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Winter 2002

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Markets and operations
(pages 357–72)

This article reviews developments in international and domestic financial markets, drawing on information from the Bank of England's market contacts, and describes the Bank's market operations in the period 23 August 2002 to 22 November 2002.

Research and analysis
(pages 373–431)

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.

What do measures of core inflation really tell us? (by Alan Mankikar and Jo Paisley of the Bank's Conjunctural Assessment and Projections Division). Despite the widespread use of the term 'core inflation', there is neither a widely accepted theoretical definition, nor an agreed method of measuring it. The wide range of conceptual bases is potentially confusing, particularly when the measures display different trends. This article offers an overview of some of the issues. It examines how core inflation has been defined, sets out to what extent the concept might be useful for policy-makers and assesses the wide range of available measures in the United Kingdom.

Estimating the impact of changes in employers' National Insurance Contributions on wages, prices and employment (by Brian Bell, Jerry Jones and Jonathan Thomas of the Bank's Structural Economic Analysis Division). This article explains how changes in payroll taxes might affect real wages and employment. It then estimates the responses of relative wages, prices and employment to the changes in employers' National Insurance Contributions (NICs) that occurred in 1999. The empirical evidence is based on industry-level data and exploits valuable variation in the extent to which these changes in the payroll tax affected different industries.

Equity valuation measures: what can they tell us? (by Anne Vila Wetherilt and Olaf Weeken of the Bank's Monetary Instruments and Markets Division). This article examines the usefulness of summary statistics, such as the price-earnings ratio and the dividend yield, that are commonly used in valuing equity markets. But these measures are very sensitive to assumptions made about the (unobservable) equity risk premium, as well as to the precise definitions of earnings or dividends used in the calculations. This limits their usefulness as summary statistics of equity valuations.

Profit expectations and investment (by Seamus Mac Gorain of the Bank's Monetary Instruments and Markets Division and Jamie Thompson of the Bank's Structural Economic Analysis Division). This article examines the relationship between expectations of future profits and companies' physical investment. Theory suggests that increased profit expectations should raise share prices as well as investment. But this correlation between investment and share prices may be rather weak if investors' opinions of companies' prospects differ from those of the companies' managers. Using a simple aggregate investment equation, the article illustrates that measures of profit expectations based on current profits and analysts' earnings forecasts appear to be more informative for investment than stock prices themselves. This result is consistent with recent research at the Bank using company data.

Financial pressures in the UK household sector: evidence from the British Household Panel Survey (by Pru Cox, John Whitley and Peter Brierley of the Bank's Domestic Finance Division). Household indebtedness has risen rapidly in relation to incomes in recent years. But aggregate data cannot indicate which types of households—by age, income or wealth—have accumulated the most debts. This article uses information from the latest British Household Panel Survey (for the

year 2000) to provide some evidence on that issue. The survey suggests that debt-to-income ratios vary widely across households. The youngest and lowest-income households increased their debt-to-income ratios by most—and from the highest levels—between 1995 and 2000. But the households with the highest absolute levels of debts tended also to have the highest incomes and net wealth in both years. A large proportion of this wealth was held in housing assets. Such households did not, however, hold substantially more liquid assets than less indebted households. Although households were relatively sanguine about their higher levels of debt, that confidence could be eroded if circumstances deteriorated. Overall, changes in the distribution of household debt in recent years suggest that the household sector may be somewhat more vulnerable to an adverse shock than the aggregate measures indicate.

Money market operations and volatility in UK money market rates (by Anne Vila Wetherilt of the Bank's Monetary Instruments and Markets Division). The Bank of England implements UK monetary policy by influencing short-term interest rates in its money market operations. The way in which the Bank operates in the market has changed significantly over time, but the aim throughout has been to ensure that the behaviour of short-term interest rates is consistent with monetary policy decisions, whether made by the Chancellor of the Exchequer or, since 1997, by the Bank's own Monetary Policy Committee. Operational choices by the central bank, together with developments in the markets themselves, are likely to have affected the volatility of short-term interest rates. This article outlines various measures of volatility in sterling money markets.

Reports

(pages 432–55)

The Centre for Central Banking Studies (by Peter Sinclair, Director, Centre for Central Banking Studies). The Bank of England's Centre for Central Banking Studies (CCBS) conducts training, seminars and collaborative research with and for central banks in the rest of the world. It enjoys contact with some 150 of these, and now averages over 1,000 training contacts each year in all. The typical medium is a week-long course in London or abroad. These cover nearly all subjects of concern to central banks, with a growing emphasis, among other topics, on forecasting and econometric modelling for monetary policy. CCBS handbooks and other publications are read all over the world; some 8,000 electronic download requests for handbooks are received each month.

The external balance sheet of the United Kingdom: recent developments (by Robert Westwood of the Bank's Monetary and Financial Statistics Division and John Young of the Bank's Domestic Finance Division). The external balance sheet (or international investment position) gives the most complete picture of the stock position of a country in its financial transactions with the rest of the world. The very breadth of coverage of the data leads inevitably to problems of measurement and valuation. Nevertheless, subject to certain qualifications, the data can throw some light on macroeconomic and financial stability issues related to the United Kingdom's cross-border financial links. This article, one in an annual series, discusses the recent evolution of the United Kingdom's external balance sheet, reviewing along the way some of the main methodological issues that impinge on an interpretation of the data. It concludes that, despite a persistent current account deficit, the balance of probability is that the United Kingdom still has net external assets, or at least the capacity to generate net investment income from overseas. There are also some grounds for optimism that the structure of its assets and liabilities has left the United Kingdom in a fairly strong position to withstand financial shocks.

Public sector debt: end-March 2002 (by Paul Burton of the Bank's Monetary and Financial Statistics Division). Public sector net debt (PSND) stood at £310.0 billion as at end-March 2002, £4.1 billion higher than at end-March 2001. This was equivalent to 30.4% of GDP, some 0.9 percentage points lower than at end-March 2001. This annual article examines the structure of the financial liabilities of the UK public sector.

Markets and operations

This article reviews developments in sterling fixed income and foreign exchange markets since the Autumn Quarterly Bulletin.(1)

- *Sterling forward interest rates from futures and gilts fell out to just beyond five years and rose a little beyond that. Sterling's effective exchange rate index increased slightly.*
- *The FTSE All-Share index fell sharply to late September, but in the second half of the period it rose and equity market volatility fell from high levels.*
- *Since CLS Bank International commenced live operations in September 2002, the value of trades, including in sterling, settling through Continuous Linked Settlement has grown sharply.*
- *Work continues to enable money market instruments to be issued in electronic form and to be settled in CREST, with delivery-versus-payment, reducing daylight credit exposures, from the second half of 2003.*

Sterling asset markets

Interest rate movements

The Bank of England's Monetary Policy Committee (MPC) left the official repo rate unchanged at 4% during the period. Forward interest rates derived from market prices, however, fell out to just beyond five years (Charts 1, 2 and 3). At short maturities, as of 22 November the December 2002 short sterling contract implied a rate of 3.98%, effectively unchanged from 4.01% on 23 August, and the June 2003 short sterling contract implied a rate of 4.14%, down from 4.40%.

Chart 1
Bank of England official repo rates, three-month Libor and expectations from futures contracts

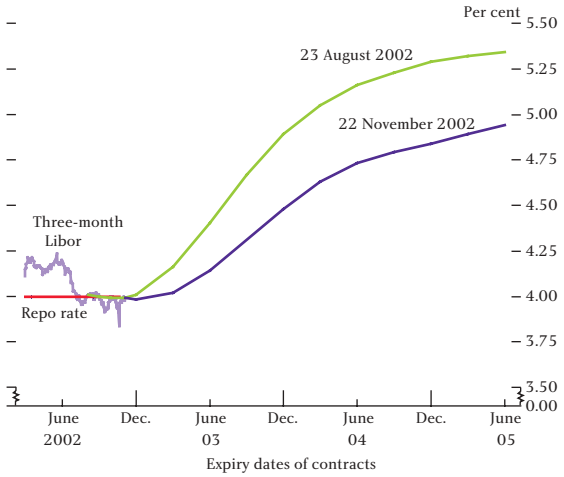
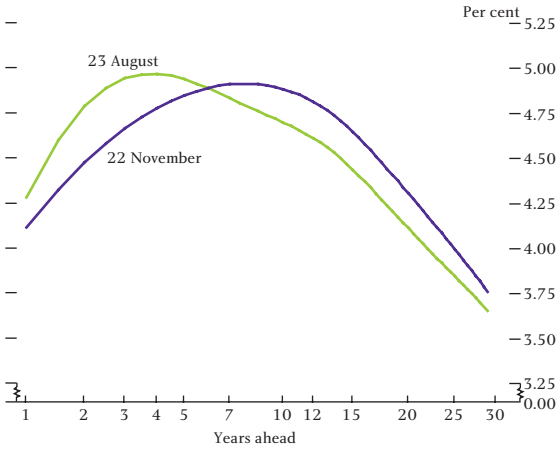


Chart 2
Forward sterling yield curves(a)

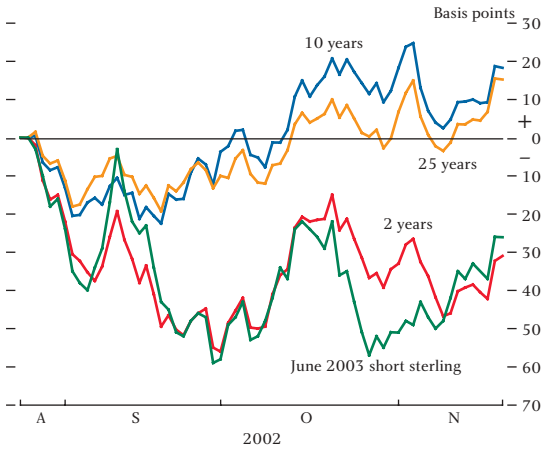


(a) Six-month forward rates derived from the Bank's government liability curve. (Estimates of this curve, and of instantaneous forward rates, are published daily on the Bank of England web site at www.bankofengland.co.uk/statistics/yieldcurve/main.htm.)

The rates implied by short sterling contracts were consistent with a central expectation in the market that the official repo rate would remain unchanged at 4% until at least the middle of 2003. Reuters' poll of economists' forecasts, conducted over 26–27 November(2) indicated a mean forecast of 4% for end-2002 and 4.42% for end-2003, and options on short sterling futures suggested that market participants assigned only a very slight probability of a reduction in the official rate by the end of 2002. At times during the period, however, market rates indicated significantly

(1) The period under review is 23 August (the data cut-off for the previous *Quarterly Bulletin*) to 22 November.
(2) Shortly after the end of the period under review.

Chart 3
Cumulative changes in sterling interest rate expectations(a)

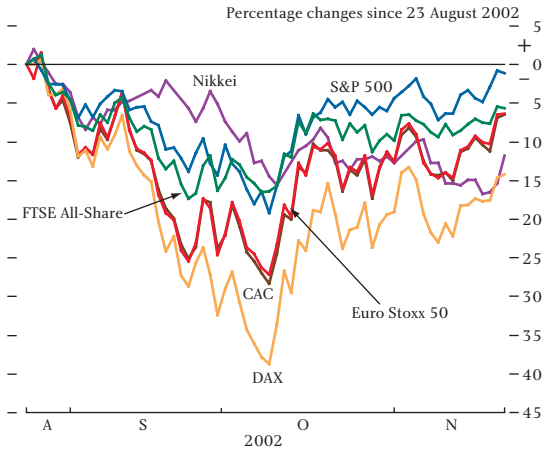


(a) June 2003 short sterling is the three-month Libor rate implied by the June 2003 short sterling contract. Other rates are three-month forward rates implied by the Bank's government liability curve.

higher probabilities of lower official repo rates at the end of 2002 and in the first half of 2003. Reflecting these changing expectations, historical volatilities of implied rates from short sterling futures have remained at fairly high levels.

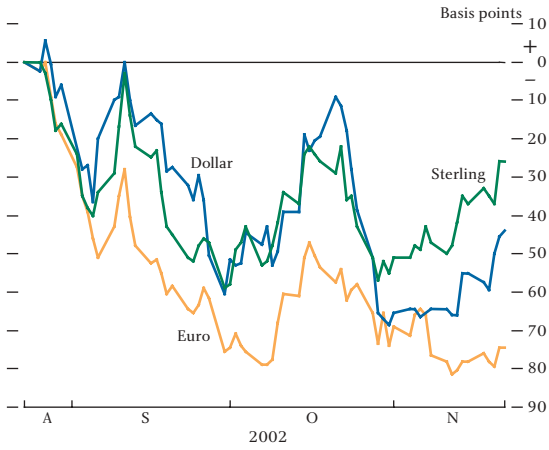
From late August to early October, major US and European equity markets fell sharply and movements in money market interest rates followed closely (Charts 4 and 5). Over the period as a whole, the major US and European equity indices continued to move together, suggesting that some of the factors driving equities remained global, consistent with relative stability in exchange rates (see below). Nonetheless, in the first half of the period, euro-area equity indices—and implied forward interest rates—fell by more than those in the United States and the United Kingdom. By the end of

Chart 4
International equity indices



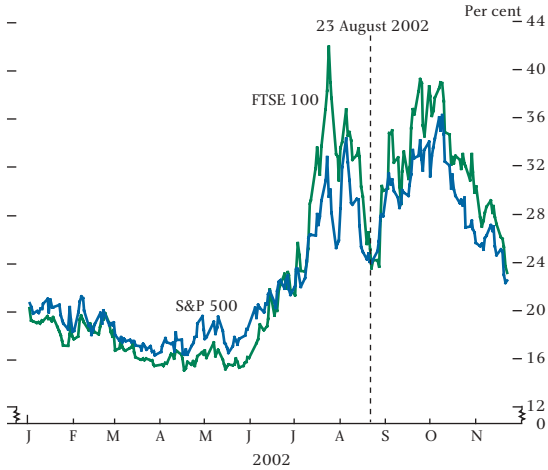
Source: Bloomberg.

Chart 5
Cumulative changes in short-term interest rate expectations(a)



(a) As implied by interest rate futures contracts maturing in June 2003.

Chart 6
Three-month implied volatilities of S&P 500 and FTSE 100 equity indices



Sources: LIFFE, CME, and Bank calculations.

September, the rate implied by the June 2003 short sterling contract had fallen by 59 basis points from its level on 23 August, a similar decline to that of the equivalent implied US dollar rate, but materially less than the equivalent euro rate (Chart 5).

From 9 October, equity indices rose strongly for over a week (Chart 4), in part following some better-than-expected US Q3 corporate earnings, and implied volatilities of equity indices declined over the remainder of the period (Chart 6). Money market interest rates also rose initially, with sterling rates increasing following the publication on 15 October of a larger-than-expected rise in the UK retail price index (RPIX) for September.(1) But they then declined, with growing market expectations of reductions in official

(1) RPIX data have been volatile in recent months; see the November 2002 *Inflation Report*, page 43.

Table A
Short-term sterling interest rate expectations: reactions to economic news and official announcements and publications(a)

	Expected	Actual	Intraday change (basis points) (b)	Daily change (basis points) (c)
US ISM manufacturing (3/9)	51.8	50.5	-4	-8
US unemployment rate (6/9)	6.0%	5.7%	3	3
MPC minutes (18/9)	n.a.	n.a.	-3	-6
US durable goods orders (26/9)	-3.0%	-0.6%	5	1
Industrial production (m-o-m) (7/10)	0.8%	-0.3%	-3	-7
RPIX (y-o-y) (15/10)	2.0%	2.1%	6	12
MPC minutes (23/10)	n.a.	n.a.	-6	-13
US consumer confidence (29/10)	90.0	79.4	-3	-5
FOMC decision (6/11)	n.a.	1.25%	-4	7
MPC decision (7/11)	n.a.	4%	13	7
Inflation Report (13/11)	n.a.	n.a.	4	6
Retail sales (y-o-y) (21/11)	5.0%	6.0%	3	7

n.a. = not available.

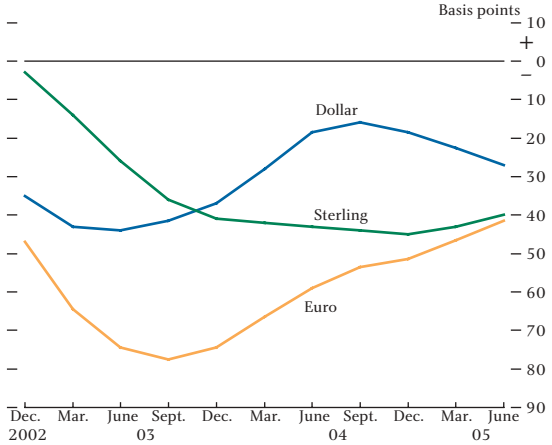
Source: Bloomberg.

(a) Reactions in rates implied by short sterling futures contracts (December 2002 contract up to 18 September, subsequently March 2003 contract).
(b) Change in rates implied by short sterling from 15 minutes before to 15 minutes after the economic news release or publication of document, or for news outside trading hours from previous closing price to 30 minutes after start of trading the following trading day.
(c) For news outside trading hours, from closing price preceding the news to closing price following the news.

rates ahead of the Federal Open Market Committee (FOMC), European Central Bank (ECB) and Bank of England MPC policy meetings at the beginning of November. In particular, sterling forward rates fell following publication of the minutes of the October meeting of the MPC, which revealed a 6:3 vote to leave the official rate unchanged, with the minority favouring a reduction of 25 basis points (Table A). Although neither the Bank of England's MPC nor the ECB changed official rates in November, sterling forward interest rates for December 2002 and March 2003 rose subsequently whereas the equivalent euro rates fell. Market participants said that expectations of a reduction in official interest rates in the United Kingdom decreased following the 4.7% increase in the Halifax house price index for October, publication of the Bank's *Inflation Report* on 13 November, and stronger-than-expected retail sales data. The ECB was widely expected to lower its policy rate at its 5 December policy meeting and subsequently did so, by 50 basis points to 2.75%. Over the period as a whole, euro forward money market interest rates fell by more than those in sterling or US dollars (Chart 7).

At longer maturities, forward yields derived from gilts fell out to around six years but rose further out. Movements in yields often followed equity indices closely, with yields falling (rising) as equity markets fell (rose).(1) This pattern has been common across US and European

Chart 7
Changes in short-term interest rate expectations over review period at different maturities(a)



(a) As implied by interest rate futures contracts.

government bond markets. News about global growth prospects might have led to this kind of relationship, with a changing economic outlook altering expectations about future dividend payments and monetary policy. Another possible explanation might be changing perceptions of equity risk, with investors, at times, demanding less risky assets, such as gilts, causing their yields to fall.(2) Market contacts have reported sizable reallocation flows between equities and bonds, in each direction at different times, which may have contributed to the close correlation in movements of the two instruments. Yields on some shorter maturity gilts fell to low levels during the period; but part of this expensiveness probably also reflected developments in the gilt repo market, as explained in the box on page 360.

The gilt market, while volatile, has been significantly less so than the US Treasury market. Market contacts suggested that greater volatility in the US Treasury market in part reflected hedging of options embedded in US mortgage-backed securities.(3) Unlike in the United States, UK households do not generally have long-term fixed-rate mortgages with prepayment options. As a result, UK mortgage lenders do not carry the same structural 'short' interest rate volatility position and do not need to 'delta hedge' this risk by buying and selling gilts or sterling interest rate swaps.

Real forward yields, as implied by index-linked gilts, rose over the review period, but by more at both very short and long maturities. As a result, derived breakeven

(1) The correlation between movements in the FTSE All-Share index and the December 2002 long gilt futures contract was -58.8%, compared to -45.9% in the previous review period. See also the November *Inflation Report*, Chart 1.5 (page 5).
(2) See also 'The financial stability conjuncture and outlook', *Financial Stability Review*, December 2002.
(3) See *Financial Stability Review*, June 2002, Box 4, page 36 for an analysis of the structure of the US mortgage market and Box 7, page 72 for an explanation of negative convexity and mortgage prepayment risk.

Bond yields and repo rates

Contacts reported that for much of the review period, the 5% Treasury 2004 traded between 10 and 15 basis points expensive to neighbouring gilts (the 6½% Treasury 2003 and the 6¾% Treasury 2004), and at times could be borrowed in overnight repo at a rate as much as 200 basis points below that of most other gilts. The expensiveness of this gilt at times affected the short-dated part of yield curves derived from yields on individual gilts, potentially giving misleading signals to those not close to the market about market expectations of the future path of official interest rates.

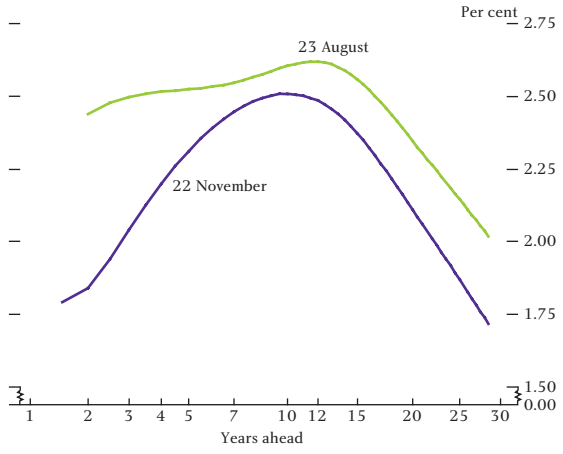
If a bond is thought to be trading at a lower yield than neighbouring bonds it is 'expensive' and traders will seek to sell it. If they already hold the bond, that selling would tend to drive the price down to its fair value. But if they do not hold the bond, as is typically true, for example, of market makers and hedge funds, they must borrow it in order to sell it. Bonds can be borrowed through the repo market: one counterparty borrows the bond from the other in exchange for a cash loan. The interest rate at which the cash is lent is the price of the repo, and if the particular bond is in great demand, this rate can be quite low. The bond would then be said to be 'tight' or 'special' in the repo market, and the additional cost of selling a bond short has to be balanced against any possible returns from a subsequent fall in its price (rise in its yield).

So asking why a bond is expensive is often equivalent to asking why a particular bond's repo rate is low. The low repo rate will usually reflect holders requiring an additional return before they will increase their lending in response to a rise in demand to borrow the bond, which could occur for a number of reasons, including:

- The bond being deliverable into a futures contract. Especially if it is cheapest to deliver, many players may wish to borrow the bond to deliver it.
- There being an auction or other new issuance of that bond, prompting market makers to sell the bond short in advance, with the intention of repurchasing it more cheaply at the auction.
- There being an issue of corporate debt at a certain spread above a particular gilt, prompting market participants to hedge the interest rate risk on the corporate bond by selling the gilt.
- Intermediaries short of a stock needing to borrow it in order to meet an increase in investor demand for this stock in the secondary market.

inflation rates were lower at the end of the period, and more so at both short and long horizons (Chart 8). According to market contacts, movements in real yields over the period were influenced by changing investor assessments of expected real returns on equities and of the additional real returns required on equities compared to index-linked gilts to compensate investors for bearing equity risk (the so-called 'equity risk premium').

Chart 8
Forward sterling inflation derived from gilts(a)



(a) One-year forward rates derived from the Bank's government liability curve.

Sterling market liquidity and issuance

Liquidity in the conventional gilt market was reported to be good throughout the period, with high turnover in gilts, particularly in October.(1)

In the gilt repo market, average daily turnover by value increased in the quarter to end-August 2002, according to the Bank's quarterly survey (Table B). The breakdown by maturity remained broadly consistent with previous quarters, with the majority of activity at 'on call and next day'. Market contacts reported that liquidity at short

(1) Based on trades reported to the London Stock Exchange.

