examining the dynamic relationship between market and policy rate changes. In the United States, researchers have found evidence of predictability at the shortest end of the yield curve, although they also show that this predictability holds over very short horizons only. Recent work has revealed that this predictability varies over time. In particular, these studies show that since the mid-1990s, market rates have become better predictors of Federal Reserve policy changes, and that the predictability horizon has lengthened. While these studies admit that this shift cannot be attributed to a single factor, they cite the improved transparency of the Federal Reserve's monetary policy as a key factor in improving market participants' ability to anticipate future policy rate changes.

In this paper, we conduct a similar analysis for UK rates in the period 1975–2003. During this period, the monetary framework changed from (albeit not pure) monetary targeting (1975–85) to (various forms of) exchange rate targeting (1985–92) and since, 1992, inflation rate targeting. In addition, monetary policy has become more transparent, with the introduction of scheduled meetings to discuss policy rate changes (October 1992), the publication of the *Inflation Report* (February 1993), the decision to publish the minutes of the monthly interest rate meetings (April 1994), and the creation of the Monetary Policy Committee (May 1997).

We start by estimating a simple term structure model and introduce exogenous breakpoints corresponding to the key policy changes. The results of this analysis indicate that predictability has improved most notably after the introduction of inflation targeting in October 1992. But closer inspection of the data reveals that predictability did not rise smoothly over time, nor is it possible to generalise this result across maturities. For example, at the longest horizon, it rose briefly after the introduction of the Medium Term Financial Strategy in March 1980 and plummeted after the suspension of ERM membership in September 1992. Rolling regressions show that in the 1980s and early 1990s predictability fluctuated between 0% and 60%, with frequent highs and lows in predictability seemingly unrelated to any policy changes.

Finally, we formally test for the presence of structural breaks in the term structure model without using any prior information on the location of potential breaks. This is done by employing the recently developed method of Bai and Perron. Unfortunately, this exercise was on the whole unsuccessful, as the tests did generally not identify the earlier-used exogenous breakpoints. We attribute this result to either the unknown power properties of the Bai and Perron method, misspecification of the term structure model, or gradual (as opposed to discrete) shifts in the term structure model possibly due to learning.

Despite this mixed evidence, we conclude that, over the longer sample period, the data show a clear improvement in the ability of market participants to predict policy rate changes by the Bank of England.

Core inflation: a critical guide

Working Paper no. 242

Alan Mankikar and Jo Paisley

The term 'core inflation' is widely used by academics and central bankers. But despite its prevalence, there is neither a commonly accepted theoretical definition nor an agreed method of measuring it. Some researchers, for example, have suggested that core inflation relates to the growth rate of the money supply. Others identify core inflation with the 'durable' part of inflation, while others define the term as that component of measured inflation that has no medium to long-run impact on real output. The range of conceptual bases is potentially confusing, and can make the large number of available measures of core inflation difficult to interpret, particularly when they display different trends. This paper sets out how the concept of core inflation might be useful to monetary policy makers and provides a conceptual and empirical evaluation of various measures of core inflation in the United Kingdom.

Month-to-month movements in inflation can be volatile, making outturns potentially difficult to interpret. The 'noise' might be a reflection of movements in relative prices, or it may reflect one-off price level effects that will affect the annual inflation rate for a year. A key task for policymakers, as with all economic variables they monitor, is to read through the volatility or 'noise' in the data to extract as much information as possible. Measures of core inflation can be helpful if they increase the signal to noise ratio in measured inflation.

This paper examines a range of measures of core inflation for the United Kingdom, setting out their motivation and highlighting their potential limitations. The literature has distinguished two main approaches to measuring core inflation. First, there is the statistical approach, where some researchers take an existing price index and either remove certain items from it or reweight the components of that index, or use statistical methods to try to extract the 'persistent' or underlying trend component. These measures can be thought of as summary statistics of the large amount of component data in the aggregate price index. Second, there are model-based measures, which are usually based on multivariate econometric analysis in which some structure has been imposed that is explicitly grounded in economic theory. These measures use past relationships between aggregate inflation and its determinants to distinguish movements in inflation that reflect underlying pressures from those that reflect transitory shocks. They also typically incorporate some prior view about the 'smoothness' of core inflation.

Because one can define core inflation in a number of ways, this can unfortunately create confusion and there is no single 'right' answer. One needs to be aware of the pros and cons of different measures. Measures that simply strip out the most volatile elements or reduce the weight of extreme observations in the price index raise the possibility of losing potentially useful information. Measures based on times-series models are sensitive to prior beliefs about the time-series properties of core inflation.

It would clearly be unwise to be too ambitious about what a measure of inflation can hope to capture. Core inflation certainly cannot act as a summary statistic for inflationary pressures that are relevant to the monetary policy decision. Some measures may be useful at certain times. And since there is no 'right' answer, the main test is whether policymakers find them useful for helping to understand the inflation process better. Most important is to be clear how the term core inflation is used and what the concept underlying it is.

A compromise conclusion on the usefulness of measures of core inflation is that each one may provide a different insight into the inflation process. This paper finds that no single measure performs well across the board. Nevertheless, there may be value in looking at a range of measures, as long as one clearly bears in mind what information each type of indicator is best at providing. When all measures are giving the same message then, in a sense, monetary policy makers can reasonably consider that these measures are providing a reliable guide to inflationary pressures. It is when the measures start to diverge that policymakers need to take a much closer look at the reasons for those divergences.

Long-term interest rates, wealth and consumption

Working Paper no. 243

Roy Cromb and Emilio Fernandez-Corugedo

Changes in interest rates influence consumption through a number of channels. This paper focuses on the role of wealth, and the importance of expectations of future interest rates. It examines the sensitivity of the level of consumption to interest rates in a standard partial equilibrium theoretical framework with no uncertainty. Using a multi-period framework, the consumption function is derived and interest rate effects are decomposed into substitution, income and wealth effects.

The paper illustrates and quantifies two key implications of the theory that are not typically emphasised in the economics literature. First, it shows that wealth effects mean that consumption is much more likely to be negatively related to interest rates than the simple two-period textbook model might suggest. Second, it demonstrates that long-term interest rates are more important than short-term rates — the sensitivity of consumption to interest rate changes depends crucially on how long these are expected to persist.

Numerical calibrations provide an indication of the sensitivity of the results to key parameters. Under plausible parameter assumptions, if future labour income is assumed to be exogenous, the (negative) wealth effect is of a similar order of magnitude to the (positive) income effect. Hence the net effect on consumption of changes in interest rates is similar to the (negative) substitution effect. In a general equilibrium context, income — particularly capital income — will not be fully exogenous to the level of interest rates. However, income may respond slowly to interest rate changes. The calibrations also show the importance of the persistence of interest rates. Rates that are only expected to be high temporarily will have less impact than rates that are expected to be high permanently.

These results are best thought of as steady-state 'comparative dynamic' comparisons, given the absence of uncertainty. The framework and the utility function used are highly stylised. Actual interest rate changes are likely to work in large part through affecting credit constraints and precautionary saving, though their impact also depends on the degree of uncertainty. Nevertheless, the model suggests that more attention should be paid to the role of long-term interest rates in empirical analysis of consumption. It also helps to provide a framework for understanding some recent empirical results in the area of consumption modelling, which stress the interaction with wealth.

Long-horizon equity return predictability: some new evidence for the United Kingdom

Working Paper no. 244

Anne Vila Wetherilt and Simon Wells

In this paper, we revisit the issue of long-horizon equity return predictability for the United Kingdom in the context of the dynamic dividend discount model of Campbell and Shiller. This model attributes predictable variation in equity prices to variations in expected returns. The model is supported by the theoretical asset pricing literature, which shows how the variation in expected returns can be related to investors' time-varying preferences for risk.

In the past, this model has received ample support from the data. In particular, the dividend yield appeared to do a reasonably good job at predicting long-horizon excess returns. Moreover, predictability was found to increase with the return horizon. But more recent research has questioned the statistical validity of these claims. In particular, incorrect econometric treatment may have led to overrejection of the null hypothesis of no predictability. Researchers have also found that simple predictability models may be unstable. In some papers, it appears that simply extending the sample period by a few years, or altering the forecast horizons, can alter both the sign of the regression coefficients and their statistical significance, and that over some periods US dividend yields do not forecast long-horizon equity returns.

Using quarterly data for the United Kingdom for the period 1965 Q1–2002 Q4, we first estimate a simple model of return predictability that relates observed excess returns to the dividend yield. Second, we focus on the small-sample issue and consider a range of statistical corrections. Third, we address the issue of robustness by estimating the dividend yield model across a range of sample periods and forecasting horizons. Although the paper does not formally address the all-important issue of model selection, we briefly discuss the forecasting performance of the earnings yield, as an alternative to the dividend yield.

We find evidence that standard valuation ratios such as the dividend and earnings yield help to forecast UK long-horizon equity returns. This result is not stable across subsample periods. In particular, we find that predictability declined significantly during the period of rapidly rising returns of the late 1990s. But as returns started falling in late 2000, the significance of the regressions was restored. The research also confirms that the relationship between the dividend yield and excess returns is highly sensitive to both the chosen return horizon and the sample period.

Horizontal and vertical integration in securities trading and settlement

Working Paper no. 245

Jens Tapking and Jing Yang

Securities trading and settlement are essential parts of any securities transaction. Trading is the process that results in an agreement between a seller and a buyer to exchange securities for funds. Settlement refers to the actual transfer of securities from the seller to the buyer and the transfer of the funds from the buyer to the seller. Trading is often carried out on securities exchanges, whereas settlement of on-exchange trades takes place in entities called central securities depositories (CSDs).

In the European Union, the securities trading and settlement infrastructure is highly fragmented. There are over 20 national exchanges and about as many CSDs. Market participants, central banks and regulators agree that consolidation is desirable. However, there is little agreement on what kind of consolidation would be optimal. Some people prefer vertical integration, that is mergers of exchanges with CSDs. Others favour horizontal integration of different exchanges or different CSDs.

In this paper, we try to shed light on the pros and cons of the different types of consolidation in a theoretical two-country model. There is an exchange and a CSD in each country. Investors can buy and sell securities on both exchanges. All trades executed on a given exchange are settled in the CSD of the same country. This reflects the current practice in all major markets. Hence, before a security held in the CSD of country 1 can be offered on the exchange of country 2, it has to be transferred to the CSD in country 2. This transfer is carried out through a so-called link, a communication line between the two CSDs. A link transfer requires the services of both CSDs. One CSD has to release the securities and the other CSD has to take them under custody.

We start from a general observation that has been well established in industrial economics. From an economic welfare perspective, two goods that are substitutes should be supplied by different decision-makers while two complements should be supplied by a single decision-maker. On the basis of this observation, we argue as follows. The link services of the two CSDs are complements since each securities transfer from one CSD to the other requires both services. Furthermore, the link service of one CSD and the settlement service of the other CSD are complements since transferring securities from one country to the other makes sense only if these securities are afterwards traded and thus settled in the other country. The two CSDs should therefore be operated by the same decision-maker (horizontal integration of CSDs).

However, this argumentation is valid only if the operating costs of the link are low enough to allow the cross-border transfer of securities at reasonable costs. If the link is too expensive, a horizontal integration of the CSDs is desirable only if it reduces these link-operating costs significantly. If it does not reduce these costs, a vertical integration of the exchange and the CSD in each country is preferable. This is because trading and settlement in a given country are also complements.

Furthermore, if there is no demand for foreign securities, there is also no demand for link transfers regardless of whether the link-operating costs are high or low. In this case, the link has no significance and the above argument in favour of horizontal integration of the CSDs is again not valid. Instead, we again find that a vertical integration of the exchange and the CSD in each country is preferable as trading and settlement in a given country are complements.

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

By Peter Williams of the Bank's Monetary and Financial Statistics Division.

In April this year, the Bank of England conducted the three-yearly survey of turnover(1) in the UK foreign exchange and over-the-counter (OTC) currency and interest rate derivatives markets, as part of the latest worldwide survey co-ordinated by the Bank for International Settlements (BIS). The results show that the volume of foreign exchange activity in the United Kingdom has increased by nearly 50% since April 2001. Turnover in OTC derivatives has more than doubled in the same period. This article presents the main results of the UK survey and highlights the effects of developments in foreign exchange and OTC derivatives markets on volumes of activity.(2) It also provides detailed breakdowns of UK survey data and a comparison with global survey results.

Introduction

In April this year, central banks and monetary institutions in 52 countries, including the United Kingdom, conducted national surveys of turnover in the traditional foreign exchange markets — spot, outright forwards and foreign exchange swaps — and in over-the-counter (OTC) currency and interest rate derivatives. These surveys have taken place every three years since 1986.(3) They are co-ordinated on a global basis by the Bank for International Settlements (BIS) with the aim of obtaining comprehensive and internationally consistent information on the size and structure of the corresponding global markets.

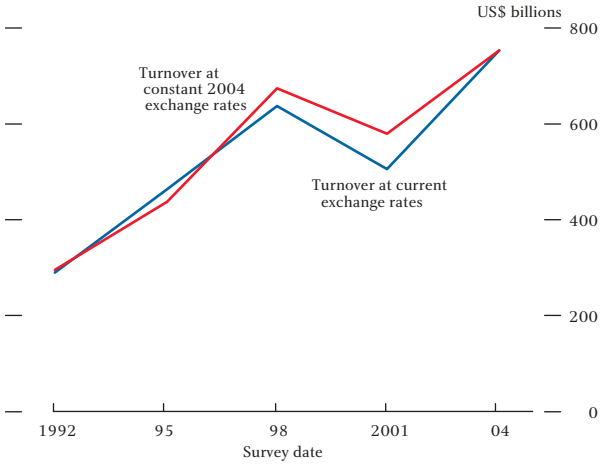
This article concentrates on the UK part of the survey, conducted by the Bank of England and covering the business of 93 institutions (both UK-owned and foreign-owned) within the United Kingdom. A comparison with the global survey is included in the box on page 479.

UK survey results for foreign exchange

Average daily turnover during April 2004 was $753 billion, 49% higher than in 2001. This growth more than reverses the fall in turnover recorded in the previous survey, and resumes the upward trend of earlier ones. The United Kingdom remains the largest centre of foreign exchange activity, with 31% of reported global market turnover.

It is likely that measured growth of foreign exchange turnover has been inflated by the depreciation of the dollar since the 2001 survey. Data collected for the survey are denominated in dollars, and the dollar depreciated by more than 25% against the euro between April 2001 and April 2004; so the same amount of turnover in other currencies will have a higher dollar value in 2004 than in 2001. Chart 1 shows the effect of fluctuations in exchange rates on the average daily turnover reported in UK surveys since 1992. Growth of foreign exchange turnover was 30% measured at constant 2004 exchange rates compared with 49% at current exchange rates.

Chart 1
Average daily foreign exchange turnover at constant and current exchange rates



(1) Turnover figures published here are adjusted to remove double counting of trades between UK principals that will have been reported by both parties (local double counting).
(2) Unless stated otherwise, comparisons in this article are with the previous survey in April 2001.
(3) OTC derivatives were included for the first time in 1995. The survey only covers currency and interest rate derivatives.

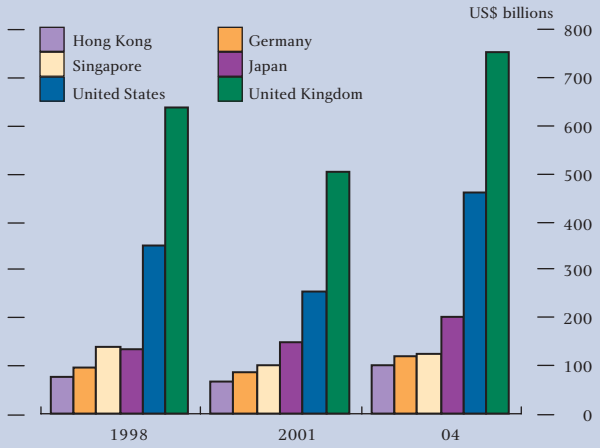
Global survey results

Foreign exchange

Average daily turnover in global foreign exchange markets was $1,880 billion in April 2004, up by 57% at current exchange rates. The United Kingdom remains the single largest centre of foreign exchange activity with 31.3% of the global share (Chart A), broadly unchanged since 2001.(1)

The change in survey method discussed in the main text on pages 474–75 has reduced the United Kingdom's share of the global foreign exchange market. Other data suggest that turnover volumes reported in the United Kingdom would have been up to 15% higher under the original definition of location. Chart A shows that other centres where pricing is passed across to overseas sales desks may have been affected similarly. For example, 'Based on trading desk reporting, the Monetary Authority of Singapore (MAS) estimates that the average daily forex turnover in Singapore reached US$153 billion in April 2004, a 51% increase over 2001 [compared with a 24% increase under the new measure]'.(2)

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



Trading in sterling increased as a share of the global market. 17% of the volume of turnover involved sterling (up from 13% in 2001), mirroring the rise recorded in the UK survey. This was at the expense of the other major currencies, though the dollar is still on one side of 89% of foreign exchange trades and remains by far the most traded currency (Table 1).

OTC derivatives

In the OTC derivatives markets, average daily turnover was $1,220 billion in April 2004, up from $575 billion in the previous survey. The United Kingdom's share of global activity has increased from 36% to 42.6%, strengthening its position as the largest centre. The next largest centre is the United States, which recorded a 23.5% global market share.

Table 1
Global foreign exchange turnover in sterling and other currencies

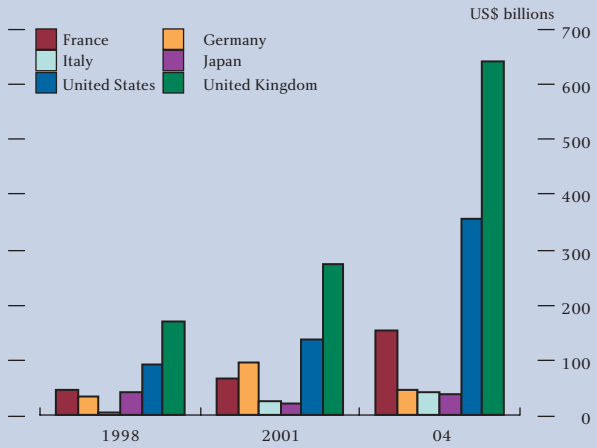
Per cent(a)

	1998	2001	2004
US dollar	87	90	89
EMS/Euro(b)	52	38	37
Japanese yen	20	23	20
Pound sterling	11	13	17
Swiss franc	7	6	6
Australian dollar	3	4	6
Canadian dollar	4	5	4
Other currencies	16	21	21
Total	**200**	**200**	**200**

(a) Because two currencies are involved in each transaction, the sum of the percentage shares of individual currencies totals 200% instead of 100%.
(b) The percentage for 1998 is the combined share of turnover for the German mark, the French franc, the ECU and all other European Monetary System currencies. Trades between these currencies are included in this figure.

Most other major centres also recorded an increase in OTC derivatives activity (Chart B). Germany was a notable exception with a 53% fall in turnover volume, resulting in its global share falling to 3% compared with 12.7% in 2001, an effect attributed to the change in reporting method discussed in the main text.(3)

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



The euro remained the most traded currency in OTC interest rate derivatives with 45% of global market turnover, followed by the dollar with 34%. Sterling was the third most actively traded currency, accounting for 8.8% of interest rate derivatives turnover (up from 7.6%).

For OTC currency derivatives, the dollar remained the biggest currency, on one side of 79% of turnover. Sterling was on one side of 11.4% of turnover in April 2004, up from 9% in the previous survey.

(1) The aggregate global results are adjusted to remove double counting of cross-border trades — the reporting of the same deal by two institutions to different central banks. So the published global aggregate is different from the sum of all national aggregates ($2,408 billion), with the latter used to calculate national shares.
(2) See the Singaporean Press Release, published at www.mas.gov.sg/masmcm/html/index.cfm?pid=0BAB23F6-6295-5312-4248845891A26CCD.
(3) See the German Press Release, published at www.bundesbank.de/download/presse/pressenotizen/2004/20040928bbk1_en.pdf.

Most reporting institutions considered activity in April 2004 to be normal (Table A). This suggests that the recorded increase in foreign exchange turnover since 2001 after adjustment for exchange rate effects reflects a longer-term trend rather than a short-term effect associated with, for example, the depreciation of the dollar in early 2004.

Table A
Survey participants' estimates of foreign exchange turnover levels

In April 2004	Number of banks	Percentage of turnover
Below normal	7	6
Normal	84	94
Above normal	2	0
In preceding six months	Number of banks	Percentage of turnover
Decreasing	2	0
Steady	72	59
Increasing	19	41

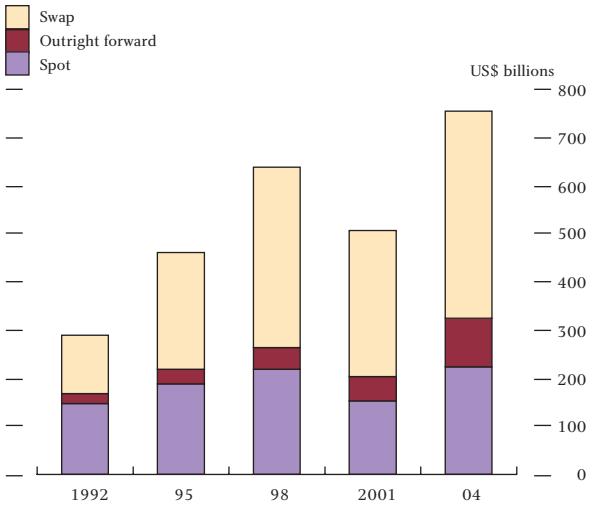
Market turnover had been expected to increase from the 2001 survey, for several reasons. First, market contacts reported an increase in active foreign exchange trading by asset managers, over and above that needed to manage the currency positions arising through bond and equity trading; lower yields in bond and equity markets have made the potential returns more attractive from trading foreign exchange as an asset class in its own right. Second, hedge funds and commodity trading advisers have grown rapidly over the past three years, both in number and funds under management: many funds have entered the foreign exchange market or increased their allocation of funds towards it. Third, the development and acceptance of electronic trading has helped to improve access to liquidity and reduce trading costs, promoting market activity. Finally, the 2001 results could be seen as abnormal, arising from the global economic downturn at that time and the loss of trading between the former currencies in the euro area after the introduction of the euro.

Transaction type

Turnover increased across all transaction types, as illustrated by Chart 2. Foreign exchange swaps remained the most common, accounting for 57% of total foreign exchange turnover. Outright forward business increased from $53 billion to $103 billion per day in April 2004 and accounted for 14% of total foreign exchange turnover (up from 11% in the previous survey).

Spot accounted for 29% of total foreign exchange turnover — similar to its share in 2001 — suggesting that the fall in the proportion of foreign exchange turnover conducted via spot transactions has slowed.

Chart 2
Average daily foreign exchange turnover by transaction type



Spot deals accounted for 51% of foreign exchange turnover in 1992, 40% in 1995, 34% in 1998 and 30% in 2001.

Currency composition

The dollar remains the biggest currency, with 90% of all trades having one side denominated in dollars (Table B). Trading in sterling has continued to take on increased market share. The proportion of foreign exchange turnover involving sterling increased from 24% to 28% and the sterling/dollar currency pair now accounts for nearly a quarter of total volumes. But yen trading has declined in the United Kingdom: only 15% of foreign exchange trading volumes were in yen, compared with 17% in April 2001.