Table B
Turnover of money market instruments

Average daily amount, £ billions

	2001				2002		
	Q1	Q2	Q3	Q4	Q1	Q2	Q3
Short sterling futures (a)	60.0	66.0	71.5	69.6	74.1	69.9	66.3
Gilt repo (b)	15.7	17.9	18.2	20.0	21.3	26.6	28.1
Interbank (overnight) (c)	10.3	11.1	9.3	10.8	12.4	12.4	12.3
CDs, bank bills and Treasury bills	11.8	12.4	11.4	11.7	10.5	11.1	10.6

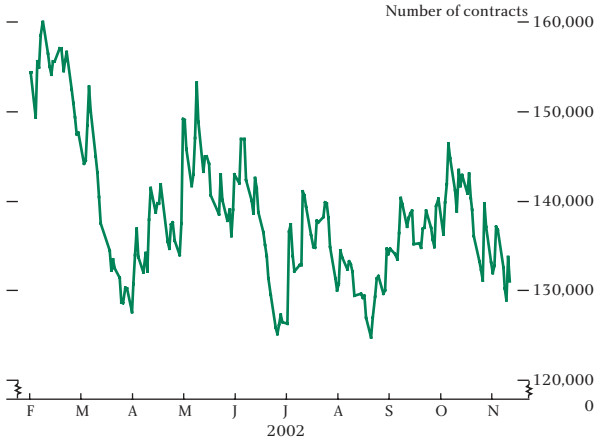
Sources: LIFFE, Bank of England, Wholesale Markets Brokers' Association (WMBA) and CRESTCo.

(a) Sum of all extant contracts, converted to equivalent nominal amount.
(b) Quarters are to end-February (Q1), end-May (Q2), end-August (Q3) and end-November (Q4).
(c) These figures are based on all unsecured sterling overnight cash transactions brokered in London as reported to the WMBA and used to calculate the SONIA fixing. They do not include transactions made bilaterally between money market participants, and so may understate actual turnover significantly.

maturities deepened further following the clearing of gilt repo trades by the London Clearing House (RepoClear), which began in August.(1) There also seems to be a belief that further improvement might follow if clearing was extended to repos of baskets of gilts selected using the 'delivery-by-value' facility in CREST.(2) The quite sharp fall of reported gilt repo outstanding in 2002 Q3 (Table C) is puzzling. It is not easy to reconcile this with higher gilt repo turnover and reports from market contacts. One possibility is that survey responses were affected by the introduction of RepoClear.

While slightly lower than in the previous quarter, short sterling futures volumes remained broadly in line with those in recent years (Table B and Chart 9). Implied interest rates from short sterling contracts continued to be more volatile than those from Libor fixings, and at times by a larger margin than had previously been typical. The increase in the volatility of implied interest rates from futures is consistent with high-frequency traders increasingly using exchange-traded derivatives rather than cash markets for speculation and hedging.

Chart 9
Short sterling volumes(a)



Sources: LIFFE, Bank calculations.

(a) Twenty-day moving averages.

Market contacts have suggested that some firms reacted to high price volatility by requiring traders to close out loss-making positions more quickly, setting so-called 'stop-loss' limits closer to current market levels.

In contrast to short sterling futures, market contacts reported lower liquidity in the market for bank certificates of deposit (CDs). There was a reduction in the turnover of CDs, bank bills and Treasury bills during 2002 Q3 (Table B).

Sterling CD issuance this year has been broadly unchanged from 2001 levels. By contrast, interbank deposits have continued to grow rapidly (Table C). Anecdotally, the relative growth of interbank deposits has reflected an increasing weight of money market activity in the overnight market or at very short maturities. Consistent with this, the sterling net wholesale liabilities becoming due over the next five days

Table C
Sterling money markets

Amounts outstanding: £ billions

		Interbank (a)	CDs (a)	Gilt repo (b)	Stock lending (b)	Eligible bills (a)	Commercial paper (a)	Other (c)	**Total**
2000	Q1	156	132	100	51	14	15	6	**474**
	Q2	159	135	124	54	12	16	7	**507**
	Q3	162	125	127	53	12	16	7	**502**
	Q4	151	130	128	62	11	18	9	**509**
2001	Q1	171	141	126	67	13	19	7	**544**
	Q2	177	131	128	67	12	22	6	**543**
	Q3	187	134	144	52	11	21	6	**555**
	Q4	185	131	130	48	11	20	16	**541**
2002	Q1	190	139	134	66	11	22	14	**576**
	Q2	229	130	148	46	11	26	20	**611**
	Q3	241	138	114	48	11	27	22	**601**

(a) Reporting dates are end-quarters.
(b) Reporting dates are end-February for Q1, end-May for Q2, end-August for Q3, end-November for Q4.
(c) Including Treasury bills, sell/buy-backs and local authority bills.

(1) See *Quarterly Bulletin*, Autumn 2002, page 258, and 'Strengthening financial infrastructure', *Financial Stability Review*, December 2002.
(2) CREST's delivery-by-value functionality enables members to give and receive centrally selected bundles of securities meeting defined criteria as collateral within CREST, usually against the creation of a corresponding CREST payment.

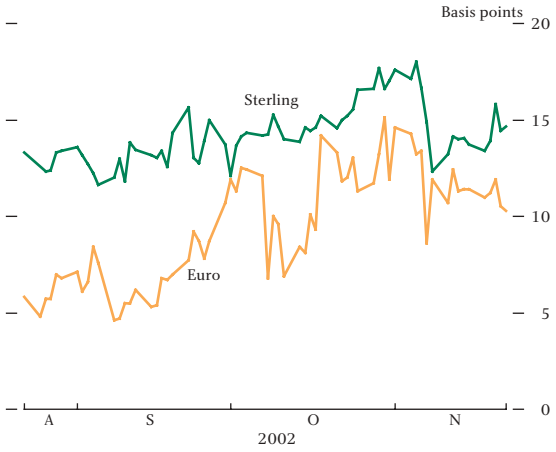
of the major UK-owned banks increased significantly in the month to mid-September and remained broadly at this level in the month to mid-October, although these data are volatile. Demand for longer-maturity money market assets was said to have fallen a little, reflecting the relative flatness of the money market yield curve and, to varying degrees over the period, continuing perceptions of significant interest rate risk. Contacts also linked the increase in short-term interbank deposits to, at times, significant increases in deposits by institutional investors seeking a safe haven from volatile equity markets (although non-bank financial institutions' sterling deposits with banks increased by only around £3 billion over 2002 Q3 as a whole, so that the anecdotal evidence is difficult to assess).

Though issuance of CDs has been flat, some UK banks have reported increased investor demand for medium-term notes, which represent an alternative source of funds. In particular, institutional investors, primarily overseas, are said to have bought structured notes, in which the investor effectively writes an interest rate option or options to the issuer in return for an above-par coupon.

Money market activity may also have been affected by changing perceptions of financial sector robustness, particularly during September when equity markets were falling. Some market participants were reassessing, and in some cases reducing, the size of limits, both to counterparties and to geographical concentrations of counterparties. For much of the period, the interest rate differential between government bond repo and unsecured interbank deposits—one indicator of perceived bank credit risk in money markets—widened in sterling, although it subsequently narrowed, ending the period little changed. In the past, this gap has generally been wider in sterling than in euro, but the differential between the two narrowed during the quarter, perhaps reflecting a marginally greater increase in credit concerns among market participants about banks more active in the euro area (Chart 10). However, these interest rate spreads have remained narrow compared with those prevailing in the Autumn of 1998 or in late 1999, when they reached over 50 basis points in sterling markets.

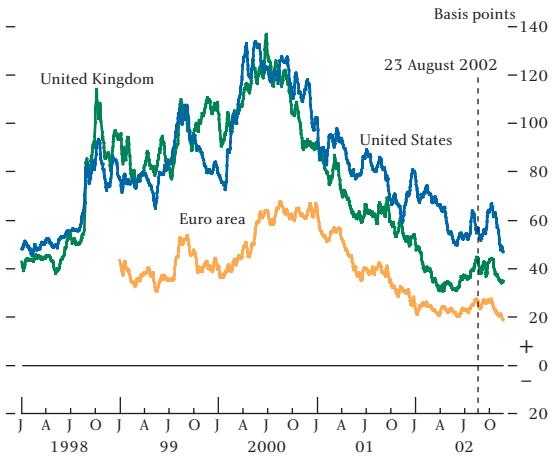
The yield differential between conventional gilts and sterling interest rate swaps—one possible measure of perceived bank credit risk at longer maturities—also

Chart 10
Spread of three-month interbank rates over general collateral government bond repo rates



Sources: BBA and EBF.

Chart 11
Ten-year swap spreads(a)



Source: Bloomberg.

(a) Five-day moving averages of yield differences between ten-year swap rates and ten-year government bonds.

widened in the early part of the period, though it too remained significantly below levels in 1999 and 2000 (Chart 11). Contacts again attributed the change to greater credit concerns amongst financial intermediaries. Widening spreads may have encouraged sterling fixed-rate issuance by various AAA-rated supranational and government-backed issuers, which often swap their fixed-rate sterling debt to a floating-rate obligation, in sterling or other currencies. Such demand to receive fixed in swaps, together with some reduction in credit concerns in financial markets, may help to explain the narrowing of spreads in the second half of the period.

Total sterling-denominated non-government bond issuance in 2002 Q3 was lower than in 2002 Q2 and

Table D
Sterling bond issuance in 2002 Q3

DMO gilt auctions (£ millions)

Conventional	Date	Amount issued	Stock
	24.07.02	2,750	5% Treasury Stock 2014
Index-linked	Date	Amount issued	Stock
	10.07.02	950	2% Index-linked Stock 2035
	25.09.02	900 (a)	2% Index-linked Stock 2035

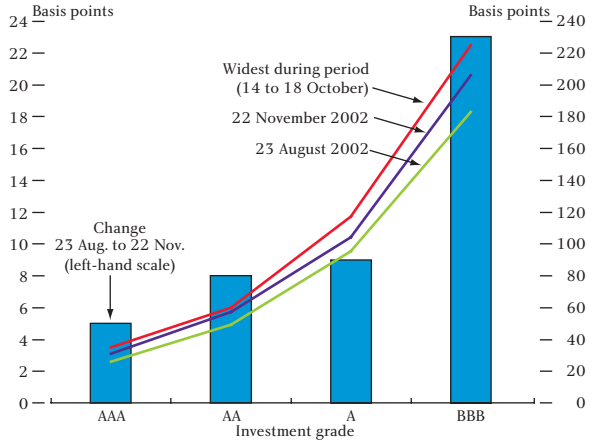
Corporate issuance		Amount (£ billions)				
			By credit rating:			
	Number of issues	Total (b)	AAA	AA	A	BBB and lower
Fixed-rate issues						
UK corporates	17	3.3	1.1	0.5	0.8	0.9
UK financials	14	2.4	0.0	1.1	0.8	0.6
Supranationals	9	1.1	1.1	0.0	0.0	0.0
Overseas borrowers	18	2.8	1.3	0.4	1.2	0.0
Total (b)	**58**	**9.6**	**3.5**	**1.9**	**2.7**	**1.5**
FRNs						
UK corporates	9	1.1	0.3	0.0	0.4	0.5
UK financials	23	2.5	1.2	0.3	0.6	0.4
Supranationals	0	0.0	0.0	0.0	0.0	0.0
Overseas borrowers	31	2.0	0.4	0.7	0.8	0.0
Total (b)	**63**	**5.6**	**1.9**	**0.9**	**1.8**	**0.9**

Sources: Bank of England, Debt Management Office, Moody's and Standard and Poor's.

(a) £826 million nominal sold to market, £74 million nominal held in official portfolios. £74 million rump stock subsequently sold to market on 14 November.
(b) Components may not sum exactly due to rounding.

roughly the same as in 2001 Q3 (Table D). The fall was attributed by market contacts to lower investor demand for the debt of less creditworthy issuers, such as those rated single A or below. A number of lower-rated issues were withdrawn or postponed, mainly by foreign companies. In August, in particular, the bond market in sterling (as well as in other currencies) was effectively closed for all but the most creditworthy issuers. The market reopened subsequently, but investors seem to have remained selective in their willingness to take credit risk, often preferring supranational and asset-backed bonds and, for corporate borrowers, placing emphasis on transparency of management information and accounts and on an established position in more stable industries. For some companies in certain sectors, such as telecoms, media, energy and insurance, issuance remained difficult, although conditions appeared to ease towards the end of the period.

Chart 12
Spreads of sterling corporate bond yields over swap rates, by credit rating



Source: Merrill Lynch.

Consistent with increased sensitivity towards credit risk among investors, spreads of sterling corporate bond yields over swap rates generally widened over the period as a whole, and by more for lower-rated investment-grade bonds (Chart 12). This was most marked in particular industries, including autos and insurance. As credit concerns eased later in the period, spreads fell from the widest levels reached in October.

Sterling exchange rates

Between 23 August and 22 November, sterling appreciated by 1.2% against the euro, 4.0% against the dollar and 6.7% against the yen. Sterling's effective exchange rate index (ERI) increased by 2.0% (Chart 13).

Changes in the dollar-sterling and euro-sterling exchange rates were broadly consistent with relative movements in interest rates (see also Chart 7). Table E illustrates a decomposition of exchange rate movements according to the uncovered interest parity condition, which seeks to identify the role of interest rate news in explaining exchange rate moves.(1) Interest rate news

(1) The method of decomposing the uncovered interest parity condition to assess the impact of interest rate news on the exchange rate is explained in Brigden, A, Martin, B and Salmon, C (1997), 'Decomposing exchange rate movements according to the uncovered interest rate parity condition', *Bank of England Quarterly Bulletin*, November, pages 377–89.

Chart 13
Sterling exchange rates

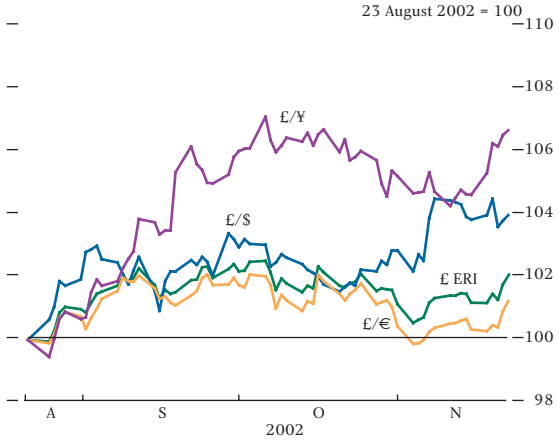


Table E
Exchange rate movements and interest rate news: 23 August to 22 November(a)

	Sterling ERI	Euro-sterling	Dollar-sterling
[A] Actual change (per cent)	2.0	1.2	4.0
[B] Interest rate news (percentage points)	0.4	0.7	0.8
of which [C] domestic	-1.8	-1.8	-1.8
[D] foreign	2.2	2.4	2.5

(a) [B] = [C] + [D]. Components may not sum exactly due to rounding. Interest rate calculations use the Bank's government liability curve. For details, see Chart 2.

here is measured as the cumulative expected return on a ten-year government bond over a ten-year horizon. In the United States and the euro area, this measure fell by more than in the United Kingdom, consistent with the direction, but not the size, of the changes in the dollar-sterling and euro-sterling exchange rates. The effect of movements in interest rates was most marked in November when the FOMC cut the fed funds target rate but the MPC and the ECB kept policy rates unchanged. Both sterling and the euro appreciated sharply against the dollar in the following days.

The high levels of volatility in international equity and interest rate markets were not matched in currency markets. Between 23 August and the end of October, actual one-month volatilities for an average of the five most traded currency pairs against the US dollar(1) fell back towards the historical lows reached in March this year (Chart 14), and implied volatilities at one-month and longer horizons also fell. Most market participants reportedly had little appetite for taking directional speculative positions, or for hedging themselves against particular directional moves, partly because of uncertainty about the consequences of a possible war with Iraq. This was reflected in the level of risk-reversals:

Chart 14
One-month implied and actual exchange rate volatility(a)

(a) For an average of the five most traded currency pairs against the US dollar.

at the end of October, risk-reversals were close to zero for most major currency pairs.(2) The depreciation of the dollar in early November was accompanied by a brief rise in implied volatilities, but they ended the period close to historically low levels.

In an environment of low and apparently falling volatility, contacts reported interest in investing in currencies that offered a higher yield—so-called 'carry trades'. The Norwegian krone was said to be the most popular of these currencies, with a short-term interest differential of more than 500 basis points over the US dollar, and it was also viewed positively as offering a hedge against rising oil prices. On 17 October the Norges Bank Governor publicly cautioned that, as Norwegian money market liquidity is not high, the 'exit' from such positions could prove disorderly should carry-trade players decide to close their positions simultaneously. Other currencies that have risen on the back of positive carry were said to have been the Australian and New Zealand dollars, and the Swedish krone. The prevalence of model-based trading—where a simple 'carry' calculation is often a key component—may have encouraged such trades.

Some market participants have ascribed sterling's 2% appreciation—at least in part—to similar factors, with some also referring to the United Kingdom being a net oil exporter. But sterling money market yields were around the average of G10 yields.

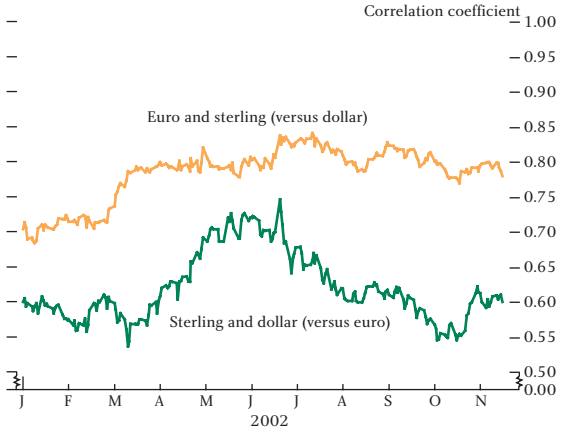
(1) As reported in the Bank for International Settlements' (BIS) *Triennial Central Bank Survey* (April 2001), the five most traded currency pairs by turnover against the dollar are the euro, the yen, sterling, the Swiss franc and the Canadian dollar.

(2) The risk-reversal is the difference in price between a 25-delta call option and a 25-delta put option. It is interpreted by some traders as a measure of market sentiment towards a particular currency relative to another currency.

Another possible explanation might be changes in market perceptions of the United Kingdom's relative short-term growth prospects. Between August and November, *Consensus* growth forecasts for the United Kingdom for 2003 were scaled down by 0.2 percentage points, compared with 0.8 percentage points for the euro area and 0.4 percentage points for the United States, and one-year ahead forecasts for sterling against the dollar and the euro were revised up.

Sterling has also been seen as somewhat independent from the US dollar and the euro and this is to some extent reflected in implied correlations, derived from options prices, of sterling with the dollar and the euro (Chart 15).(1) The one-year implied correlation of sterling with the dollar (against the euro) fell close to its lowest level since June 1999 at the end of October, but subsequently increased to end the period broadly unchanged (Chart 15). The implied correlation of sterling with the euro (based on exchange rate movements against the dollar) remained little changed.

Chart 15
One-year implied correlations



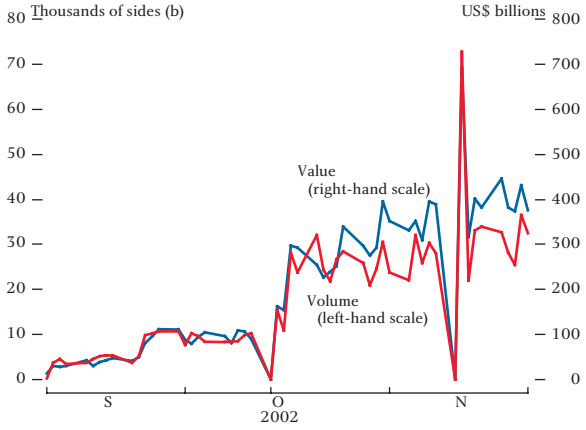
Developments in market structure

The past few months have seen further important developments in settlement arrangements for transactions in foreign exchange and UK securities, as well as work on contingency planning for London's markets.

Continuous Linked Settlement (CLS)

As described in the Autumn *Quarterly Bulletin*, CLS Bank International (CLSB) began live operations on 9 September 2002, settling foreign exchange transactions in seven major currencies, including sterling.(2) Since then, values(3) settling through CLS have risen sharply (Chart 16).

Chart 16
Daily settlement volumes and values in CLS(a)



Source: CLS Bank International.

(a) 14 October and 11 November were both US holidays, which accounts for the very low level of trades settled on those days.
(b) Each trade consists of two sides; see footnote 3 of this page.

CLSB initially placed some controls on participants in CLS in order to limit the impact of any problems during the first few weeks. These restrictions were removed on 14 October, which partly accounts for the large increase shortly thereafter (Chart 16). Since 17 October, sterling has accounted for around 12%(4) of the value of trades settled through CLS, similar to the Japanese yen. In comparison, the euro accounted for around a quarter of the value of trades and the US dollar for around a half. Over the same period, the average daily value settled through CLSB has been $339 billion. Comparing this with the Bank for International Settlements' (BIS') 2001 triennial survey of foreign exchange and over-the-counter (OTC) derivatives suggests that CLS may already settle around a quarter of the value of foreign exchange transactions undertaken by major banks, which would be a significant reduction of foreign exchange settlement risk in a short period of time.(5) By way of comparison, in October the sterling equivalent of

(1) For a discussion of implied correlations, see Butler, C and Cooper, N (1997), 'Implied exchange rate correlations and market perceptions of European Monetary Union', *Bank of England Quarterly Bulletin*, November, pages 413–23.
(2) 'Markets and operations', *Bank of England Quarterly Bulletin*, Autumn 2002, pages 257–58.
(3) Each trade consists of two sides and is recorded as such by CLSB. For example, the sale of $15 million for £10 million would, in US dollar terms, equate to two sides with a combined value of around $30 million.
(4) Since each trade consists of two sides, any one currency can account for a maximum of 50% of the overall value settled through CLS. The figure in the text is approximate, since it is not possible exactly to convert the values traded into a common currency.
(5) The latest (April 2001) BIS survey reported the average daily foreign exchange turnover of the largest market participants ('reporting dealers')—which includes all those currently settling trades through CLS—to be $689 billion in April 2001. However, CLSB data show both sides to a foreign exchange trade, whereas the BIS data are adjusted to show one leg of the trade only. Therefore to compare the two sets of data, it is necessary to halve the CLSB data.

around $330 billion was settled each day on average through CHAPS RTGS Sterling,[1] and the comparable figure for CHIPS and Fedwire's fund transfers combined during 2002 H1 was $2,833 billion.[2]

Third-party settlement began on 4 November. This permits customers (the third parties) to submit trades to their CLS settlement members, who then settle the trades through CLS. The impact of this change on total volumes settling through CLSB has been small so far, as few such third parties have chosen to begin settling trades in this way immediately—anecdote suggests that many are waiting until the beginning of 2003.

Participating banks have been required to modify their intraday liquidity management to meet CLSB's payment deadlines. The Bank has been monitoring this. So far contacts have not reported consequent liquidity pressures in sterling payment systems or money markets.

Contingency planning in London markets

CLS is designed to reduce counterparty risk in foreign exchange settlement, so underpinning the financial system's resilience. As such, it is an important part of the financial infrastructure. The events of 11 September 2001 highlighted the operational challenges that can arise if infrastructure is significantly disrupted. Since then, the UK financial sector authorities—HM Treasury, the Bank of England and the Financial Services Authority (FSA)—have established a resilience and continuity subgroup of the tripartite Standing Committee[3] to coordinate the work of the authorities and other collective bodies for the UK financial sector.[4] Strands of work have included: development of emergency contact databases; the assessment of financial firms' business contingency plans; and, in association with other groups, the establishment of a working group to review the resilience of financial sector telecoms; and work on the physical infrastructure.

In the same vein, the Sterling Money Markets Liaison Group (MMLG), chaired by the Bank, has been considering how to respond to any widespread disruption in the sterling money markets. In the event of such disruption, there may well be unexpected overdrafts and credit balances. A subgroup of the MMLG has, therefore, considered at what rate such unintended overdrafts and balances should be charged or remunerated, its recommendations being accepted by MMLG.

MMLG has recommended use of the Bank's official repo rate, which has the advantages of neutrality, of being known to all in the market, and hence of giving rapid certainty and transparency. Nonetheless, consistent with paragraph 106 of the Non-Investment Products Code,[5] the Bank would continue to have discretion to determine and publish a rate following a market-wide event of this kind, taking account of the particular circumstances. The subgroup's report and recommendations were published in October 2002 and are annexed to this article.

The Foreign Exchange Joint Standing Committee, also chaired by the Bank, has created an operations subgroup to focus specifically on technical operational issues within the foreign exchange and international money markets, including contingency planning.

Securities lending and short selling

Another market committee chaired by the Bank is the Stock Lending and Repo Committee (SLRC). Over the past year, it has discussed the relationship between securities lending and short selling, including the merits of greater transparency in these markets.[6]

Short selling is the sale of an asset, say an equity or bond, by a trader who does not own it. In order to meet their delivery obligation, the trader has to borrow the asset through the stock borrowing or repo markets. The SLRC, which guides markets standards and practices in the UK stock borrowing market, has therefore contributed to the debate about whether greater transparency in this market would provide a useful window on short selling. On 21 October the FSA published a discussion paper seeking views on possible

(1) The Clearing House Automated Payment System (CHAPS) is the United Kingdom's interbank payment system for high-value wholesale payments. It is a real time gross settlement (RTGS) system.
(2) CHIPS is the Clearing House Inter-Bank Payments System. Fedwire data are for 2002 H1. CHIPS data for 2002 year to 1 November.
(3) As described in the 1997 Memorandum of Understanding between HM Treasury, the Bank of England and the FSA, the Standing Committee meets on a monthly basis to discuss individual cases of significance and other developments relevant to financial stability. Meetings can be called at other times by one of the participating institutions if it considers there to be an issue which needs to be addressed urgently. See www.bankofengland.co.uk/financialstability/mou.htm
(4) These initiatives are described on the web site, www.financialsectorcontinuity.gov.uk
(5) Available at www.bankofengland.co.uk/markets/nipscode.pdf
(6) The minutes of the SLRC are published on the Bank's web site: www.bankofengland.co.uk/markets/

Table F
Euroclear/CRESTCo merger settlement details[a]

	Euroclear	CRESTCo	New Group
Value of securities	€130,000 bn £81,000 bn	€96,400 bn £59,900 bn	€226,000 bn £141,000 bn
Number of (pre-netted) transactions settled	161 million	74 million	235 million
Number of (netted) transactions settled	47 million	74 million	121 million
Securities held in custody	€7,900 bn £4,800 bn	€2,900 bn £1,800 bn	€10,700 bn £6,600 bn
Coverage of European equity market (Eurotop 300)			60%
Coverage of European domestic fixed-income securities outstanding			52%
Number of eligible securities	208,000	16,000	215,000
Number of domestic market links	32	3	32
Number of settlement currencies	32	3	32

Sources: Euroclear and CRESTCo.

(a) Based on year-end 2001 data.

options for increased disclosure of short selling or securities lending.(1) Neither the FSA's paper nor the SLRC have seen any case for applying constraints on, or further regulation of, short selling in the United Kingdom. However, the FSA suggested various means by which the transparency of short selling could be increased. One of these would be through publication of additional statistics on stock borrowing levels in individual UK equities and gilts by CRESTCo, which might provide a proxy for short selling activity. The deadline for comments on the FSA paper is 31 January 2003.

Merger of CREST and Euroclear

On 4 July the Boards of Euroclear and CRESTCo announced a merger proposal and, following shareholder and regulatory approval, CRESTCo became a wholly owned subsidiary of Euroclear plc on 23 September, with CRESTCo shareholders receiving a 19% stake. CRESTCo will become part of Euroclear Bank SA/NV in due course.

The new Euroclear Group provides settlement services for Belgian, Dutch, French, Irish and UK securities, as well as international bonds and a broad range of other securities (Table F).

It is intended that the Group will integrate Euroclear Bank, CREST and the other national settlement platforms into a single settlement system. By 2005, the Group aims to incorporate core functions only of each legacy system, which users will initially be able to access via existing interfaces. Customers will continue to have a choice as to the jurisdiction under which they hold securities, but in functional terms all customers will have a single securities account number for their holdings. A second phase is intended to deliver a common interface to the single settlement system and to provide various additional optional services such as custody, tri-party repo and securities lending and borrowing by 2008. Customers will be able to choose between payment in 'commercial bank money' balances (for example across the books of Euroclear Bank or of other banks) or in 'central bank money' (either directly or, as in the current CREST model, through a range of commercial settlement banks, which in turn settle in central bank—in the case of CREST, Bank of England—money). The precise details will be important to the nature and extent of payment system risk entailed in settling trades in the markets that Euroclear serves.

Reform of settlement of money market instruments

A range of money market instruments—certificates of deposit (CDs),(2) Treasury bills, commercial paper and bankers' acceptances—are still paper instruments, 'immobilised' in a depository at the Bank of England, with transfers effected by book-entries in the Central Moneymarkets Office (CMO) system, which is owned by CRESTCo. Moving to delivery-versus-payment (DVP) has for some time been on the agenda of the UK authorities for improving the safety and soundness of the UK payment and settlement systems. Unlike the CREST settlement system, CMO does not offer DVP, entailing potentially large intraday settlement exposures amongst CMO members.

Work is now progressing to enable money market instruments to be issued in non-material form and settled in the CREST system from the second half of 2003, with title evidenced by names on an electronic register (as is currently the case for gilts and corporate securities). The aim is for dematerialised equivalents of money market instruments—called eligible debt securities (EDSs)—to be issued into CREST from Summer 2003. This requires legislative amendment to the Uncertificated Securities Regulations 2001 and the amendment of legislation relating to Treasury and local authority bills. HM Treasury's aim is to have the legislation in force by mid-2003, so that the issuance of non-material securities into CREST can begin from 2003 H2. These proposals are discussed in HM Treasury's consultation document 'Modernising the settlement of money market instruments' of September 2002.

(1) Available at www.fsa.gov.uk/pubs/discussion/17/
(2) Although most CDs are already dematerialised in this system by deed of covenant and contractual arrangement.

The Bank's and CRESTCo's consultations in 1999–2000 set the general shape of the changes to CREST necessary to support the issuance and redemption of EDSs and improved collateral management facilities. This work has been followed up with more recent discussions with the market, and CRESTCo published a response to these consultations in October.(1) More work on the transitional arrangements continues.

It will be necessary for issuers of EDSs to produce terms of issuance in order to constitute the securities and to enable them to be issued into CREST. The Bank has been working on a set of standard terms with a subgroup of the MMLG and its legal advisers, and draft terms of issuance and draft explanatory notes were published on 22 November 2002.(2) Comment is requested by 20 December, and a second stage of consultation is expected in January or February 2003. The aim is to reach a market consensus by March 2003, so that issuers, issuing and paying agents, and investors can be familiar with the documentation in good time before issuance of EDSs is due to begin in late Summer 2003.

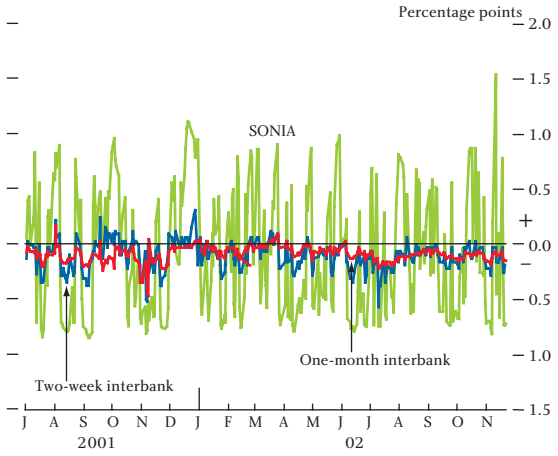
Dematerialisation will enable money market securities to be issued as fungible securities; and to be settled in real time with delivery-versus-payment, eliminating the current settlement exposures among CMO members. This would complete the programme of work, begun in the early 1990s, to reduce intraday settlement risk in the UK payment and settlement systems by introducing real-time gross settlement and DVP in central bank money.

Bank of England official operations

Over the review period, spreads of one-month CD, interbank and general collateral repo rates averaged 12, 10 and 18 basis points below the Bank of England's official repo rate respectively, compared with 11, 8 and 17 basis points in the year to 23 August. Two-week general collateral repo rates averaged 15 basis points below the Bank's repo rate compared with 16 basis points in the year to 23 August.

Overnight cash rates remained almost entirely within the ±100 basis points range around the official repo rate determined by the Bank's collateralised overnight lending and deposit facilities. The average spread between the Sterling Overnight Index Average (SONIA) and the Bank's repo rate was plus 14 basis points in August, minus 13 basis points in September, plus 9 basis points in October and minus 37 basis points from 1 to 22 November (Chart 17).(3)

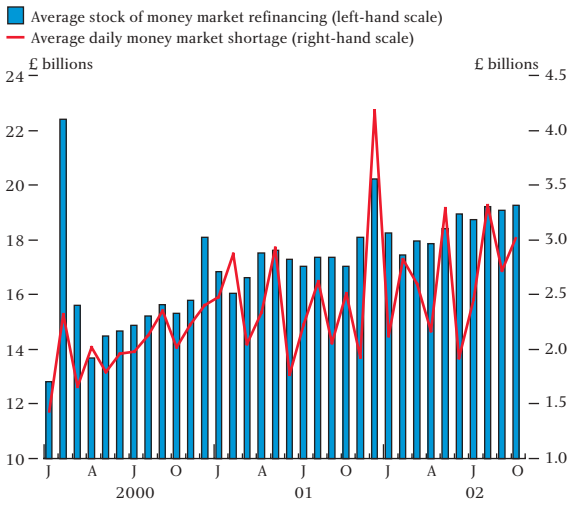
Chart 17
Spread of SONIA, two-week and one-month interbank rates over the Bank's repo rate



Open market operations

The stock of money market refinancing held on the Bank's balance sheet (which comprises the short-term assets acquired via the Bank's open market operations (OMOs)) averaged £19.2 billion in the three months to end-October (Chart 18). This was slightly higher than in the previous three-month period, consistent with the underlying growth of notes in circulation.

Chart 18
Stock of money market refinancing and daily shortages



(1) *Money market instruments in CREST: consultation response.* CRESTCo also recently published an *Enhancing CREST white book—extending repo facilities in CREST* and a further *Enhancing CREST white book—money market instruments in CREST.*
(2) Available at www.bankofengland.co.uk/markets/money/eligibledebt.pdf
(3) See also the article 'Money market operations and volatility in UK money market rates', pages 420–29 of this *Bulletin.*

During August, September and October counterparties chose to refinance 78% of the daily money market shortages at the 9.45 am and 2.30 pm rounds of operations (which largely have a two-week maturity) and 22% in the late rounds of operations, on an overnight basis (see Chart 19). As a result of the higher proportion of overnight lending, the rate of turnover of the Bank's stock of refinancing increased to once every 6.3 days (from once every 7.2 days during the previous three-month period and an average of 8.3 days since the reformed system was introduced in 1997); and the average daily money market shortage increased to just over £3 billion in the three months to end-October (Table G).

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

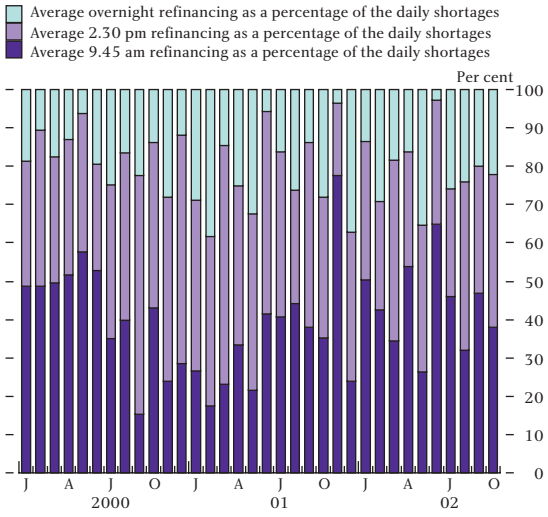


Table G
Average daily money market shortages

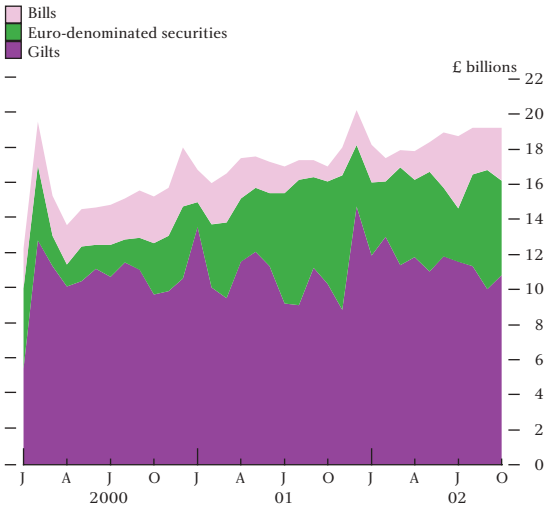
£ billions

1998	Year	1.42
1999	Year	1.20
2000	Year	2.02
2001	Year	2.48
2002	Q1	2.50
	Q2	2.50
	July	2.46
	August	3.32
	September	2.72
	October	3.00

Compared with the previous three-month period, gilts accounted for a lower proportion of the stock of collateral taken by the Bank in its OMOs in the three months to end-October, with euro-denominated securities (issued by EEA governments and supranational bodies) increasing (Chart 20).

Counterparties placed money with the Bank, under the terms of the Bank's 3.30 pm deposit facility, on three

Chart 20
Instruments used as OMO collateral



occasions during the three-month period. In order to leave the market square by close of business, the Bank increased the amount of refinancing available at the 4.20 pm late repo facility by the size of the deposits and, on each occasion, the settlement banks borrowed the full amount of refinancing available. The Bank continues to keep under review the operation of this still relatively new deposit facility, which so far has fulfilled its objective of providing a floor to the interbank overnight money market rate, and consequently other short-dated market interest rates.

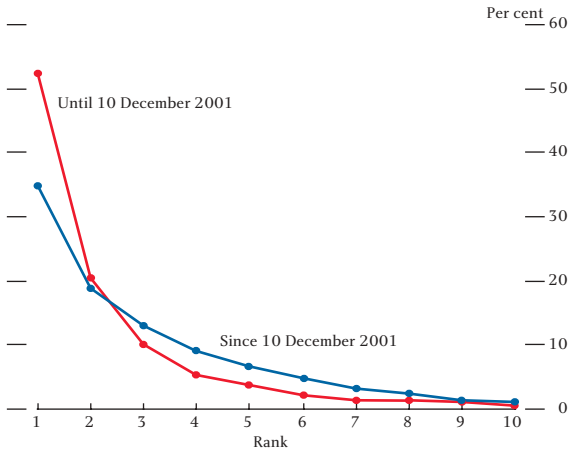
The Bank used foreign exchange swaps to lend a total of £1 billion against US dollars on 3 and 4 October, maturing on 8 and 9 October, in order to help smooth the pattern of future daily liquidity shortages.

The number of counterparties in the Bank's regular OMOs increased during the period from 17 to 18.

In its OMOs the Bank reserves the right to scale down its allotment of funds to individual counterparties. Such action may be taken to reduce what the Bank considers to be an undue concentration of its OMOs in the hands of one or more counterparties and so help ensure that access to sterling liquidity is available as smoothly as possible to a wide range of market participants. Since December 2001, the Bank has contacted individual counterparties in advance if, for this reason, they might be scaled down if they were to participate in its OMOs on the following day.

Chart 21 shows the change in concentration of counterparty shares of the stock of the Bank's refinancing since this change in December 2001. The

Chart 21
Median share of the stock of refinancing by rank



red dots show the median shares of counterparties with the *n*th largest share of the stock on each day over the period leading up to 10 December 2001. The median share of the largest counterparty on each day over this period was around a half of the stock. The blue dots show the same information for the period since 10 December 2001. The median share of the largest counterparty over this period has fallen to just over a third and the shares of the third to eighth largest counterparties have increased correspondingly. So the concentration across counterparties of the stock of refinancing has declined somewhat.

Bank of England euro issues

The Bank of England continued to hold regular monthly auctions of euro bills during the period. Each month €900 million of bills were auctioned, comprising €600 million of three-month and €300 million of six-month Bank of England euro bills. The stock of euro bills outstanding on 22 November was €3.6 billion. The auctions continued to be oversubscribed, with the issues being covered an average of 6.9 times the amount on offer; bids were accepted at average yields of between Euribor minus 10.4 and 17.2 basis points.

The Bank of England did not issue any euro notes during the period under review.

Annex

Sterling Money Markets Liaison Group Contingency Planning Rates Subgroup

Terms of reference

1. The subgroup had the following terms of reference:

   'To propose to MMLG non-binding guidelines for the interest rates that might be applied to unexpected long and short balances in the event of major market disruption or infrastructure failure.

   The proposals might be in the form of various options with pros and cons in different circumstances.

   The subgroup might helpfully review practice in other markets and note relevant past events in the sterling market.'

Background

2. Previous disruptions in UK markets included the 1987 hurricane and a Central Gilts Office interruption in early 1990. On both those occasions a rate which was in practice equal to the official policy rate had been recommended for application to consequential overdrafts and credit balances. A more recent occasion in April 2002 had been an interruption to settlement of deliveries-by-value in CREST, preventing settlement of some repo, but not unsecured, transactions. It was questionable whether this had been an event of sufficient scale to be covered by the subgroup's terms of reference, but on that occasion the Bank of England had applied the day's high and low to any settlement bank overdrafts and credit balances respectively.

3. On 11 September 2001, New York markets followed long-established New York Clearing House guidelines to apply the effective fed funds rate (plus an administration fee) for any displaced balances. In its operations the Fed switched from lending sufficient funds for banks to meet reserve balance targets to lending as much as counterparties wanted: for one week after the disaster, open market operations were in overnight repo. The Fed encouraged counterparties to make all their payments and give customers liquidity.

4. In the euro area the Federation Bancaire has agreed that EONIA +/- 25 basis points should be applied to compensation claims in respect of ordinary business. No such ground rules for compensation exist in sterling markets, but in any case the purpose of the subgroup was not to discuss undue enrichment in a day-to-day context.

5. In the Pan-EU TARGET system for euro payments a compensation scheme based on the ECB's main refinancing rate has been in operation for use when payments remain unprocessed at the end of a business day because of a malfunction (for whatever reason) of a TARGET component. The scheme is based on the principle of no undue enrichment and is cost-neutral for national central banks. There are, however, current discussions as to whether the compensation rate should be based on a market rate such as EONIA.

Discussion

6. The consensus among subgroup members was that the approaches adopted in other international markets, although of interest, were probably of more relevance in their respective domestic contexts given different money market structures and operational techniques.

7. The subgroup considered a range of scenarios—an event causing physical or electronic disruption to a significant number of key market participants or infrastructure providers, a CREST problem, a CHAPS problem or a SWIFT problem. It concluded there need be no difference between the approach applied in these various possible situations—long and short positions would result because of an inability to complete the day's business in one or more of the settlement and payment systems. The key point was that this should have market-wide consequences rather than affecting the business of one or two market participants only.

8. The view of the subgroup was that a single rate should be applied to both long and short positions arising from a large-scale disruption. Long and short positions arising from a disruption would not be deliberate, so any penalties would be arbitrary. It was also not obvious how a fair spread could be determined. The subgroup also saw no justification for the application of administration fees, it being unclear what the concept meant in

this context. And in any event administration costs tended to net out between parties.

9. The minutes of the subgroup's meeting[1] describe the various arguments for and against applying a rate based on what may have already taken place in the market prior to any disruption. In the event of a large-scale shock, it may prove to be impossible to establish any middle market rate which would be generally acceptable. The use of a SONIA-type average rate, reflecting business successfully conducted before the event, was considered but ruled out on the grounds that it was open to challenge and would probably take too long to determine, or perhaps not be possible to determine at all. The use of the previous day's SONIA was also considered, as was a long-run average of it, but these too were thought inappropriate. A rate based on quotes collected from a BBA-type panel of banks was another idea, but this also was thought to be likely to take too long and again be open to challenge. The prevailing Bank of England official repo rate was on the other hand neutral and, of course, known to all in the market. Use of the Bank's official repo rate would give rapid certainty and transparency.

Recommendations

- Following an event causing market-wide disruption to settlement of sterling money market transactions, unintended long balances should be remunerated and unintended overdrafts charged at the current Bank of England official repo rate.
- The rate to be applied to balances should be the official repo rate most recently announced by the Bank of England's Monetary Policy Committee at the close of business on the day of a disruption, following any changes announced on that day.
- Transactions agreed before any disruption occurred, including on that day, should stand at the rates at which they were struck.
- Maturing transactions, if extended because of the inability to return funds, should run on at the Bank's repo rate, not the rate applicable to the original transaction.
- Notwithstanding the subgroup's recommendations and as reflected in the NIPS code, the Bank of England would continue to have discretion to determine and publish a rate following a market-wide event of this kind. It was important to retain this flexibility given the impossibility of forecasting the circumstances at the time.
- Members of the APACS End-Of-Day Transfer Scheme have agreed to use the rate of interest published by the Bank for loans between members on the day of a disruption.
- The Wholesale Markets Brokers' Association has agreed to use the rate of interest published by the Bank as the fixing of the Sterling Overnight Index Average (SONIA) on the day of a disruption.

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(1) Available at www.bankofengland.co.uk/markets/mmlgjun02sub.pdf

What do measures of core inflation really tell us?

By Alan Mankikar and Jo Paisley of the Bank's Conjunctural Assessment and Projections Division.

Despite the widespread use of the term 'core inflation', there is neither a widely accepted theoretical definition, nor an agreed method of measuring it. The wide range of conceptual bases is potentially confusing, particularly when the measures display different trends. This article offers an overview of some of the issues. It examines how core inflation has been defined, sets out to what extent the concept might be useful for policy-makers and assesses the wide range of available measures in the United Kingdom.