Table B
Foreign exchange turnover — currency breakdown

Per cent[(a)]

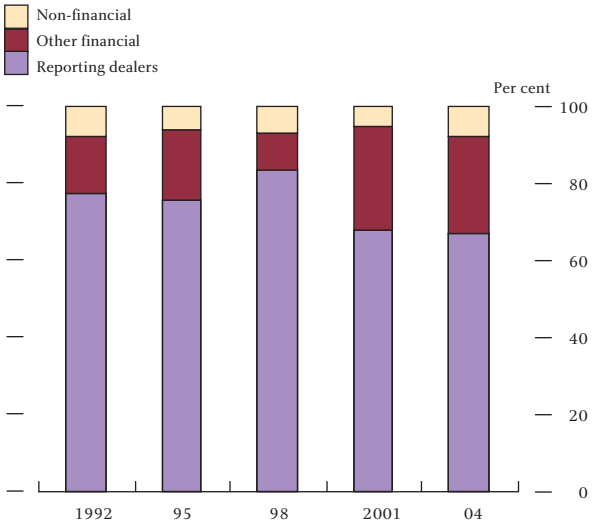
	2001	2004
US dollar	92	90
Euro	41	42
Pound sterling	24	28
Japanese yen	17	15
Swiss franc	6	6
Canadian dollar	4	3
Australian dollar	3	4
Other currencies	13	12
Total	**200**	**200**

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

Counterparty

Chart 3 shows the breakdown of foreign exchange turnover by counterparty. Around two thirds of foreign exchange turnover was between reporting dealers, a similar proportion to that in the previous survey. Turnover attributable to non-financial corporations more than doubled in absolute amount, and accounted for 8%

Chart 3
Foreign exchange turnover by counterparty



of turnover compared with 5% in 2001. But the share of turnover attributable to 'other financial institutions' has decreased (to 25%, from 28%). This is perhaps surprising, given that institutions such as hedge funds and commodity trading advisers are widely perceived to be more active in foreign exchange markets than before.

The fall in other financial institutions' share of turnover may reflect the increasing use of prime brokerage rather than be a true indication of changing market activity. Prime brokerage is a service offered by major financial institutions to customers such as hedge funds. The prime broker sets up an arrangement enabling the customer to trade directly with predetermined third-party institutions, but with the prime broker clearing the trades on the customer's behalf. Prime brokerage has increased in popularity, especially for hedged and other managed funds. It allows customers to deal with a variety of counterparties, using the balance sheet and credit assessment facilities of the prime broker, which itself benefits from fee income and economies of scale.

But the third-party institutions will record these trades as being with the prime broker, not the customer, and the survey will therefore capture prime-brokered trades as interdealer business.(1) This will increase the share of transactions recorded between reporting dealers (shaded lilac in Chart 3) at the expense of transactions with other financial institutions (shaded burgundy).

Hence, the increasing participation of hedge funds and other non-bank financial institutions is likely to be understated by the survey results.

Electronic trading(2)

In 2004, the survey collected detailed information on the volume of turnover across electronic platforms for the first time. Table C contains a summary of these data for the United Kingdom, and includes similar data for the United States (the second largest centre for foreign exchange) for comparison. The box on page 474 provides a brief explanation of these platforms. Trading by UK principals through dealer systems accounted for 66% of spot activity, and a significant volume of business took place on customer platforms. A greater proportion of turnover is via electronic platforms in the United Kingdom than elsewhere.

Table C(a)
Proportion of total foreign exchange turnover across electronic platforms

Per cent

	United Kingdom		United States(b)	
	Dealer systems	Customer platforms	Dealer systems	Customer platforms
Total foreign exchange	**48**	**7**	**24**	**4**
Spot	66	10	34	5
Forward and swap	40	6	16	4

(a) All data in the table are based on gross turnover volumes, with no adjustment for local double counting. Some large dealers were unable to report this information. The data should therefore be treated with caution, as the proportions are likely to be underestimated.
(b) See the US Press Release, published at www.newyorkfed.org/markets/triennial/fx_survey.pdf.

Electronic broking was identified as a factor in the lower volume of turnover recorded for the 2001 survey, as it was thought to have led to a decline in the number of traditional deals and dealers in the spot market. It was estimated for the 2001 survey that two thirds of interdealer spot business was conducted through automated order-matching systems; the 2004 survey recorded a similar proportion.

Subsequently, further developments in technology are thought to have facilitated growth in foreign exchange activity. Electronic platforms act as effective liquidity 'pools'. They reduce trading costs and allow participating institutions to increase the frequency of speculative activity. In addition, e-commerce offers greater transparency and access to liquidity for customers.

(1) Prime brokers and third-party liquidity providers will be reporting dealers in most cases, as they are usually active participants in the interdealer market.
(2) Further definitions and explanations of the terms surrounding electronic trading can be found in Bank of England (2003), 'Foreign Exchange Joint Standing Committee e-commerce subgroup report', *Bank of England Quarterly Bulletin*, Summer, pages 235–39.

Types of electronic trading platform

Dealer systems

An *electronic broking system* such as EBS or Reuters has a similar function to a traditional voice broker, but without the need for human intervention. Users of the system — generally large banks and securities houses — enter their foreign-currency requirements anonymously into the system, which matches buyer and seller automatically. Electronic broking systems are primarily used for spot dealing, but are also increasingly popular for forward transactions.

Other dealer systems such as Reuters Dealing provide one-to-one trading applications for participants in the interbank market.

Customer systems

Many institutions have designed *single-bank proprietary systems*, which allow their customers to trade directly with them via a custom-built Internet platform.

Multi-bank e-trading portals are set up by individual institutions or by consortia. A number of different banks quote exchange rates and provide liquidity to the system for end-users.

Market concentration

Concentration in the UK foreign exchange market increased slightly since April 2001, though not as much as in previous surveys (Table D). The combined market share of the ten institutions with the highest level of turnover increased from 57% to 61%, and the top 20's share from 79% to 80%. Merger activity did not affect market concentration unduly: several of the top 20 institutions from 2001 (of which 16 were still in the top 20 in 2004) were involved in mergers, but not among themselves.

Table D
Market share of the largest principals in the UK survey

Per cent

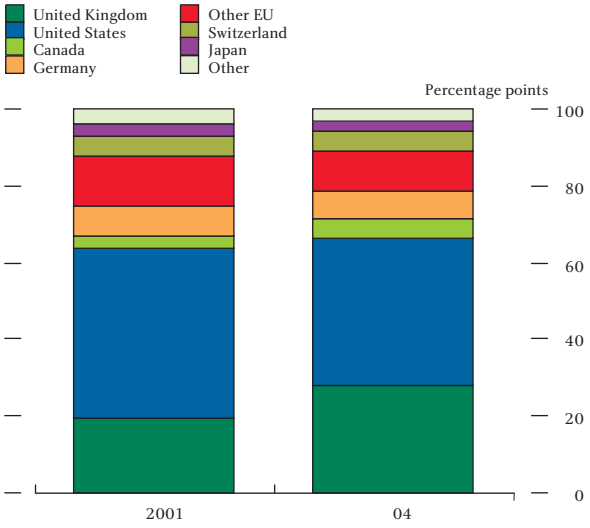
	1995	1998	2001	2004
Ten largest	44	50	57	61
Twenty largest	68	69	79	80

The number of firms individually accounting for more than 1% of total turnover has increased from 21 in 2001 to 25 in 2004. This slight diversification may be because fewer reporting dealers completed the survey than before (discussed further in the box on pages 478–79). It may also reflect the influence of 'white labelling', a process whereby a smaller bank uses an e-platform to allow its customers to trade at prices quoted by a larger bank. In this way, smaller or 'white-label' banks — some of which were survey reporters — are able to provide foreign exchange services to end-users, but pass the associated risk to larger, more liquid third-party banks.

Market share by nationality

UK-owned principals' share of the foreign exchange market in the United Kingdom increased from 19% to 28% of aggregate turnover, due to strong growth in foreign exchange activity by several UK-owned survey participants. US-owned institutions' market share was 39%, compared with 44% in the previous survey, and turnover attributed to other European-owned institutions was lower than previously. Chart 4 illustrates these results.

Chart 4
Foreign exchange turnover in the United Kingdom by nationality of bank ownership



The changes in UK market share by nationality of ownership may be in part the result of a difference in reporting method for the 2004 survey. Survey participants were asked to identify the location of a

trade by location of the sales desk rather than of the price-setting dealer, as in previous surveys. Foreign-owned institutions that price deals out of their London offices will nevertheless maintain sales desks elsewhere, possibly having a negative effect on their share of UK business under the new definition of location.

UK survey results for OTC derivatives

Average daily turnover for OTC currency and interest rate derivatives in the United Kingdom has more than doubled since the 2001 survey. Turnover during April 2004 averaged $643 billion per day, compared with $275 billion recorded in 2001. Within this total, turnover in interest rate instruments increased from $238 billion to $563 billion per day, and in currency instruments from $37 billion to $80 billion. As a result, the United Kingdom's share of the global OTC derivatives market increased from 36% to nearly 43%.

Depreciation of the US dollar has possibly inflated measured growth of currency and interest rate derivatives, as it did with foreign exchange turnover. Estimated growth was over a third lower at constant 2004 exchange rates than at current exchange rates, in line with constant exchange rate growth in the previous survey.

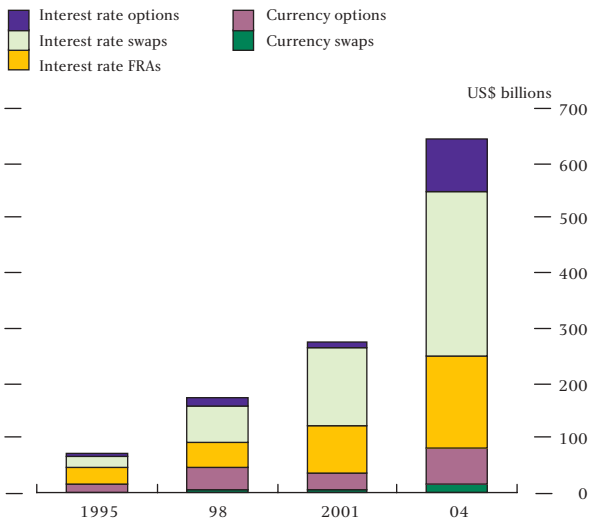
The growth in turnover since 2001 is consistent with other data sources, notably the semi-annual survey of the global OTC derivatives markets published by the BIS.(1) Reasons cited for the increase in market activity include: increased use for risk management; increased position taking; increased use by other financial institutions; and greater use of more complex products such as options.

Central counterparty clearing services,(2) for example LCH SwapClear, may also have contributed to growth in turnover. Such services are likely to increase the volumes of business recorded, as they offer reductions in credit risk, operational risk and transaction costs. SwapClear currently deals with interest rate swaps of up to ten years maturity, but its scope is widening to include longer maturities, cross-currency swaps and options.

Instruments

As Chart 5 shows, interest rate swaps remained the most highly traded product, accounting for nearly half of the volume of OTC derivatives turnover in April 2004. But growth was strongest in options products. Interest rate options turnover increased from $13 billion to $94 billion and they accounted for 15% of OTC derivatives activity, up from 5% in 2001. Turnover in OTC currency derivatives increased from $37 billion to $80 billion. Currency derivatives — consisting of currency swaps and currency options — accounted for only a 12% share of OTC derivatives turnover.

Chart 5
Average daily OTC derivatives turnover by instrument



Currency composition

The euro was the most traded currency in the OTC interest rate derivatives market, accounting for 58% of total turnover (up from 48%). The euro accounted for a greater proportion of interest rate derivatives turnover than the combined currencies it replaced did in 1998 (Table E). The proportion of turnover denominated in sterling fell from 17% to 14%.

As with traditional foreign exchange, the dollar remained the most traded currency in the OTC currency derivatives market. 78% of turnover involved the dollar, down from 81% in 2001. The proportion of turnover involving the euro increased slightly to 49%, as did the proportion involving sterling (16%), but the proportion involving the yen fell to 29% (from 37% in 2001), reflecting a decrease in dollar/yen trading.

(1) The BIS data, which show notional amounts and gross market values outstanding, are available at www.bis.org/publ/otc_hy0405.htm.
(2) Where a single entity becomes the counterparty to registered and cleared transactions in OTC instruments, thus replacing bilateral netting arrangements with multilateral netting.

Table E
OTC interest rate derivatives turnover by currency

Per cent

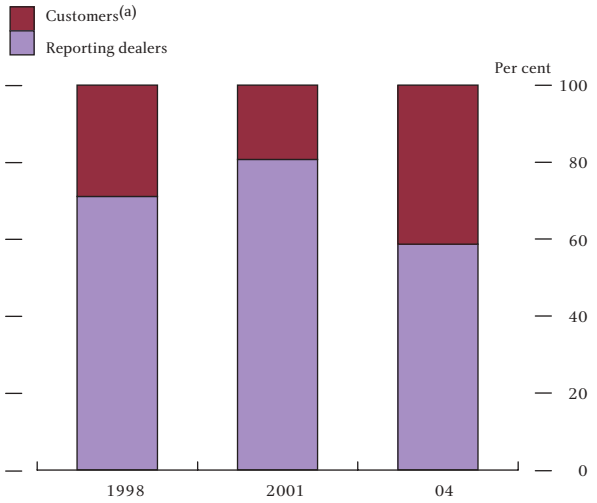
	1998	2001	2004
US dollar	16	26	21
EMS/Euro[a]	57	48	58
Japanese yen	4	3	2
Pound sterling	13	17	14
Other currencies	10	6	5
Total	**100**	**100**	**100**

(a) The percentage for 1998 is the combined share of turnover for the German mark, the French franc, the ECU and all other European Monetary System currencies. Trades between these currencies are included in this figure.

Counterparty

In OTC interest rate derivatives, the proportion of the market accounted for by trades involving non-reporting dealers increased substantially, from 19% to 42% (Chart 6). This was driven by strong growth in business conducted with 'other financial institutions'. In the OTC currency derivatives market the increase was less pronounced, but customer business accounted for a significant proportion of turnover — 38% compared with 32% in 2001.

Chart 6
OTC interest rate derivatives by counterparty



(a) Includes other financial institutions and non-financial institutions.

The increase in business with other financial institutions may reflect the activities of mutual funds, hedge funds and insurance companies in the OTC derivatives markets. The number of hedge funds in particular has grown rapidly in the past three years. Many of these have entered the OTC derivatives markets or diverted a larger allocation of funds to that area. Hedge funds are reported to have been trading volatility via the options markets, which may have contributed to the increased proportion of OTC derivatives activity accounted for by options discussed earlier.

Electronic trading

The survey data about the use of electronic trading are summarised in Table F. Use of e-commerce is not as well established for OTC derivatives as for traditional foreign exchange. This may be due to the greater complexity of the instruments involved. But market commentary suggests it was increasing in importance, particularly in the United Kingdom. April 2004 survey results show that 39% of turnover was conducted via electronic systems. Nearly a third of this was across customer platforms, further evidence of a widening range of participants in OTC derivatives markets.

Table F
Proportion of OTC derivatives turnover across electronic platforms[a]

Per cent

	United Kingdom		United States[b]	
	Dealer systems	Customer platforms	Dealer systems	Customer platforms
OTC derivatives	**27**	**12**	**8**	**1**
Currency instruments	28	21	22	3
Interest rate instruments	26	11	7	1

(a) All data in the table are based on gross turnover volumes, with no adjustment for local double counting. Some large dealers had difficulty in reporting this information accurately, particularly the location and identity of the counterparty. It should therefore be treated with caution, as the proportions are likely to be underestimated.
(b) See the US Press Release, published at www.newyorkfed.org/markets/triennial/fx_survey.pdf.

Market concentration

Market concentration in the United Kingdom has continued to increase (Table G). The ten largest institutions accounted for 80% of total reported turnover in April 2004, compared with 74% in 2001; the top 20 accounted for 94% (up from 89%). A smaller number of participants undertook currency derivatives business than interest rate derivatives business, but the number of firms individually accounting for more than 1% of turnover was higher for the former (17) than the latter (14).

Table G
OTC derivatives market share of the largest principals in the UK survey

Per cent

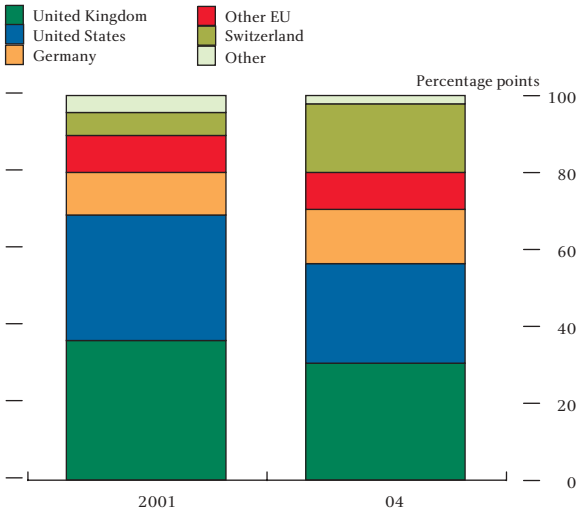
	1995	1998	2001	2004
Ten largest	52	67	74	80
Twenty largest	74	82	89	94

17 of the 20 largest institutions with the highest level of total OTC derivatives turnover from 2001 remained in the top 20. But the identity of the largest participants in 2004 varied between currency and interest rate derivatives; institutions most active in interest rate derivatives markets were not necessarily active in currency derivatives.

Market share by nationality

UK-owned institutions' share of the UK market fell to 30% from 37% in 2001, as shown in Chart 7. Here, the change in the survey's reporting method (to the location of the sales desk rather than that of the price-setting dealer) had the opposite effect to that seen in foreign exchange. Several large European-owned banks have moved their OTC derivatives sales desks to London within the past three years, increasing their volume of turnover relative to that recorded in the 2001 UK survey, and their share of the UK market.(1)

Chart 7
OTC derivatives turnover in the United Kingdom by nationality of bank ownership



(1) Effects of the change in method are also evident in the global results for OTC derivatives, summarised in the box on page 471.

Survey details and definitions

Participants

93 institutions (mainly commercial and investment banks) completed the 2004 UK survey. This was fewer than in other survey years (for example, 257 completed the 2001 survey), but this should not have affected coverage given the concentration of the markets in the United Kingdom. Only firms that are active in the interdealer market and/or in business with large customers were asked to participate by the Bank of England. Other institutions, active in the relevant markets, did not take part directly but participating principals will have reported transactions with them.

The questionnaire

Survey participants completed a questionnaire prepared by the Bank of England, based on a standard format agreed with other central banks and produced by the Bank for International Settlements (BIS). Participants provided details of their gross turnover for the 20 business days in April 2004, broken down by instrument, currency and counterparty type. Gross turnover (measured in nominal values) was defined as the absolute total value of all deals contracted; there was no netting of purchases against sales. The questionnaire requested data in terms of US dollar equivalents, rounded to the nearest million. The location of a trade was identified by the location of the sales desk, rather than that of the price-setting dealer as in previous surveys.

The survey distinguished the following types of transaction:

Foreign exchange

- *Spot transaction*: Single outright transaction involving the exchange of two currencies at a rate agreed on the date of the contract for value or delivery (cash settlement) within two business days. The spot legs of swaps and swaps that were for settlement within two days (ie 'tomorrow/next day' swap transactions) were excluded from this category.

- *Outright forward*: Transaction involving the exchange of two currencies at a rate agreed on the date of the contract for value or delivery (cash settlement) at some time in the future (more than two business days later). Also included in this category were forward foreign exchange agreement transactions (FXA), non-deliverable forwards, and other forward contracts for differences.

- *Foreign exchange swap*: Transaction that involves the actual exchange of two currencies (principal amount only) on a specific date at a rate agreed at the time of the conclusion of the contract (the short leg), and a reverse exchange of the same two currencies at a date further in the future at a rate (generally different from the rate applied to the short leg) agreed at the time of the conclusion of the contract (the long leg). Short-term swaps carried out as 'tomorrow/next day' transactions are included in this category.

OTC currency derivatives

- *Currency swap*: Transaction involving the actual exchange of two currencies on a specific date at a rate agreed at the time of the conclusion of the contract, and an agreement to exchange streams of interest payments in the currencies for an agreed period, followed by a reverse exchange at a pre-agreed exchange rate at maturity.

- *Currency option*: Option contract that gives the right to buy or sell a currency with another currency at a specified exchange rate during a specified period. This category also includes currency swaptions, currency warrants and exotic foreign exchange options such as average rate options and barrier options.

Single-currency OTC interest rate derivatives

- *Forward rate agreement (FRA)*: Interest rate forward contract in which the rate to be paid or received on a specific principal for a set period of time, beginning at some time in the future, is determined at contract initiation.

- *Interest rate swap*: Agreement to exchange periodic payments related to interest rates on a single currency. Can be fixed for floating, or floating for floating based on different indices. This category includes those swaps whose notional principal is amortised according to a fixed schedule independent of interest rates.

- *Interest rate option*: Option contract that gives the right to pay or receive a specific interest rate on a predetermined principal for a set period. Included in this category are interest rate caps, floors, collars, corridors, swaptions and warrants.

Reporting institutions were asked to distinguish between transactions with *reporting dealers*, *other financial institutions* (all categories of financial institution other than reporting dealers) and *non-financial institutions*. In each case they were asked to separate local and cross-border transactions (determined according to the location, rather than the nationality of the counterparty) to permit adjustment for double counting.

The aggregate responses (adjusted for double counting) for the main sections of the UK questionnaire are reproduced in Tables H, I and J (at the end of this article). The BIS intends to publish an analysis of the global survey results in early 2005. National central banks also conducted surveys of global outstanding positions in the derivatives markets (measured at the end of June 2004) and the BIS has released aggregate results on its website at www.bis.org/publ/rpfx04.htm.

Table H
Average daily net/gross foreign exchange turnover[(a)]

US$ millions (rounded to the nearest million)

	US dollar against:						Sterling against:						
	Euro	¥	Swfr	Can$	Aus$	Other	US$	Euro	¥	Swfr	Can$	Aus$	Other
Spot													
Reporting dealers	**57,387**	**18,753**	**5,950**	**3,835**	**5,201**	**10,916**	**19,632**	**7,774**	**478**	**194**	**103**	**93**	**101**
Local	12,430	4,051	1,431	808	1,326	2,896	5,969	2,472	69	49	50	17	31
Cross-border	44,957	14,703	4,520	3,027	3,874	8,019	13,663	5,303	409	145	54	76	70
Other financial institutions	**21,973**	**6,820**	**2,147**	**1,632**	**1,752**	**6,140**	**9,334**	**3,052**	**245**	**144**	**76**	**73**	**169**
Local	4,877	1,321	463	261	369	440	3,451	1,512	103	74	19	32	137
Cross-border	17,096	5,499	1,685	1,370	1,383	5,700	5,883	1,540	142	70	57	40	33
Non-financial institutions	**8,192**	**1,926**	**402**	**393**	**394**	**429**	**2,177**	**954**	**49**	**56**	**13**	**17**	**81**
Local	4,516	275	63	185	70	101	923	349	21	17	9	10	49
Cross-border	3,676	1,651	339	209	324	328	1,254	605	28	40	4	7	32
Subtotal	**87,552**	**27,500**	**8,500**	**5,860**	**7,347**	**17,485**	**31,143**	**11,780**	**773**	**395**	**192**	**182**	**351**
Outright forward													
Reporting dealers	**21,818**	**10,107**	**1,438**	**1,469**	**1,523**	**8,863**	**8,634**	**1,911**	**139**	**117**	**8**	**42**	**57**
Local	3,049	1,523	220	232	297	1,876	2,213	426	22	24	0	3	13
Cross-border	18,768	8,584	1,218	1,237	1,226	6,986	6,421	1,485	117	93	7	39	44
Other financial institutions	**7,314**	**3,327**	**774**	**764**	**609**	**2,752**	**6,346**	**1,813**	**250**	**145**	**23**	**37**	**90**
Local	2,390	1,036	153	190	217	597	4,592	1,065	145	74	19	22	60
Cross-border	4,923	2,291	621	574	392	2,155	1,755	748	105	71	4	15	29
Non-financial institutions	**6,700**	**1,860**	**369**	**448**	**246**	**630**	**1,874**	**1,148**	**141**	**71**	**18**	**36**	**103**
Local	4,771	647	89	246	65	207	1,111	625	94	28	9	15	63
Cross-border	1,929	1,213	280	202	181	423	763	523	46	44	9	21	40
Subtotal	**35,831**	**15,294**	**2,581**	**2,681**	**2,378**	**12,245**	**16,853**	**4,872**	**530**	**333**	**49**	**114**	**249**
Foreign exchange swaps													
Reporting dealers	**86,755**	**32,415**	**14,647**	**9,839**	**12,710**	**41,202**	**93,109**	**4,282**	**614**	**159**	**50**	**134**	**183**
Local	25,324	10,146	3,306	2,590	4,558	8,973	40,208	1,211	498	57	39	23	51
Cross-border	61,431	22,270	11,341	7,249	8,152	32,229	52,900	3,071	117	102	11	111	131
Other financial institutions	**33,156**	**9,303**	**3,439**	**3,046**	**4,020**	**11,037**	**29,076**	**2,896**	**1,051**	**91**	**74**	**73**	**92**
Local	12,574	3,081	755	1,353	1,124	3,255	15,753	1,634	132	33	38	62	65
Cross-border	20,583	6,222	2,684	1,694	2,896	7,782	13,324	1,262	920	57	37	11	28
Non-financial institutions	**6,631**	**3,005**	**1,004**	**601**	**613**	**1,096**	**4,105**	**2,551**	**2,679**	**97**	**44**	**54**	**239**
Local	2,233	978	95	199	182	345	1,987	1,142	2,651	52	36	43	125
Cross-border	4,398	2,028	909	402	431	751	2,118	1,409	28	46	9	11	113
Subtotal	**126,543**	**44,724**	**19,090**	**13,486**	**17,342**	**53,334**	**126,290**	**9,728**	**4,344**	**347**	**169**	**261**	**514**
Total foreign exchange turnover	**249,925**	**87,518**	**30,171**	**22,028**	**27,067**	**83,064**	**174,286**	**26,381**	**5,646**	**1,075**	**409**	**557**	**1,113**
Maturity of forwards; per cent[(b)]													
Seven days or less	74	68	80	78	78	79	73	49	10	49	48	33	45
Over seven days	26	31	20	21	21	20	26	49	89	50	51	67	54
Over one year	1	1	0	0	1	2	1	2	0	0	1	0	1

(a) Adjusted for local double counting.
(b) Gross maturities data cannot be adjusted accurately for local double counting. Figures in this table are unadjusted, given as a percentage of gross outright forward and foreign exchange swap turnover, and may not sum to 100% due to rounding.