Introduction

The term 'core inflation' is widely used by academics, central bankers and economic commentators. But despite its prevalence, there is neither a widely accepted theoretical definition nor an agreed method of measuring it. Bryan and Cecchetti (1993), for example, have suggested that core inflation relates to the growth rate of the money supply. Blinder (1997) identifies core inflation with the 'durable' part of inflation, while Quah and Vahey (1995) define core inflation as '…that component of measured inflation that has no medium to long-run impact on real output'. The wide range of conceptual bases is potentially confusing, and can make the resulting large number of measures of core inflation hard to interpret, particularly when they display different trends. This article sets out how core inflation might be useful to monetary policy makers and provides a conceptual and empirical evaluation of different measures of core inflation in the United Kingdom.

Core inflation and monetary policy

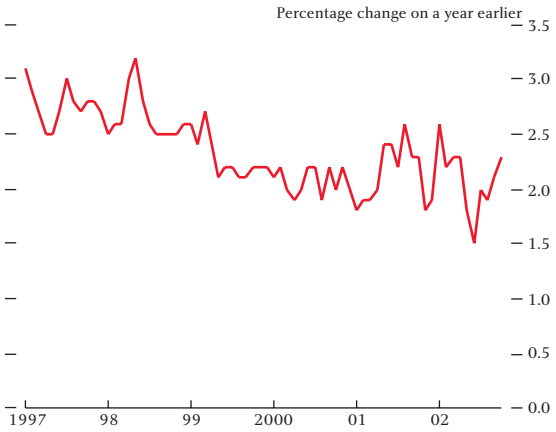
In the United Kingdom, the Monetary Policy Committee's (MPC) remit states that it must aim 'to maintain price stability, and subject to that, to support the economic policy of Her Majesty's Government, including its objectives for growth and employment'. Price stability is currently defined as keeping the annual inflation rate of the retail price index excluding mortgage interest payments (RPIX) at 2½% at all times.

To achieve its remit, the MPC needs to have an understanding of how the economy works, how shocks are transmitted and how monetary policy affects the economy. Importantly, because changes in policy affect activity and inflation with a lag, monetary policy makers need to be forward looking. Given the lags in the transmission mechanism, monetary policy can do little to affect activity and inflation in the short run, and so policy-makers are most interested in the *outlook* for inflation, typically over the one to two-year horizon where monetary policy can have most of its influence. In making judgments about the outlook for inflation, policy-makers employ a variety of economic models and monitor a wide range of economic variables and indicators, which potentially reveal information about the shocks affecting the economy.

Inflation itself is one of the numerous variables that policy-makers monitor in order to make judgments about the outlook for inflation. Chart 1 shows, however, that month-to-month movements in annual RPIX inflation can be volatile, making outturns potentially hard to interpret. A key task for policy-makers, as with all the variables that they monitor, is to read through the volatility or 'noise' in the data to extract as much information as possible.

An important question is whether an outturn for inflation—or indeed any other economic variable—changes the outlook and merits a change in policy. As Zeldes (1994) notes, 'presumably the answer depends on the persistence of the inflation innovation in the absence of any change in monetary policy'. Blinder, a former central banker, suggests that 'the name of the game was distinguishing the signal from the noise, which was often difficult. What part of each monthly observation on inflation is durable and which part is fleeting?' (Blinder (1997)). That is, when policy-makers

Chart 1
RPIX



see changes in inflation, they are interested in the 'news' for the outlook for inflation.

In making these judgments, policy-makers do not view outturns for inflation in isolation. They must understand current movements in inflation and the shocks affecting the economy in the context of the other variables that they monitor and the models of the economy that they employ. Measures of core inflation may be useful if they help policy-makers see through the 'noise' in inflation outturns and provide a better indication of underlying inflationary developments. But what do we mean by 'noise'?

What induces 'noise' in measured inflation?

There are two main reasons why annual RPIX inflation may be 'noisy'. The first is economic, while the second is a function of the focus on annual inflation rates. Both are discussed below.

Movements in relative prices and aggregate inflation

In a world with fully flexible prices and unchanged monetary policy, a shock to a particular sector (such as a change in tastes or technology) would lead to instantaneous changes in relative prices, which would, other things being equal, leave the aggregate price level, and therefore the aggregate inflation rate, unchanged.

In practice, however, movements in relative prices do affect the aggregate price level and therefore the aggregate rate of inflation, and sometimes for a considerable period. Why is this? For a start, prices are not fully flexible in the short run. This may be because of menu costs associated with changing prices, or perhaps because of staggered price-setting across firms. In these situations, a temporary wedge may open up between firms' desired and actual prices—in other words, relative prices take time to adjust. There are also more practical reasons relating to the construction of the price index, which mean that movements in relative prices can affect the aggregate price level. Consumer price indices cover only a subset of prices in the economy.(1) Relative price movements between two goods, one included in the RPI basket and the other not, would change the level and therefore the inflation rate of the RPI. Also, many consumer price indices (including the RPI) do not allow for the substitution effects that would normally follow changes in relative prices, and so are affected by relative price movements.

In theory, since relative price changes should have no long-run effect on the price level or inflation, they should not require a monetary policy response. So policy-makers would like to be able to distinguish between relative price movements and changes in prices that reflect underlying inflationary pressures. A measure of core inflation that is free from the noise induced by changes in relative prices may therefore be useful.

Interpreting changes in annual inflation rates

Inflation targets around the world are exclusively framed in terms of annual inflation rates, so that the price level in the latest month is compared with the price level twelve months earlier. Focusing on annual inflation rates is a simple way of trying to overcome the problem of seasonal price changes, ie that prices are changed at similar times each year. But while annual inflation rates are less volatile than monthly or even quarterly inflation rates, they can still be quite noisy. A one-off change in the price level, for example, will affect the annual inflation rate for a whole year before it drops out of the annual comparison. A key question when interpreting movements in the annual rate is to what extent they reflect price changes this year and/or price changes last year (so-called 'base' effects). Changes in the seasonal pattern of price changes from year to year can also induce noise into the annual rate.

The difficulty is that it is virtually impossible in real time to distinguish between price changes that contain news about inflation and those that simply reflect a change in seasonality or between those that reflect a one-off or temporary price level change. Indeed, it may only be

(1) The GDP deflator comes closer to a whole-economy price index.

some time after the event that one can be confident how to interpret a given change in an annual inflation rate. Nevertheless, measures of core inflation that attempt to smooth the volatile movements in inflation may help in this regard.

Uses of measures of core inflation

Given the 'noise' associated with measured inflation, there are two natural uses of measures of core inflation. First, they might provide a 'clean' measure of current inflation: for example, the targeted inflation rate without the 'noise' induced by relative price movements. Second, measures of core inflation might be indicative of the outlook for inflation, providing information on the likely course of the targeted rate of inflation over the next few months or so, as relative prices continue to adjust to shocks affecting the economy. This may be particularly useful since the lags in the effects of policy mean that monetary policy makers are most interested in the outlook for inflation.

Measuring core inflation

Since core inflation is unobservable, there is no 'right' answer as to how to measure it, and therefore no single agreed method. In the literature, there have been two main ways in which core inflation is measured. First, there is the statistical approach. Within this there are those that 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 is the model-based approach. These usually involve multivariate econometric analysis in which some structure has been imposed that is explicitly grounded in economic theory. They also typically incorporate some prior view about the time-series properties of inflation to help distinguish between core and non-core inflation. The measures calculated under this approach use past relationships between aggregate inflation and its determinants to distinguish movements in inflation that reflect underlying pressures from those that reflect transitory shocks.

The next sections examine a range of available measures, setting out the motivation for each and highlighting their potential limitations.

Measures based on trimming

Trimmed mean measures of core inflation are calculated by excluding a certain percentage of the largest and smallest (weighted) price changes among the components of the index—up to 50% from each tail of the distribution in the case of the (weighted) median. The trimmed mean does not require *a priori* judgment about which components to include or exclude permanently. Rather, components' price changes are included or excluded on the basis of their relative magnitudes. The trimmed mean and the weighted median for the United Kingdom are shown in Charts 2 and 3, together with RPIX inflation.

Chart 2
RPIX and trimmed mean

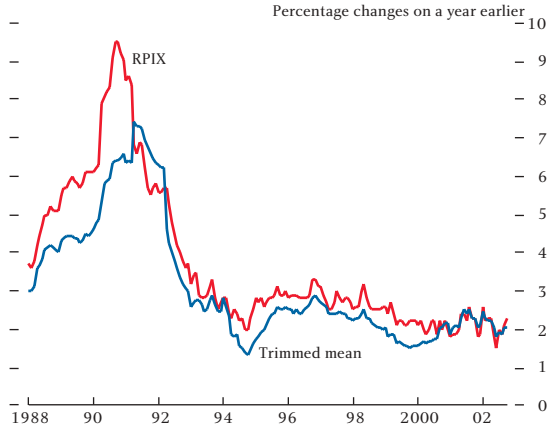
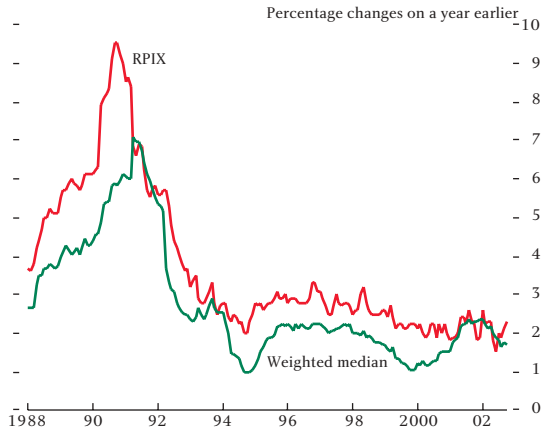


Chart 3
RPIX and weighted median



The ability of the trimmed mean to exclude relative price movements, but retain price movements associated with aggregate shocks, depends on the former being at the extremes of the price distribution. A recent UK case where trimming might have been appropriate is the outbreak of foot-and-mouth disease. A restriction on domestic meat supplies led to a sharp increase in the

retail prices of directly affected meat (eg pork, beef and lamb). These rises were unlikely to be related to underlying inflation because the source of the shock was known—a supply shock affecting primarily one sector of the economy, which would be expected to lead to an adjustment in relative prices. In this case, trimming out these sharp price increases might have provided a better indication of underlying inflation in those particular months. But the question then arises how those meat prices and other prices adjust back to their equilibrium level over the following months. If these subsequent relative price adjustments are not large enough to qualify for trimming, they would be included in the trimmed mean in the next few periods.

Though in this example trimming might not be seriously misleading, there are instances when trimming would unambiguously misinform policy-makers. For example, take an aggregate demand shock, such as an exogenous increase in world demand, which raises all firms' 'desired' prices. Say only a few firms change their prices in the first period following the shock, while the other firms leave their prices unchanged. As noted by Bakhshi and Yates (1999), trimming out the few price rises would yield a zero trimmed mean inflation rate, giving a misleading picture of underlying inflation. In this case, the information in the tails of the price distribution would be of more use to monetary policy makers than that in the centre of the distribution. Thus, knowing the source of the shock is crucial in determining whether it is wise to trim.

In practice, the validity of the trimmed mean as a measure of core inflation hinges on the premise that price fluctuations beyond some (albeit arbitrary) threshold are associated mainly with movements in relative prices and temporary price level effects. That is, these price changes must be generally larger in absolute magnitude than those price changes associated with aggregate shocks. But it is not clear that the magnitude of a price change is, in itself, necessarily a reliable signal of the cause of the shock. It seems more likely that both the trimmed mean and the excluded tails will contain a mixture of the effects of aggregate and relative price shocks. Indeed, this would be entirely consistent with theoretical arguments based on menu cost and staggered-price setting models.

An informal way of gauging the usefulness of the trimmed mean is to look at the frequency with which price changes of each of the components of RPIX are excluded in the calculation of the 15% trimmed mean measure monitored at the Bank of England.(1) Of the 21 components which are excluded more than 50% of the time between 1975 and 2002, five are seasonal food, three are non-seasonal food and two are energy. Of the other eleven, four are components whose prices are regularly heavily discounted in the January and summer sales. It may therefore be sensible to exclude their price movements in these months. This limited evidence does at least suggest that the trimmed mean in the United Kingdom has predominantly excluded those items that are most subject to shocks affecting particular sectors and to short-term volatility.

One advantage of the trimmed mean is that it is timely and can be easily computed (so people outside the central bank can easily verify the measure). But overall, given other concerns, it is unlikely that one would want to place much weight on the inflationary signals given by the trimmed mean. Furthermore, it is not clear how much of the distribution of price changes should be trimmed, so there is still a large degree of judgment needed. Some have decided this by considering how well measures with different degrees of 'trim' approximate a particular 'reference measure', with the 37-month centred moving average of inflation being a popular benchmark (see Bryan and Cecchetti (1993) for example). But it is difficult to determine whether the benchmark is sensible. One argument for using a reference measure is that it is 'smooth'. But if underlying aggregate shocks affecting the economy are not smooth, and/or the transmission of the effects of these shocks onto prices is changing, then a measure of core inflation would not be expected to be smooth either (see also the section on model-based measures).

Measures based on 'exclusion'

Some measures of core inflation are derived by permanently excluding certain components from the price index, *a priori*. In the United Kingdom, there are two prominent examples of measures of inflation in which certain items are permanently excluded. First, mortgage interest payments (MIPs) are excluded from

(1) At the Bank of England, the trimmed mean inflation rate is calculated as follows. First, one-month percentage changes of the 81 subcomponents of the RPI are calculated. They are then arranged according to their weight, to give a string of 1,000–n numbers, where n is the current weight of mortgage interest payments (MIPs). Second, these 1,000–n numbers are sorted into ascending order. Third, the smallest 15% and largest 15% from these 1,000–n numbers are excluded. Fourth, an average is taken over the remaining 0.7 * (1,000–n) numbers. This gives the one-month change in the 70% trimmed mean of RPIX. This series of one-month percentage changes is used to create an index, from which annual inflation rates can be calculated.

the all-items retail price index to give RPIX, the target measure. MIPs are excluded from the targeted measure, since otherwise changes in interest rates would have, at least in the short run, perverse effects on the targeted inflation rate. The second prominent measure of this kind is RPIY, which also excludes all indirect taxes.(1) These exclusions may be useful for monetary policy purposes. Although indirect taxes are important components of a cost-of-living index, they do not constitute 'core' inflation: changes in indirect taxes may reflect headline consumer price inflation (duties are often raised in line with the rate of RPI inflation) but are independent of the underlying inflationary process.

Other components of aggregate consumer price indices are often excluded on the grounds that their prices are considered to be too volatile—adding 'noise' to the measured inflation rate—and obscure the signal of underlying pressures in the targeted rate of inflation. Two examples of such measures for the United Kingdom are shown in Charts 4 and 5.

The case for excluding seasonal food prices is clearest. Since their supply is heavily influenced by changes in weather conditions, and given their relatively low elasticity of demand, shifts in supply can cause large changes in their prices and consequently in aggregate inflation. The argument for excluding energy prices is less clear cut. To the extent that petrol prices are driven by global oil supply conditions, this may be a valid reason for exclusion. But, it is likely that global demand conditions will also have a significant influence on the prices of these commodities, implying that energy prices contain useful information about underlying inflation.

Like the trimmed mean, an advantage of measures based on excluding components is that they are timely and easy to compute and explain. However, their downside is that they require a once-and-for-all (subjective) judgment about what the least informative price components are for estimating core inflation. And in a sense, these types of measure add little to the information set of monetary policy makers. They are just another way of representing certain components' contributions to the annual aggregate inflation rate, which are monitored as a matter of routine already in the Bank.

Chart 4
RPIX and RPIX excluding seasonal food and petrol

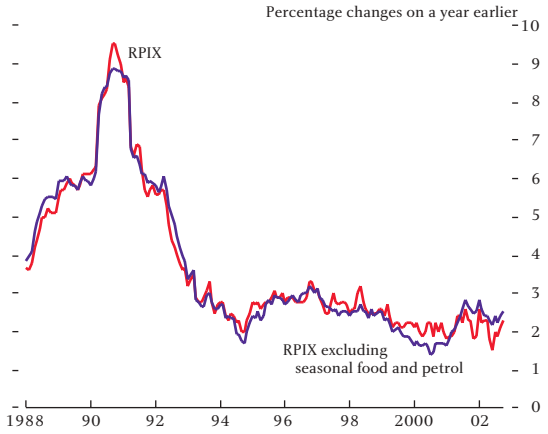


Chart 5
RPIX and RPIX excluding food, drink, petrol and tobacco

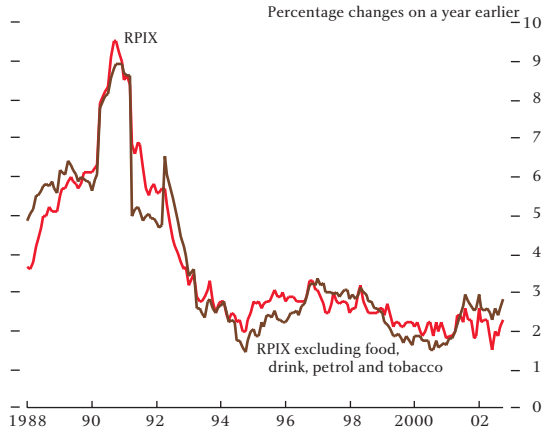
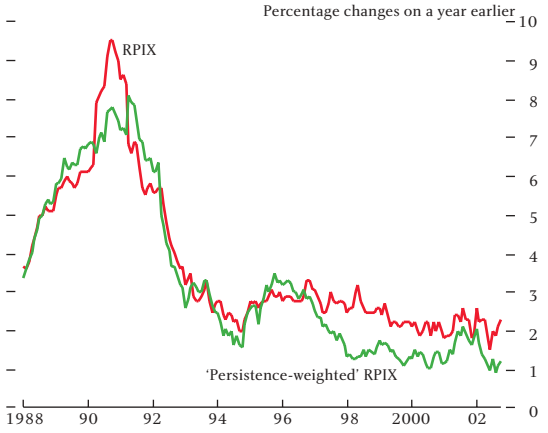


Chart 6
RPIX and 'persistence-weighted' RPIX



(1) Stripping out the effects of indirect taxes from consumer prices is not straightforward, since it involves making behavioural assumptions about the extent to which duty changes are passed on to consumers. For a description of how RPIY in the United Kingdom is constructed see Beaton and Fisher (1995).

Measures based on the whole price distribution

Other measures of core inflation use all available (disaggregated) information from the consumer price index. One such approach is to reweight the disaggregated price indices to maximise the 'signal' in the data, however that might be defined. For instance, sectors in which supply conditions are believed to be relatively important in determining prices might have their weights reduced, whereas prices in the remaining sectors would be assigned higher weights. Some authors have argued for components to be weighted according to the inverse of their volatility.

Blinder (1997) identifies 'core' inflation with the 'durable' part of inflation. In trying to estimate this component, he advocates constructing an index by weighting together individual price changes 'according to their usefulness in forecasting future inflation'. This idea is operationalised for the United Kingdom by Cutler (2001), who reweights the components of RPIX according to the 'persistence' of their annual inflation rates. The weights are obtained by estimating coefficients in a first-order autoregressive model for each component of RPIX in order to derive a 'persistence-weighted' RPIX measure (ie components with a more 'persistent' annual inflation rate are given a higher weight).

Bryan and Cecchetti (1993) adopt an alternative approach based on dynamic factor analysis. They assume that individual inflation series share a component that is subject to common disturbances. The disturbance to the common inflation component is assumed to be uncorrelated with idiosyncratic (or relative) price shocks, either contemporaneously or serially, at all leads and lags. In the core inflation measure, prices are weighted according to their determination by common, as opposed to idiosyncratic, shocks rather than by expenditure weights. Underlying this particular approach is the view that some price changes are driven primarily by supply disturbances that are uncorrelated with the persistent or general tendency of inflation.

One concern with the reliability of measures based purely on statistical criteria is that they may be vulnerable to the Lucas critique. For example, in 'persistence-weighted' RPIX, the coefficients in component price autoregressions will depend in part on past policy. If future policy were to take into account such weights, the weights would change, and the measure would become misleading. Problems with the stability of these types of measures would be more acute when the economy is undergoing significant structural change and, as in the United Kingdom, when the definitions and classifications of the subcomponents of the RPI change.(1) Another more general problem with any particular reweighted price index is that its inflation rate can have a different trend to that of the target measure, depending on the relative trends in the individual reweighted price series. If so, these types of core measure will exclude not only temporary disturbances to inflation but also a part of trend inflation.(2)

Model-based approaches

Model-based approaches are attractive in that they are multivariate and use econometric techniques, in which some structure is imposed explicitly, grounded in economic theory. They typically derive measures of core inflation from aggregate inflation data and tend to rely on some prior belief about the time-series properties of core inflation—for example, how cyclical the measures should be. The difficulty with discriminating between them is that they are all based on slightly different definitions.

Eckstein (1981) is commonly attributed with the original definition of core inflation, which he identified as '…the trend increase of the cost of the factors of production'. This '…originates in the long-term expectations of inflation in the minds of households and businesses, in the contractual arrangements which sustain the wage-price momentum, and in the tax system'.

The definition used by Quah and Vahey (1995) is that core inflation is ' …that component of measured inflation that has no medium to long-term impact on real output'.(3) The non-core element is essentially unanticipated inflation—and this is the component of measured inflation that does have a medium to long-run

(1) Redefinition of price series, through reweighting at low levels of aggregation, recategorisation of particular prices, or the addition/removal of various prices, means that the time-series properties of particular RPI components may change markedly.
(2) Treatment of 'non-market' prices, such as utility prices, is also problematic. These prices show persistent, non-cyclical trends together with infrequent (typically annual) jumps.
(3) A shock that raises output permanently (and so raises actual and potential output) is assumed to have no long-run effect on inflation.

impact on output.(1) This definition clearly hinges on how one defines 'medium to long run' as opposed to short run. Quah and Vahey are trying to capture inflationary pressures that feed into or reflect inflation expectations. With a vertical long-run Phillips curve, these are aggregate demand shocks, and inflation is neutral in its effects on the real economy in the long run. The remainder is the part of inflation caused by shocks that have a permanent effect on output (ie aggregate supply shocks).

The two definitions seem to differ according to the effect of cyclical influences on core inflation. In Eckstein's world, core inflation should not be cyclical; in Quah/Vahey's world, core inflation should be strongly correlated with output in the short run. Roger (1998) suggests that we should not overdo the differences: the difference between a transient influence on inflation and cyclical and long-term influences is an artificial construct. This distinction should really be drawn in reference to the policy-maker's horizon. If the policy-maker is focusing on the medium run, then the Quah/Vahey definition is appropriate. If the policy horizon is longer, then Eckstein's definition may be more relevant.

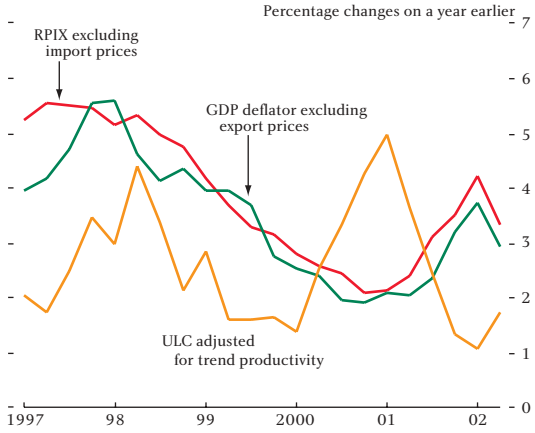
One attraction of the model-based approach is that the measures are more deeply based on economic theory. They also benefit from being the product of multivariate analysis, in that they use non-price variables in calculating core inflation. The downside, however, is that the restrictions imposed are rarely uncontroversial. These models are also sensitive to their exact specification and identification scheme. For example, Folkertsma and Hubrich (2000) suggest that at least five different SVAR models have been proposed in the literature. These use different variables, and therefore identification schemes, which result in different estimates of core inflation. This non-robustness to the precise specification of the model is a limitation to their practical and routine use by policy-makers.