Euro against:						
¥	Swfr	Can$	Aus$	Other	Residual	Total, all currencies
5,614	**5,498**	**126**	**200**	**3,709**	**1,156**	**146,772**
1,368	1,366	53	46	842	265	35,539
4,245	4,132	73	154	2,867	891	111,182
2,734	**1,446**	**63**	**71**	**982**	**340**	**59,192**
507	421	12	17	276	31	14,322
2,228	1,025	51	53	707	309	44,870
402	**590**	**34**	**36**	**363**	**83**	**16,592**
82	71	2	14	46	5	6,809
321	519	32	22	317	77	9,783
8,750	**7,534**	**224**	**306**	**5,054**	**1,578**	**222,506**
1,842	**854**	**38**	**74**	**608**	**313**	**59,852**
321	168	8	21	146	36	10,597
1,521	686	31	53	462	277	49,255
1,328	**702**	**90**	**89**	**773**	**297**	**27,521**
314	180	48	42	315	81	11,539
1,015	522	43	47	457	216	15,982
782	**314**	**45**	**73**	**345**	**111**	**15,312**
434	46	9	32	81	19	8,589
348	268	36	42	264	92	6,723
3,952	**1,870**	**174**	**236**	**1,726**	**720**	**102,685**
2,404	**314**	**153**	**452**	**536**	**846**	**300,802**
1,111	25	55	169	87	300	98,730
1,294	289	98	283	449	546	202,072
3,921	**381**	**52**	**96**	**533**	**150**	**102,487**
1,113	69	22	33	145	21	41,260
2,807	312	30	63	388	129	61,227
324	**396**	**63**	**211**	**581**	**234**	**24,529**
90	91	20	165	167	116	10,717
234	304	43	46	413	118	13,812
6,649	**1,091**	**268**	**758**	**1,650**	**1,230**	**427,818**
19,350	**10,495**	**665**	**1,301**	**8,429**	**3,529**	**753,009**
42	43	30	36	34	57	72
56	56	65	63	65	42	27
2	1	5	1	1	1	1

Table I
Average daily net/gross OTC currency derivatives turnover(a)

US$ millions (rounded to the nearest million)

	US dollar against:						Sterling against:						
	Euro	¥	Swfr	Can$	Aus$	Other	US$	Euro	¥	Swfr	Can$	Aus$	Other
Currency swaps													
Reporting dealers	**4,213**	**1,590**	**1,036**	**23**	**530**	**389**	**2,528**	**591**	**72**	**1**	**4**	**0**	**0**
Local	2,999	107	778	0	121	216	1,483	355	0	0	4	0	0
Cross-border	1,214	1,484	258	23	409	173	1,045	236	72	1	0	0	0
Other financial institutions	**779**	**219**	**36**	**8**	**12**	**87**	**379**	**595**	**153**	**0**	**0**	**0**	**26**
Local	112	64	15	0	0	0	86	189	75	0	0	0	2
Cross-border	667	155	21	8	12	87	293	406	77	0	0	0	24
Non-financial institutions	**1,000**	**244**	**4**	**23**	**4**	**53**	**155**	**213**	**5**	**0**	**6**	**1**	**12**
Local	10	3	0	0	0	0	46	83	5	0	0	1	12
Cross-border	990	241	4	23	4	53	109	130	0	0	6	0	0
Subtotal	**5,992**	**2,053**	**1,076**	**54**	**546**	**529**	**3,062**	**1,399**	**229**	**1**	**10**	**1**	**38**
OTC options sold													
Reporting dealers	**5,412**	**4,494**	**421**	**655**	**1,128**	**785**	**1,802**	**555**	**27**	**59**	**5**	**14**	**2**
Local	1,343	1,220	83	196	255	267	648	182	6	13	1	3	1
Cross-border	4,069	3,274	338	459	873	518	1,153	373	21	46	4	12	1
Other financial institutions	**3,001**	**2,318**	**303**	**343**	**536**	**569**	**827**	**299**	**12**	**30**	**1**	**16**	**11**
Local	1,077	492	138	106	158	154	316	123	6	20	0	5	9
Cross-border	1,924	1,826	165	236	378	415	511	177	6	10	1	11	3
Non-financial institutions	**910**	**322**	**87**	**70**	**105**	**131**	**193**	**160**	**3**	**8**	**2**	**0**	**23**
Local	96	40	4	0	1	23	77	44	0	0	0	0	16
Cross-border	814	283	83	70	103	108	116	62	3	8	2	0	6
Subtotal	**9,324**	**7,134**	**811**	**1,068**	**1,769**	**1,485**	**2,821**	**960**	**42**	**97**	**8**	**30**	**36**
OTC options bought													
Reporting dealers	**5,494**	**4,503**	**453**	**605**	**1,222**	**990**	**1,782**	**542**	**31**	**84**	**14**	**32**	**14**
Local	1,392	1,190	96	189	246	261	660	185	2	12	2	5	1
Cross-border	4,102	3,313	358	417	976	729	1,122	357	29	72	12	27	13
Other financial institutions	**3,026**	**2,274**	**233**	**446**	**551**	**544**	**1,080**	**278**	**8**	**39**	**0**	**13**	**14**
Local	747	517	76	96	143	122	407	124	4	29	0	0	12
Cross-border	2,278	1,756	157	349	408	422	673	154	3	9	0	13	1
Non-financial institutions	**953**	**529**	**93**	**61**	**97**	**122**	**275**	**147**	**3**	**22**	**2**	**0**	**23**
Local	63	40	3	1	18	9	61	52	2	1	0	0	20
Cross-border	889	489	89	60	79	112	215	94	1	21	2	0	3
Subtotal	**9,473**	**7,306**	**779**	**1,112**	**1,870**	**1,655**	**3,137**	**968**	**42**	**144**	**16**	**45**	**51**
Total OTC options	**18,796**	**14,440**	**1,590**	**2,180**	**3,639**	**3,139**	**5,958**	**1,928**	**84**	**241**	**24**	**75**	**86**
Total	**24,788**	**16,492**	**2,666**	**2,233**	**4,185**	**3,668**	**9,020**	**3,327**	**313**	**242**	**34**	**76**	**124**

(a) Adjusted for local double counting.

Euro against:						
¥	Swfr	Can$	Aus$	Other	Residual	Total, all currencies
64	**30**	**6**	**31**	**71**	**168**	**11,347**
5	1	0	0	14	2	6,085
59	29	6	31	57	166	5,262
108	**6**	**5**	**59**	**33**	**30**	**2,534**
5	0	1	0	3	0	552
103	6	4	59	31	30	1,982
15	**21**	**15**	**6**	**27**	**79**	**1,879**
0	0	0	0	0	1	160
15	21	15	6	27	78	1,719
186	**57**	**26**	**95**	**131**	**276**	**15,760**
1,690	**632**	**19**	**86**	**483**	**322**	**18,592**
510	178	7	21	162	90	5,185
1,180	454	12	65	322	231	13,407
825	**447**	**17**	**80**	**279**	**399**	**10,312**
195	163	0	32	110	133	3,236
630	285	17	47	169	266	7,076
373	**151**	**7**	**7**	**64**	**46**	**2,608**
4	1	0	1	5	16	329
369	151	7	6	59	30	2,279
2,888	**1,230**	**43**	**173**	**827**	**767**	**31,512**
1,897	**828**	**32**	**74**	**626**	**385**	**19,606**
573	207	14	27	192	88	5,341
1,324	621	18	47	434	297	14,265
936	**349**	**20**	**95**	**279**	**419**	**10,602**
264	67	3	27	97	176	2,912
672	282	18	67	182	243	7,690
351	**57**	**4**	**11**	**80**	**82**	**2,910**
8	5	0	3	1	6	293
344	52	4	9	80	75	2,618
3,184	**1,233**	**56**	**179**	**985**	**885**	**33,118**
6,072	**2,464**	**99**	**352**	**1,811**	**1,652**	**64,630**
6,258	**2,520**	**126**	**447**	**1,943**	**1,928**	**80,390**

Table J
Average daily net/gross OTC interest rate derivatives turnover[a]

US$ millions (rounded to the nearest million)

	£	US$	Euro	¥	Swfr	Can$	Aus$	Dkr	HK$	Skr	Other	Total
FRAs												
Reporting dealers	**17,012**	**19,907**	**40,300**	**147**	**1,131**	**156**	**521**	**524**	**8**	**3,904**	**5,667**	**89,276**
Local	6,864	5,777	8,861	31	371	73	9	51	3	723	657	23,421
Cross-border	10,147	14,130	31,438	116	759	83	512	473	5	3,181	5,011	65,856
Other financial institutions	**6,525**	**6,799**	**63,667**	**17**	**155**	**28**	**145**	**59**	**1**	**502**	**303**	**78,220**
Local	4,089	3,637	55,986	12	78	0	4	22	1	163	44	64,036
Cross-border	2,436	3,162	7,681	5	77	28	141	37	0	339	259	14,164
Non-financial institutions	**810**	**1,157**	**216**	**0**	**2**	**0**	**11**	**0**	**0**	**6**	**27**	**2,227**
Local	118	875	3	0	0	0	0	0	0	0	2	998
Cross-border	691	282	213	0	2	0	11	0	0	6	25	1,229
Subtotal	**24,346**	**27,862**	**104,182**	**164**	**1,288**	**184**	**677**	**582**	**9**	**4,411**	**5,997**	**169,703**
Swaps												
Reporting dealers	**29,707**	**42,133**	**107,602**	**7,906**	**2,535**	**1,195**	**1,828**	**228**	**1,017**	**1,590**	**2,103**	**197,845**
Local	11,110	9,387	22,569	1,358	657	106	207	37	108	308	255	46,102
Cross-border	18,597	32,747	85,033	6,547	1,878	1,089	1,621	192	909	1,282	1,849	151,743
Other financial institutions	**15,629**	**11,954**	**52,547**	**2,898**	**960**	**213**	**765**	**99**	**139**	**803**	**572**	**86,579**
Local	6,634	1,885	20,483	515	180	20	19	13	45	222	52	30,067
Cross-border	8,996	10,068	32,064	2,383	780	193	747	86	93	581	521	56,512
Non-financial institutions	**2,550**	**3,655**	**8,106**	**109**	**127**	**0**	**34**	**7**	**3**	**80**	**53**	**14,723**
Local	1,218	1,626	4,352	67	35	0	0	0	0	2	2	7,302
Cross-border	1,332	2,028	3,754	42	91	0	34	7	3	78	51	7,420
Subtotal	**47,886**	**57,742**	**168,255**	**10,913**	**3,621**	**1,408**	**2,628**	**334**	**1,159**	**2,472**	**2,728**	**299,146**
OTC options sold												
Reporting dealers	**1,178**	**7,324**	**9,892**	**976**	**185**	**0**	**323**	**0**	**21**	**6**	**56**	**19,962**
Local	287	1,268	2,485	153	85	0	3	0	4	6	6	4,296
Cross-border	891	6,056	7,407	823	100	0	320	0	18	1	51	15,667
Other financial institutions	**409**	**6,981**	**15,510**	**337**	**324**	**0**	**50**	**0**	**135**	**34**	**34**	**23,814**
Local	172	995	3,068	27	8	0	11	0	1	19	23	4,323
Cross-border	237	5,986	12,442	310	316	0	39	0	134	16	11	19,491
Non-financial institutions	**310**	**1,983**	**624**	**60**	**0**	**0**	**0**	**0**	**0**	**3**	**5**	**2,985**
Local	295	282	15	56	0	0	0	0	0	0	0	647
Cross-border	15	1,701	609	5	0	0	0	0	0	3	5	2,338
Subtotal	**1,897**	**16,288**	**26,026**	**1,373**	**509**	**0**	**372**	**0**	**156**	**43**	**95**	**46,761**
OTC options bought												
Reporting dealers	**1,104**	**9,826**	**10,195**	**445**	**140**	**0**	**334**	**2**	**188**	**31**	**85**	**22,349**
Local	328	1,467	2,464	95	23	0	12	0	8	11	4	4,412
Cross-border	777	8,359	7,732	350	117	0	322	2	179	20	81	17,937
Other financial institutions	**2,845**	**2,291**	**14,899**	**250**	**159**	**2**	**12**	**1**	**2**	**18**	**46**	**20,524**
Local	107	612	2,266	6	1	0	3	0	0	10	45	3,050
Cross-border	2,739	1,679	12,633	244	158	2	9	1	2	8	1	17,474
Non-financial institutions	**154**	**2,388**	**1,615**	**16**	**21**	**0**	**0**	**0**	**0**	**0**	**32**	**4,226**
Local	79	410	10	0	2	0	0	0	0	0	19	519
Cross-border	75	1,978	1,605	16	20	0	0	0	0	0	13	3,707
Subtotal	**4,104**	**14,505**	**26,709**	**711**	**320**	**2**	**346**	**2**	**190**	**49**	**162**	**47,099**
Total OTC options	**6,001**	**30,793**	**52,735**	**2,084**	**829**	**2**	**718**	**2**	**346**	**92**	**257**	**93,860**
Total OTC interest rate derivatives	**78,233**	**116,397**	**325,172**	**13,161**	**5,738**	**1,594**	**4,023**	**919**	**1,514**	**6,976**	**8,982**	**562,710**

(a) Adjusted for local double counting.

The external balance sheet of the United Kingdom: recent developments

By John Elliott and Erica Wong Min of the Bank's Monetary and Financial Statistics Division.

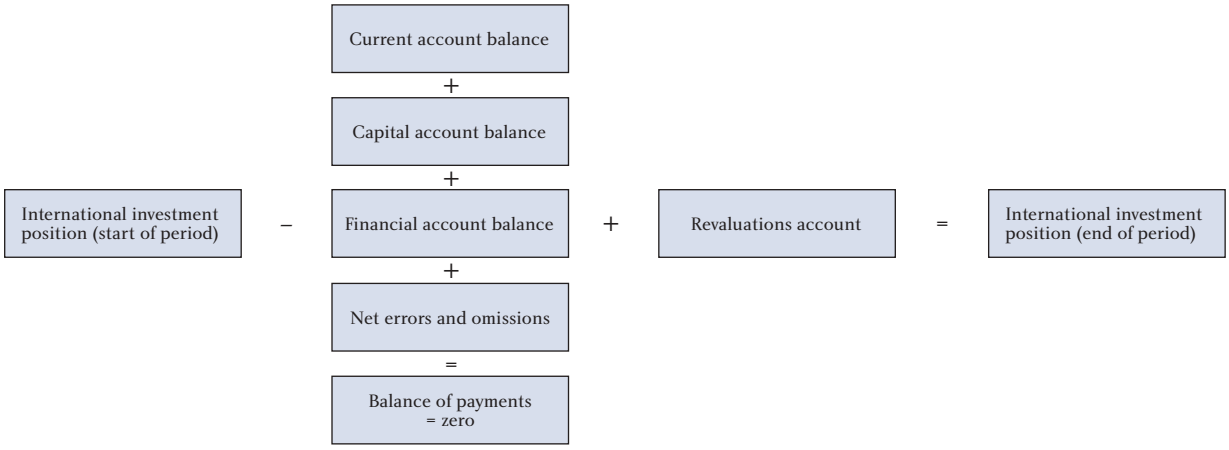
The United Kingdom's external balance sheet currently records assets and liabilities of more than £3.5 trillion. Both sides of the external balance sheet grew sharply during 2003, continuing the marked expansion that has been recorded since the early 1990s. This article examines recent trends within the balance sheet components with reference to the associated financial flows and income. There is a particular focus on data reported by monetary financial institutions. The article discusses some of the problems involved in compiling an external balance sheet, examining two key issues through the estimation of a breakdown of revaluations to outstanding stocks and a discussion of foreign direct investment data. We also report on current domestic and international initiatives aimed at further improving the quality of external statistics.

Introduction

The external balance sheet is a summary of a country's financial relationship with the rest of the world. For the United Kingdom, it combines the stock of UK residents' financial investments in the rest of the world (assets) and the stock of financial investments into the United Kingdom from abroad (liabilities). Figure 1 places the external balance sheet in the integrated balance of payments accounts and shows its conceptual relationship to the balance of payments flow measures.(1) The external balance sheet is now usually referred to as the international investment position (IIP).

Reading horizontally, the change in the net asset/liability position between two points in time must, by definition, be equal to the net flow of assets and liabilities recorded in the financial account, plus or minus net changes in the valuation of the stocks, recorded in the revaluations account.(2) Reading vertically outlines the balance of payments identity; the current account should be equal and opposite to the

Figure 1



(1) The financial account records transactions in financial assets and liabilities, with the main classifications being the same as those used in the IIP (see page 486 of this article). The capital account consists of capital transfers and the net acquisition or disposal of non-produced, non-financial assets (such as land, patents and copyrights). Capital transfers include transfers of ownership of fixed assets and the cancellation of liabilities by creditors, without any counterparts received in return. Most transfer payments involve central government: examples include payments to and receipts from institutions of the European Union, and debt forgiveness. For more details see *The Pink Book 2004*, pages 170–71.

(2) In this simplified representation the revaluations account will capture changes in net worth due to both nominal holding gains/losses and other changes in volume (for example write-offs). International manuals suggest the construction of a revaluations account sourced from data suppliers, but at present the United Kingdom is not able to do this. The revaluations decomposition presented in this article is based on a Bank of England best endeavours method. See *Balance of Payments Manual* — 5th edition (BPM5) published by the International Monetary Fund (IMF), Chapter 3, pages 14–19.

sum of the financial account and the capital account. In practice an errors and omissions term is necessary to ensure that this is so. We discuss some of the problems involved in the collection of balance of payments and IIP data in the box on page 491.

Table A sets out the United Kingdom's balance of payments flows since 1998. The financial account is presented in accordance with the usual balance of payments convention, so a positive figure represents a net financial inflow.

Table A
Balance of payments

£ millions

	1998	1999	2000	2001	2002	2003	2004 H1
Current account	-3,972	-24,416	-24,094	-22,391	-18,222	-20,430	-11,909
Capital account	516	773	1,527	1,206	868	1,243	1,241
Financial account	2,219	20,944	24,944	23,816	8,849	17,455	4,880
Errors and omissions	1,237	2,699	-2,377	-2,631	8,505	1,732	5,788

Source: ONS.

Table B sets out the changes in the net IIP since 1998. When considered in this context the sign on the financial account flows is reversed. A net financial account inflow represents a net increase in external liabilities.

Table B
Net international investment position

£ millions

	Net IIP (at start period)	Financial account flows	Revaluations	Net IIP (at end period)
1998	-73,833	-2,219	-57,168	-133,220
1999	-133,220	-20,944	83,520	-70,644
2000	-70,644	-24,944	59,475	-36,113
2001	-36,113	-23,816	-13,500	-73,429
2002	-73,429	-8,849	-29,085	-111,363
2003	-111,363	-17,455	76,384	-52,434
2004 H1	-52,434	-4,880	-48,351	-105,665

Source: ONS.

The Office for National Statistics (ONS) publishes a limited set of IIP figures each quarter in the *Balance of Payments First Release* with a full breakdown published annually in the *Pink Book*.(1) The IIP is broken down into the following instruments:

- **Direct investment** is defined as a cross-border financial transaction in which a resident in one economy acquires a lasting interest in an enterprise resident in another economy. A direct investment relationship exists if the investor has an equity interest in an enterprise of 10% or more of the ordinary shares or voting stock. Direct investment levels are also affected by all subsequent financial transactions (equity or debt) and any earnings of the direct investment enterprise that are retained rather than repatriated to the investor.(2)

- **Portfolio investments** are defined as investments in equity and debt securities apart from those included in direct investment and reserve assets. Debt securities comprise bonds and notes and money market instruments.

- Though the term **other investment** suggests a residual category, it is in fact the largest component of the UK external balance sheet. Other investment consists of external transactions other than direct and portfolio investments. The largest component of other investment is loans and deposits, including repos and reverse repos.

- **Reserve assets** refer to foreign financial assets controlled by monetary authorities, for example foreign exchange, monetary gold and special drawing rights.

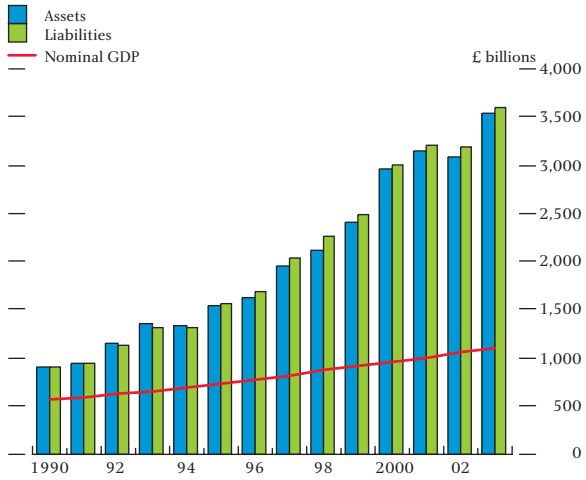
- **Financial derivatives**(3) covers any financial instrument the price of which is based upon the value of an underlying asset. The main contract types include futures and forwards, options and swaps.

Recent trends in the UK external balance sheet

Chart 1 shows the extent to which the United Kingdom's gross external assets and liabilities have grown since 1990. In this 13-year period, both assets and liabilities have increased by more than £2.6 trillion, at an average annual rate of more than 11%. This easily outstripped the 5.4% average annual growth rate of nominal UK GDP over the same period. At end-2003, external assets stood at £3.55 trillion and external liabilities stood at £3.60 trillion.

(1) 'United Kingdom Balance of Payments', published annually by the ONS, Chapter 8.
(2) BPM5, Chapter 8, paragraph 177.
(3) UK IIP data do not at present include stock figures for financial derivative instruments. Table FD in the *Pink Book* gives a partial sectoral breakdown of derivatives assets/liabilities for end-1998 to end-2003 inclusive. The ONS has stated that '[they] are not included in the main aggregates of the United Kingdom's IIP as the data are experimental'. Limited data on transactions in financial derivatives are included in the financial account of the balance of payments.