Domestically generated inflation

Domestically generated inflation (DGI) may be viewed as a particular type of core inflation measure that aims to exclude the one-off price level effects of external shocks on the aggregate rate of inflation. Since RPIX inflation is a weighted average of DGI and imported inflation, DGI may be useful in providing information on the pressure being exerted on prices by domestic conditions. The effects of an external shock on actual inflation will be temporary though it may be hard to know the extent and duration of such effects. Once the effects have worked through the economy, inflation should revert to DGI. If DGI had strong inertia then it would be a leading indicator of actual inflation during an external shock.

There is no unique definition of DGI, and so no single way of measuring it. It could be model or statistically based. At the Bank of England, three measures of DGI are constructed and monitored: the GDP deflator excluding export prices; RPIX excluding import prices; and a measure based on unit labour costs (ULC). These are shown in Chart 7. Even if the conceptual basis for DGI is attractive, there are some practical concerns about how well the measures of DGI achieve their objective. First, the measures are only likely to strip out the direct, but not the indirect effects of external shocks, which should ideally be excluded as well. Second, the measures are sensitive to the precise assumptions underlying their construction. Third, and perhaps most worryingly, the different measures have shown very different trends over the past couple of years.

Chart 7
Measures of domestically generated inflation



Evaluating measures of core inflation

There are several ways in which we might assess the usefulness of measures of core inflation. In the

(1) Quah and Vahey estimate a structural vector autoregressive (SVAR) model containing RPI inflation and output, on which they impose long-run identifying restrictions. But in their model the level of core inflation is not determined—since their VAR consists of just output and inflation, there is no nominal anchor. Blix (1995) adds money to the Quah/Vahey two-variable VAR. In this case, the system is identified by assuming that changes in the level of the money stock, rather than changes in the growth rate of money, are output neutral in the long run. But the precise nature of identifying restrictions and the data used will affect the estimates of SVARS.

literature, many have put forward properties that they believe measures of core inflation should ideally possess. Roger (1998), for instance, suggests that measures of core inflation should be timely, credible, verifiable and easily understood by the public. In addition, Wynne (1999) argues that measures of core inflation should be computable in real time, forward looking in some sense, have a track record and have an economic theoretical basis.

And though it may be helpful for measures of core inflation to possess some of these properties, a more useful method of evaluation is to assess how well the measures achieve what they were constructed to do. As already highlighted, one potential use of measures of core inflation is to provide information on the outlook for inflation. The following sections, use a cointegration framework to try to determine which measures of core inflation in the United Kingdom are most informative about the future short-term path of annual RPIX inflation.

If a measure of core inflation does not cointegrate with RPIX inflation, then the two series will diverge over time, meaning that movements in that measure of core inflation will not be informative about the future path of RPIX inflation.(1) At the same time, the presence of cointegration does not eliminate the possibility that the two may diverge for considerable periods of time. If the period of adjustment is longer than the policy-maker's horizon, typically one to two years, then cointegration itself is not sufficient to render a measure of core inflation useful.

The next section sets out some tests proposed by Marques *et al* (2000) that measures of core inflation should satisfy, if they are to be useful in providing forward-looking information about the targeted rate of inflation. Like the measures of core inflation themselves, the tests are not without their problems as discussed below. The following section applies the tests to the available measures of core inflation in the United Kingdom, before drawing inferences from the results.

Tests proposed by Marques *et al* (2000)

Marques *et al* (2000) propose the following testable conditions when the targeted and candidate core inflation rates are found to be non-stationary:

(i) Targeted (π_t) and core inflation (π_t^*) should be cointegrated with a unit coefficient.
(ii) Core inflation should be an 'attractor' of targeted inflation.
(iii) Targeted inflation should not be an 'attractor' of core inflation (ie core inflation should be strongly exogenous).

The attraction of the tests is that they attempt to formalise the relationship between targeted and core inflation by exploiting information contained in the differential between the two. The conditions essentially imply that the targeted rate of inflation should converge to core inflation in the long run, but not *vice versa*. The first condition ensures that core inflation and the targeted rate of inflation move one-for-one in the long run, and that the impact of relative price movements on the targeted inflation rate should have a zero mean once all relative prices have adjusted. A unit coefficient on core inflation ensures that targeted and core inflation do not display a permanently diverging trend. If this were not the case, it would suggest that the measure of core inflation was not fully capturing some part of the trend rate of inflation. Also, it would make it harder for the central bank to use the measure of core inflation in its communication of its actions to the public.

The second condition formalises the assumption that the targeted rate of inflation converges to core inflation in the long run, or to use Marques *et al*'s terminology, core inflation should be an 'attractor' of the targeted rate of inflation. If condition (ii) holds, then when π_t is above (below) π_t^*, π_t will at some point decrease (increase) and converge to π_t^*. The third condition says that core inflation should not converge to targeted inflation. If it did, it would be extremely difficult to infer anything about the future path of targeted inflation by looking at core inflation, as the relationship would run both ways.

How do measures of core inflation in the United Kingdom perform in the tests?

The key results for a range of measures of core inflation for the United Kingdom are shown in Table A.

The results are mixed. Only three of the measures of core inflation pass all three tests: RPIX excluding seasonal food and petrol, RPIX excluding food, alcohol,

(1) Cointegration techniques should only be applicable to series that are I(1). The use of cointegration tests to evaluate measures of core inflation is valid, at least statistically, because RPIX inflation and the measures themselves are found to be I(1) in standard unit root tests. The finding that RPIX inflation and the various measures of core inflation are not I(0) is not that surprising given that inflation has fallen over the sample period of the tests.

Table A
Replicating Marques *et al* tests for measures of core inflation in the United Kingdom[a]

	Condition (i)		Condition (ii)	Condition (iii)
	($\pi_t - \pi_t^*$) stationary	…and mean zero	Core inflation (π^*) should be an 'attractor' of targeted inflation (π)	Targeted inflation (π) should not be an attractor of core inflation (π^*)
RPIX excluding food	✔	✘	✔	✘
RPIX excluding seasonal food	✔	✘	✔	✘
RPIX excluding food and fuel	✔	✘	✘	✘
RPIX excluding food, alcohol, tobacco and petrol	✔	✔	✔	✔
RPIX excluding seasonal food and petrol	✔	✔	✔	✔
Trimmed mean	✔	✘	✘	✘
Weighted median	✔	✘	✘	✘
'Persistence-weighted' RPIX	✔	✘	✔	✔
'Quah and Vahey' measure	✔	✘	✔	✔
RPIY	✔	✘	✔	✔
DGI: RPIX excluding import prices	✔	✘	✘	✘
DGI: ULC measure	✔	✔	✔	✔
DGI: GDP deflator excluding export prices	✔	✘	✔	✘

n.a. = not available.

(a) A tick indicates that a measure passes the test at the 10% significance level.

tobacco and petrol, and the DGI measure based on ULC.

How should these results be interpreted? On the face of it, they suggest that RPIX excluding seasonal food and petrol and RPIX excluding food, alcohol, tobacco and petrol are potentially the two most useful measures of core inflation. However, care needs to be taken in interpreting the results. For a start, there are some problems with the tests.

In particular, the regressions in the tests are reduced-form representations of the inflation process and the results will therefore be affected by past monetary policy. The following argument highlights the problem. Suppose the target for monetary policy was to keep annual RPIX inflation to some prescribed path, for example 2.5% at all times. And suppose that, over the sample period, policy had been used actively, and set optimally to achieve the target. Then, RPIX inflation would simply follow the prescribed path, save perhaps some unavoidable and unforecastable error. If we were to perform Marques *et al*'s tests on a measure of core inflation, it would fail conditions (ii) and (iii). That is, RPIX inflation would not be attracted to the measure of core inflation since it follows the exogenously prescribed path, but core inflation would be attracted to RPIX inflation.[1] This finding would cause us to reject this measure of core inflation as useful in providing forward-looking information about the future path of RPIX inflation, even though it might well be useful in setting policy. Thus, failure in the tests does not necessarily mean that a measure of core inflation is not informative—it may just be that the effects of past policy mean that Marques *et al*'s tests do not help in making that judgment.

But even if the results of the tests were not affected by the policy followed over the sample period, there still may be problems. For example, condition (iii) implies that lagged inflation contains no information about core inflation, which led Marques *et al* to reject a large number of measures of core inflation in Portugal. But there is a risk that this is overly stringent. There may be circumstances when core inflation might lag targeted inflation: for example, when movements in relative prices (temporarily) affect the aggregate inflation rate and inflation expectations. In this case, targeted inflation might lead core inflation to the extent that monetary policy is accommodative in allowing the relative price movements to affect inflation expectations.

Indeed, because the differential between targeted and core inflation is likely to be some function of the stance of monetary policy, at least in the short run, the tests may be vulnerable to the Lucas critique. That is, if policy were to be based on some estimated relationship between core and targeted inflation, that relationship may change and become misleading as a guide to the future.

The tests put forward by Marques *et al* seem attractive and may be indicative of the relative usefulness of different measures of core inflation. However, the problems with the tests outlined above mean that the results are in no way conclusive, like the measures themselves.

So how useful are measures of core inflation? Bearing in mind what information each type of indicator is best at providing, it can be valuable to look at a range of measures. Measures of core inflation can then provide a different perspective on the inflationary process in the context of the other variables that policy-makers monitor.

(1) The Granger representation theorem implies that if two series are cointegrated, then one of them at most is strongly exogenous.

Conclusion

When policy-makers see a change in measured inflation, a key question is how much news there is for the outlook for inflation. Does it reflect movements in the fundamental determinants of inflation? How persistent is the change likely to be? Measures of core inflation are potentially useful in answering these questions, but as summary statistics, they are no substitute for understanding the sources of shocks affecting the economy and how these are likely to evolve over the future. Moreover, the large number of available measures, based on a wide range of different conceptual bases, is potentially confusing.

A compromise conclusion on the usefulness of measures of core inflation is provided by Hogan *et al* (2001) who suggest, in the Canadian context, that each one can provide a different insight into the inflation process. As this article has also found, no single measure performs well across the board. Hogan *et al* suggest that there can be value in looking at a range of measures, as long as it is clear 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 they are providing a reliable guide to inflationary pressures. It is when the measures start to display different trends that they need to take a much closer look at the reasons behind those divergences.

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Estimating the impact of changes in employers' National Insurance Contributions on wages, prices and employment

By Brian Bell, Jerry Jones and Jonathan Thomas of the Bank's Structural Economic Analysis Division.

This article explains how changes in payroll taxes might affect real wages and employment. It then estimates the responses of relative wages, prices and employment to the changes in employers' National Insurance Contributions (NICs) that occurred in 1999. The empirical evidence is based on industry-level data and exploits valuable variation in the extent to which these changes in the payroll tax affected different industries.

Introduction

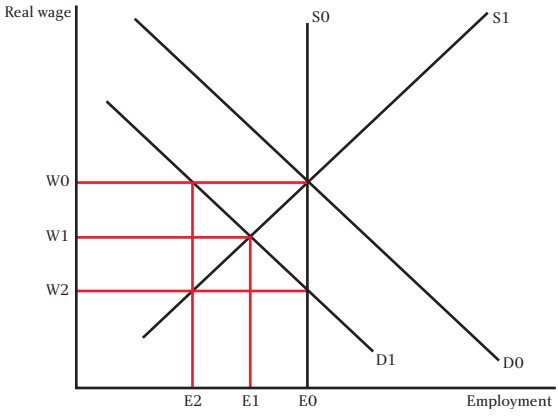
In the 2002 Budget the Chancellor announced that the NICs of both employers and employees would rise by 1 percentage point in April 2003. Employers' NICs will rise from 10% to 11% on all workers whose weekly pay exceeds the lower earnings limit (LEL) and employee contributions will rise from 11.8% to 12.8%. Unlike previous rises, the increase in the employee rate of 1 percentage point will be levied not only on earnings between the lower and upper earnings limit (UEL), but also on all pay above the lower threshold.(1) There is considerable uncertainty as to what the impact of these changes will be on wages, prices and employment.

This article explores the impact of changes in employers' NICs from a previous episode. The NICs reforms, in 1999, were designed to be revenue neutral. They also had a neutral effect on the aggregate wage bill. Consequently, their implications for aggregate prices and wages are likely to have been negligible; any resulting movements in wages and prices are likely to have been relative changes. In contrast, the 2003 reforms are designed to raise additional revenue. Because most firms will be affected, firms and workers may be more likely to assume that wages and prices can be increased (at least partially) without affecting relative wages and prices. To that extent, evidence from the 1999 changes may not allow us to draw robust inferences about the likely impacts of the 2003 reforms, particularly for the pass-through onto nominal wages and prices. Nevertheless, the 1999 changes are informative and may provide insight into the mechanisms that are likely to be at work.

The wage and employment implications of changes in NICs

What are the effects of changes in NICs? Standard public finance theory tells us that it is irrelevant which side of the market a tax is levied on. The ultimate incidence of a payroll tax depends on the elasticities of the supply of and the demand for labour, not on whether the tax is levied on employees or employers. A simple illustration of the impact of a payroll tax on employment and wages is given in Chart 1. The horizontal axis measures the level of employment whereas the vertical axis measures the real consumption wage. The downward-sloping curve, D0 is the initial demand for labour. The chart shows two possible labour

Chart 1
The supply of and demand for labour with payroll taxes



(1) For 2002–03, the LEL is £75 per week and the UEL is £585 per week.

supply curves. S1 is an upward-sloping supply curve implying that more labour is supplied as the real wage rises. In contrast, S0 is a vertical labour supply curve implying that a fixed quantity of labour is supplied irrespective of the real wage.

A payroll tax levied on a firm reduces the demand for labour by raising the after-tax cost of workers. Consequently the demand curve shifts inwards to D1. The resulting impact on real wages and employment depends on the slope of the labour supply curve. If labour supply is inelastic, the real wage falls from W0 to W2, which is equal to the full amount of the tax. In this case employment remains constant and workers bear the full tax burden. In contrast, if supply is somewhat elastic, the real wage only drops from W0 to W1 and employment now falls from E0 to E1. In this case the impact of the tax is shared between workers and firms.

So far we have only considered long-run outcomes. In the short run, it is possible that workers will resist attempts by firms to shift the tax onto them ('real wage resistance'). Suppose workers are initially successful at resisting any reduction in the real wage. While the wage remains at W0, firms will still want employment determined by the new labour demand curve, D1. Hence employment falls to E2. The accompanying rise in unemployment puts downward pressure on real wages, which eventually absorb the full tax rise, and both unemployment and employment move back to their long-run levels.(1)

There has been a sizable body of empirical research into the employment and wage effects of payroll taxes. This literature is summarised by Nickell and Layard (1999). One problem the studies face is that it is very difficult to isolate the causal effect of tax changes on wages and employment because other factors are changing at the same time. Nonetheless, the findings suggest that, in the long run, wages absorb the changes in payroll taxes. Nickell and Layard (1999) conclude that there may be small long-run effects on employment but they emphasise that the results are fragile.

The response of real wages to payroll tax changes can in principle be broken down into nominal wage changes and price changes. Suppose a 1 percentage point increase in payroll taxes is entirely borne by workers, so real wage growth falls by 1 percentage point. This could be achieved by a 1 percentage point drop in nominal wage growth or by a 1 percentage point rise in price increases—or any combination in between. The extent to which nominal wages or prices are used to achieve a given real wage adjustment will depend upon the relative extent of nominal rigidities in wages and prices, worker bargaining power, and the competitive pressures facing the firm.(2) Whereas previous empirical work has explored the effect of changes in payroll taxes in the context of models of nominal wages and prices, these models have generally ignored the relative movements between the two. Moreover, this research has been based on time-series models which are unlikely to provide robust estimates.(3)

The 1999 NIC changes

This article intends to exploit a previous change in employers' NICs to estimate the response of employment, nominal wages and prices to payroll tax changes. The changes to employers' NICs in 1999 were the most recent reforms of the tax. They were also the first reform of National Insurance since the Bank of England was given operational independence for setting interest rates, which may be relevant to the extent that employer responses to the tax changes depend on how the monetary authority is expected to behave. The main adjustments, which were revenue neutral, were:

- the replacement of a stepped payment schedule (with rates of 3%, 5%, 7% and 10%) with a single contribution rate of 12.2%;
- payments to be levied on employee earnings above the lower earnings limit (LEL), rather than on all earnings, provided the employee earned above the LEL; and
- the effective LEL was raised from £64 per week to £81 per week.(4)

(1) Although this discussion considers employment in heads, it may also be instructive to think of employment in hours. If firms find it easier to adjust work hours rather than heads then it is possible that hours might be more sensitive to payroll tax changes. This issue is explored in the empirical analysis.
(2) For example, firms in the traded goods sector are more likely to face constraints on their ability to raise prices than those in the non-traded goods sector.
(3) Poterba, Rotemberg and Summers (1986) use the responsiveness of nominal wages and prices to changes in the tax structure as a way of testing for nominal rigidities.
(4) The effective LEL and the actual LEL differ because the first part of earnings above the actual LEL is subject to NICs at a zero rate. In practice this simply moves the effective LEL to a higher starting point.

These reforms were aimed at reducing the cost of employing low-paid workers. During his 1998 Budget speech, the Chancellor argued that 'with these changes, we are cutting the costs to business of employing 13 million of our lower-paid employees'. It was expected that raising the level at which employers would pay no payroll tax on employees to £81 per week would be a particular spur to low-wage job creation, supported by the elimination of payments on the first £81 for higher-paid workers. However, these impacts would have been countered to some extent by the replacement of the stepped payment schedule with a single rate of 12.2%.

Method and data

This article's approach to estimating the effects of NIC changes on wages, prices and employment broadly follows that of Gruber (1997), who examined the effect of a change in payroll taxes in Chile that reduced the average tax rate from 30% to 5% over a six-year period. Gruber's study used data on a sample of manufacturing plants which allowed him to create payroll tax rates for each firm by dividing total tax payments by wages. He then modelled the change in wages and employment at a given plant following the policy change as a function of the change in the average tax rate for the plant. The findings indicated that payroll taxes affected real consumption wages, with little impact on employment. Unlike Gruber's approach, the analysis here is based upon industry-level data rather than data at plant level, but otherwise the method is the same.

The following regression for industry i at time t is estimated:

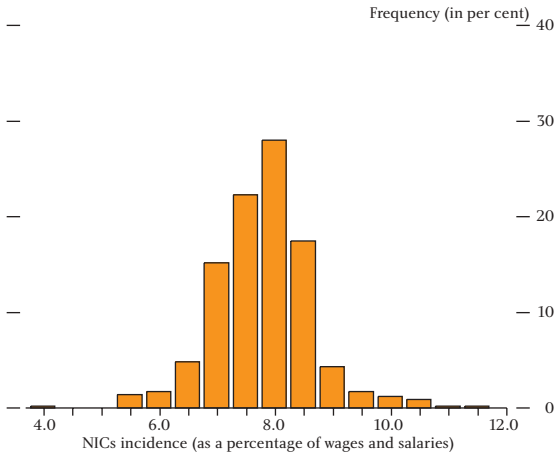
$$\Delta y_{it} = \alpha + \beta \Delta NIC_{it} + \varepsilon_{it} \qquad (1)$$

where Δy_{it} is the percentage change in the dependent variable (eg average industry employment, average industry wage, and average industry price), ΔNIC_{it} is the corresponding percentage point change in the NICs share of total wages and salaries and ε_{it} is an error term. The key idea is that the share of workers whose weekly pay lies below the NIC threshold varies considerably across industries. This variation can be used to identify the movements of wages, prices, and employment following a change in employers' NICs (see the box on page 387).

In estimating equation (1), data from the Annual Business Inquiry (ABI) are used. The ABI is an annual survey that covers around 70,000 UK businesses that are registered for Value Added Tax (VAT) and/or Pay as You Earn (PAYE). In its current form, the ABI has been running since 1998 and covers around 85% of all businesses. Survey variables include turnover, employment (full-time and part-time), labour costs, wages and salaries, and social security contributions. Social security contributions can be split into employer NICs and other costs (mainly contributions to pension schemes). Hence by dividing NIC payments by total wages and salaries, industry-level estimates of the incidence of payroll taxes can be obtained. For the manufacturing sector only, the ABI data can be supplemented with producer price indices obtained from Business Monitor. These are matched at the 2, 3 and the 4-digit level, giving around 200 industries with both price and wage data. To assess the impact of NICs changes on working time, matched data on average working hours across industries are used from the 1998–2000 waves of the New Earnings Survey (NES).

The incidence of NICs differs across industries due to variations in the proportion of workers who are below the LEL. Chart 2 shows the 1998 frequency distribution of NICs incidence as a percentage of the paybill across the 579 industries for which information is available. Those industries in the lower tail of the distribution tend to be those with a relatively high share of part-time workers, such as retail stores, hotels and restaurants. Industries in the upper tail are far more heterogeneous, and include manufacturing sectors with very few part-timers, and professional services such as finance.

Chart 2
NICs incidence across industries in 1998 (pre-1999 reforms)



The difference-in-difference method

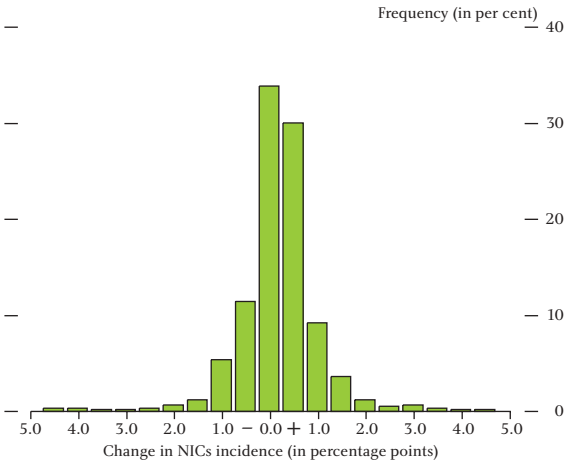
Since economics is not a natural science, we are unable to conduct controlled random experiments in order to estimate the impact of policy changes on variables of interest. If payroll tax rates could be randomly distributed across the population, it would be easy to identify the effect on wages and employment, by simply comparing the outcomes for those with different tax rates. As an alternative, the natural experiment approach considers the policy reform itself as an experiment and tries to find a control group that has little or no exposure to the reform. The method, of which the equation in the text is an example, is often called 'difference in differences', as it is estimated by comparing the difference in average behaviour before and after the reform for the eligible group with that for the control group (see Blundell and Costa-Dias (2000)).

Under certain assumptions, this method measures the average effect of the policy reform on those exposed to it. It does so by removing unobservable individual effects and common macro effects. It relies, however, on two crucial assumptions regarding these effects. These are: (i) macro effects are common across groups; and (ii) unobserved temporary individual-specific components are absent. The first assumption requires a macro shock to have similar impacts on both the treatment and control groups.(1) The second assumption requires that, at the time of the policy reform, there are no other events occuring that have different impacts on the treatment and the control groups. The strength of the approach is that it does not require any of the exclusion restrictions commonly adopted when estimating the impact of a policy reform, nor does it require assumptions on the exact data-generating process.

(1) A solution to this problem was proposed by Bell, Blundell and Van Reenen (1999), which requires a differential adjustment of the treatment and control group using a previous macro event.

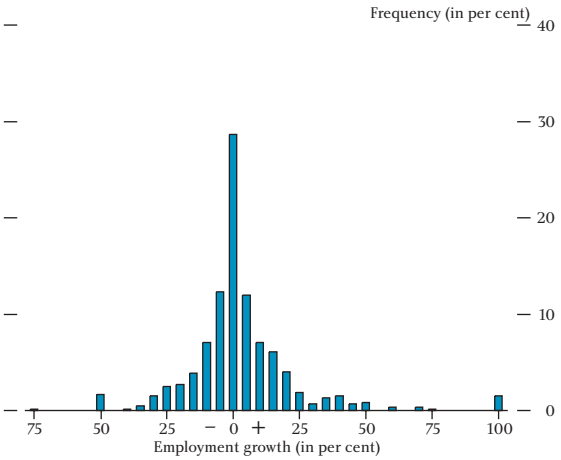
Chart 3 shows the frequency distribution of the percentage point change in NICs incidence following the 1999 reforms. On average, there was no change in NIC payments as a proportion of wages and salaries, reflecting the fact that the reforms were revenue neutral. But the actual changes ranged from a decline of around 4 percentage points to a rise of 5 points in the NICs share. Around 33% of all industries experienced no change whatsoever.

Chart 3
1998–99 change in NICs incidence



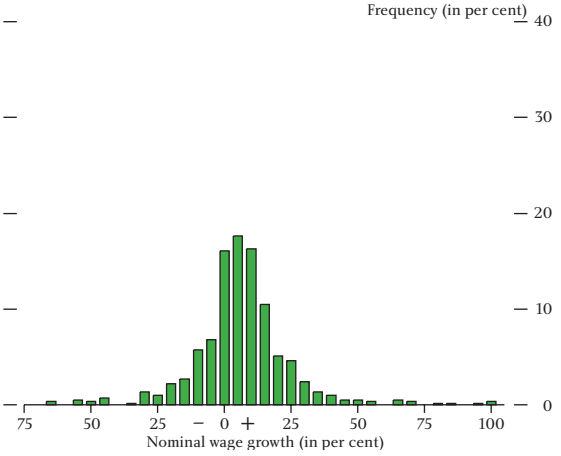
In the wage (price) regressions, the dependent variable in equation **(1)** is the growth rate of the average industry wages (prices) over 1998–99. Employment averages for these years are unavailable, so we use the growth rate of industry employment between December 1998 and December 1999. The ABI employment figures are rounded to the nearest thousand. Consequently, there is considerable scope for measurement error when constructing the employment growth rates. For example, if an industry employed 4,499 workers in December 1998 this would be reported as 4,000. If employment increased to 4,501 in 1999 this would be reported as 5,000, implying employment growth of 25% which would be incorrect. Since the nominal and real wage data are calculated on a per head basis, these would also be contaminated by the same measurement error. To avoid this measurement error, those observations where employment changed by more than ±5% are excluded. Those observations where nominal wages fell by more than 10% or rose by more than 20% are also excluded (Nickell and Quintini (2001)). A similar restriction was imposed in the real wage regressions. Other exclusions did not appreciably affect the results. Charts 4–6 show the distribution of employment, nominal wage and producer price growth between 1998 and 1999.

Chart 4
Distribution of 1998–99 employment growth



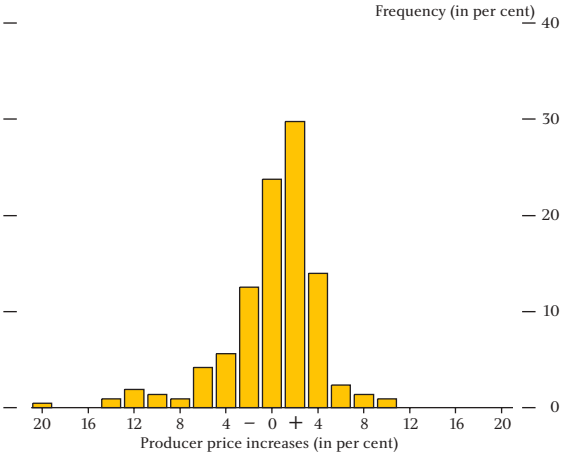
Note: There are three observations where the change in employment exceeds 100%. These are not shown in the histogram.

Chart 5
Distribution of 1998–99 nominal wage growth



Note: There is one observation where the change in nominal wage exceeds 100%. This is not shown in the histogram.

Chart 6
Distribution of 1998–99 producer price increases



Results

Table A provides a summary of the main regression results. All the point estimates shown can be interpreted as the percentage point impact of a 1 percentage point change in the share of NICs in total labour costs on the dependent variable in question.

Table A
Impact of change in NICs' labour cost share

	Impact	Standard error	Sample size
Nominal wage growth	-1.44	0.62	405
Producer price increases	1.28	0.60	209
Real producer wage growth	-1.07	1.55	156
Employment growth	0.46	0.31	222
Average hours	-0.26	0.09	213

The relative wage and price effects of the NICs change are shown in the first and second rows respectively. Both wage and price effects are statistically significant. A 1 percentage point rise in the NICs share is predicted to reduce nominal pay growth by around 1.4 percentage points after a year, while producer prices in the manufacturing sector rise by around 1.3 percentage points.(1)

For the manufacturing sector, the impact on real producer wages can be estimated. The third row shows that real wage growth in manufacturing declines by 1.1 percentage points. While the hypothesis that the tax rise is fully passed on to real wages cannot be rejected, it should be noted that the estimate is very imprecise. Consequently this result is best interpreted as supporting the evidence from the first two rows in Table A that both nominal wages and prices move in the direction of reducing real wages.(2)

The fourth row indicates that, across a range of sectors, a 1 percentage point rise in the NICs share leads to a rise in employment growth of 0.5 percentage points, but the effect is statistically insignificant. There are several possible explanations for the lack of evidence of a decline in employment. If employment reacts quickly to shifts in the structure of labour costs, then the results may be picking up the long-run adjustment of employment back to its initial level. Although it is impossible to test the validity of this hypothesis, some support for full real wage adjustment comes from the evidence (discussed above) suggesting that the full

(1) Results using NES data on nominal wages per hour to examine the impact of NICs changes on nominal pay growth were similar.
(2) The observant reader will note that the estimated impact on the real wage is not equal to the estimated effect on nominal wages minus the estimated effect on producer prices. This is because the estimated nominal wage response is for all industries, while the effect on producer prices and real wages is for the manufacturing sector only. There is no way of knowing whether non-manufacturing prices behaved in the same way.

pass-through of the tax to lower real wages occurs within a year.

Alternatively, it is possible that employment in hours, rather than heads, bears most of the adjustment. This idea was examined with matched data on average employee working hours from the NES. The final row of Table A indicates that a rise in NICs exposure is associated with a statistically significant decline in industry working time. The results therefore suggest that the rise in employer NICs does not reduce the level of employment but does appear to put downward pressure on employment in hours, possibly by encouraging employers to increase the share of part-timers in the workforce.(1)

Summary

In the 2002 Budget it was announced that the NIC rate for both employers and employees would rise by 1 percentage point in April 2003. Although such changes might be expected to put downward pressure on both real wages and employment, the precise split between the two is an empirical matter. It is perfectly possible for employment to remain unchanged, with the entire burden of the tax reflected in reduced real wages.

This paper uses industry-level data from the Annual Business Inquiry for 1998 and 1999 to assess the employment, wage and price impacts of the revenue-neutral 1999 reforms of employers' NICs. Although there is no evidence of a significant impact on heads employment, average working hours across industries did appear to decline. This may reflect the fact that working time responds more rapidly to changes in labour costs than heads employment.

However, the effect on hours is quite small and coupled with the evidence that real wages in the manufacturing sector adjust to absorb the tax change, this suggests that real wages respond more than employment in heads and hours to payroll tax changes. One novel feature of the research is that it allows identification of the roles of relative wages and prices in any real wage response. It emerged that real wage adjustment occurred through both reduced nominal wages and higher prices.

To what extent are these findings for the 1999 reforms informative about the likely impacts of the prospective 2003 changes in employers' NICs? Any comparison between the episodes must be tentative for several reasons. In particular, there are important distinctions between the 1999 and 2003 reforms, which mean that the responses of wages, prices and employment are likely to differ. Though the 1999 reforms had a neutral impact on the aggregate wage bill, the 2003 reforms are likely to increase the total wage bill.

The response to the 2003 NIC changes will also depend on the monetary regime and the credibility of monetary policy: inflation is, after all, ultimately a monetary phenomenon. Workers and firms will expect the MPC to continue to aim to hit the inflation target and to adjust interest rates as it judges necessary to do so. In such an environment, it would be difficult for firms to achieve a fall in real wages simply by adjusting their prices. So even NIC changes before 1999 that have increased the total wage bill might not be wholly instructive. More of the adjustment from the 2003 changes might occur through nominal wages than might previously have been the case.

(1) Around 92% of all employees earning less than the 1999 effective LEL were part-timers.

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Equity valuation measures: what can they tell us?

By Anne Vila Wetherilt and Olaf Weeken of the Bank's Monetary Instruments and Markets Division.

This article examines the usefulness of summary statistics, such as the price-earnings ratio and the dividend yield, that are commonly used in valuing equity markets. But these measures are very sensitive to assumptions made about the (unobservable) equity risk premium, as well as to the precise definitions of earnings or dividends used in the calculations. This limits their usefulness as summary statistics of equity valuations.

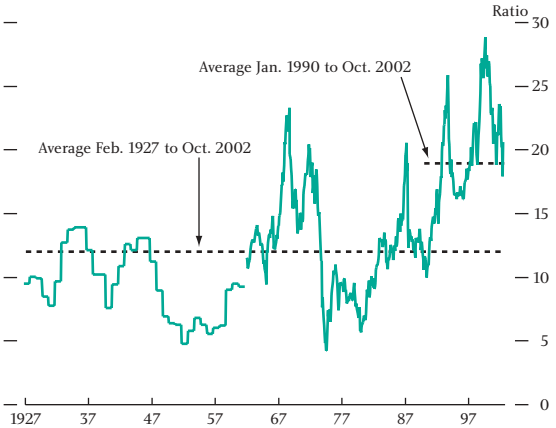
Introduction

Between January 1995 and September 2000, the FTSE All-Share index more than doubled. At that time, many economists and market participants commented on the extraordinary behaviour of market valuation ratios, such as price-earnings ratios, which had risen to all-time highs. Since then equity markets have fallen substantially. For example, at the end of October 2002, the FTSE All-Share index was about 40% below its all-time high of 4 September 2000.

This article discusses the usefulness of some popular ratios for assessing the valuation of equity markets. The price-earnings ratio and the dividend yield are among the best known of these summary statistics.
Price-earnings ratios indicate the prices investors are willing to pay in relation to companies' earnings. The dividend yield is a measure of the income return on a stock or an equity index.(1) Another popular valuation measure, commonly referred to as the 'Fed Model', is the relationship between the earnings yield (the inverse of the price-earnings ratio) and nominal bond yields.(2) These three valuation measures are closely related to a well-known accounting model, the dividend discount model, that can itself be used in assessing market valuations.(3)

Charts 1 and 2 show the price-earnings ratio and the dividend yield for the FTSE All-Share index since 1927. They illustrate how over long periods these ratios have tended to move away and then return to their historical averages. In the 1990s, both ratios deviated again substantially from their long-run averages. This prompted some commentators to suggest that equity prices could not depart for much longer from their historical relationships with either dividends or earnings and therefore needed to fall. However, the choice of the historical benchmark is not uncontroversial. Some

Chart 1
FTSE All-Share: price-earnings ratio(a)



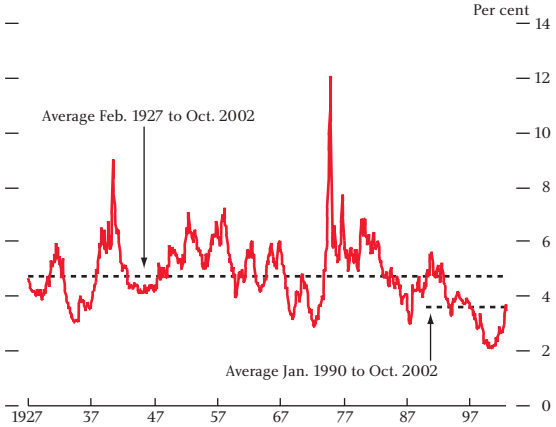
Sources: Global Financial Data, Inc. and Thomson Financial Datastream.

(a) Annual data until 1962, monthly data thereafter.

(1) For an equity index such as the FTSE All-Share index, the price-earnings ratio is the ratio of the total market value of all constituent companies of the index to their net earnings. The dividend yield is the ratio of dividends to the total market capitalisation of the index constituents. Both measures are adjusted for shares that are not actively traded. See FTSE (2002).
(2) This relationship was discussed in Board of Governors of the Federal Reserve System (1997). Lander, Orphanides and Douvogiannis (1997) present a formal model.
(3) Another valuation measure sometimes referred to is 'Q'. It is defined as the value of a firm's capital relative to its replacement cost (Tobin (1969)). In contrast to the other valuation measures described above, Tobin's Q is not derived from the same simple accounting framework and will not be discussed in this article. See Robertson and Wright (2002a and 2002b) for a discussion of Q as a valuation tool for equity markets and Mac Gorain and Thompson (2002) on Q-theory and investment.

commentators have argued that historical relationships may have broken down and that long-term averages—such as the 1927–2002 averages shown in Charts 1 and 2—may therefore no longer be appropriate benchmarks. Compared with an average over a shorter sample period—for example for the 1990s—the price declines of the past two years might lead some to the conclusion that equity prices have 'fallen enough' or 'have fallen too much'. In fact, depending on the historical time horizon chosen, many statements about equity valuations could be supported.

Chart 2
FTSE All-Share: dividend yield



Sources: Global Financial Data, Inc. and Thomson Financial Datastream.

This article will not comment on current equity valuations. Instead it aims to clarify some of the issues surrounding popular equity valuation measures. It first sets out the accounting framework that forms the cornerstone for the main valuation measures. It goes on to examine the historical relationship between the dividend yield and equity prices. The article then considers under which conditions equity valuation measures can be expected to revert to historical averages and whether such historical benchmarks may have shifted. The penultimate section examines the 'Fed Model' and the dividend discount model. Throughout this analysis, it is assumed that all variables are correctly measured. Measurement issues and their implications for valuation ratios are discussed in the final section of this article.

A framework for interpreting valuation measures

The dividend yield, the price-earnings ratio and the 'Fed Model' all go back to a simple present value formula: stock prices P equal the present discounted value of expected cash flows D.

$$P_t = \frac{D_{t+1}}{1+r_{t+1}} + \frac{D_{t+2}}{(1+r_{t+1})(1+r_{t+2})} + \ldots \qquad (1)$$

where the discount rate (r) is equal to the expected or required real return on equity. In this framework, stock prices are high when investors expect future cash flows to be high and/or future returns to be low.(1) The expected return (r) in turn can be written as the sum of the expected real return from a risk-free asset such as a government liability (r^f) and the extra return that investors require as compensation for the uncertainty about future cash flows associated with equity investments. This excess return is called the equity risk premium (k).

Although conceptually very simple, the present value model presents some practical difficulties that arise because the discount factor may vary over time. To simplify matters, a linear approximation of the present value model, first suggested by Campbell and Shiller (1988), can be used, which is explained in the appendix. Alternatively, simplifying assumptions can include a constant discount factor, as in the well-known constant-growth dividend discount model.

In its simplest form, this model assumes that both the risk-free rate and the equity risk premium are constant, that earnings (Y) grow at a constant rate (g) and that in each period a constant fraction (θ) of earnings is paid as dividends. Under these assumptions, equation **(1)** collapses to the 'Gordon growth model':

$$P_t = \frac{D_t(1+g)}{r-g} = \frac{D_t(1+g)}{r^f+k-g} \qquad (2)$$

Rearranging equation **(2)**, simple expressions for the dividend yield and the price-earnings ratio can be derived:

$$\frac{D_t}{P_t} = \frac{r^f+k-g}{(1+g)} \qquad (3)$$

Equation **(3)** tells us that when the dividend yield is low, equity investors expect some combination of high future dividend growth (g) and low future returns ($r^f + k$). And equation **(4)** below shows that price-earnings ratios are

(1) A third possibility is that investors expect future stock prices to be even higher. This possibility is ruled out in the accounting framework used to derive equation **(2)**. See Shiller (2000) for a detailed treatment of so-called asset price bubbles.

high when investors expect future earnings growth (g) to be high, dividend pay-out ratios (θ) to be high and/or future expected returns to be low.

$$\frac{P_t}{Y_t} = \frac{(1+g)\theta}{r^f + k - g} \qquad (4)$$

The 'Fed Model' can be derived by imposing the additional simplifying assumptions of a 100% pay-out rate ($\theta = 1$). As will be shown later, this also implies zero earnings growth ($g = 0$). Now equation **(4)** can be rewritten as:

$$\frac{Y_t}{P_t} - r^f = k \qquad (5)$$

Splitting the real risk-free rate (r^f) into the nominal risk-free rate (R^f) and expected inflation (π^e), the left-hand side of equation **(6)** represents the 'Fed Model':

$$\frac{Y_t}{P_t} - R^f = k - \pi^e \qquad (6)$$

The main valuation ratios are thus affected by the same variables: the risk-free rate, the equity risk premium and—with the exception of the 'Fed Model'—the growth rate of earnings or dividends.

The historical relationship between the dividend yield and equity prices

Having set out the accounting framework for these equity valuation measures this section focuses on the historical relationship between equity valuation ratios and equity prices. As shown in Charts 1 and 2, valuation ratios have in the past tended to fluctuate within a fairly narrow and stable range. Whenever these valuation ratios have moved towards the bounds of this range, some form of adjustment has followed that restored the ratio towards its historical average. This adjustment process is referred to as mean reversion. In the case of the dividend yield it could in principle be brought about by either a change in equity prices or in dividends. In the case of the price-earnings ratio either equity prices or earnings might adjust.

In an influential article, Campbell and Shiller (1998) argued that valuation measures for the US equity market were at extreme levels in 1997 and that the adjustment would be brought about through a correction in equity prices. They illustrated their argument with a series of scatter plots that showed the historical relationship between valuation ratios and subsequent equity price changes for the S&P 500 index since 1872. This section repeats their analysis using a long sample of historical data for the FTSE All-Share index. For illustrative purposes, the focus is on the dividend yield, but the analysis of this section applies equally well to the price-earnings ratio.

To see whether in the United Kingdom dividend yields have in the past been systematically related to subsequent actual dividend growth or equity price changes, some simple scatter plots are shown in Charts 3 and 4. On the horizontal axis, they show the current dividend yield. On the vertical axis, they show real dividend growth rates (Chart 3) and real equity price changes (Chart 4) measured over a fixed ten-year future horizon.(1)

Chart 3
Dividend yield and ten-year real dividend growth

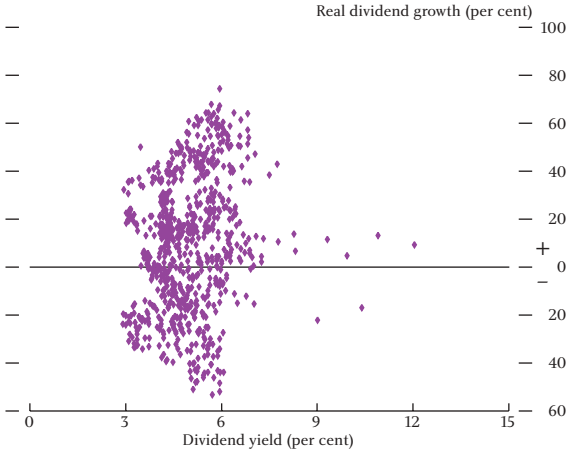
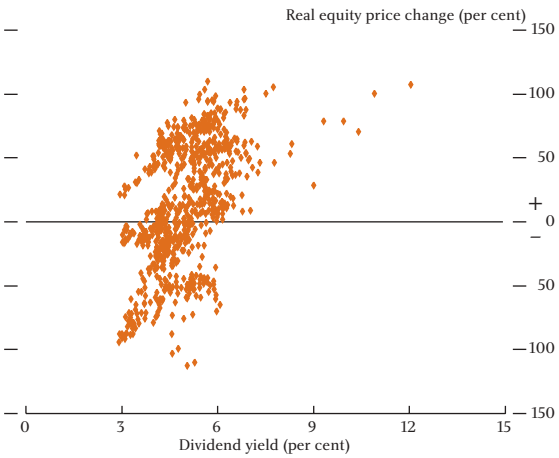


Chart 4
Dividend yield and ten-year real equity price change



(1) The underlying data are the same as presented in Chart 2, with the calculations in Charts 3 and 4 based on a sample from January 1927 to July 2002.

These scatter plots suggest that the dividend yield bears little relationship with future dividend growth (see Chart 3), but appears more related to future equity price changes (see Chart 4). This implies that historically, prices rather than dividends have been the driving force behind the observed mean reversion in the FTSE All-Share dividend yield. And since investors cannot predict future dividend growth, equation **(1)** indicates that they must have expected higher future returns on their equity investment.

Admittedly, the empirical evidence presented in Charts 3 and 4 is not overwhelming. But Campbell and Shiller (1998) reach a similar conclusion using historical data for the S&P 500. And a consensus has emerged in the academic literature that dividend growth is not forecastable,(1) but that dividend yields can tell us something about future equity prices.

If dividend yields bear some relationship with expected returns (r), can this relationship be attributed to either the equity risk premium (k) or to the real risk-free rate (r^f) components of expected returns? Though the academic debate on this issue is ongoing and far from resolved,(2) the dominant view at present is that stock price movements required to restore the dividend yield to its equilibrium level are brought about by changes in the equity risk premium.(3) In other words, mean reversion implies some degree of predictability in equity risk premia. But this raises new questions, namely why do risk premia change over time, and why are such changes often predictable? The next section outlines a theoretical model for thinking about the equity risk premium.

Mean reversion and equity risk premia

Before describing how equity risk premia contribute to mean reversion, it is important to bear in mind that investors base their valuations of equity on the expected or *ex ante* equity risk premium. This summarises their views on the risk inherent in future equity investments. Few direct estimates of this *ex ante* risk premium are available, so economists often use historical data on equity and bond returns to construct an *ex post* premium. But there is no reason to believe that this historical risk premium provides an unbiased estimate of the *ex ante* risk premium. That would imply that investors can correctly predict future asset returns. This may not always be true.

Moreover, no consensus exists about the level of the *ex ante* equity risk premium. One reason for this lack of agreement is that even estimates of the *ex post* risk premium vary widely. Dimson *et al* (2002) report estimates of the average UK equity risk premium for the period 1900–2000 between around 4% and 6.5%, depending on the method of calculation and the risk-free asset considered. For the United States, similar estimates range from about 4% to 9%.(4) Likewise, surveys of finance professionals report widely diverging opinions on the best estimate for the *ex ante* equity risk premium.(5) A survey of US academic financial economists conducted between 1997 and 1999 found that estimates tended to cluster between 5% and 9%.(6)

(i) Understanding equity risk premia

Over the past decades, developments in asset-pricing theory have led to a better understanding of the way in which observed patterns in equity risk premia relate to rational investors' behaviour.(7) In particular, this literature has emphasised how the equity risk premium is related, first, to the amount of risk represented by equities, and second, to the degree to which investors dislike this risk, ie their risk preferences. The previous section argued that variation in historical dividend yields has been associated with variations in expected returns. These in turn have been attributed to variations in equity risk premia. For equity risk premia to display such predictive time variation there would need to be some degree of predictive time variation in either the amount of risk or investors' risk preferences.