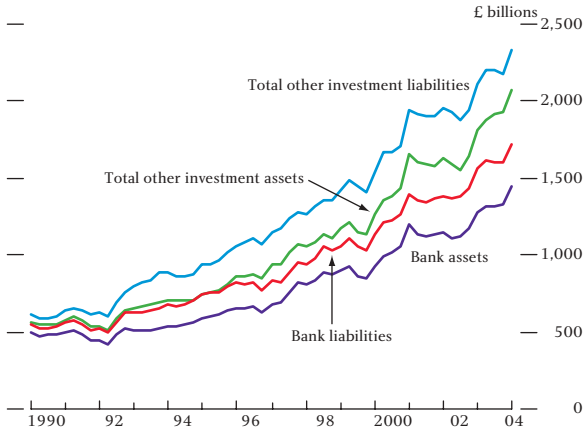
Chart 1
UK gross external assets and liabilities



Source: ONS.

More than half of the £2.6 trillion expansion of the United Kingdom's external assets and liabilities has been in other investment, which probably reflects the success of the United Kingdom as an international financial centre, particularly for cross-border banking. Chart 2 shows how influential the banking sector is within other investment, accounting for almost 70% of other investment assets and almost 75% of other investment liabilities at end-2003. Data collected by the Bank of England disaggregate this into assets and liabilities of UK-owned and non resident-owned banks. At end-2003, non resident-owned banks held just under 80% of the UK banking sector's external other investment assets, with the figure at just over 75% for liabilities. We present geographic and currency detail of banking sector other investment data in the box on page 488.

Chart 2
Other investment assets and liabilities

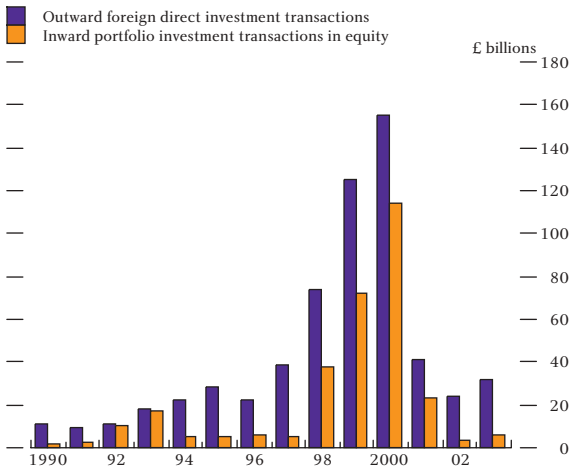


Source: ONS.

The other major factor driving growth in the United Kingdom's external assets and liabilities over this period was the sharp surge in cross-border mergers and acquisitions beginning in 1998 and peaking in 2000. This activity typically affects the external balance sheet in two places. The acquisition of an overseas company will be recorded as direct investment abroad, which increases external assets. When the purchase is financed wholly or partly with equity, initially at least, the acquisition will also increase non-residents' portfolio investment in UK equities, which raises external liabilities.

Chart 3 shows that the most significant financial transactions resulting from this activity increased foreign direct investment assets and portfolio equity liabilities. A similar pattern, but on a smaller scale, was seen through direct investment into the United Kingdom (boosting direct investment liabilities and portfolio equity assets).

Chart 3
UK direct investment abroad and non-residents' portfolio investment in the United Kingdom



Source: ONS.

International mergers and acquisitions activity will result in a permanent increase in non-residents' holdings of UK equities only to the extent that non-residents are willing to retain their increased exposure to the UK economy and corporate sector. Chart 3 shows that non-residents have continued to invest into UK equity (via positive flows every year).

Chart 4 shows how the respective net positions of each of the IIP components have developed over the same period. The United Kingdom ran a small net asset position in direct investment and equity portfolio investment until past the mid-point in the previous decade. From 1998 to 2000 the increase in the net direct investment asset position and the swing from a net equity portfolio investment asset position to a net liability position are evident.

Geographic and currency detail of banking sector other investment data

Geographic detail for the complete IIP is presently only available for end-2002. The full details are presented in the ONS publication *Economic Trends*, June 2004.

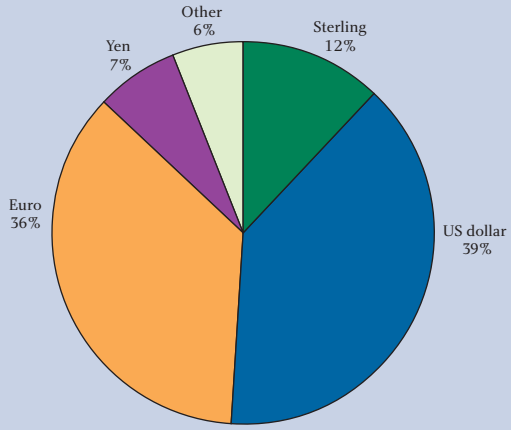
Data collected in the statistics division of the Bank of England allow us to study the geographic and currency detail of the banking sector contribution to other investment up to the end of 2004 Q2.

The currency breakdowns of banks' assets and liabilities at the end of 2004 Q2 (Charts A and B respectively) show that the US dollar remains the most important currency within the United Kingdom's gross positions, although the euro accounts for only a slightly smaller proportion. The breakdowns also confirm that the currency composition of cross-border banking is broadly neutral, as mentioned in the revaluations section on pages 489–90.

The net positions, displayed in Chart C, show that sterling and the US dollar drive the net liability position.

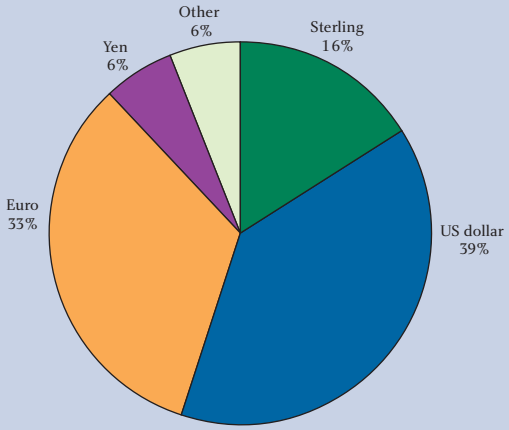
Chart D shows the country breakdown of the net banking sector other investment position. The country with whom the United Kingdom holds the largest net liability position is Switzerland, followed by Jersey, Germany and the Cayman Islands. The United Kingdom holds a net asset position with the United States, Japan and France.

Chart A
Currency breakdown of banks' assets — end-2004 Q2



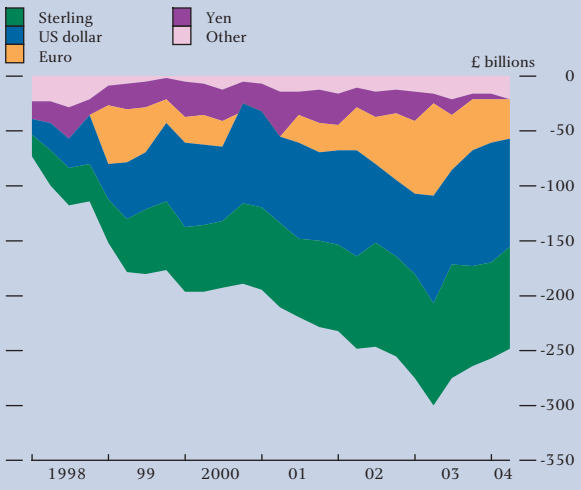
Source: Bank of England.

Chart B
Currency breakdown of banks' liabilities — end-2004 Q2



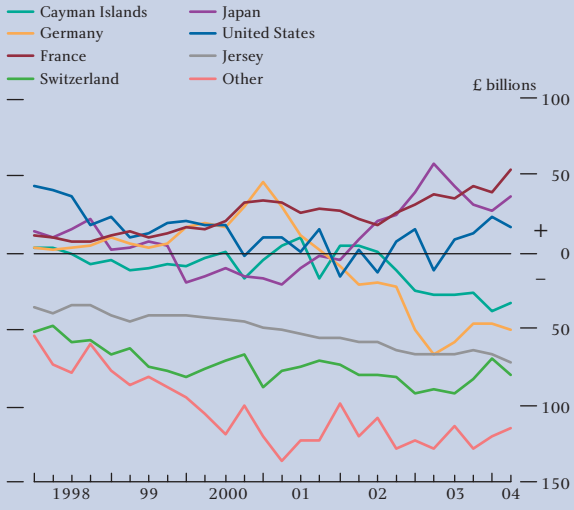
Source: Bank of England.

Chart C
Net position split by currency



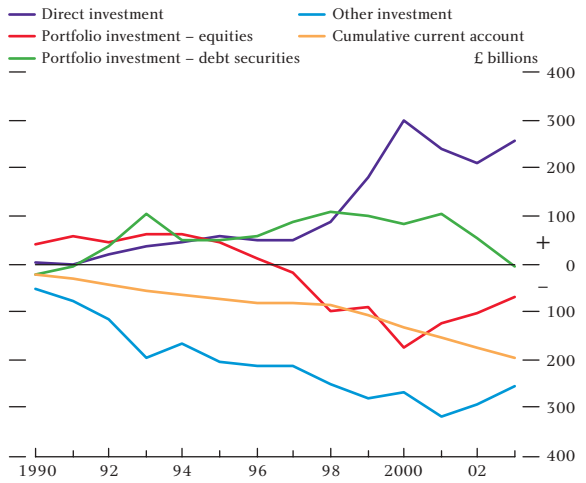
Source: Bank of England.

Chart D
Net banking sector other investment position



Source: Bank of England.

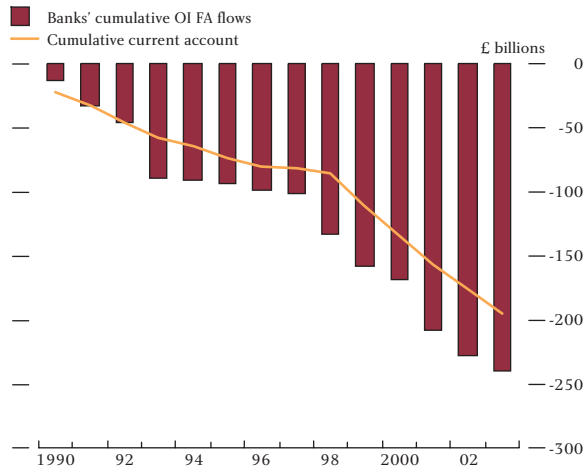
Chart 4
UK net external positions by component



Source: ONS.

Alongside the growth in the United Kingdom's gross other investment assets and liabilities since 1990 there has been a trend increase in the other investment net liability position, although this has been partly reversed over the past two years. For much of this period, the development in the other investment net liability position has broadly tracked the cumulative current account deficit (Chart 4), suggesting that UK residents without access to capital markets have been borrowing from abroad, through the domestic banking sector, to fund their net external expenditure.(1) Chart 5 plots cumulative banking sector other investment financial account flows(2) against the cumulative current account. It shows that this pattern of overseas borrowing through banks has continued over the past two years. The narrowing of the total other investment net liability position is explained by the reduction in the other investment liability position of securities dealers, and the increase in the other investment asset position of other UK residents.

Chart 5
Banking sector cumulative other investment (OI) financial account (FA) flows and cumulative current account deficit



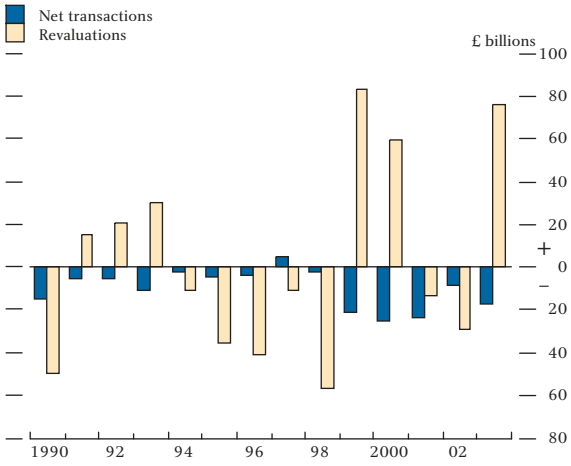
Source: ONS.

Revaluations

Movements in the external balance sheet can result not only from financial transactions but also from the revaluation of outstanding stocks. For example an increased net external liability position does not necessarily require inward net financial flows, but may be caused by negative revaluations to stocks.

Chart 6 shows how important revaluations have been to the evolution of the United Kingdom's external balance sheet in recent years. They were larger than recorded financial transactions in all but one year since 1990. In 2003, large positive revaluations of almost £80 billion more than offset the inward financial flows (see footnote 2 below) of £17.5 billion and narrowed the net liability position. This contrasts with 2001 and 2002, when the financial account inflows were accompanied by negative net revaluations, which added further to the widening in the net liability position.

Chart 6
Changes in UK net external balance sheet



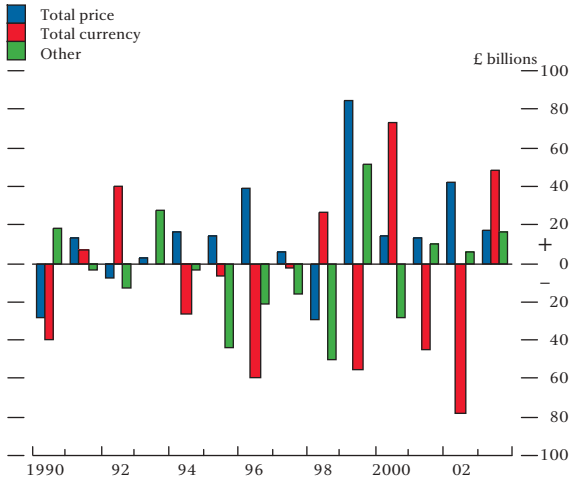
Sources: Bank calculations and ONS.

Two factors contributing to revaluations of assets and liabilities are changes in value due to movements in marketable instrument prices (in the currency of denomination) and changes in value due to the translation of foreign currency denominated assets and liabilities into sterling at prevailing exchange rates. The

(1) See Speight, G and Parkinson, S (2003), 'Large UK-owned banks' funding patterns: recent changes and implications', *Financial Stability Review*, December, pages 135–42.
(2) Financial account inflows represented by a negative figure, contrary to usual Balance of Payments convention.

Bank attempts to estimate the respective effects of these two factors using limited instrument and geographic detail of the balance sheet together with market indices and exchange rates. There is also a residual category which captures the effect of other changes in volume, for example write-offs.(1) It also picks up errors and omissions in the collection of the balance of payments data (see the box on page 491 for a discussion of errors and omissions), and in the Bank's decomposition method. Chart 7 sets out the Bank's estimate of this decomposition of net revaluations since 1990.

Chart 7
Revaluation effects decomposition

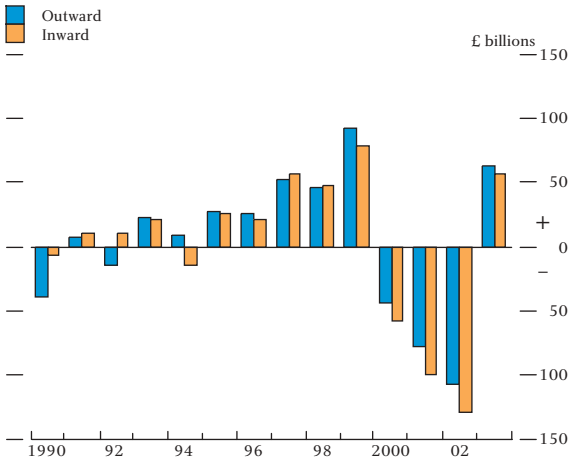


Sources: Bank calculations and ONS.

Currency effects have tended to be the most important factor in the revaluation of the United Kingdom's IIP over the past decade or so. This highlights the different currency composition of the United Kingdom's assets and liabilities. Investment into the United Kingdom tends to be denominated in sterling while UK investment abroad tends to be in foreign currencies (the major exception to this is cross-border banking business, which is broadly currency neutral). Consequently (and with other factors held unchanged), a general fall in the external value of sterling will lead to a rise in the sterling value of foreign currency denominated assets, hence a positive revaluation to the IIP. This is demonstrated by the positive net revaluation in 1992 following sterling's departure from the Exchange Rate Mechanism.

Revaluations due to price effects have been driven largely by equity price movements in recent years. The net revaluation effect of price changes has tended to be relatively small because the world's major equity markets have broadly moved in line with each other. This can be seen in Chart 8, which shows estimated revaluations to portfolio equity investment assets and liabilities due to equity price movements. Both inward and outward revaluations due to price changes were positive in 2003, reflecting the return to positive capital growth in the world's major equity markets. Revaluations due to movements in bond prices are also estimated and were relatively small in 2003. Negative revaluations to both assets and liabilities were caused by falls in bond prices. The revaluation to liabilities was larger than that to assets, leading to a net positive effect for the UK IIP.

Chart 8
Portfolio equity price revaluations



Sources: Bank calculations and ONS.

International comparisons

In this section, we compare the external balance sheet data of the United Kingdom with those of some of its major international counterparts. Geographical detail of balance of payments data can highlight, through bilateral asymmetries, the different compilation methods used in different countries. Therefore, care should be taken when making comparisons. One of the main areas in which this is evident is the measurement of foreign direct investment stocks and income. We focus on some of the issues arising in this area in the box on foreign direct investment measurement issues on pages 492–93. Progress continues to be made internationally to harmonise concepts and collection methods. The primary focus for this is the planned update to the fifth Balance of Payments Manual.(2)

(1) See footnote 2 on page 485.
(2) The Intersecretariat Working Group on National Accounts (ISWGNA) is overseeing the process of updating the System of National Accounts, 1993; the revision of associated manuals — including the Balance of Payments Manual — is being co-ordinated by the IMF. Details of the process are available on the United Nations Statistics Division website at http://unstats.un.org/unsd/nationalaccount/snarev1.htm.

Errors and omissions

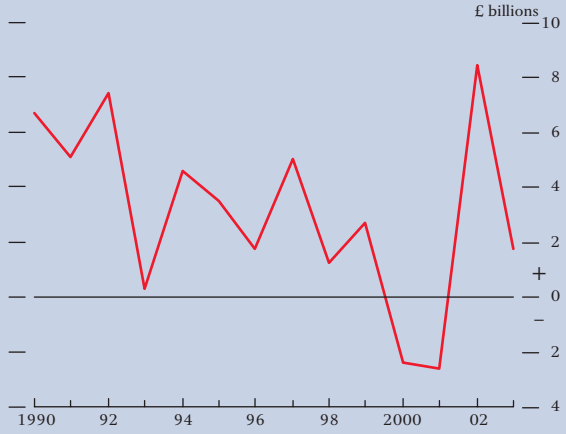
The compilation of the balance of payments for an economy such as the United Kingdom involves drawing together data from a wide range of institutions and economic agents, which inevitably results in a degree of imprecision.(1)

Within the balance of payments flows identity this is allowed for by the incorporation of an 'errors and omissions' term. This acts as a natural indicator of internal consistency for the balance of payments.

Chart A plots the errors and omissions term since 1990 and shows that in 12 years out of 14 it has been positive. Errors and omissions are believed to stem mainly from the financial account, in which case a positive error term would imply that either assets have been overestimated or that liabilities have been underrecorded.

For the relationship between the financial account and the IIP, we have no such natural indicator. Within our revaluations estimates, we have an 'other revaluations' term which is constructed to pick up discrepancies between flows and stocks not explained by price and currency effects. In the majority of years since we began to estimate the decomposition (in 1987), this 'other revaluations' term has been negative.

Chart A
Net errors and omissions

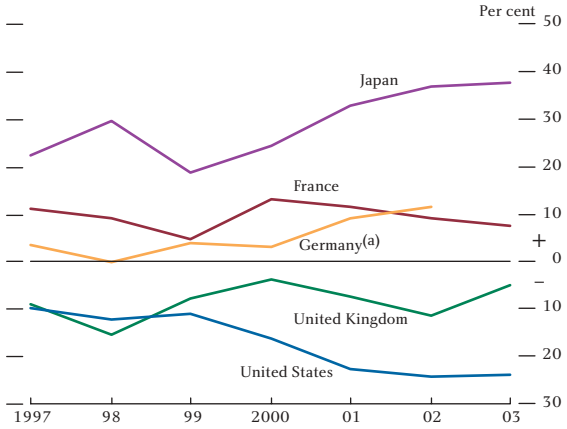


Source: ONS.

A possibility that would account for both these discrepancies would be the underrecording of the flow of non-residents' acquisitions of UK liabilities. Portfolio investment is a likely area in which this may occur. CPIS data(2) on stocks of portfolio investment liabilities present a similar picture to ONS published data. This suggests that the bulk of the error is explained by a failure to record liability flows in the financial account.

(1) The Bank of England compiles data from the monetary financial institutions sector using a near-census. The Office for National Statistics uses a combination of administrative data and large-scale surveys to compile data from the other sectors of the economy, although the data on the household sector are limited.
(2) The co-ordinated portfolio investment survey (CPIS), an International Monetary Fund initiative completed by 68 countries in 2002, allows countries to build a picture of their gross external portfolio investment liabilities from counterpart countries' portfolio investment assets data. For more details see the box in Westwood, R and Young, J (2002), 'The external balance sheet of the United Kingdom: recent developments', *Bank of England Quarterly Bulletin*, Winter, pages 440–50.

Chart 9
Net IIP as a percentage of nominal GDP



Source: *International Financial Statistics.*

(a) Data for 2003 not available at time of publication.

Chart 9 compares the net international investment positions, as a percentage of nominal GDP, for the United States, Japan, Germany, France and the United Kingdom. Japan's net assets and the United States' net liabilities have both grown over recent years. Germany's net asset position has begun to grow again after moving into a net liability position in 1998. France and the United Kingdom have maintained their respective net asset and net liability positions.

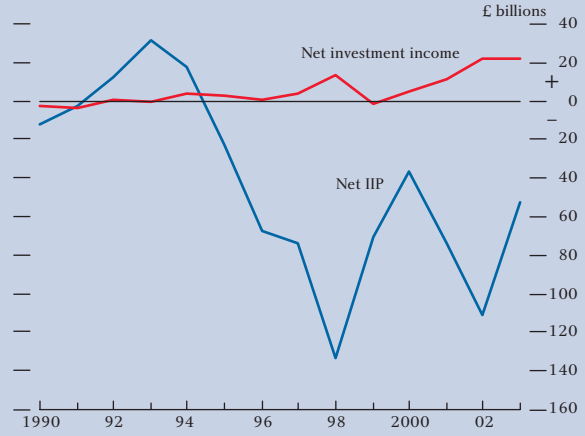
Germany ran a current account and public sector deficit during the 1990s following reunification. As a result of the offsetting financial account net inflows, Germany's net external assets declined, before stabilising around the turn of the century. From 2002, the German current account has turned from a deficit to a surplus, mainly driven by a large increase in exports of goods. The resultant net financial account outflow has led to an increase in the net asset position evident in Chart 9.

The United States' increasing net external liability position (Chart 9) reflects the financial flows required to

Foreign direct investment measurement issues

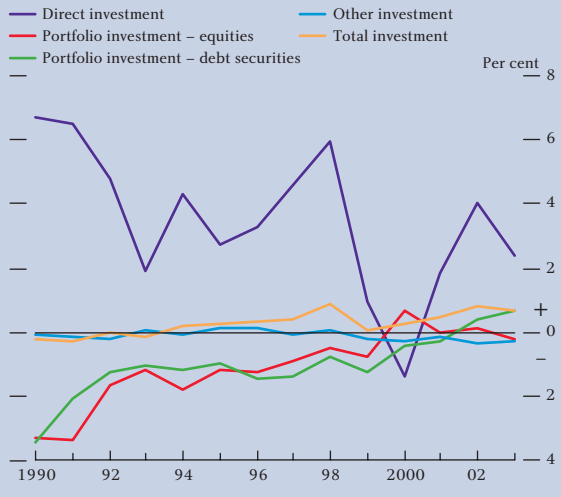
Chart A shows how, throughout the early part of the 1990s, net investment income was broadly stable whereas the net IIP moved from a net asset to a net liability position. Over the past few years the United Kingdom has recorded an increasing net investment income surplus despite running a net IIP liability position. Chart B, which plots net rates of return on investment,(1) suggests that income earned on direct investment might be the main factor.