The amount of risk is typically measured by the comovement of stock returns and consumption. The intuition is that risk-averse investors will be content with a lower equity premium on assets that provide positive returns when they are most needed, namely when

(1) This is the dominant view in the academic literature (see for example Cochrane (2001)). For a recent contrarian view, see Lettau and Ludvigson (2002).
(2) The large literature that examines empirical models of long-horizon equity returns has recently started to question the statistical significance and robustness of the relationship between dividend yields and expected returns. Moreover, researchers have become aware of serious model selection issues.
(3) See for example Cochrane (2001) for some empirical evidence.
(4) See for example Fama and French (2001), Dimson *et al* (2002) and Mehra (forthcoming).
(5) See Dimson *et al* (2002).
(6) See Welch (2000).
(7) See for example Cochrane (2001) for an overview of this literature.

consumption growth is expected to be low. Statistically, the comovement of equity returns and consumption can be represented by three components: the variability of consumption, the variability of equity returns and the correlation between consumption and equity returns. It follows that predictable time variation over a long time horizon in the amount of risk can stem from time variation in one or all three of its components. An extensive academic literature has developed around this issue, yet has failed to find conclusive evidence of such long-horizon patterns.

Can changes in investors' risk preferences explain past movements in equity risk premia? For a long time, the asset pricing literature was content to assume that risk preferences would be constant over time. But recent work suggests that they might change over time in a predictable manner. Habit-formation models explore the possibility of business cycle variation in risk preferences.(1) In these models, investors seek protection against unexpected developments that would move them away from their usual spending habits. When investors see their consumption sliding closer to this habit level, and hence an increasing possibility of it falling below, they become more risk averse and demand a higher excess return. So, in this framework, a countercyclical pattern emerges: in booms consumption rises, and risk aversion and risk premia fall, whereas the opposite happens in recessions.(2)

Some researchers have also argued that investors' risk aversion is likely to be influenced by fluctuations in their financial wealth, in addition to fluctuations in consumption growth. Past financial losses are thought to increase an investor's risk aversion going forward, whereas past gains might make him less risk averse.(3) In yet another explanation, it is argued that patterns in the equity risk premium could stem from variations in labour income risk, primarily the risk of becoming unemployed. In these models, risk aversion increases in economic downturns, as labour income risk is higher in such situations.(4) These models often incorporate market imperfections (such as borrowing constraints or high transaction costs) to explain why income risk cannot be fully insured.

(ii) Equity risk premia and mean reversion: have historical benchmarks changed?

The previous subsection suggested that time-varying risk preferences, through their influence on the risk premium, could be an important factor behind mean reversion in dividend yields or price-earnings ratios. But Charts 1 and 2 raised the question whether it is reasonable to believe that valuation ratios always revert to the same, long-run historical mean. Could these means change periodically, implying a different pattern of mean reversion? Such structural shifts in the mean could be the result of permanent changes in investors' risk preferences. For example, if investors became less risk averse in the 1990s, thereby demanding a lower equity risk premium, equations **(3)** and **(4)** demonstrate that—other things equal—a lower dividend yield and a higher price-earnings ratio could be supported. A number of explanations have been put forward to argue that risk preferences may indeed have changed in the 1990s.

First, greater risk tolerance of the post World War II baby-boom generation is often cited as a factor contributing to a lower equity risk premium. It is possible that baby boomers invest more readily in equities and accept a lower equity risk premium, perhaps because they do not remember the 1930s.(5) A related argument is that, as ageing baby boomers started saving for their retirement, demand for high-return assets increased substantially and pushed up equity prices. Research undertaken in the United States further suggests that investors' risk aversion declines as they enter their early middle age. Given the size of the baby-boom generation, this could have contributed to a lower equity risk premium. But the retirement of the baby-boom cohorts could produce a higher equity risk premium if ageing baby boomers decided to shift their wealth from equities to bonds, thereby pushing down the returns on bonds relative to equities.(6) Empirically, however, it has proved difficult to find any conclusive evidence of a systematic relationship between asset returns and age structure.(7)

A second argument starts with a well-known result from portfolio theory that states that, although investors

(1) See for example Campbell and Cochrane (1999).
(2) There is some indirect evidence to support this. For example, it is well documented that expected returns (which are commonly proxied by the dividend yield) are highly correlated with variables that covary positively with the business cycle, such as credit and term spreads (Fama and French (1989)). But Mehra (forthcoming) questions whether investors' risk aversion displays the large business cycle variation implied by some of the habit-formation models.
(3) See for example Barberis, Huang and Santos (2001).
(4) See for example Constantinides and Duffie (1996).
(5) See for example Campbell (2001).
(6) See for example Brooks (2000) and Young (2002).
(7) See for example Poterba (2001) for a detailed survey of both the empirical and theoretical literature.

cannot reduce systemic risk, portfolio diversification reduces the exposure to firm-specific risk. Financial innovations, such as unit trust funds and on-line trading technology, together with increased competition between financial intermediaries, may have lowered the cost of portfolio diversification, thereby allowing more people to hold diversified portfolios. This may have reduced aggregate risk aversion and lowered the equity risk premium.(1)

Mean reversion, growth and real interest rates

The previous section has shown how structural changes in investors' risk preferences via the resulting changes in the equity risk premium, could support a new benchmark level for equity valuations. But equations **(3)** and **(4)** have shown that—apart from a lower equity risk premium—a lower real risk-free interest rate or a higher growth rate could also support a lower dividend yield and a higher price-earnings ratio. This section discusses the effects of changes in the real risk-free interest rate and growth rates.(2)

Expectations of higher productivity and output growth resulting from the increased usage of information technology were frequently cited as factors supporting rapidly rising share prices in the late 1990s. But such 'New Economy' arguments have received weak support from UK data. Survey data do not show a marked upward revision of expectations for long-term output growth in the United Kingdom. For example, forecasts for real GDP growth from Consensus Economics six-to-ten years ahead, rose to 2.4% in 1999 and have remained close to this rate since. This compares to a low of 2.1% in 1996, but remains below the 2.6% recorded in 1990.

Expectations of higher productivity growth are also difficult to reconcile with the observed fall in real interest rates. Higher productivity growth would raise the marginal product of capital and—for a given supply of savings—lead to higher interest rates. But Chart 5 shows that real interest rates, as measured by the yields on index-linked gilts, fell markedly during the 1990s.(3) Lower interest rates could, however, provide further support for a lower benchmark dividend yield (or a higher benchmark price-earnings ratio).

Chart 5
UK ten-year spot real interest rates

To summarise, this and the previous section have shown how lower equity risk premia or lower real interest rates could support a new benchmark level for valuation measures. The next section examines the implications of changes in real interest rates and the equity risk premium for two other popular valuation measures: the dividend discount model and the 'Fed Model.'

The 'Fed Model' and the dividend discount model

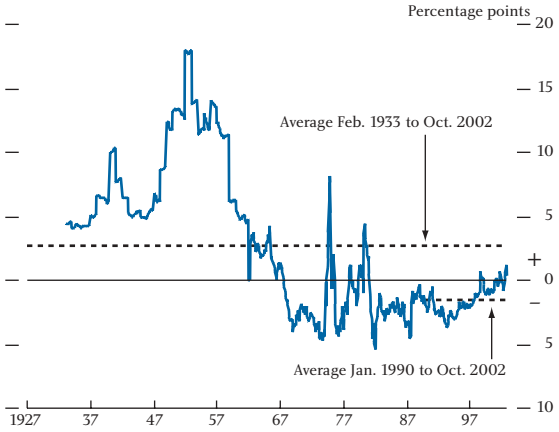
(i) The 'Fed Model'

The previous section has shown that a change in the risk-free rate will affect the dividend yield and the price-earnings ratio. The 'Fed Model' explicitly takes this relationship into account by considering the difference between the earnings yield (the inverse of the price-earnings ratio) and the risk-free rate. The latter is commonly proxied by a ten-year government bond yield. The 'Fed Model,' as shown in Chart 6,(4) is then commonly interpreted as suggesting that a deviation of this difference from its long-term average requires an adjustment in equity prices. For example, with reference

(1) See for example Heaton and Lucas (1999).
(2) It should be noted that equations **(1)** to **(6)** were not derived in a general equilibrium context. The effects of independent changes in the growth rate (g) or the real risk-free interest rate (r) on equity prices are thus only partial effects. A general equilibrium model that endogenises these variables, thereby allowing for the interdependence between r and g, would provide a more comprehensive picture.
(3) Real interest rates are derived from index-linked gilts using the variable roughness penalty (VRP) method described in Anderson and Sleath (1999). Scholtes (2002) discusses why these rates are an imperfect measure of the risk-free rate.
(4) Various measures of the earnings yield have been used to construct the 'Fed Model'. Lander *et al* (1997) use a weighted average of IBES estimates of earnings in the previous calendar year, and forecasts for the current and next calendar years. The Board of Governors of the Federal Reserve System (1997) uses IBES forecasts of earnings over the next twelve months. IBES forecasts of earnings are not available for the FTSE All-Share index and are only available since the end of the 1980s for the FTSE 100. To construct Chart 6 the inverse of the price-earnings ratio shown in Chart 1 was used.

to the long-term average it has been argued that equities are 'expensive' relative to bonds, while the opposite argument has been made with reference to the average over the 1990s. And some have argued that because the difference between the earnings yield and bond yields is small equities are fairly valued relative to bonds.

Chart 6
FTSE All-Share earnings yield minus long-term bond yield



Sources: Global Financial Data, Inc. and Thomson Financial Datastream.

But such interpretations can be misleading for a number of reasons. First, although the previous section discussed—among others—the relationship between the price-earnings ratio or dividend yield and the *real* interest rate, the 'Fed Model' shows the relationship between the earnings yield and a *nominal* risk-free rate. The difference between nominal and real interest rates, inflation expectations (π^e), appears on the right-hand side of equation **(6)**. A fall in inflation expectations would—other things equal—support a higher valuation level than in the past, using the 'Fed Model'. Long time series for inflation expectations are not available for the United Kingdom. But Chart 7 shows a short sample of such expectations, one market based and one survey based. These are measured as an average of inflation expectations over the next ten years, the time period relevant for a ten-year bond.(1) The chart shows that inflation expectations have fallen substantially over the past 10–15 years. On that basis, there is no reason to expect equity valuations to return to the average level suggested by the 'Fed Model' in the past.

Equation **(6)** also shows that, similar to the price-earnings ratio and the dividend yield, the 'Fed Model' is related to the equity risk premium. So the

Chart 7
UK inflation expectations and break-even inflation rates

Notes: (a) Prior to April 1997, the twice-yearly Consensus Forecast inflation expectations refer to the general index of retail prices (RPI). They refer to the retail price index excluding mortgage interest payments (RPIX) since the April 1997 survey.
(b) Break-even inflation rates refer to the RPI.

Sources: Consensus Economics and Bank of England.

same arguments about the equity risk premium discussed earlier also apply to the 'Fed Model'. Finally, compared with equation **(3)** and **(4)** the restrictive assumption of a payout rate of 100% (implying zero long-term growth) has to be made in order to obtain the 'Fed Model'.

(ii) The dividend discount model

The ratio of observed equity prices to those implied by the 'Gordon growth model' (equation **(2)**) is itself another popular valuation measure. If the 'Gordon growth model' is the true representation of the value of equity, and if investors use this model correctly, then any deviation between prices implied by the model and actual prices will not persist. In other words, observed prices will adjust to bring the ratio of observed to implied prices back to unity.

Equity prices implied by the 'Gordon growth model' are usually estimated by making assumptions about the growth rate of dividends and the appropriate equity risk premium. It can be shown(2) that in the steady state the growth rate of dividends equals:

$$g = (k + r^f)(1 - \theta) \qquad (7)$$

The intuition of equation **(7)** is that—other things equal—the higher the payout ratio θ, the lower the share of earnings used for investment and hence the lower the growth rate of future earnings. Substituting

(1) These measures of inflation expectations are discussed in detail in Scholtes (2002).
(2) See Panigirtzoglou and Scammell (2002).

equation **(7)** into the 'Gordon growth model', equation **(2)** becomes:

$$P_t = \frac{D_t(1+(k+r^f)(1-\theta))}{(k+r^f)\theta} \qquad (8)$$

Equation **(8)** shows that the ratio of observed to implied prices will crucially depend on the assumption made about the equity risk premium (k).

This is illustrated in Chart 8, which shows this ratio for three different proxies of the unobservable equity risk premium: an equity risk premium of 4%, as in Panigirtzoglou and Scammell (2002), and of 2% and 6%. It shows that the ratio based on the highest equity risk premium has remained well above unity despite the earlier falls in equity prices, whereas the ratio using the lowest equity risk premium has fallen below unity.

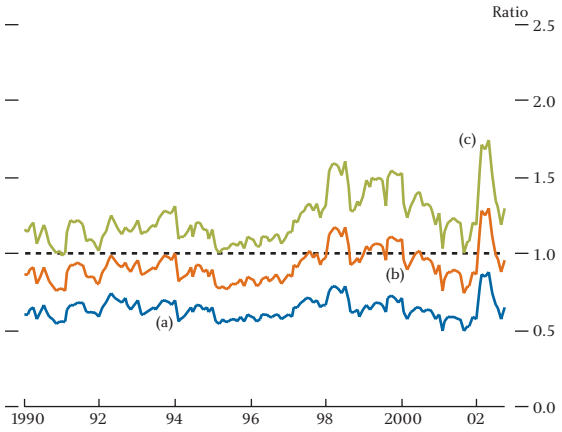
Chart 8
FTSE All-Share: valuation ratios implied by simple dividend discount model

Based on equity risk premium of (a) 2%, (b) 4% and (c) 6%.

The simple dividend discount model in equation **(8)**, together with the other valuation measures presented in equations **(2)** to **(6)**, is restrictive in that it does not allow for periods of supernormal profit growth. But at times of rapid technological progress, firms may temporarily experience periods of market power and exceptionally strong profit growth before competition drives these supernormal profits to zero. To allow for this possibility, practitioners have used multi-period dividend discount models. Panigirtzoglou and Scammell (2002) describe such a model that uses Institutional Brokers Estimate System (IBES)(1) sell-side analysts forecasts of medium-term earnings per share growth. They find that equity prices implied by their model have tended to be higher than those implied by a simple dividend discount model, so that the ratio of the actual price to that given by the model would be lower.

This is reflected in Chart 9,(2) which shows that—for a given risk premium—the valuation ratios based on the multi-period dividend discount model (DDM) have been lower than those based on the simple DDM (Chart 8).(3) Indeed, except for the highest equity risk premium, the valuation ratios based on the multi-period dividend discount model are below unity.

Chart 9
FTSE 100: valuation ratios implied by multi-period dividend discount model



Based on equity risk premium of (a) 2%, (b) 4% and (c) 6%.

Note: IBES forecasts are not available for the FTSE All-Share index.

So this section further emphasises how sensitive equity valuation measures are with respect to the assumptions made about the level of the unobservable equity risk premium. In addition, measures using the dividend discount model—and by extension the other valuation measures based on the same accounting framework—are sensitive to the assumptions made about the existence and duration of supernormal profits.

Measurement issues and valuation ratios

The previous sections have shown that many of the commonly employed summary statistics for equity

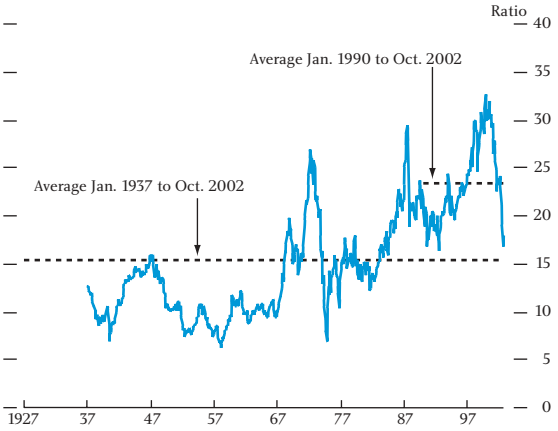
(1) Panigirtzoglou and Scammell (2002) show that there are indications that these IBES forecasts may be biased, but conclude that this could be the result of the small sample available.
(2) A long time series of IBES forecasts is available for the FTSE 100, but not for the FTSE All-Share index. Therefore, the multi-period DDM is shown for the FTSE 100 instead (Chart 9).
(3) In deriving the multi-stage DDM measure, the following assumptions were made: (i) in the first four years, g is equal to the IBES medium-term growth rate; (ii) in the next eight years, g declines linearly towards its long-run rate; and (iii) this long-run rate is computed using equation **(7)**.

valuations are only of limited use, unless care is taken in their interpretation. Moreover, the quality of the data on earnings and dividends imposes some practical limits on the usefulness of these summary statistics. These are discussed below.

(i) Price-earnings ratios and earnings estimates

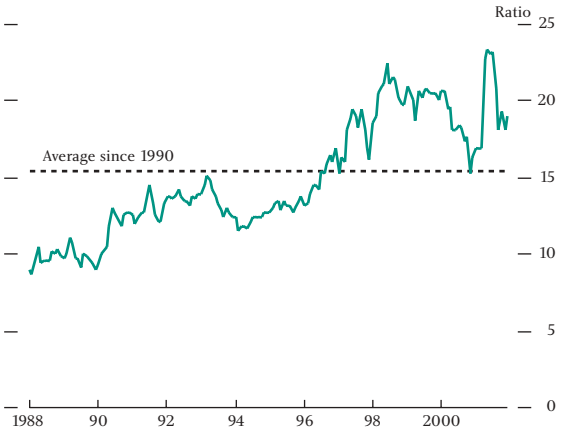
First, there are a number of possible measures for the price-earnings ratio. Current earnings, as used in the calculations in Chart 1, are strongly affected by cyclical conditions. For example, in an economic slowdown current earnings are likely to be temporarily depressed. This may lead to an unusually high price-earnings ratio in a slowdown, with the reverse happening in a boom. To adjust for such temporary fluctuations, Shiller (2000) uses a ten-year moving average of earnings to calculate a price-earnings ratio for the S&P 500 index. Chart 10 shows such a price-earnings ratio for the FTSE All-Share index. This trailing price-earnings ratio has recently been below its average for the 1990s and much closer to its long-term average than the price-earnings ratio shown in Chart 1.

Chart 10
FTSE All-Share: ten-year trailing price-earnings ratio



Another widely used price-earnings ratio is based on IBES forecasts of earnings. A long time series of IBES forecasts for the FTSE All-Share index is not available, so Chart 11 shows a price-earnings ratio based on IBES forecasts for FTSE 100 earnings instead (going back to 1988). In contrast to the trailing earnings presented in Chart 10, this forward-looking measure remains above its average for the 1990s.

Chart 11
IBES twelve-months ahead price-earnings ratio for FTSE 100



Source: Thomson Financial Datastream.

Second, earnings depend on accounting conventions. This issue is discussed in detail in Cortes *et al* (2002) but a number of issues are worth drawing out here.

Estimates of price-earnings ratios for the S&P 500 index show that accounting conventions can make a large difference.(1) For example Nakamura (1999) argues that price-earnings ratios in the United States are overstated because research and development (R&D) is treated as an expense (thereby reducing earnings) rather than investment. Since the share of R&D in corporate GDP has increased over time, this would also distort the time profile of price-earnings ratios.

On the other hand, Liang and Sharpe (1999) argue that stock options—although they dilute the claims on earnings of existing shareholders—are not regularly treated as an expense. This leads to an understatement of price-earnings ratios and—with the usage of stock options having increased over time—again distorts the time profile of price-earnings ratios.

Accounting conventions may also explain some of the differences between price-earnings ratios in Charts 1 and 10 and the IBES estimates in Chart 11. Charts 1 and 10 are based on reported earnings, whereas Chart 11 is based on operating earnings, ie a corporation's net income from ongoing operations.

More recently, the revelation of accounting malpractice at some companies in the United States and Europe has created uncertainty about the quality of earnings. Some

(1) For example on 30 October 2002, the price-earnings ratio for the S&P 500 calculated by Thomson Financial Datastream was 21.5; the measure published by Standard and Poor's was 33.3. The differences mainly reflected the different treatment of goodwill and losses of individual firms.

commentators have argued that this makes the dividend yield a preferable summary statistic to the price-earnings ratio.

(ii) Dividend yields

In contrast to earnings, dividends generate an observable cash flow. They tend to be less volatile than earnings. This may reflect companies' practice of only changing dividends when they expect changes in long-run sustainable earnings.(1) As such, dividend yields are less affected by cyclical factors than price-earnings ratios.

But the dividend yield also has its drawbacks. The present value formula in equation **(1)** discounts all future cash flows *D*, not just dividends. Historically, these cash flows have primarily been distributed in the form of dividends. But in recent years share buy-backs have gained in popularity as a means to distribute cash flows to investors. Jagannathan *et al* (2000) point out that, in contrast to dividends, which tend to increase steadily over time, share buy-backs tend to be very procyclical and are seen as a means to distribute temporarily high cash flows, without implicitly committing the firm to continue such payments. Nevertheless, if a large part of cash flow is distributed to shareholders by means other than dividends, the usefulness of the dividend yield as a summary statistic for valuations is reduced. Liang and Sharpe (1999) analyse the importance of share repurchases for the largest 144 companies in the S&P 500 index. They show that, when adjusting for the proceeds from the exercise of stock options, the net cash outflow associated with share repurchases accounted for 1.5% of market value in 1998. This compares with a dividend yield of 1.4%.(2)

Finally, the capacity of a company to pay dividends depends on its capacity to generate earnings. If the quality of published earnings is impaired to a degree that a company's present situation and future prospects cannot be analysed, little can be said about dividend growth.

Conclusion

Valuation measures, such as the dividend yield, the price-earnings ratio, the 'Fed Model' and various forms of the dividend discount model, have been at the heart of the debate on equity valuations for many years. This article has shown that all these measures are special cases of the simple present value concept and that they are therefore affected by the same underlying variables. It has also shown that to use them as simple summary statistics to be compared with past averages may lead to invalid conclusions, if some of the underlying variables, such as the risk premium, have changed. Moreover, the quality of the data on earnings and dividends further affects the usefulness of these valuation measures. The article concludes that the valuation measures described cannot serve as a substitute for a careful analysis of the data and the underlying economic developments driving them. But this is not to say that such measures are without their use. On the contrary, unusual movements or large deviations from past averages in equity valuation measures may prompt us to reflect on the fundamental factors driving asset prices and may in turn help to understand changes in the behaviour of economic agents.

(1) See Marsh and Merton (1987) for the United States.
(2) This view is not uncontroversial. For example Arnott (2002) argues that during the late 1990s share buy-backs were outstripped by new share issuance.