Chart A
Net IIP and investment income



Source: ONS.

Chart B
Net rates of return on individual components



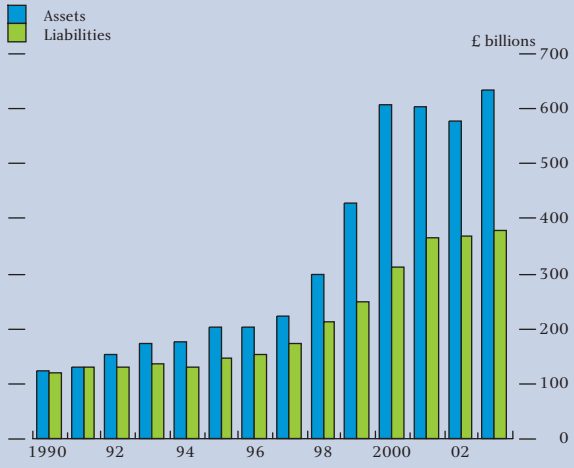
Source: ONS.

International standards recommend that direct investment assets and liabilities are measured at current market prices.(2) However, due to data availability, many countries, including the United Kingdom, depart from this when compiling direct investment stocks. Book values are often used to determine the value of the stock of direct investments. With asset prices generally rising over time, it is almost certain that these book values underestimate the corresponding market values.

Direct investment income is the return that non-resident investors receive on their investment, ie the profits of the respective branch or subsidiary. The Balance of Payments Manual (BPM5) states that this should exclude capital gains or losses which arise from the revaluation of assets.(3) Typically the data available for the statistical reporting of direct investment income are the bottom-line profits figures. While for most sectors of the economy this complies with international definitions, for monetary financial institutions this will often include holding gains and losses arising from their portfolio investments.(4) With asset prices generally rising over time, this will usually imply a trend overestimation of direct investment income.

Therefore, due to the underestimation of stocks and the overestimation of income, rates of return on both direct investment assets and liabilities will be inflated. During the period since 1997 UK net direct investment assets have risen sharply, as shown in Chart C. The overestimation of income on these net direct investment assets relative to the imputed income on the portfolio investment liabilities created as a counterpart (Chart 4) is likely to have contributed to the positive net total investment income (Chart A).

Chart C
UK direct investment assets and liabilities



Source: ONS.

The Bank of England and the ONS are involved in efforts to improve the collection of foreign direct

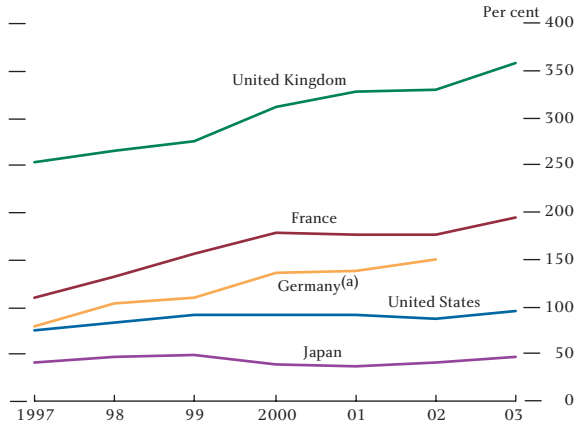
(1) These are simple yields — ie the income figures do not include holding gains or losses.
(2) BPM5, paragraphs 376 and 377.
(3) BPM5, paragraph 285.
(4) For all sectors of the economy the treatment of reinvested earnings further complicates comparisons between income on direct investment and other instruments. See BPM5, paragraph 31.

investment data both domestically and internationally. Relevant initiatives and developments currently include:

- A Eurostat/ECB taskforce recently completed a study into the reporting of direct investment.(5) A result of this is that from 2006 euro-area countries will be required to collect direct investment stocks according to a common definition, and will report market values for listed companies.
- The move to International Accounting Standards(6) and in particular the emphasis on recording economically meaningful valuations in financial reporting may result in better coverage of direct investment assets and liabilities at market or fair value.
- The IMF has proposed conducting an international co-ordinated direct investment survey (CDIS).(7) Such a survey would (i) increase the coverage of direct investment statistics; (ii) improve the comparability of direct investment statistics between countries; and (iii) provide data on the geographical breakdown of direct investment. Gross direct investment assets would be compiled by participating countries with a geographical breakdown. Participants could then derive their direct investment liabilities from counterpart countries' assets data. A taskforce comprising the IMF, World Bank, OECD, ECB, Eurostat and UNCTAD is currently reviewing the feasibility of a CDIS.
- It is anticipated that, in the medium term, direct investment income for UK monetary financial institutions will be presented on the internationally preferred basis, ie holding gains and losses will be excluded.

(5) Available at www.ecb.int/pub/pdf/other/foreigndirectinvestment200403en.pdf.
(6) See www.iasb.org/index.asp.
(7) See www.imf.org/external/pubs/ft/bop/news/pdf/0804.pdf.

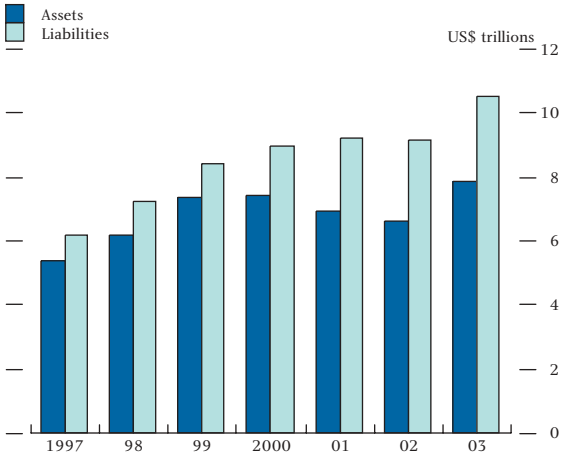
Chart 10
Gross external liabilities as a percentage of nominal GDP



Source: *International Financial Statistics.*

(a) Data for 2003 not available at time of publication.

Chart 11
US gross external assets and liabilities



Source: *International Financial Statistics.*

fund the current account deficit over recent years. However, Chart 10 shows that gross external liabilities as a percentage of GDP were little changed over this period. Chart 11 shows that, when considered in money terms, the increase in the net liability position between end-1999 and end-2002 is explained by a combination of a US$777 billion reduction in gross external assets and a US$730 billion increase in gross external liabilities. In 2003, the reduction in gross external assets recorded in the preceding three years was more than reversed — by a US$1,251 billion increase. Gross external liabilities rose even more sharply, by US$1,348 billion.

Chart 10 shows that the United Kingdom's gross external liabilities (a similar picture emerges for gross external assets) remain significantly higher than those of the other major economies considered, when expressed as a percentage of nominal GDP. This reflects in the main the combination of the presence of the City of London in the UK economy (the predominant international financial centre in its time zone) and the relatively open nature of the UK economy, in particular to inward and outward portfolio investment.

Future initiatives

The statistical community recognises that there are problems in the quality, comparability and availability of

external statistics. While mindful of the need to limit the burden on survey respondents, there are a number of domestic and international initiatives aimed at further improving the quality of external statistics.

Over the next two to three years, both the Bank and the ONS will be providing input into the planned revisions to the IMF's Balance of Payments Manual and the United Nations' System of National Accounts.(1) Research has already begun on a number of major conceptual issues. Staff from both organisations are represented on groups of experts set up to consider various topics.

A new reporting form for gold will be introduced at the beginning of 2005. The United Kingdom's Balance of Payments statistics currently include only limited estimates of transactions in non-monetary gold — additional data collection from participants in the London gold market will improve this.

Work has begun on the assessment of the potential implications for financial statistics of new institutional netting arrangements, and of the possible need to look for additional sources of information.

The Special Data Dissemination Standards (SDDS)(2) were established by the International Monetary Fund as a guide to the provision of economic and financial data to the public, in the hope of enhancing the availability of timely and comprehensive statistics. In 2003, these were extended to cover external debt statistics.

A new European Commission Balance of Payments regulation comes into force in 2006. This will require the United Kingdom to provide more information on the geographical breakdowns of direct investment flows and stocks. As part of the re-engineering of the foreign direct investment surveys used to collect this information, the ONS will also assess the feasibility of collecting stock data at market prices.

(1) See footnote 2 on page 490.
(2) Available at http://dsbb.imf.org/Applications/web/dsbbhome.

Stability and statistics

In this speech,[1] *Rachel Lomax, Deputy Governor responsible for monetary policy, notes that the past decade has been a time of unparalleled macroeconomic stability. This has helped to give policy makers a high degree of credibility which itself reduces the risks posed by sharp shocks to activity or inflation. But good monetary policy decisions depend on good information. Much of the MPC's energy is devoted to ensuring that its judgements are firmly grounded in reality. Bank staff work very closely with ONS to interpret and improve the national statistics. As well as monitoring a very wide range of different indicators, and paying close attention to data quality, the MPC talks to business people through the Bank's network of Agents and members' own regional visits.*

> 'The first time we saw the MPC we were given the folder of all the statistics they had which was something like a foot high. We found it hard to believe that they all read that stuff but they claimed they did. Statistics seem to be their life blood...'
>
> Chairman, House of Lords, Select Committee on Economic Affairs, HL Paper 176 - II.

The past decade has been a time of unparalleled stability for the UK economy. It is more than twelve years since the United Kingdom experienced a single quarter of negative GDP growth. Consumer spending, investment and output have all shown a degree of stability over the past ten years which is unmatched in any decade since the war — indeed in the twentieth century. Inflation has been impressively stable too, as well as lower on average than at any time since the war. And, to complete the story, employment has grown steadily, and unemployment has fallen to a 30 year low.

A stable economy has created a much better climate for business. So no wonder soaring oil prices make people nervous. Those with long memories know we have achieved low inflation and steady growth before — though never for so long — only to see them slip away. They ask: what's to prevent that happening again?

A lot has changed in the past fifteen years. We now have an approach to setting interest rates which provides much better incentives for policy makers to take the right decisions. This — and the strong track record built up over the past decade — has stabilised expectations, with the result that it takes more to throw inflation off course. This is crucial insurance against the risk of a more turbulent decade ahead.

A trickier issue — and one on which I want to spend some time tonight — is the vexed question of information. Statisticians get an even worse press than economists. But they are indispensable. Just as well run businesses need good management information, so successful monetary policy depends on having good information about the economy. The statistical fog surrounding the true state of the economy has proved a particularly potent breeding ground for policy errors in the past. Are we yet in sight of a clearer view?

The policy framework

But let me start first with the policy framework: what grounds are there for being confident that it provides the right incentives for policy makers to take good decisions?

The origins of the present approach go back to 1992, when the Conservative Government adopted an inflation target as the centrepiece of a package of reforms designed to rebuild credibility with financial markets in the wake of sterling's abrupt departure from the ERM. This approach — which came to include the popular 'Ken and Eddie show' — proved successful in establishing a track record of low and stable inflation.

(1) Delivered to the North Wales Business Club on 23 November 2004. This speech can be found on the Bank's website at www.bankofengland.co.uk/speeches/speech232.pdf. I would like to thank Simon Hayes and Jens Larsen for research support and Spencer Dale, Mark Cornelius and colleagues at the Bank of England for helpful comments.

In 1997, the incoming Labour Government 'entrenched' this success by handing the operation of monetary policy over to the Bank of England and setting out a detailed institutional and legal framework for the conduct of monetary policy. The result was to depoliticise interest rate decisions, within a framework of accountability that left the Government clearly in charge of setting objectives for inflation.

Taking operational monetary policy decisions out of the hands of politicians was a decisive step. The touchstone of a successful monetary policy framework is its credibility. If people believe policy makers will always act to keep inflation low, this expectation will itself put a brake on inflationary wage and price increases.

Economists long argued that it was difficult for politicians to make a fully credible commitment to low inflation. And perceptions are what matter: even if a government has no intention of manipulating monetary policy for political ends, as long as firms, workers and financial markets entertain that as a possibility, the job of keeping inflation low will be that much harder.

Nowadays, the Chancellor specifies the inflation target each year, in a letter to the Governor, but decisions about interest rates are taken by a Committee of nine independent experts who have strong incentives to keep inflation close to target.

That is not just because a measurable target provides a clear focus for decisions, important as that is. The regime is intentionally highly transparent with a heavy emphasis on accountability to Parliament and the general public as well as the government of the day. Our individual votes are a matter of public record, and we regularly appear in front of the Treasury Committee to explain our decisions. Minutes of MPC meetings are published within a fortnight. And every three months, we publish an *Inflation Report*, with the MPC's views on the outlook for growth and inflation over the next three years. This is the subject of regular briefings to business audiences around the country as well as a high profile press conference fronted by the Governor.

All this gives monetary policy watchers — in financial markets and in the country at large — plenty of information by which to judge how we are doing, as well as to form their own expectations of future inflation and growth.

How successful have we been in establishing a credible policy regime? A key test is what people expect about inflation, and in particular how those expectations react to unexpected economic news. If the regime is credible, people should expect inflation to stay close to target. And any shocks that affect inflation in the near term should have no impact on inflation expectations further out, because people believe we will take whatever action is needed to return inflation to target. And by this measure, the current policy framework seems to be highly credible.

There are those who claim that the MPC has never really been tested. In fact, the UK economy has been hit by a number of quite severe shocks over the past five or six years. International financial markets were convulsed by the Asian financial crisis in 1997, the Russian debt default and LTCM crisis in 1998, the 9/11 terrorist attacks, the Enron and WorldCom scandals in 2001/2 which dented confidence in corporate governance. Around the same time, we also saw the bursting of the dot.com bubble and a slowdown in world activity.

In the past decades, shocks like this would almost certainly have destabilised UK economic activity and inflation. That, after all, is what happened in the 1970s, when the price of oil quadrupled, and then again in 1979 when it more than doubled. Since the late 90s however, medium-term inflation expectations — both as measured by surveys and as implied by financial asset prices — have barely budged. Even this year, when oil prices rose by over 70% to their peak in late October before falling back, and other producer input prices, including metals, have surged ahead, both surveys and financial asset prices show inflation expectations fluctuating around the MPC's inflation target, within a very narrow range.

This remarkable de-coupling of inflation expectations from economic disturbances is the single most encouraging indicator that the new monetary policy framework is doing its bit to ensure continued economic stability.

The importance of reliable information

In monetary policy as in business, reputations that have taken decades to build can be lost with distressing speed: it only takes one banana skin to turn a confident stroll into a painful tumble. And while monetary policy may be a matter for experts these days, it is very far from being a precise science.

Any honest assessment of the economic outlook comes with very large health warnings. That's why, in its quarterly *Inflation Reports*, the MPC discusses at some length the main economic risks that may knock its central projection off course. These tend to focus on events beyond our control — the state of the world economy for example — or gaps in our understanding of key economic relationships — such as the link between house prices and household spending. The minutes of our policy meetings reflect a lively awareness of the range of possible outcomes which need to be factored into decision taking.

But few subjects consume more of our time and energy than another, more insidious, source of uncertainty: one with which the MPC does daily battle — the data. As the last Governor liked to remark, 'There are three kinds of economists — those who can count and those who can't'. The MPC is emphatically in the first group; we agree with Sherlock Holmes, 'It is a capital mistake to theorise before one has data'. Indeed, as Lord Peston, Chairman of the House of Lords Select Committee on Economic Affairs, recently observed, referring to our foot high data pack: 'Statistics seem to be [the MPC's] life blood'.

Why should this be so?

The MPC sets interest rates in response to its assessment of the outlook for economic activity: the key question is whether the level of aggregate demand is above or below the economy's capacity to supply. The difficulty — and it is a fundamental one — is that we cannot observe the true values of many key macroeconomic variables, such as aggregate demand.

Of course, the Office for National Statistics (ONS) produces estimates of such variables. These are derived from comprehensive surveys of firms and households, and provide the most authoritative available guide to macroeconomic developments. But measuring economic activity across the whole of the United Kingdom is a hugely complex and difficult task, and 100% accuracy is simply not feasible.

And producing reliable estimates takes time. If the ONS waited two or three years before publishing their first estimates, they would have reasonably complete information. But it would be of rather limited value for policy purposes. We need more timely indicators of economic activity, even though these will tend to be less accurate than later estimates.

That is why the ONS publishes preliminary estimates of key data a few weeks after the month or quarter to which they refer, derived from sub-sets of their overall samples. As time passes, more information is processed and estimates are revised, making them progressively more accurate.

But the fact remains that the data that give the timeliest read on economic activity are also the ones that are measured least accurately. So there is always a risk that the official data will give a misleading view of the current economic situation.

Reading the economy is difficult

And indeed there have been times when economic policy has been led astray by misleading data. For example, in the second half of the 1980s economic policy was founded on the view — indicated by the official data at the time — that the pace of recovery from recession had been relatively modest, and there was considerable spare capacity in the economy.

But a sequence of data revisions proved that view to be wrong. Nigel Lawson, who was Chancellor at the time, recalled that revisions to the trade figures in 1988 made it clear to him that 'demand in the economy was pressing against the limits of capacity to a much greater degree than I had previously realised'. The GDP figures were also heavily revised. For example, growth in 1986 was initially estimated at 2.4% (in early 1987) — close to economists' view of trend growth. Three years later — in 1990 — this had been revised up to 3.6%. The latest (2004) estimate is that growth was actually 4% — a long way above trend.

As Robin Leigh-Pemberton, then Governor of the Bank of England, said:

> 'we put the brakes on when the speedometer indicated we were doing 60mph. Some time later it was revealed we were doing 55. When the tachograph was opened, however, it revealed that we had actually been doing 70, when the speedometer read 60… more brake pressure was therefore entirely appropriate'.

This episode marked a low point for the United Kingdom's GDP statistics in recent times. Since then, a number of methodological changes have been introduced, and data sources have been improved. Analysis both by the ONS and the Statistics Commission

indicates a dramatic reduction in the average size of revisions over the past 15 years. Even so, measuring the economy remains a complex task, and data uncertainty is a fact of life.

So what does the MPC do to ensure its judgements are as firmly grounded in reality as possible?

We have a four pronged approach:

- We monitor a very wide range of data
- We pay careful attention to data quality
- We talk to business people around the country
- We are working closely with ONS to transform the quality of official statistics.

Monitoring a wide array of indicators

First, we critically review an enormous quantity of data. The MPC regularly monitors more than 1,500 data series, of which around 1,000 are for the United Kingdom. The point of doing this is that often there are puzzles and questions about the behaviour of the economy to which no single piece of data can provide a complete answer. But we may build up a convincing picture by piecing together a range of indicators.

The housing market provides a classic example of this approach. There is an enormous array of indicators of housing market activity — data on mortgage approvals and lending, house price indices from the main lenders (the Halifax and the Nationwide), the Office of the Deputy Prime Minister and the Land Registry, and various surveys of estate agents and house builders. One approach would be to pick out a single indicator, and monitor that. But experience shows that none of these indicators individually has consistently given a plausible indication of developments in the housing market; the indicators provide a better guide when taken together. So we monitor a full set of housing market indicators, and we have found that the clearest signals come when all of the indicators are pointing in the same direction. In economic assessment, there is safety in numbers.

Awareness of data quality

But looking at a large array of indicators can be bewildering without some way of narrowing the focus. So the second element of our approach is to recognise explicitly that data vary widely in their quality, and hence in their usefulness for policy assessment. Bank staff grade data series on a number of quality criteria, and we use this grading to make the best use of the available information.

The basic principle is simple: a sensible approach to economic assessment takes a weighted average of all available indicators, where the weight placed on each reflects the quality of that indicator relative to other available data. Generally speaking, in terms of overall accuracy the highest quality data come from the ONS and other national statistical agencies. This is scarcely surprising, since they have a very comprehensive information base. For example, ONS data on manufacturing output are based on surveys of 10,000 of the United Kingdom's 160,000 manufacturers. All firms with more than 150 employees are surveyed, supplemented by stratified random sampling of smaller companies.

Some private sector business organisations — such as the Chartered Institute of Purchasing and Supply, the CBI and the British Chambers of Commerce — also publish surveys of manufacturers. But these samples are typically less than one-tenth of the size of those used by the ONS.

On top of that, the private sector surveys ask only whether activity has risen or fallen, rather than recording exactly how much activity has changed. This can be a particular problem when sub-sectors of an industry are experiencing dramatic movements in output compared with the rest of the sector. For example, manufacturing output declined quite sharply between 1999 and 2002, driven by sharp falls in ICT output, as the strong growth in business spending on IT through the mid-1990s came to an abrupt halt. But the dip in the manufacturing survey balances in this period was much less pronounced than the ONS's estimated fall in output. This was due in part to the qualitative nature of the surveys, which meant that ICT firms could record only that their output had fallen — and not that it had fallen off a cliff!

In principle then, the ONS data should provide the most accurate guide to developments in UK economic activity. But monetary policy decisions are made every month, and need to be informed by the best assessment of economic activity available at that time. That is why the MPC sets particular store on timely economic data — that is, data that are released soon after the period to which they refer.

This is where the business surveys really can add value. For example, the CIPS surveys for the manufacturing and services sectors are released just a few days after the reference month. This is around one month before ONS manufacturing output estimates are available, and around two months before the ONS releases its monthly service sector data. The private sector surveys may be less accurate than the ONS data; but so long as we bear that additional uncertainty in mind, they can be a valuable addition to the MPC's armoury.

In fact, recent work by Bank staff has shown that, even when preliminary ONS estimates are available, combining these with the information from the business surveys can provide a more accurate assessment than if we were to throw the business survey information away and rely solely on the ONS data.

This type of analysis is influencing our judgement at the moment. The ONS's preliminary estimate of GDP growth in the third quarter was just 0.4%, suggesting a marked slowdown in growth driven by a sharp contraction in industrial output. But business surveys suggest that manufacturing output continues to expand. Taking these two pieces of information together, the MPC judges that overall growth was a little higher in Q3 than the official data currently indicate.

We talk to people

A third way of reducing the risk of error is to talk to people on the ground. If the hard data are at odds with what they are telling us, that will give us pause for thought — about the likely economic outlook, or at least the risks around our central view.

Back in the early 90s a familiar charge against the Treasury (which at that time had primary responsibility for setting interest rates) was that they were out of touch — stuck in London, they missed early signs of the recession. The Bank has been careful to avoid this trap. It has built up a network of Agencies to act as its eyes and ears around the country.

That regional network has grown out of the Bank's branches that were established in 1826 to deal with problems caused by the failure of local banknote-issuing banks. (The nearest branch to North Wales would have been in Liverpool, and like several of the 16 branches which the Bank opened at that time it was located on land previously occupied by licensed premises — the old Queen's Arms in Castle Street. Indeed the guiding principle seems to have been 'If it works as a pub it will work as a bank'. The Licensed Victuallers Association has taken its revenge in recent decades, as old banks have been turned into pubs.)

Within the branches, the Bank appointed an Agent to liaise with local industry and commerce, and since 1930 they have been sending regular reports on their economies to Threadneedle Street. During the 1980s and 1990s, most of the branches were closed as different schemes for guaranteeing the supply of bank notes were established. But the Agents remained, and the network was extended to its current line-up of twelve — including a new Welsh Agency located in Cardiff.

Between them, the Agents are in regular contact with some 8,000 firms. This provides the basis for the Agents' monthly reports and presentations to the MPC; the Committee also commissions special surveys and asks for Agents' help in understanding puzzles in the data. This information is currently published in summary form each quarter, alongside the *Inflation Report*. We are now looking at ways of making it available on a monthly basis, alongside the minutes of the MPC meeting.

MPC members regularly take their own eyes and ears on visits to individual businesses, making around 60 visits to the regions a year. As well as acting as a reality check on economic statistics, talking to businesses around the country improves our understanding of longer-term changes in economic environment. These visits are a good opportunity to discuss issues as varied as the impact of migrant labour on skill shortages; or outsourcing to China; or the growth of buy to let housing; or the changing structure of the retailing sector; or even the impact of weather and public holidays on the pattern of consumer spending.

And in unusual economic circumstances, the Agents' network of contacts can give us information that is not available from any other source. The outbreak of Foot and Mouth Disease in 2001 is a case in point. Our Agents helped us to identify in real time the wider effects on the non agricultural sectors of the economy, notably of course tourism — and that gave us a better picture of the underlying development of the economy.

We support measures to improve the quality of official statistics

Finally, and most important, our longer-term strategy for mitigating data uncertainty is to support the ONS in

improving the quality of the national statistics. Bank staff maintain very close links with their ONS counterparts both on a day-to-day basis, and in developing their ambitious modernisation programme.

This was already in hand when the Chancellor of the Exchequer commissioned Chris Allsopp, a former member of the MPC, to assess how well the ONS's provision of statistics matched the needs of policy makers. The Allsopp Report,(1) published earlier this year, has recommended some fundamental changes to the way that key economic data are put together. These concern regional and service sector data; and the ONS's capacity to respond to changes in the structure of the economy.

First, Allsopp recommends that the national statistical system should be reoriented to produce better quality regional data. This is likely to involve, for example, establishing an ONS office in every English region — not dissimilar to the Bank's Agency network. The ONS's main business surveys are also to be expanded to obtain greater regional coverage. For example, the Annual Business Inquiry — a major workhorse of economic statistics, which provides detailed information on, for example, employment, production and investment — is likely to be trebled in size.

Monetary policy operates at the level of the whole economy, and cannot target particular regions or countries of the United Kingdom. But to the extent that better measurement and understanding of regional activity leads to improvements in the quality of UK national statistics, as the Allsopp Report expects, this development will improve the information base on which monetary policy is founded.

The second main focus of the Allsopp review is the stark imbalance between the coverage, timeliness and quality of statistics on the services sector relative to those on manufacturing. Suppose you were interested in studying the economic behaviour of the UK textiles industry — which accounts for around one-third of one percent of UK output. The good news is there's plenty of coverage in the National Accounts, although you have some decisions to make. Are you interested in clothing, or carpets and rugs? And if clothing, are you interested in knitted and crocheted garments…or work wear…or outerwear…or indeed underwear? Each of these has its own data set: the array of sub-categories is truly impressive.

However, suppose instead that you were interested in the retail sector, and wanted to know, for example, how much the large supermarket chains have contributed to GDP in recent years, or what inroads they have made into the non-food market. No dice. Although the retail sector nowadays accounts for over 5% of UK output — so it is nearly 20 times the size of the textiles industry — more detailed data are not produced for the UK National Accounts.

The need for better service sector statistics goes well beyond any interest we might have in detail for its own sake. In the United Kingdom, early estimates of GDP rely heavily on measuring output. Since the service sector accounts for more than 70% of UK output, the quality of early GDP estimates is inextricably linked to the quality of service sector statistics. Over the past ten years, revisions to services output have accounted for more than half of the average revision to GDP growth; and around four-fifths of the variance of GDP revisions can be attributed to revisions to service sector growth.

Indeed, research by Bank staff has indicated that the private sector business surveys may give a better guide to the ONS's estimate of service sector output growth two years or more after the event than do the ONS's own early estimates. (In contrast, the ONS's early estimates of manufacturing output growth clearly outperform the business surveys as a guide to later estimates.)

The ONS is well aware of this imbalance. In fact, it has been at the forefront of developing and improving measures of service sector output: within the OECD only the United Kingdom and Korea produce a monthly Index of Services production, the counterpart to the well-established monthly Index of Production for the industrial sector. The Allsopp Report should give further welcome impetus to this work.

The third focus of the Allsopp Report is the capacity of the ONS to identify and respond to structural change in the economy. The make-up of UK economic activity is constantly changing. Fifty years ago, the manufacturing industry accounted for about one-third of UK output. The service sector made up less than one-half. Today,

(1) Allsopp, C (2004), *Review of statistics for economic policymaking*. Final report to the Chancellor of the Exchequer, the Governor of the Bank of England and the National Statistician.

the corresponding shares are less than 16% for manufacturing, and over 70% for services.

Responding to this sort of change is challenging. ONS needs to be proactive in measuring activity in new sectors, even if it is not straightforward — as it often won't be. For example, bricks-and-mortar retailing is tangible and growing rapidly, but how does it compare with developments in internet sales? People can now make some purchases via mobile phone text message. How can we measure that? Allsopp recommends a greater capacity within the ONS for considering these issues.

Improving the quality of macroeconomic data is a first order issue for monetary policy makers. So Bank of England staff will play an active role in supporting these developments.

But it is just as important for ONS to maintain the quality of its current output during this period of major transition. Again, we will be working closely with the ONS to ensure that the transition is made with minimal impact on day-to-day policy.

How well placed are we to respond to more challenging times?

We live in highly uncertain times. This year rising oil prices and a significant slowdown in the housing market have awoken bad memories of the 1970s and 1980s. The MPC will be doing very well if it can achieve the same stability over the next decade as we have enjoyed over the past ten years. But an important legacy of the past decade is that policy makers enjoy a degree of credibility that would have seemed unimaginable a generation ago. This in itself reduces the risk that sharp shocks to activity or inflation will throw us off course.

But there is no magic about monetary policy: good decisions depend on good information, and this continues to be a challenging area. Much of the MPC's energies go into distilling the message from a battery of often conflicting data. We do not complain about this — it is what we are paid for — but it does complicate the task of explaining our decisions. Improving the quality of national statistics lacks some of the glamour of making the Bank of England independent. But it may be the best single way of ensuring that the MPC continues to respond effectively to challenging times ahead.

Why is inflation so low?

In this speech,(1) Richard Lambert, member of the Bank's Monetary Policy Committee, discusses factors that influence the outlook for inflation. He argues that the low rate of price inflation is not just a UK phenomenon, and reflects structural factors such as globalisation, new technology, deregulation and changes in the labour market. He concludes that inflation overall remains low and stable despite swings in the prices of individual goods and services, although its likely future path is uncertain.

In the twelve months to September, the sterling price of Brent crude oil jumped by 43%. Steel prices were up by 34%, and the price of houses rose 19%. Retail gas and electricity prices climbed by around 6%, and Council Taxes were up by an average 6%.(2)

This was happening at a time when the economy had been growing somewhat above its long-term trend — 3.6% in the year to the second quarter — and the unemployment rate was hovering around a 30-year low. It seemed there was very little, if any, spare capacity left in the economy to absorb the rapid growth rate — suggesting that inflationary pressure would be building up across the economy.

All that sounds like an explosive mixture for the Bank of England, which through its management of monetary policy is responsible for maintaining a low and stable rate of inflation in the United Kingdom. And the inflationary risks might seem even greater if you allow for the fact that, although nominal interest rates have been rising over the past year, they are still well below levels seen at this stage of the business cycle at any time in recent decades.

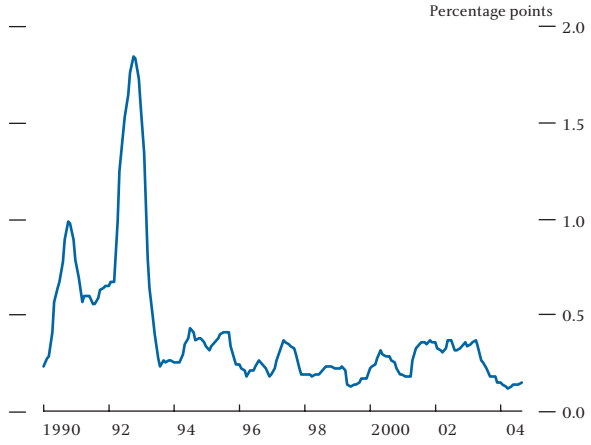
And yet the fact is that in the twelve months to September, inflation as measured by the consumer prices index clocked in at just 1.1%, and it seems likely to remain fairly close to this rate for the rest of 2004.

As you know, the target for CPI inflation — set annually by the Chancellor of the Exchequer — is currently 2%. If the figure comes in more than 1 percentage point above or below that figure, the Governor of the Bank of England has to write a public letter to the Chancellor, explaining why the target has been missed and what the Bank's Monetary Policy Committee plans to do about it.

So we are now getting very close to the point where the Governor would have to exercise his letter-writing skills.

Not only has the rate of CPI inflation been surprisingly low this past year, it has also been astonishingly stable, even by the standards of recent years. If you track the path of the twelve-month rolling standard deviation of CPI inflation (Chart 1), you find it moves pretty much in a straight line through 2004, despite the fact that the prices of some components of the index have been leaping around all over the place.

Chart 1
Twelve-month rolling standard deviation of CPI inflation



(1) Given at the Institute of Chartered Accountants of Scotland on 25 October 2004. I am grateful to Rain Newton-Smith and Michael Sawicki for help in preparing this paper, and to John Power whose work I have drawn on. I have also benefited from comments and discussions with many colleagues at the Bank. The views expressed here are personal and should not be interpreted as those of the Bank of England or other members of the Monetary Policy Committee. This speech can be found on the Bank's website at www.bankofengland.co.uk/speeches/speech230.pdf.

(2) Data referred to are twelve-month inflation rates for month-average sterling Brent crude oil spot prices, PPI iron and steel prices, the average of the Halifax and Nationwide house price indices, gas and electricity subcomponents of the CPI, and the Council Tax subcomponent of the RPI respectively.

Some newspaper columnists have decided that this is all too much: that the contrast between the big headline price increases and the low and stable rate of increase in the CPI is simply too big to be believable. They point to the fact that in December 2003 the inflation target was switched from RPIX, which includes a measure of house price inflation and Council Taxes, to the CPI, which does not. Something dodgy must be going on, they conclude.

So the two questions I would like to address today are these.

Is the rate of inflation really as low and stable as the consumer prices index suggests?

And what might happen to inflation over the next couple of years? The answer to this latter question, of course, is what will shape the course of interest rates in this country over the coming months.

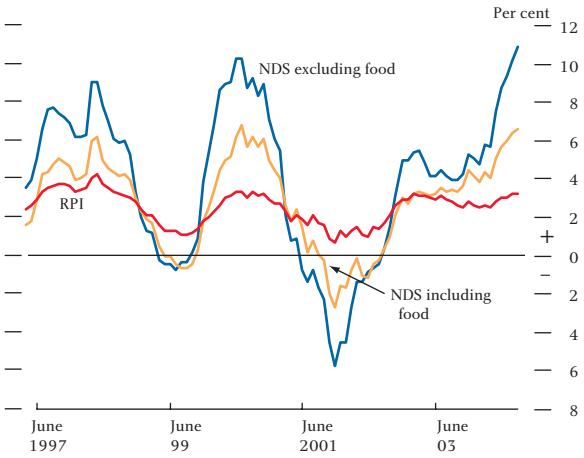
Since we all spend our money on different things, every one of us could in theory construct our own personal measure of inflation. For example, I have hardly touched my car in the past year — a period when the cost of running the thing has risen by around 7% in terms of fuel and maintenance.(1) But I have been splashing out a bit on audio-visual equipment where prices have been falling by roughly 10%.(2)

The Office for National Statistics constructs an average measure by weighting together the inflation rates of a basket of more than 650 goods and services on the basis of the estimated spending habits of a representative household. So an individual's personal experience may well be quite different from that average figure.

Some elements of what you might call non-discretionary spending have been rising a good bit faster than the overall index over the recent past. If you lump together household bills, rent, mortgage interest payments, Council Tax and petrol — which together account for about 20% of the retail prices index — you find that particular corner of the consumer price basket has risen by almost 11% (Chart 2).(3)

However, most of us also need to buy food and clothing, where prices have actually been falling in the past year.

Chart 2
Annual RPI and non-discretionary spending (NDS) inflation



If you add these two items to the non-discretionary shopping basket, the rate of increase comes down to around 5%.

And it is plain wrong to suggest that the change in the target from RPIX to CPI — neither of which includes mortgage interest payments — has somehow disguised an underlying change in the overall pace of UK inflation. RPIX inflation has also been running at a low and stable rate — 1.9% in the year to September, compared with the old target of 2.5%.

If, as now seems likely, the pace of house price inflation is set to decrease in the coming months, the old and the new indices will draw closer together. Although some components of the consumption basket are rising in price, the impact is being offset by falls in the prices of other goods and services — which are reflected in both indices.

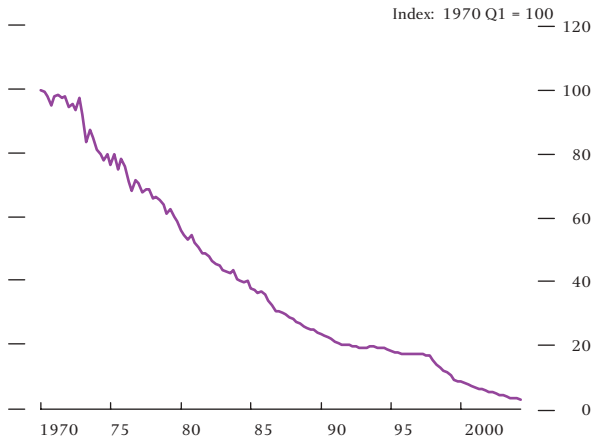
This surprisingly soft pattern of inflation in recent months is not just a UK phenomenon. For example, average inflation in the other countries of the G7 was just over 2% in the year to 2004 Q2.(4) International as well as domestic factors are combining together to hold down the pace of inflation just about everywhere.

Some of these changes are structural in nature — big changes in the way that particular markets work which have been in progress for many years and may well continue for some time to come. For example, the relative price of IT consumption within the UK economy

(1) Weighted averages of CPI subcomponents: fuels and lubricants, and maintenance and repairs.
(2) Weighted averages of CPI subcomponents: reception and reproduction of sound and pictures, and photographic, cinematographic and optical equipment.
(3) 'Household bills' is a weighted average of RPI subcomponents: fuel and light and water and other charges.
(4) As measured by year-on-year changes in consumption expenditure deflators weighted by UK trade weights. Also see Rogoff (2003) for a discussion of trends in global inflation in recent years.

has fallen by well over 90% in the past 30 years, and continues to decline (Chart 3). The impact of rising global trade has pushed down prices for a wide range of goods and services, and there is no obvious reason why this should not continue to be the case.

Chart 3
Relative price of IT consumption



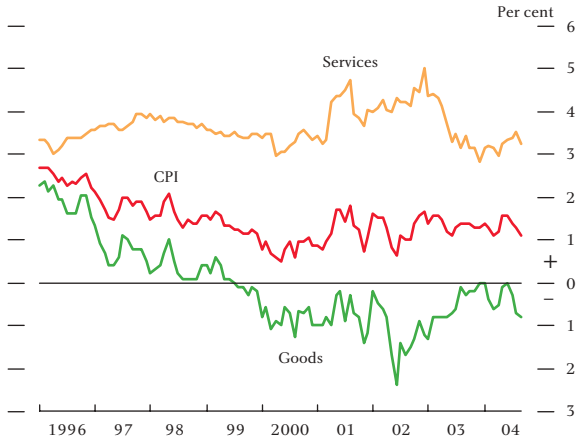
But all that has been reasonably predictable. Given the surprising weakness in inflation this year, the question is whether any of these structural changes have for some reason accelerated in a way that was not anticipated. Or maybe price inflation is simply being held back by temporary or cyclical factors, which could unwind rapidly as the economy moves forward. In that case, the CPI could start to move ahead sharply over the next year or two.

One striking feature of the UK economy over the past half dozen years has been the particular weakness of goods price inflation. If you break down the consumer prices index into its services and goods components, you find that service price inflation has been averaging close to 4% since 1997, whereas the price of goods has actually been showing modest declines through most of the period (Chart 4).

You would expect price inflation to run at a higher rate in the services sector, where productivity growth and price competition are less intense than in the goods sector, which on average is more capital intensive and faces more competition from abroad. So with an overall inflation target of 2%, goods prices taken as a whole were bound to be under downward pressure.

However, goods price inflation has been much weaker in the United Kingdom than has been the case either in

Chart 4
Annual CPI inflation



the United States or the euro area. There are at least two possible explanations. One is that the prices of consumer goods imported to this country have been soft. And the second — possibly related to this — is that structural changes within the United Kingdom are leading to a fall in costs or a squeeze in margins. Both these explanations help to explain what is happening to the CPI today.

Take clothing as a case in point. The clothing and footwear price components of the CPI fell by around 40% between 1991 and 2003 as the share of imports in UK clothing consumption pushed ahead sharply. Increased competition from abroad — both directly through cheaper imports and indirectly through the impact of this competition on domestic producers — has led to dramatic price reductions. Those domestic producers who have managed to stay in business have had to cut their costs savagely in order to survive.

And at the same time, there have been big changes in the way that clothing is sold in the United Kingdom. The wholesaling side has been squeezed, and we all know how the big supermarket chains are forcing their way into the clothing business. And with further trade liberalisation to come next year, the price of clothing should continue to pull down the cost of the family shopping basket.

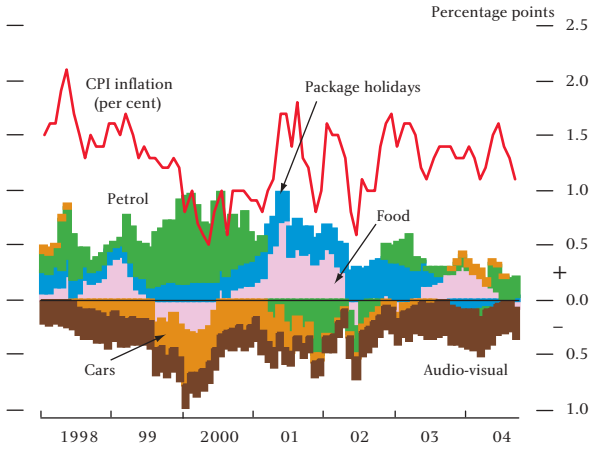
Or consider the example of electronic equipment. The price of ICT goods coming into the United Kingdom fell by more than half between 1995 and 2002, and these products account for a particularly large share of the United Kingdom's total import of goods — more than a fifth on average in recent years.(1)

(1) See Dury *et al* (2003).

The fall in the price of imported ICT goods will have helped to lower costs and improve productivity in a wide range of industries. And affordable PCs have made it much easier for consumers to compare the prices of goods and services, and also to buy goods and services directly from the producers — whether it be an air ticket to Barcelona, or flowers for your Granny.

In addition, deregulation is also making a big and lasting contribution to holding down price inflation in the United Kingdom. Threatened and actual intervention by the Competition Commission and the European Commission led to substantial falls in the price of new and used cars in the United Kingdom during the past five years (Chart 5). Although prices have been broadly stable over the past two years or so, they have still been slightly softer than at this time last year — one of the reasons why overall CPI inflation has weakened in the past few months.

Chart 5
Contributions to annual CPI inflation



Structural changes have not just been confined to the goods sector. One spectacular example in services has been the package holiday industry, where a combination of deregulation and technology (in the form of Internet bookings) led first to weak inflation and then to marked deflation across the whole business. This had a measurable impact on holding down consumer price inflation in recent years.(1)

Globalisation, changing technology, deregulation, structural change in the labour market: all of these have contributed to an era of low and stable inflation — not just in the United Kingdom but across the developed world. And of course there is another factor that has played a critical part, and that is the de-politicisation of interest rates. Central bank independence, a clear mandate to place low and stable inflation at the centre of monetary policy, better central bank communications and improved monetary control capabilities: all this has led in the United Kingdom, as in many other countries, to a dramatic change in the way that people think about inflation.

It was not so long ago that we in the United Kingdom took it for granted that high and volatile inflation was pretty much a fact of life, and we planned our affairs accordingly. In a remarkably short space of time, people have come to a very different view. Inflation surveys and the financial markets tell much the same story: that inflationary expectations over the long term are well anchored close to the Bank of England's target (Chart 6).

Chart 6
Inflation expectations

(a) The difference between five-year forward, five-year yields on conventional and index-linked gilts.
(b) Consensus Economics survey expectations for one to two years ahead.

And those changed expectations are themselves contributing to structural changes in the economy which have the effect of holding down prices. Consider the case of retail distribution. In the bad old inflationary days, retailing was a comfortable business to be in. Customers found it hard to compare prices in different stores. Revenues grew at a rate of inflation plus, and all you had to do was to keep your costs under reasonable control to make a very nice living.

Retailing today is a much more brutal business. Price comparisons are easier and customers are much more value conscious. The only way to get better prices for

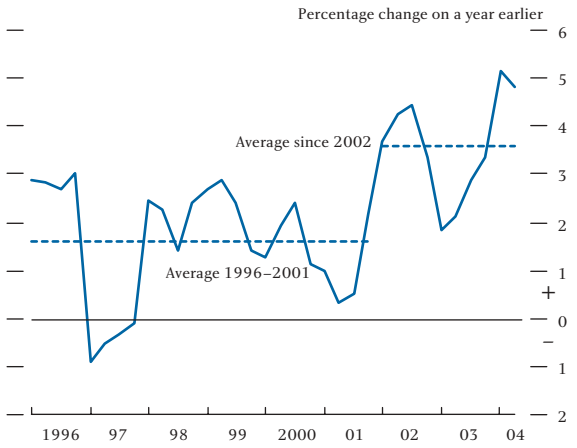
(1) Insofar as weakness in 2003 may have also reflected more temporary factors such as SARS or terrorist fears, package holiday inflation potentially could push up on overall CPI inflation looking forward.

most products is to improve their quality in some way. Giant retailing groups are using their muscle power to deal directly with suppliers rather than going through a wholesaler, and they are widening their product ranges: I have already mentioned the way that food retailers are shifting into selling other goods and services. The big chains are also likely to be able to make better use of technology to hold prices down than their smaller competitors.

The results of this increasing competition are clear in the very mixed profits news that has been coming out of the retail sector lately. In a period when retail sales as a whole have been quite strong some household names have been having a terrible time — while others have been making big profits.

And of course all this is also helping to hold down product prices. Productivity within the retail sector has risen sharply since the end of 2001 (Chart 7), and profit margins across the distribution sector appear to have been squeezed somewhat. Consumers have picked up the benefits.

Chart 7
Retail sector productivity



Another very important way in which changed expectations about price inflation feed through to the consumer prices index is through the labour market. In the old days, the starting point for wage negotiations would again be inflation plus — and since inflation was so volatile, labour negotiators would attempt to build in an extra margin to allow for the risk that inflation might shoot ahead of expectations.

Today, the picture is dramatically different. The so-called NAIRU — the non-accelerating inflation rate of unemployment — fell steadily through the 1990s as a result of big changes in the labour and products markets: for example, the trade union reforms of the 1980s obviously had an important part to play.(1) That is what has helped to make possible the current combination of low unemployment and a relatively low rate of earnings increases. And the NAIRU may still be falling, helped by policies like the New Deal.

These big structural changes in the economy help to explain why the pace of inflation really does remain low and stable in the United Kingdom, despite those alarming news headlines. But most of them have been under way for quite a period of time now. They do not help us to understand the weakness in CPI inflation over recent months.

Is this just a temporary or cyclical phenomenon, which will unwind in the coming months and push inflation back up to or even beyond the 2% target? Or is something happening that is likely to have a more lasting impact on prices? This is, of course, the $64,000 question for the MPC, and I am afraid it is not one to which I have a clear answer.

One way to approach the question is to identify those components of the CPI that have been surprisingly weak, and to look for an explanation there. One is the price of food and alcoholic beverages, which represent about a tenth of the CPI. A fall this year was always on the cards in comparison with the rather fast pace of inflation in the second half of 2003. But the decline is turning out to be bigger than expected, especially in fresh foods. Perhaps there are temporary explanations — I do not know what this year's weather has been doing to the asparagus harvest. But structural changes could also be playing a part. For example, the further consolidation that has taken place in the supermarket business over the past year may well have increased the degree of competition in food retailing.

Car prices, as I have mentioned, have also been quite weak — sales took a dip from mid-summer and big changes in the distribution system are still working their way through the market place. Other areas of price weakness might also be explained by increased competition. Financial services are a case in point.

All this has more than offset the impact of recent rises in the price of petrol. But looking further ahead, it does

(1) See, for example, Wadhwani (2000).

not really help us to think about how the path of inflation might unfold in the next year or two, which is of course what matters for the Monetary Policy Committee. Interest rate increases can take a year or more to have their full impact on the aggregate level of activity in the economy. So we have to try to anticipate inflationary pressures before they take hold — and lean against them by adjusting interest rates in good time. The cost of waiting until the pressure points actually appear may well be that we would have to push interest rates higher than would have been the case if we had cut them off in advance.

Right now, however, there is a considerable degree of uncertainty about the outlook for inflation through 2005 and 2006. You could take the view that the pace of price increases is going to remain very muted. The factors that have led to surprising weakness in recent months could continue for a further period of time, in addition to the long-run structural trends in place. In terms of activity, house price inflation seems to be on the turn, and the pace of spending on the high street may cool off more rapidly than had been expected. Confirming the impression of softness in recent data, the preliminary estimate of GDP for Q3 suggests that growth has slowed, although business surveys still paint a somewhat less gloomy picture. But it now seems unlikely that economic growth in the third and fourth quarters of this year will match the very strong performance of the second — so the pressure of demand may turn out to be less intense than might have been expected.

Moreover, the trend of prices in industry's supply chain still looks quite muted. If you exclude the impact of oil, manufacturing input price inflation has been broadly flat in recent months: the prices of imported manufactures have picked up a bit, but at a modest pace. And unless oil prices spiral ahead even further — which of course remains a risk — they are not going to have a huge impact on overall inflation looking forward. Remember that in real terms, the price of oil is still well below the levels of previous peaks. The United Kingdom has become very much more efficient in its use of energy, so the economy is less vulnerable to damaging price increases. And so long as people continue to believe that inflation will remain low and stable, the secondary impact of rising oil prices — on wages, for example, or the price of industrial goods — should be limited.

But you could also take a very different view about the outlook for the next year or two. It is true that the pace of economic growth has moderated a little. But the impact of this on inflation could at least partly be offset by the recent weakness in sterling and a flattening in the market yield curve in the past few weeks, both of which — should they persist — could help to sustain the level of economic activity. Even with some moderation, the economy may still be growing at somewhere close to trend, and as I have already said there seems to be little or no slack left in the system. The pressure of demand in the rest of the world — the United States, China, the euro area — could start to push up further on import prices. And rising cost pressures through the supply chain are not exclusively an oil story: output price inflation excluding petroleum products has been running at its fastest pace since mid-1996.

What seems certain is that events in the labour market will play a big part in determining how all this works out. Earlier this year, there seemed to be clear signs that the market was tightening and that private sector wages were starting to move ahead. This is what you would have expected. Unemployment was low, the economy was moving ahead at a good pace, and corporate profitability was stronger than it had been for five years. The business surveys pointed to a strong demand for labour, and the number of unfilled vacancies was rising.

But the tone seems to have changed somewhat in the past few months, even before the economy hit the 'softer patch' we have seen in the Q3 GDP data. The employment rate has slipped a little, and the level of inactivity has risen. The number of average hours worked has declined, and the business surveys have not shown much change. The market still looks tight, but for some reason it does not seem to be getting any tighter.

At the same time, the pace of regular pay growth in both the public and private sector appears broadly to have flattened out. Unit labour costs have dipped a little, and the labour share has if anything edged down a little.

It is very hard to come up with a convincing explanation for this apparent change of mood. Is something happening on the supply side — perhaps a return of older workers to the jobs market, or the arrival of more immigrant workers? Or are we at risk of overinterpreting some odd data from what — after all — is a quiet period of the year for the jobs market?

Is it even conceivable that the longed-for rise in productivity growth could at last be making a more significant contribution? Private sector productivity in the year to the second quarter rose at its fastest pace for nearly ten years — but that may simply have been the reflection of a relatively fast pickup in the growth of output at a time of modest employment gains during a period of cyclical economic recovery.

Whatever the answer, if we can get it right, we will be a long way towards understanding the broader picture for price inflation over the coming year.

The message I would like to leave you with is this. Inflation is indeed low and stable in the United Kingdom, and is set to remain so despite some violent swings in the prices of individual goods and services. The likely path of inflation over the coming year is, however, uncertain. The MPC will keep an open mind, and will make its decisions according to how the data and business surveys unfold.

I think we are in for an interesting few months.

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Monetary policy, data uncertainty and the supply side: living with the statistical fog

Economic statistics are often only an approximation of the underlying reality they are attempting to measure. Official statistics, especially in timely first releases, can be subject to significant uncertainty and revision. In this speech,(1) Marian Bell,(2) a member of the Monetary Policy Committee, looks at the various ways in which data uncertainty might arise and discusses how policymakers should respond. A particular difficulty for statisticians can be the allocation of movements in nominal variables to changes in prices and volumes. Such uncertainty is high when the structure of the economy and relative prices change significantly. In such circumstances, looking at a money value measure of activity may be informative.

Moreover, estimated levels of real activity appear more prone to revision than growth rates, so we should be wary of conventional, mechanical estimates of the output gap, which rely heavily on information on the level of activity.

Ms Bell concludes that revisions to data stemming either from more information or methodological improvements will inevitably lead us to reassess our view of the underlying truth. Improvements to statistics are to be welcomed, and understanding the nature of data uncertainty and revisions should inform our judgements about the state of the world.

'For, tell me, do you think our prisoners could see anything of themselves or their fellows except the shadows thrown by the fire on the wall of the cave opposite them? …And would they see anything more of the objects carried along the road? …Then if they were able to talk to each other would they not assume that the shadows they saw were the real things? …And if the wall of their prison opposite them reflected sound, don't you think that they would suppose, whenever one of the passers-by on the road spoke, that the voice belonged to the shadow passing before them? …

And so in every way they would believe that the shadows of the objects … were the whole truth.'(3)

In this way, Plato in *The Republic* helps his pupil Glaucon to 'picture the enlightenment or ignorance of our human condition'.

Economic statistics are often only an approximation of the underlying reality they are attempting to measure. Like the prisoners in Plato's cave, we risk confusing the shadows we see with the abstract notions of economic theory. And when a change in the light causes the shadows to change we may become angry, suspecting that we have been misled, failing to see that the truth has not changed and that the different image might be a source of knowledge.

This evening, I would like to spend some time looking at the various ways in which data uncertainty might arise, attempting to evaluate the extent of our ignorance, before moving on to discuss how the monetary policy maker might discern developments in inflationary pressure in the face of such uncertainty. In particular, I shall examine uncertainty over how the measured money

(1) Delivered to the Society of Business Economists on 15 September 2004. This speech can be found on the Bank's website at www.bankofengland.co.uk/speeches/speech228.pdf.

(2) I would like to thank Lavan Mahadeva and Alex Muscatelli for their considerable research support in preparing this speech and for allowing me to draw extensively on their work, Jonathan Marrow for technical support, and Martene Giles and Helen Jay for secretarial assistance. I am grateful to Kate Barker, Charlie Bean, Rebecca Driver, Jenni Greenslade, Neal Hatch, Simon Hayes, Mervyn King, Robin Lynch, Benjamin Martin, Colin Mowl, Edward Nelson, Jumana Saleheen, Sally Srinivasan, Nick Stern, Geoffrey Wood and Tony Yates for helpful comments received on an earlier draft. I am also grateful to Carl Walsh for allowing me to use and show results from his research. The views expressed are my own and do not necessarily reflect those of the Bank of England or other members of the Monetary Policy Committee.

(3) Plato, *The Republic* (translated by Desmond Lee), Penguin Classics.

value of spending and output in an economy is allocated between prices and volumes, and how that could affect the relative weight a policymaker might choose to place on measures of growth in the money value or in the volume of national output, and on the level of output and the output gap.

Conceptual discrepancy

Much recent interest has been over data measurement issues and revisions policies. And I intend to devote some time to these issues this evening. But first we should recognise that this is not the only source of data-related uncertainty. Even when data can be perfectly measured, there is often a discrepancy between the economic concept that we would like to measure and the real-world phenomenon that the statistics attempt to measure.

Take money data for example; in my view some of the most timely and accurate data available — largely directly measured, so suffering little from sampling problems, rather less vulnerable to late returns than many other series, and yet a potpourri of financial balances held in an arbitrarily defined set of financial institutions for a multitude of reasons: for transactions, savings, a store of value, a buffer stock.

Or the claimant count: again, precisely defined and directly measured. But how important is it as a measure of unemployment, or the tightness of the labour market?

Both the retail prices and the consumer prices indices are measured from information on the prices of a defined basket of goods and services collected on a particular day each month, weighted together in a particular way. There are some differences in method between the two series, and yet both measure the same underlying concept — consumer price inflation. Moving from one measure to another does not mean *by itself* that our view of the underlying concept has changed, but it does mean that we need to understand how each measure is put together.

So, before we even begin to think about how accurately data are measured, we need to give some thought to what it is we are seeking to measure, and how accurately can the data, no matter how well measured, capture the underlying concept.

A measure of consumption that we can relate to theories of how consumers behave would be consumer spending on non-durable goods and services plus the flow of services enjoyed from durable goods. But this latter component is not observable. So in practice what the statisticians try to measure is household expenditure on durable goods, as well as on services and non-durable goods. And no matter how well they succeed in accurately measuring household spending, there will still be a difference between that and what we would wish to measure.

The Monetary Policy Committee has recently spent some time looking at measures of government activity. We are not alone in this, so has Sir Tony Atkinson who is presently investigating how to improve the measurement of government services. What has become very clear in this work has been the importance in identifying what it is we are trying to measure. For the MPC, the interest has been in identifying the inflationary pressure generated by government activity. That depends on the resources absorbed by the public sector and how that affects the ability of the market sector of the economy to meet the demand for its goods and services.
Sir Tony Atkinson's review concentrates on measuring the volume of government output within the context of the National Accounts, recognising their dual function as a measure both of economic activity and of welfare. And, as his Interim Review says, any change to 'the direct measure of government output should not affect the macroeconomic policy stance'.(1)

Measurement uncertainty and revisions

Not all economic series can be directly measured. Many more must be estimated. Gross domestic product seeks to measure the total economic activity, the value added, that takes place within the United Kingdom. It would be a gargantuan task to measure this directly, to attempt to track every economic transaction, and would impose an intolerable administrative burden on businesses and consumers. Much of the data that we commonly use therefore have to be estimated from surveys. This gives rise to measurement issues stemming from problems of coverage, sampling and non-response.

Official statistics can thus be subject to significant uncertainty, especially in timely first releases. Revisions then inevitably arise from new information that improves the accuracy of the data — a late return perhaps, or a

(1) Atkinson (2004).

more in-depth survey carried out with less frequency. Some may arise from methodological improvements such as the revisions to the measurement of the output of the National Health Service, or the move to annual chain-linking.

Data quality and monetary policy

The Monetary Policy Committee recognises that revisions are inevitable. Indeed, insofar as they bring us to a better understanding of the underlying reality, we welcome them. And it is incumbent on us, collectively and individually, to try and make the best decision possible each month in the light of the information available to us at the time and our interpretation of it.

In doing so we recognise that much of the data with which we work is imperfect and subject to revision. We recognise that data quality varies within the release cycle, that the preliminary estimate may be different from the final release, and that some series are more reliable than others. It is the job of all users of economic statistics to recognise and deal with this. There is inevitably a trade-off between timeliness and accuracy, but in general, aware of the shortcomings, we would prefer early imperfect data to late perfect series — it gives us something to work with.

At the Bank[1] data quality is typically assessed in terms of:

Relevance — how closely do the data accord with the underlying concept we want to measure for the purpose of inflation targeting;

Accuracy — how well are they measured and how much are they revised;

Timeliness — are the data released within a timescale that makes them useful for policy purposes;

Coherence — how well do they relate to other pieces of data, over time and across the economy.

We are aware of the scope for revision to many data series and we are continuously developing models that help us to assess how much weight to place on a particular observation of data at any point in time.

Price/volume uncertainty

A particular difficulty can be in allocating movements in nominal variables to price and volume changes. This matters for monetary policy; not just because monetary policy is concerned with the price level and its rate of change, but because the policymaker aims to achieve a stable inflation rate by ensuring that the volume of demand for an economy's output grows in line with its potential to supply. And it is on this source of data uncertainty and its policy implications that I would like to concentrate this evening.

Conceptually it seems fairly clear. In practice it is fraught with difficulty. If one buys a car one year for £10,000 but a similar model costs £11,000 a year later it might seem straightforward. The price has risen by 10%. But what if the car now has air conditioning, and a CD player comes as standard? Suppose crash test statistics suggest it has a better safety performance? How do we then allocate the change in the cost of the car between quantity and price?[2]

A further complication arises when we are considering not just the output of one good, or the expenditure on one good, but the production or consumption of a basket of goods and services. How should the components of total output or total expenditure be weighted together?[3]

In general, National Accounts statistics are compiled by bringing together data on values and prices from surveys. Typically, these will be surveys covering, for example, firms' turnover, expenditure, income and profits, consumers' expenditure, income, etc. To calculate the aggregate real volume change, data from the various production sectors of the economy are weighted together, with the weights for each sector typically determined by the current-price value share of that sector in whole-economy output in a base year. Direct volume measures are available for few series. Similarly, data for the various expenditure aggregates are weighted together according to the share of that

(1) The criteria used draw on the work of Brackstone (1999).
(2) One way statistical agencies deal with quality change is by the use of 'hedonic regressions' recommended by the Price Statistics Review Committee (US) way back in 1961. The idea is that the characteristics of the goods rather than the goods themselves are the true components of the utility function (outputs of the production function) and that heterogeneous goods are an aggregation of characteristics. Hedonic regression relates the price of these goods to data on the characteristics themselves (such as processing speed in computers, or the number of rooms in houses).
(3) See Tuke and Reed (2001) and Lynch (1996) for a description of alternative methods.

category of expenditure in total expenditure, defined in terms of current value, in the base year.

Periods in which value shares change notably from the base period, reflecting changing economic structures and relative prices, are therefore periods of high data uncertainty or 'mismeasurement'.

The exact nature of this 'mismeasurement' depends on the source of these relative movements and the price elasticities of the goods. The most well-known case is that of 'substitution bias' with fixed-weight indices. Substitution bias arises if goods whose relative prices are falling are also those whose volumes are rising, but such that their value share is decreasing. In that case a fixed-weight index, which failed to update weights as relative prices changed, would overstate volume growth and understate inflation.

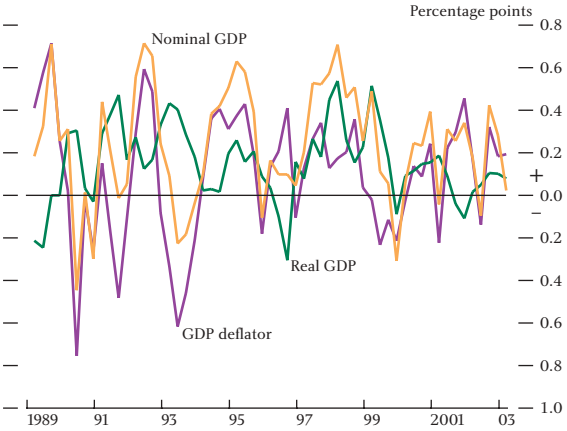
Revisions to data

Like most economic statistics, National Accounts data are revised regularly, with revisions taking into account both new information and new methods. Regular rebasing ensures that changes in industry structures and/or relative prices are taken into account in the production of aggregate data. Through the introduction of methodological changes, such as more frequent rebasing and chain-linking, statistical offices are, in a sense, responding to price/volume uncertainty error by periodically bringing in new information on relative prices, and on the relative importance of each sector of the economy.

Until last year, the ONS rebased the National Accounts every five years. In September 2003, annual chain-linking of real GDP data was introduced. Real GDP growth in each year (up to 2001) was calculated on the basis of weights measured as the current-price share of total activity in the previous year. The main rationale behind the introduction of annual chain-linking was that annual rebasing would give a more accurate picture of the weight of each sector in the economy.

Here we look at vintages of quarterly real and nominal GDP data going back to 1989 Q3.(1) We have made no attempt to separate the different types of revisions across these vintages, nor to isolate revisions to the price-volume split.(2) Chart 1 plots the cumulative revisions in growth rates, where the cumulative revision is defined as the percentage point difference between the initial release of data and the latest vintage (the release of 30 June 2004 in this case). Table A summarises the statistics on the revisions.

Chart 1
Cumulative revisions to quarterly growth rates



Note: Centred three-quarter moving average.

Table A
Summary statistics on cumulative revisions to quarterly growth rates of GDP data (1989 Q3–2004 Q1 vintages, 59 observations)

	Mean revision	Mean absolute revision	Standard deviation
Nominal GDP (quarterly growth)(a)	0.24	0.54	0.67
Real GDP (quarterly growth) **(1)**(a)	0.13	0.27	0.35
GDP deflator (quarterly growth) **(2)**(a)	0.11	0.54	0.70
Correlation between **(1)** and **(2)**		-0.35	

(a) Percentage points.

Some patterns stand out. First, quarterly real GDP growth and GDP deflator inflation have both been revised up on average over this period, and by roughly the same amount as measured by arithmetic mean revisions (column 1). The mean absolute revision in the second column measures the absolute size of these revisions without taking account of whether they were positive or negative. This absolute measure shows that

(1) Castle and Ellis (2002) discuss the construction of a database that contains successive releases of data for the expenditure measure of real GDP and its components.
(2) Akritidis (2003) provides an analysis of revisions to real GDP growth estimates in the United Kingdom, showing that a substantial part of revisions to initial estimates of real GDP growth is due to revisions to the data following the second *Blue Book*, ie the second time the estimate of GDP has appeared in a *Blue Book*. GDP data at this stage are subject to balancing in the Supply and Use input-output balancing framework for the second time or more. We checked to see if correlations changed when we restricted ourselves to data that had been through at least two *Blue Books* (up to 2001 Q4) and found that the correlation between revisions to quarterly GDP deflator inflation and to quarterly GDP growth became only slightly more negative.

quarterly deflator inflation rates have been revised by more on average than have real growth rates. And the third column shows that deflator inflation revisions are more volatile, as shown by a larger standard deviation, so that it is more difficult to predict them than real growth revisions. Revisions to nominal GDP growth are on average larger and slightly more variable — proportional to the mean — than those to real GDP growth.

Taken together, this pattern of revisions might suggest that new information on nominal values and prices plays a significant role in data revisions. But most interesting for us is to note that the revisions to prices and volumes have been, to some extent, offsetting — the correlation between cumulative revisions to the deflator inflation and real growth across quarters is minus 0.35 — at least for this period. This is consistent with the presence of price/volume measurement error in early releases.(1)

Price/volume uncertainty in early releases was also apparent in the revisions contained in the 2003 *Blue Book*, which brought in annual chain-linking accompanied by perhaps the most significant set of data revisions for some time. The real annual GDP growth rate between 1995 and 2001 was revised up by 0.2 percentage points on average. The average revision to annual growth of nominal GDP over the same period was zero. This was mainly due to significant upward revisions in real growth and downward revisions in the annual GDP deflator inflation rate in the 1999–2000 period.

In terms of components, the revisions to real GDP growth in the 2003 *Blue Book* primarily reflected revisions to imports and investment. Charts 2 and 3 show how the revisions to investment left the level of nominal investment broadly unchanged, but shifted up the level of real investment considerably. The revisions to investment growth primarily reflected a rebasing of producer prices to 2000 (previously 1995). The rebasing led to downward revisions to investment deflators, and hence upward revisions to volume growth reflecting a greater weight given to those goods such as computers which had experienced rapidly falling prices and rising volumes.(2)

More frequent rebasing brings in more information and makes the measurement of real growth rates more

Chart 2
Real whole-economy investment, before and after *Blue Book* 2003

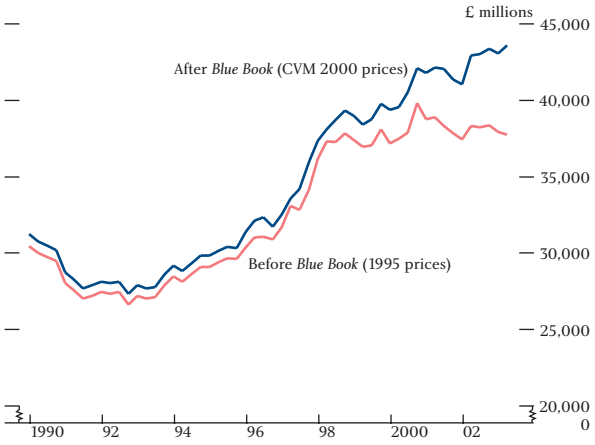
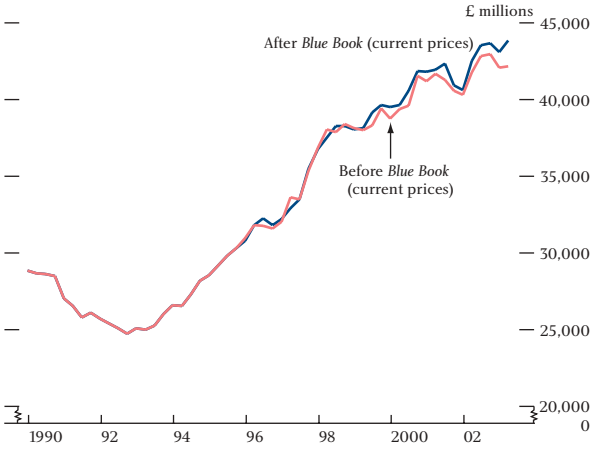


Chart 3
Nominal whole-economy investment, before and after *Blue Book* 2003



accurate. However, the level of real output is not comparable across time periods when weights change. A levels series is therefore created by chain-linking growth rates across base periods.

Not surprisingly therefore, Table B shows that cumulative revisions to the level of GDP are on average higher, though rather less variable — proportional to the mean — than revisions to growth rates.

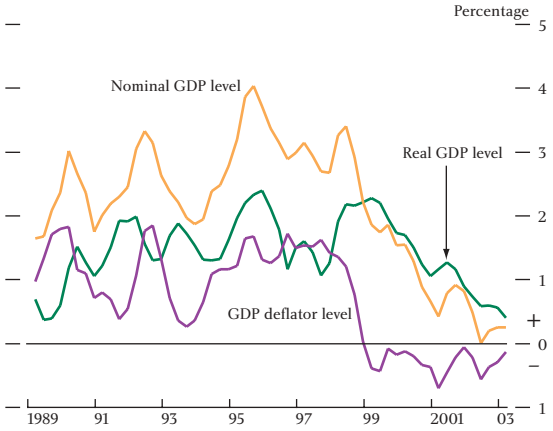
Table B
Summary statistics on cumulative revisions to real GDP data (1989 Q3–2004 Q1 vintages)

	Mean revision	Mean absolute revision	Standard deviation
Real GDP (level)[a]	1.39	0.56	0.68
Real GDP (quarterly growth)[b]	0.13	0.27	0.35

(a) Percentage of first release of data.
(b) Percentage points.

(1) See also Maitland-Smith (2004).
(2) Because chain-linking is not done at the very lowest level of aggregation, rebasing of this type can affect volumes growth. As the producer price data will not be rebased in the near future, the investment data will remain vulnerable to this sort of measurement issue, if relative prices continue to move significantly.

Chart 4
Cumulative revisions to levels



Note: Centred three-quarter moving average.

Of course, levels data on anything are rarely informative by themselves, but must be understood in relation to something else, such as their own value in the previous period or another variable: GDP in relation to population; debt in relation to assets; and so on. Later we shall look at the level of output in relation to potential, or the output gap.

Monetary policy implications of price/volume uncertainty

How does the presence of price/volume data uncertainty affect the weight a policymaker should place on different kinds of information when setting interest rates? And if relationships established in old vintages of data stand to be revised, when does this have implications for a monetary policymaker's view of the future inflationary pressure?

Here I will focus on two dimensions. First, how much information is there in nominal GDP growth data compared with real GDP growth data. Second, how much weight should a policymaker place on growth as against levels data and estimates of the output gap that are derived from levels data.

Nominal versus real data

One response to price/volume uncertainty could be that at times when relative prices change significantly, and trying to assess the split between real activity and a price index is difficult, looking at a money value measure of activity may be informative.

As the Governor said last year(1) '…it is easier to measure the money value of spending and output in the economy than to split it into estimates of 'real' output, on the one hand, and price indices, on the other. That is why the latest data revisions have altered the picture of real growth over recent years, leaving estimated money spending and output broadly unchanged. In such circumstances it is sensible to focus on money spending. Indeed, the success of the new monetary framework can be seen in the stability not just of retail price inflation but also of the growth rate of domestic demand in money terms.' Charts 5 and 6 below show the greater stability of the growth rates of nominal domestic demand and nominal GDP in recent years.

Chart 5
Nominal domestic demand growth

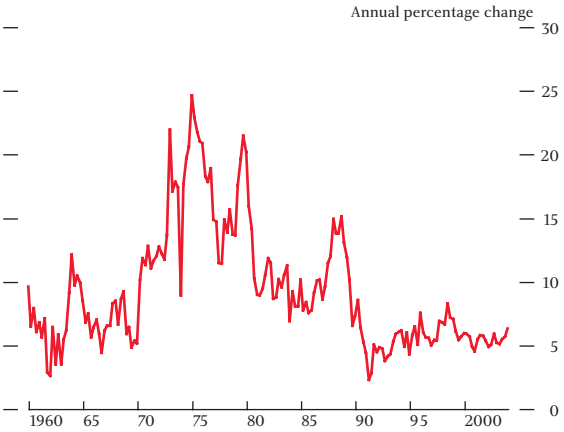
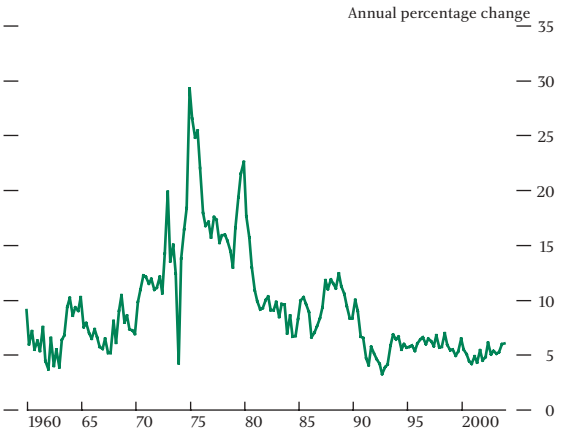


Chart 6
Nominal GDP growth



Here I want to consider the value of nominal GDP data in an inflation-targeting regime, where the objective is to keep inflation close to target without excessive volatility in real output. It should be stressed that I am not talking about a nominal GDP targeting framework here. That is beyond the scope of this evening's talk. Here I will consider nominal GDP data as but one in a set of indicators that jointly help to understand the

(1) King (2003).

development of domestic inflationary pressure as captured by the true, unobserved output gap. In particular I assume that reliable inflation data on the target measure are also available. So the issue is really whether nominal GDP growth data can complement real growth data.

A simple way of assessing the worth of nominal GDP growth data against that of real GDP growth data might be to compare how well each would do in estimating the unobservable change in the output gap.

Let us suppose that real GDP growth is mismeasured only because of price/volume mismeasurement. Our assumption that the price/volume mismeasurement error affects real GDP growth data in the opposite direction to the deflator inflation data means that nominal GDP is accurately measured. CPI inflation is also accurately measured, but is assumed to diverge from GDP deflator inflation by an error term.

Equations **(1)** and **(2)** below show how each data source is linked to the change in the output gap. For simplicity we assume, for the moment, that true potential output growth is known.

REAL GDP GROWTH DATA = CHANGE IN THE OUTPUT GAP + POTENTIAL OUTPUT GROWTH + PRICE/VOLUME MISMEASUREMENT **(1)**

NOMINAL GDP GROWTH DATA – CPI INFLATION = CHANGE IN THE OUTPUT GAP + POTENTIAL OUTPUT GROWTH + OTHER DEFLATOR MISMEASUREMENT **(2)**

Comparing **(1)** and **(2)**, we can see that there is a trade-off between price/volume mismeasurement and other sources of GDP deflator mismeasurement. If there is greater uncertainty over the price/volume split in nominal GDP than there is over the assessment of GDP deflator inflation, using an independent measure of inflation such as the CPI, then nominal GDP growth data (deflated by CPI inflation) will be relatively more useful in gauging the build-up of inflationary pressure. But if uncertainty over GDP deflator inflation dominates, real growth data may be a better source.

Ongoing work using a structural dynamic model of the transmission mechanism calibrated on UK data suggests that, as price/volume data uncertainty increases, monetary policymakers should place greater emphasis on nominal GDP growth data and correspondingly less emphasis on the separate uncertain estimates of prices and volume growth in interest rate setting. But our calibrations indicate that estimates of real growth cannot be entirely disregarded, even when the data are very uncertain.

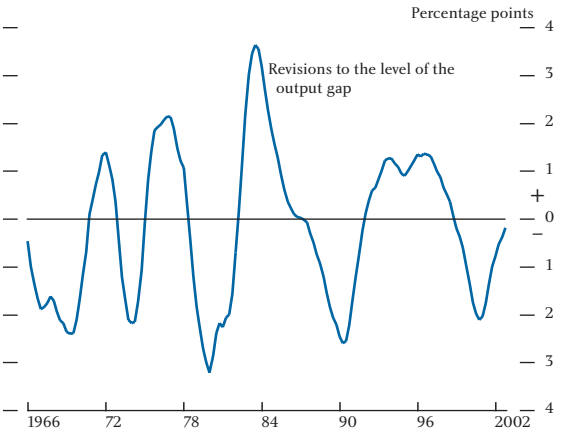
Interpreting levels revisions

We have seen that there can be large shifts in estimated real GDP levels following revision and rebasing. Should this lead us to alter our view of the inflationary outlook?

Walsh (2003) has used vintages of data for the level of real GDP for the United States to calculate estimates of potential output and output gaps where potential output is estimated using a Hodrick-Prescott filter. His results, reproduced in Chart 7, show that estimates of the level of the output gap are subject to significant revision, by up to 4% of potential output.

Chart 8 applies the same procedure to our UK data from 1989 Q3 to 2004 Q1.(1)

Chart 7
Cumulative revisions to output gap estimates (United States)



Source: Walsh (2003).

Looking at these charts, we can see that, if we were to take these estimates at face value, we would judge that data mismeasurement seems to affect the estimate of the level of the output gap much more than it affects estimates of trend growth or real growth. Table C compares the revision in the output gap level with the

(1) Although we have real and nominal GDP data from the mid-1950s onwards, which were used in our estimates of potential output, in our data set *vintages* of data are available only from 1989.

Chart 8
Cumulative revisions to output gap estimates (United Kingdom)

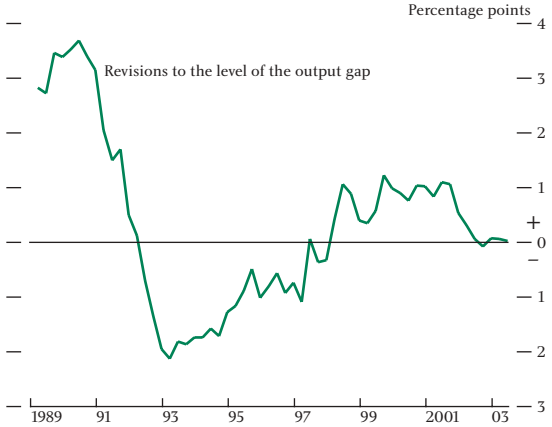


Table C
Summary statistics on cumulative revisions to UK output gap estimates (1989 Q3–2004 Q1 vintages)

	Mean revision	Mean absolute revision	Standard deviation
Output gap (level)[a]	0.31	1.21	1.55
Real GDP (quarterly growth)[a]	0.13	0.27	0.35

(a) Percentage points.

revision in real growth rates, showing that both the mean and the standard deviation are much higher.(1) This is of concern since output gap mismeasurement has played a significant role in policy mistakes of the past.(2)

This analysis might suggest placing less emphasis on output gap estimates, and correspondingly more on growth rate data. The suggestion that for practical data measurement reasons we should place more emphasis on rates of change than levels has some history. For example Federal Reserve Board Governor Edward Gramlich(3) discussed whether, because of measurement error, policymakers should concentrate more on the rate of change of real variables than their levels, within acceptable margins, in judging how much inflationary pressure was building up in the economy.(4)

But is this essentially mechanical approach to estimating the output gap sensible? Let us suppose that, following a rebasing, the level of real GDP is much higher while the CPI inflation data remain unchanged. Should our view of the output gap have changed, or might the revisions suggest that the level of potential output is also much higher than previously thought, such that the estimate of the output gap has not changed? In other words, should news in the revision cause us to change our view of the inflation outlook?

There are good reasons to be wary of estimates of output gap uncertainty derived from mechanical approaches. In addition to the variability of GDP levels data, mechanical estimates of the output gap are derived by assuming that potential output is either fixed or is a smoothed trend in real GDP. Hence, by construction, the potential level is unlikely to change as much as the real GDP level. This assumption may be incorrect, indeed it is likely that potential output will vary in response to real changes to, for example, investment, technology, demographics or preferences.(5)

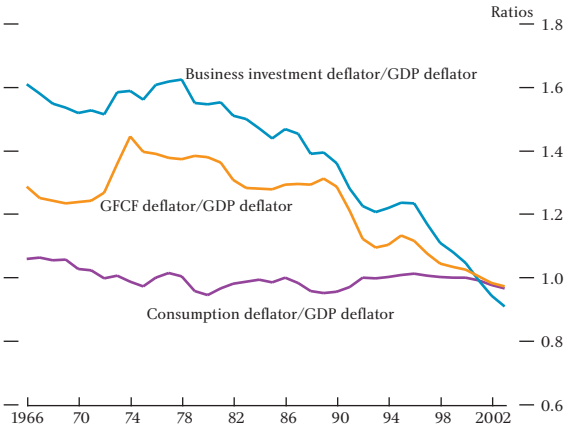
Moreover, the mechanical method takes no account of other information such as inflation data, the labour market or surveys of capacity utilisation, all of which the MPC uses to inform its judgement as to the amount of spare capacity in the economy. The mechanical approach also assumes that only aggregate real GDP data are relevant. But disaggregate information on relative price movements might influence our view of supply.(6) If we were to allow such additional information, we might find that our best guess of potential output would shift along with our best measure of actual output following a revision. Looking at disaggregate data would also mean acknowledging that rebasing has given us access to potentially relevant new information.

In this respect it may be useful to look at the shifts in relative prices in ONS data and consider what factors might have driven them. We have seen that a change in the price/volume allocation of nominal investment growth was responsible for a large part of the upward revision to GDP growth rates in the 2003 *Blue Book*. If we look at the main expenditure components of GDP, we

(1) The addition of a new observation might result in a re-estimation of trend, even in the absence of other revisions. The Hodrick-Prescott filter used here is particularly susceptible to a change in the end-point, although all methods will suffer from this drawback to some extent. We have looked at two additional methods of estimating trend output (a simple and a split trend) and find that the standard deviation of revisions to the output gap is little changed. Following Orphanides and Van Norden (2001) we find that a little over half of the standard deviation of revisions to the output gap using the Hodrick-Prescott filter is attributable to changing the end-point, the remainder to revisions in the data.
(2) See Nelson and Nikolov (2002).
(3) Gramlich (1999).
(4) There are separate theoretical arguments for why we should emphasise rates of change above levels. For example the economy might be prone to inflationary bottlenecks whenever it grows too fast.
(5) This point is not new. See for example Woodford (2001), Nelson (2002).
(6) See, for example, Whelan (2000, 2001).

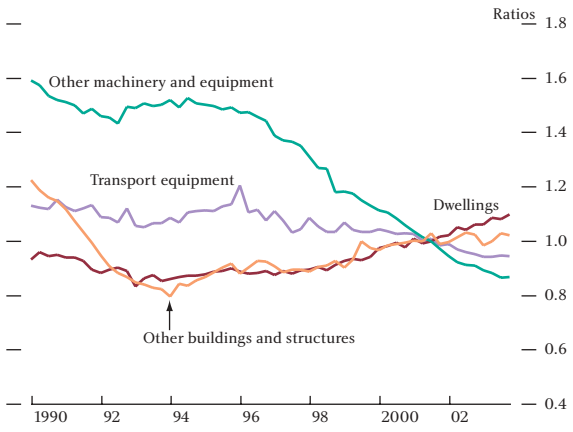
can see from Chart 9 that the relative price of investment, both whole-economy and business, has trended downwards since the early to mid-1980s.

Chart 9
Consumption, business investment and gross fixed capital formation deflators relative to the GDP deflator (1966–2003)



When we look at whole-economy investment by asset, in Chart 10, we see that, at least in the 1990s, the fall in relative price of whole-economy investment seems to have been driven by 'other machinery and equipment'. This includes ICT goods, which probably best illustrate the possibility of trend changes in relative prices.(1) As the relative price has fallen, the volumes purchased of these goods have increased.

Chart 10
Prices of whole-economy investment by asset relative to the GDP deflator (1990 Q1–2004 Q1)



This could be an example of what economists have referred to as investment-specific technological progress, related to improvements in the efficiency with which we can generate productive equipment capital.(2) This would suggest that those goods that have experienced falling relative prices are those that are capital-intensive in their production and distribution.

Consumer durable goods that, once purchased, yield services over time, also tend to be capital-intensive. And although the relative price of consumption as a whole has not changed much over the past four decades, as shown in Chart 9, within the broad categories of household consumption there are substantial differences between consumer durable and non-durable goods. Chart 11 shows that, while the relative price of non-durables has been stable and that of services has trended upwards since 1980, the relative price of both durables and semi-durables has fallen since the mid-1990s.

Chart 11
Prices of categories of households' consumption expenditure relative to the GDP deflator (1980 Q1–2004 Q1)

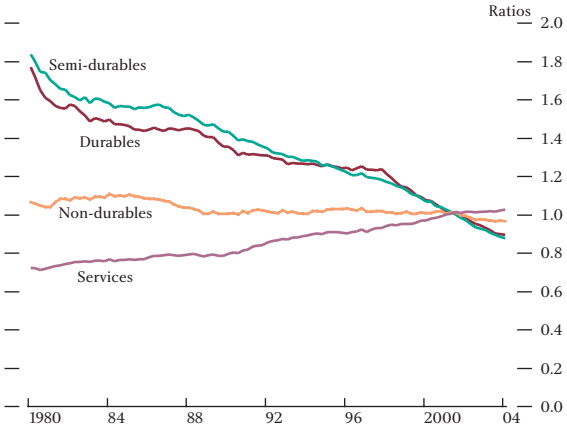
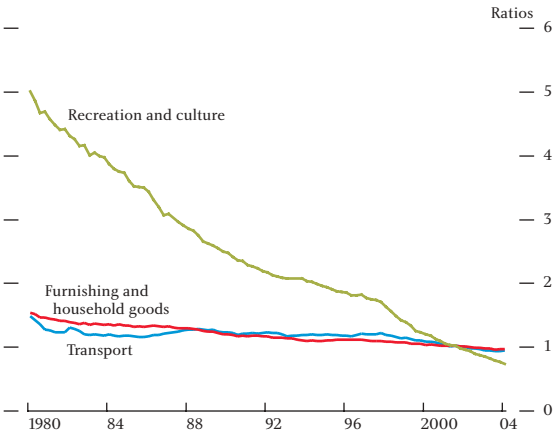


Chart 12 plots the relative prices of the three main components of durable consumption. The downward trend in the relative prices has been due to a sharp decline in the relative price of 'recreation and culture' goods, which account for just over 20% of all durable goods, and include such items as audio-visual equipment and information-processing equipment.(3)

It thus appears that those sectors that have experienced falling relative prices and rising volumes are predominantly those with a higher rate of technical progress. Of course there is an international dimension to this, as many of these goods are purchased from abroad. But it could be consistent with 'strong underlying productivity growth that is difficult to discern in the data […] associated with investment in

(1) See also, for example, Bakhshi, Oulton and Thompson (2003) and Ellis and Groth (2003).
(2) See Greenwood, Hercowitz and Krusell (1997).
(3) See also Power (2004).

Chart 12
Prices of categories of durables relative to the GDP deflator (1980 Q1–2004 Q1)



ICT'.[1] This could be a factor that might have raised the rate of growth of potential output, with implications for our assessment of the output gap.

Conclusion

We can rarely directly observe the economic concepts we might hope to measure. Not only might the concepts not map easily into real-world phenomena, but the real world will often not lend itself to direct measurement and will have to be estimated. Such estimates will be subject to revision as more information becomes available. And at times a new method might help to bridge the gap between the measurable real world and the underlying concept, or enable improved estimation of the real-world phenomena.

Revisions to data stemming either from more information or methodological improvements will inevitably lead us to reassess our view of the underlying truth. As the prisoners in Plato's cave found when the Guardian tried to enlighten them, this is not always comfortable. But it is an inevitable part of the policymaker's job, and that of other users of statistics, to make sense of revisions. Improvements to statistics should be something we welcome, not criticise.

I have argued that understanding the nature of data uncertainty and revisions should inform our judgements about the world. In the presence of price/volume uncertainty for example, we may find that measures of nominal values contain useful information, which can supplement the imperfect estimates of real variables. Data on the level of GDP appear more prone to mismeasurement than growth rates, and we should be wary of conventional mechanical estimates of the output gap, which rely heavily on levels information. I argue that we should not ignore other relevant information and the relative price data used in the rebasing process may itself be informative.

We should remember that the true understanding in Plato's cave comes not when the one prisoner is forced blinking into the light and sees the true objects for the first time, but when he goes back into the cave and comprehends how the interaction of the light, the objects and the wall of the cave produces the shadows, which is all that those who are still captive can see.

(1) See Bank of England (2004).

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Bank of England speeches

Speeches made by Bank personnel since publication of the previous *Bulletin* are listed below.

What fates impose: facing up to uncertainty.
Speech by Mervyn King, Governor, at the Eighth British Academy Annual Lecture, 2004 in London on 1 December 2004.
www.bankofengland.co.uk/speeches/speech234.pdf.

The Colchester Town Partnership Annual Dinner.
Speech by Charles Bean, Executive Director and Chief Economist on 25 November 2004.
www.bankofengland.co.uk/speeches/speech233.pdf.

Stability and statistics.
Speech by Rachel Lomax, Deputy Governor, to the North Wales Business Club Dinner in Llandudno, Wales on 23 November 2004.
www.bankofengland.co.uk/speeches/speech232.pdf. Reproduced on pages 495–501 of this *Bulletin*.

Financial instrument accounting.
Speech by Sir Andrew Large, Deputy Governor, to the 13th Central Banking Conference at Painter's Hall in London on 22 November 2004. www.bankofengland.co.uk/speeches/speech231.pdf.

Why is inflation so low?
Speech by Richard Lambert, member of the Monetary Policy Committee, to The Institute of Chartered Accountants of Scotland in Glasgow on 25 October 2004. www.bankofengland.co.uk/speeches/speech230.pdf. Reproduced on pages 502–09 of this *Bulletin*.

The Bank of England's Court Dinner at the Eden Project.
Speech by Mervyn King, Governor, at the Eden Project, Cornwall on 12 October 2004.
www.bankofengland.co.uk/speeches/speech229.pdf.

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Articles and speeches (indicated S)

Winter 2003 (continued)

The distribution of unsecured debt in the United Kingdom: survey evidence

Innovations in retail payments: e-payments

The macroeconomic impact of revitalising the Japanese banking sector

Financial stability and the United Kingdom's external balance sheet

The Governor's speech at the East Midlands Development Agency/Bank of England dinner (S)

Inflation targeting: the UK experience (S)

UK monetary policy in a changing world (S)

Two current monetary policy issues (S)

Spring 2004

Durable spending, relative prices and consumption

Asset pricing and the housing market

The relationship between the overnight interbank unsecured loan market and the CHAPS Sterling system

How much does capital matter?

Measuring total factor productivity for the United Kingdom

The Governor's speech at the annual Birmingham Forward/CBI business luncheon (S)

Inflation targeting—achievement and challenges (S)

Risk, uncertainty and monetary policy regimes (S)

E-commerce and the foreign exchange market—have the promises been met? (S)

Summer 2004

Assessing the stability of narrow money demand in the United Kingdom

Deriving a market-based measure of interest rate expectations

The economics of retail banking—an empirical analysis of the UK market for personal current accounts

The financing of smaller quoted companies: a survey

Recent developments in surveys of exchange rate forecasts

Sterling money market funds

The new Bank of England Quarterly Model

Public attitudes to inflation

Perfect partners or uncomfortable bedfellows? On the nature of the relationship between monetary policy and financial stability

Summer 2004 (continued)

A review of the work of the London Foreign Exchange Joint Standing Committee in 2003

Reform of the Bank of England's operations in the sterling money markets

Puzzles in today's economy—the build-up of household debt (S)

Speech at the National Association of Pension Funds Annual Investment Conference (S)

Boring bankers—should we listen? (S)

Speech at CBI Yorkshire and the Humber annual dinner (S)

Autumn 2004

How should we think about consumer confidence?

Household secured debt

Housing equity and consumption: insights from the Survey of English Housing

Why has world trade grown faster than world output?

The institutions of monetary policy (S)

The Governor's speech to the CBI Scotland dinner (S)

The Governor's speech at the Mansion House (S)

Keeping the party under control—anniversary comments on monetary policy (S)

Some current issues in UK monetary policy (S)

Managing the central bank's balance sheet: where monetary policy meets financial stability (S)

Household debt, house prices and consumption growth (S)

Winter 2004

British household indebtedness and financial stress: a household-level picture

The new sterling ERI

Using option prices to measure financial market views about balances of risk to future asset prices

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

The external balance sheet of the United Kingdom: recent developments

Stability and statistics (S)

Why is inflation so low? (S)

Monetary policy, data uncertainty and the supply side: living with the statistical fog (S)

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No.	Title	Author
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
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245	Horizontal and vertical integration in securities trading and settlement *(November 2004)*	Jens Tapking Jing Yang

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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 will be 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: Daxa Khilosia, Monetary and Financial Statistics Division, Bank of England: telephone 020 7601 5353; fax 020 7601 3208; email daxa.khilosia@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
Prospective change in the Bank's measure of Divisia money: consultation with users		July	23–24
Data cleansing for banking and monetary statistics	Julie Bigwood	July	22
Population review for other specialist mortgage lenders	Lorna Hall	July	20–21
A work programme in financial statistics—April 2004 update	Sheila Watson	July	14–19
A new Statistical Code of Practice for the Bank of England	Chris Wright	July	11–13
Developments in UK international banking statistics	Pat O'Connor	July	5–10
An introduction to financial soundness indicators	Andrew Moorhouse	July	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.

Practical issues arising from the euro

This is a series of booklets providing a London perspective on the development of euro-denominated financial markets and the supporting financial infrastructure, and describing the planning and preparation for possible future UK entry. Recent editions have focused on the completion of the transition from the former national currencies to the euro in early 2002, and the lessons that may be drawn from it. Copies are available from Public Enquiries Group, Bank of England, Threadneedle Street, London, EC2R 8AH and on the Bank's website at: www.bankofengland.co.uk/euro/piq.htm.

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The *Economic models at the Bank of England* book, published in April 1999, contains details of the economic modelling tools that help the Monetary Policy Committee in its work. The price of the book is £10.00. An update was published in September 2000 and is available free of charge.

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An index of the *Quarterly Bulletin* is also available to customers free of charge. It is produced annually, and lists alphabetically terms used in the *Bulletin* and articles written by named authors.

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

- analysis of money and asset prices;
- analysis of demand;
- analysis of output and supply;
- analysis of costs and prices;
- summary of monetary policy during the quarter; and
- assessment of the medium-term inflation prospects and risks.

The *Minutes* of the meetings of the Bank's Monetary Policy Committee appear as a separate publication on the same day as the *Report*.

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Summer	20 June	May	11 May
Autumn	26 September	August	10 August
Winter	12 December	November	16 November

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