Appendix
The present value model

Stock prices (P_t) are equal to the present discounted value of future expected cash flows (D_t):[1]

$$P_t = E_t \sum_{j=1}^{\infty} \frac{(D_{t+j})}{\prod_{k=1}^{j} (1+R_{t+k})} \qquad \textbf{(a.1)}$$

where (R_t) is the required real return.[2] Campbell and Shiller (1988) show that this expression can be simplified, without forgoing time variation in the discount rate.[3] Linearising equation **(a.1)** with a Taylor expansion, one obtains the following expression for stock prices:

$$p_t = E_t \sum_{j=0}^{\infty} \rho^j [(1-\rho) d_{t+j+1} - r_{t+j+1}] + \kappa \qquad \textbf{(a.2)}$$

In equation **(a.2)**, p and d are the log price and dividend, respectively, r the log real return, ρ a discounting parameter ($\rho < 1$) and κ a constant coming from the linear approximation. Equation **(a.2)** can be rearranged so that one obtains an expression for the dividend yield ($d_t - p_t$):

$$d_t - p_t = E_t \sum_{j=0}^{\infty} \rho^j [-\Delta d_{t+j+1} + r_{t+j+1}] - \kappa \qquad \textbf{(a.3)}$$

One can further rearrange equation **(a.2)** to obtain a relationship between prices and earnings, shown in equation **(a.4)**:

$$p_t - y_t = E_t \sum_{j=0}^{\infty} \rho^j [\Delta y_{t+j+1} - r_{t+j+1} + (1-\rho)(d_{t+j+1} - p_{t+j+1})] + \kappa \qquad \textbf{(a.4)}$$

(1) In equation **(a.1)**, the possibility of a so-called bubble is ruled out by the following limiting condition:

$$E_t \left[\frac{P_{t+T}}{(1+R_T)^T} \right] \to 0 \text{ as } T \to \infty.$$

(2) The notation used in this appendix differs slightly from that in the main article. Here 'R' is the real return and 'r' is the *log* real return.

(3) The interested reader is referred to Cochrane (2001) for a careful derivation of equations **(a.2)** to **(a.4)** (pages 395–97).

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Profit expectations and investment

By Seamus Mac Gorain of the Bank's Monetary Instruments and Markets Division and Jamie Thompson of the Bank's Structural Economic Analysis Division.

This article examines the relationship between expectations of future profits and companies' physical investment. Theory suggests that increased profit expectations should raise share prices as well as investment. But this correlation between investment and share prices may be rather weak if investors' opinions of companies' prospects differ from those of the companies' managers. Using a simple aggregate investment equation, the article illustrates that measures of profit expectations based on current profits and analysts' earnings forecasts appear to be more informative for investment than stock prices themselves. This result is consistent with recent research at the Bank using company data.

Introduction

Investment is driven by companies' expectations about their future profits. Although such expectations are unobservable, share prices are influenced by a similar factor—the stock market's expectations of companies' future profits. Changes in share prices might therefore be correlated with future changes in investment.

Business investment growth in the United Kingdom picked up sharply in the latter half of the 1990s, before weakening markedly. This experience has broadly tracked that of the UK stock market—Chart 1 compares the annual growth in the FTSE All-Share index with annual growth in business investment at current prices. A similar picture emerges from a cross-country comparison. Chart 2 shows that countries that experienced a pick-up in current-price business investment (as a share of GDP) in the second half of the 1990s also experienced sharp rises in stock market capitalisation (as a share of GDP). But both charts show that these relationships are far from perfect.(1)

Chart 1
FTSE All-Share index and business investment

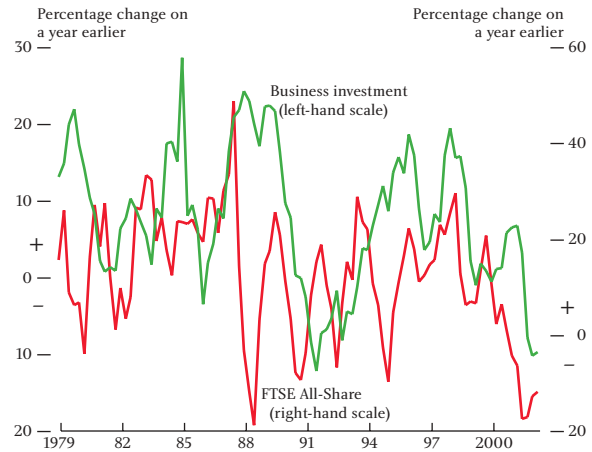
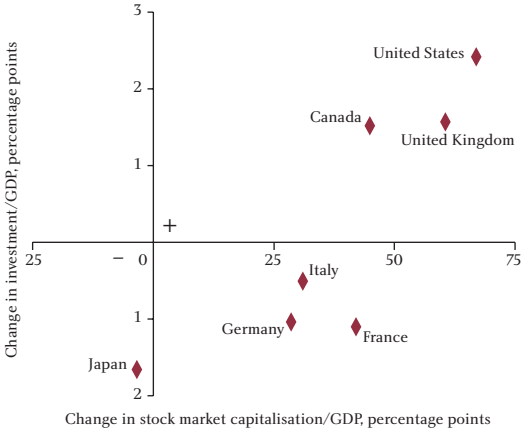


Chart 2(a)
Change in business investment and stock market capitalisation (as shares of GDP) in G7 economies between 1991–95 and 1996–2000



(a) Chart 2 shows the change between 1991–95 and 1996–2000 in the average level of the investment-to-GDP ratio and the stock market capitalisation-to-GDP ratio. The data on stock market capitalisation are from the International Federation of Stock Exchanges (FIBV), while data on investment and GDP are from the IMF and the OECD. Note that data for Italy are 'private investment' rather than 'business investment'.

Q theory and investment

One approach to looking at the link between expected future profitability and investment is Q theory. This

(1) This might in part reflect the fact that companies listed on the stock market represent a smaller sample than contained in the 'business sector' investment category. And many of these companies have large overseas investment activities. There may also be structural reasons for the increase in stock market capitalisation, such as privatisations.

states that a company should invest if the discounted value of future profits from an extra unit of capital exceeds the cost of acquiring it. When companies invest, they are typically thought to incur adjustment costs, such as training workers to operate new machinery, and these are usually thought to be increasing in the rate of investment. This means that companies tend to adjust their capital stocks only gradually.

The ratio of discounted future profits to the acquisition cost of new investment—marginal Q—is unobservable. But Hayashi (1982) demonstrated that under certain assumptions it equals average Q, the ratio of the discounted value of a company's future profits to the replacement cost of its total capital stock. First, companies must operate in a competitive environment where they are unable to influence the market-clearing price of their goods. Second, there must be constant returns to scale—if a company uses twice as much capital and labour as another company, it will produce twice as much output.(1)

Average Q is observable and suggests a simple rule of thumb. If the ratio of the stock market value of a company to the replacement cost of its assets—Tobin's Q—exceeds one, then the company can increase profits by investing. And the rate at which it invests will depend on the costs of adjustment. Tobin's Q should be a 'sufficient statistic' for investment, summarising all information relevant to the company's investment decision.

However, Tobin's Q has generally fared poorly in empirical studies of its predictive power for aggregate investment. Even though Q should theoretically incorporate all information relevant to the company's investment decision, studies have found that other variables, such as cash flow (that is, current revenue less expenses and taxes) and sales, are also significant in explaining movements in investment. Given that Q theory assumes that companies can borrow freely at the market rate for similarly risky projects, this has been widely interpreted as supporting the existence of borrowing constraints for companies in the credit market.(2)

The poor performance of Q may equally reflect violations of the assumptions under which marginal Q is equal to average Q; or mismeasurement of average Q itself, perhaps due to unreliable estimates of the replacement cost of companies' capital stock.(3) Mismeasurement could also arise if the stock market's expectations of future profitability differ from managers' expectations. In this case, a Q measure based on stock market valuation would no longer be a sufficient statistic for investment.

Managers' Q

At times, the stock market's expectations of a company's future earnings (as implied by its share price) may differ from managers' own opinions about their company's future profitability. This might occur if, for example, managers have superior information about their investment projects.

Fischer and Merton (1985) argue that, as a large part of companies' finance comes from the stock market, the terms at which they obtain that finance—that is, the value the market places on their shares—will affect investment decisions. They argue that companies should take advantage of cheaper financing costs to raise equity and invest if *Tobin's Q* rises—even if their *own* estimate of Q does not.

Blanchard *et al* (1993) extend this analysis. They point out that if managers issue equity when the stock market valuation of their company exceeds their own, then the buyers of that equity will lose out if and when the stock market value returns to equal managers' expectations. So issuing equity benefits a company's current shareholders at the expense of future shareholders. Further, they observe that as shareholders will only realise gains if and when they sell their shares, then investors' horizons will matter, so 'managers who are concerned with their long-term shareholders should follow their own valuation…but managers of firms whose shareholders have short horizons should…go with the market valuation'.

Several empirical studies have examined the effect of divergences of opinion over companies' valuation. Blanchard *et al* construct an estimate of *managers' Q* based on past profits and dividends, and find that the market valuation has only a marginal impact on investment when they control for companies' expectations of future profits in this way.

(1) Note that the constant returns to scale assumption applies not only to a company's output, but also to its adjustment costs.
(2) See Hubbard (1998) for a review of the literature on credit market imperfections and investment.
(3) See Erickson and Whited (2000) for a detailed discussion of mismeasurement and Q theory. The authors suggest that Q has good explanatory power once purged of measurement error.

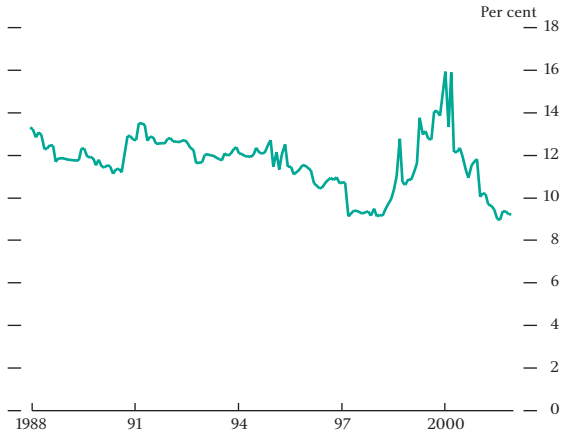
Analysts' Q

An alternative approach is to use the information contained in equity analysts' earnings forecasts rather than the conventional stock market valuation as a guide to companies' future profitability.(1) Measures based on analysts' forecasts might arguably give a better indication of managers' opinions than stock market valuations, given that analysts have a close understanding of the companies they cover.

Given that share prices tend to react to changes in analysts' earnings forecasts, one could interpret earnings forecasts differently, as a proxy for the market's earnings projections. But on their own, changes in earnings forecasts explain only a small part of equity price movements. This might in part reflect investors reacting to other aspects of analysts' reports, such as price targets,(2) or not fully reacting to changes in earnings forecasts themselves. Either way, to the extent that analysts' earnings forecasts differ from the market's, the analysts' projections might arguably give a better indication of managers' opinions than stock market valuations.

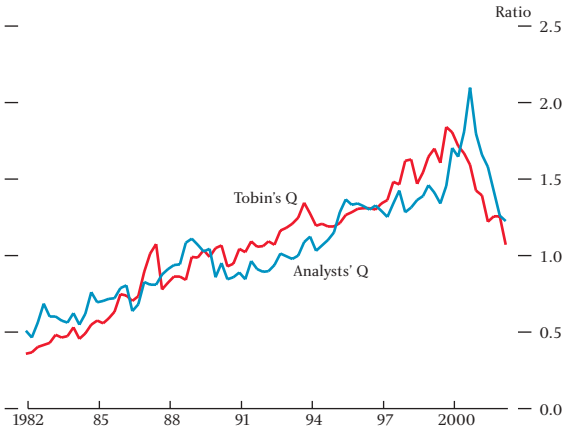
Chart 3 shows one measure of analysts' forecasts, provided by IBES. These forecasts are used to construct an *analysts' Q* measure, in which the numerator is the value of the FTSE All-Share index implied by a three-stage dividend discount model.(3) This model uses the forward-looking information provided by the analysts' forecasts as a guide to dividend growth in the medium term.(4) In the long run, dividend growth is assumed to converge to a rate at which the return on equity is equal to the cost of equity. This long-run growth rate depends on current earnings, as a higher level of earnings available for reinvestment raises the future growth rate of the company.

Chart 3
IBES forecasts of medium-term earnings growth for FTSE 100 companies



In calculating analysts' Q, the premium that investors demand for holding equities rather than risk-free assets is held constant at 4%. As such, analysts' Q and Tobin's Q may diverge, not only because analysts' earnings forecasts differ from those embodied in stock market valuations, but also because investors revise their opinion of the level of the risk premium over time. Chart 4 compares the standard Tobin's Q with the above measure of analysts' Q.

Chart 4
Tobin's Q and analysts' Q



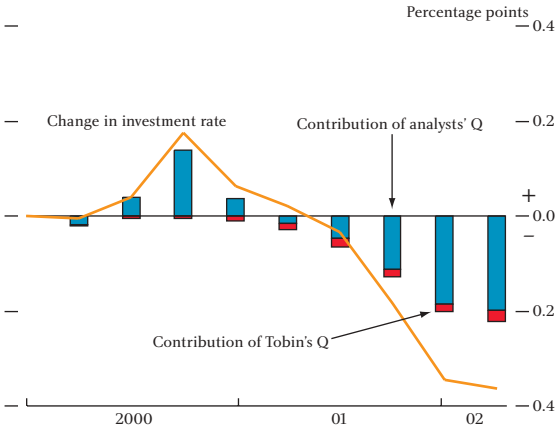
A simple aggregate econometric model illustrates the relative information content of analysts' Q and Tobin's Q for investment (see appendix for further details). Consistent with Q theory, this model relates the rate of investment to Tobin's Q. But the estimated equation also includes the above measure of analysts' Q.

To the extent that the equation can explain variations in the rate of investment, it does so almost entirely by the

(1) A wide literature has attempted to determine whether analysts' forecasts are biased. Keane and Runkle (1998) find that once they allow for aggregate shocks, which will only average out over many years, they cannot reject the hypothesis that Institutional Brokers Estimate System (IBES) one-quarter-ahead forecasts are unbiased. Chan, Karceski and Lakonishok (2001) compare realised long-term growth rates with forecasts provided by IBES and conclude that analysts' estimates tend to be too optimistic over long horizons.
(2) See Asquith *et al* (2002).
(3) The model is described in greater detail in Panigirtzoglou and Scammell (2002).
(4) This article uses IBES medium-term forecasts for the FTSE 100 index. These forecasts refer to the next business cycle, which IBES defines as three to five years. Note that long-term IBES forecasts for the United Kingdom begin in 1987. For earlier data in the sample, these profit expectations are approximated using the relationship between IBES forecasts and profits, GDP and inflation. This represents another potential source of mismeasurement.

Q measure that is based on analysts' earnings forecasts rather than that based on stock market valuations.(1) This is demonstrated in Chart 5, which shows the (cumulative) change in the investment rate since early-2000 and the contributions of analysts' Q and Tobin's Q.

Chart 5
Cumulative change in investment rate and the contribution of Q



In line with the previous literature, however, the performance of this aggregate model is quite poor. Movements in Tobin's or analysts' Q can account for only a small part of the substantial movements in actual Q observed (although the equation performs reasonably well in the most recent period). The equation residuals are serially correlated—if the equation overpredicts the investment rate this quarter, it is likely to do so again in the next quarter. And it is possible to find a role for other variables, such as sales, which is inconsistent with the idea that Q is a sufficient statistic for investment.

A superior approach may be to examine the role of analysts' Q using company-level data. This allows coefficients to be estimated with higher precision, by providing more observations with greater variability than aggregate data. This is particularly important because aggregate variables, such as share prices and investment, tend to move together over the business cycle.

Analysts' Q: a disaggregate approach

Recent joint research between the Bank and the Institute for Fiscal Studies has investigated the role of the stock market and analysts' earnings forecasts for investment using company-level data (Bond *et al* (forthcoming)).(2) Because longer-term forecasts are not available for most UK companies, they use forecasts of expected earnings for the current and following year as a guide to short-term profitability. As such, their analyst-based measure of future profitability would not be expected to provide a sufficient statistic for investment. Nonetheless, they find an important role for these IBES forecasts. And Tobin's Q provides little information for investment when they control for forecasts of short-term profitability in this way.(3)

Conclusion

Q theory states that companies invest until the cost of a unit of capital is equal to the profits that unit is expected to generate. As the stock market reflects investors' expectations of companies' discounted future earnings, stock market valuations have traditionally been used as a measure of expected future profits, the numerator in Q, but with unconvincing empirical results.

One possible reason for these empirical failures is a divergence between the market's expectation of future profits and managers' own opinions, so that Tobin's Q is no longer a sufficient statistic for investment. In this case, alternative measures of future earnings may contain more accurate information about investment intentions. One such measure—an analysts' Q based on IBES earnings forecasts—appears to perform better than a traditional Tobin's Q measure. But in line with other empirical evidence at the aggregate level, the equation estimated in this article performs quite poorly and can explain only a small part of the substantial movements in actual investment over the past two decades.

A more promising avenue for research appears to be at the disaggregate level. Recent research conducted by the Bank of England and the Institute for Fiscal Studies finds that Tobin's Q has limited information for investment, whereas analysts' earnings forecasts are more informative.

(1) Note that this result is consistent with analysts' forecasts of earnings being closer to managers' expectations of earnings than investors' opinions, or the constant risk premium being closer to managers' perceptions of risk than the market risk premium, or both.
(2) Bond and Cummins (2001) adopt a similar approach for the United States. The authors find that a standard stock market based Q has no additional explanatory power for investment when their analysts' measure is included.
(3) Interestingly, Bond *et al* also find that cash flow is insignificant under this specification. Their findings suggest that Tobin's Q may indeed be a poor measure of companies' expected future profitability, and that the cash flow variables widely used in investment equations might capture information about future profitability rather than financing constraints. Other variables, such as sales growth, are found to be significant, possibly because they contain information about longer-term profitability not included in analysts' short-term forecasts.

Appendix

Each variable is expressed in natural logarithms, and (Newey-West adjusted) t-statistics are given in brackets. The model is estimated on quarterly data between 1982 Q1 and 2002 Q2.(1)

$$invrate_t = -3.68 + 0.02 q_t + 0.22 q^*_t$$
$$\quad\quad (-189.11)\ \ (0.18)\quad\ (2.15)$$

R-squared	= 0.440	Adjusted R-squared	= 0.426
S.E. of regression	= 0.092	Durbin-Watson statistic	= 0.218

where:

invrate = log of (constant-price) business investment divided by the previous period's (constant-price) capital stock at replacement cost.(2)
q = Tobin's Q, defined as private non-financial corporations' net financial valuation divided by their capital stock at replacement cost.(3)
q^* = analysts' Q, defined as value of FTSE-All Share index implied by three-stage dividend discount model divided by private non-financial corporations' capital stock at replacement cost.

(1) In line with traditional aggregate Q studies, this article estimates a constant-price investment rate equation. This approach is consistent with a one-sector growth model. In a model with several capital goods, the relationship between the investment rate at constant prices and Q is rather more complicated. Current Bank research is investigating potential implications for aggregate modelling in a multi-sector framework. See also Tevlin and Whelan (2002).
(2) The business sector capital stock at replacement cost was constructed using the method outlined in Oulton (2001). Specifically, the 'Perpetual Inventory Method' was used to calculate the cumulated depreciated stock of investment flows, estimated separately for whole-economy plant and machinery excluding computers, buildings and vehicles. An implied aggregate depreciation rate was then calculated and applied to aggregate business investment data (the ONS does not publish an asset breakdown of business sector investment) in order to construct the business sector capital stock series.
(3) Data limitations mean that q and q^* are calculated from data on the private non-financial corporations sector rather than the broader business sector.

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Financial pressures in the UK household sector: evidence from the British Household Panel Survey

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Household indebtedness has risen rapidly in relation to incomes in recent years. But aggregate data cannot indicate which types of households—by age, income or wealth—have accumulated the most debts. This article uses information from the latest British Household Panel Survey(1) (for the year 2000) to provide some evidence on that issue. The survey suggests that debt-to-income ratios vary widely across households. The youngest and lowest-income households increased their debt-to-income ratios by most—and from the highest levels—between 1995 and 2000. But the households with the highest absolute levels of debts tended also to have the highest incomes and net wealth in both years. A large proportion of this wealth was held in housing assets. Such households did not, however, hold substantially more liquid assets than less indebted households. Although households were relatively sanguine about their higher levels of debt, that confidence could be eroded if circumstances deteriorated. Overall, changes in the distribution of household debt in recent years suggest that the household sector may be somewhat more vulnerable to an adverse shock than the aggregate measures indicate.

Introduction

This article summarises information contained in the latest British Household Panel Survey (BHPS), pertaining to the distribution of financial pressure across households in Great Britain.(2) The latest survey, published in April 2002, is the first for five years to contain extensive information, not available elsewhere, on the distribution of household sector assets and liabilities.

There are clearly many different ways in which the evidence from the BHPS can be presented.(3) The article highlights some stylised facts relating to three standard indicators of financial health used in the Bank: debt-income ratios; income gearing measures; and capital gearing ratios derived from the relationship between the liabilities and assets sides of the household sector balance sheet.

For each indicator, the article considers (a) how financial stress is distributed across households; (b) how this distribution has changed between 1995 and 2000, the two years for which fuller information is available; and (c) the types of household—by age, income and wealth—in the most indebted financial positions. Aggregate data cannot provide information on any of these factors. Furthermore, measures of central tendency (mean, median, mode) taken across heterogeneous groups of households cannot capture the position of households in the tails of the distribution. In assessing financial stress, we are most concerned about households whose indebtedness has reached levels likely to prove a heavy burden.

The article seeks to demonstrate that the disaggregated evidence from the BHPS provides additional and relevant information that can usefully supplement and augment the aggregate national accounts indicators of the household sector's financial position. Life-cycle considerations and casual observation suggest that the burden of debt varies substantially across households. At one end of the spectrum, younger households, for example, may borrow substantially against future income to purchase and furnish a house. At the other end, older households may have largely paid off their debts. Differences of this type mean that aggregate measures of

(1) The British Household Panel Survey data used in the paper were originally collected by the ESRC Research Centre on Micro-social Change and were made available through The Data Archive.
(2) Some results have already been reported in the Bank's *Financial Stability Review* for June 2002, page 83.
(3) See, for example, Banks, J, Smith, Z and Wakefield, M (2002), *The distribution of financial wealth in the UK: evidence from 2000 BHPS data*, Institute for Fiscal Studies.

financial pressure can only serve as proxies for the extent to which individual households on average experience difficulty in repaying their debts.

The information summarised in this article is relevant to some of the recent debates about the financial health of households in the United Kingdom and the United States. The Monetary Policy Committee noted the importance of examining financial stress at an individual household level in the minutes of its June meeting. The Committee was particularly interested in whether it was the same or different households who had been accumulating assets on the one hand and building up debt on the other in recent years, and whether debt was becoming more concentrated among particular groups of households.(1) In the United States, Federal Reserve Board Chairman Alan Greenspan has also illustrated the importance of disaggregated data in his testimony to the Joint Economic Committee in April this year. He emphasised the uneven distribution of debt and assets across households and noted that 'increased debt burdens appear disproportionately attributable to higher-income households' who 'should not experience much strain in meeting their debt service obligations'.(2)

In addition to quantitative information, the BHPS also provides qualitative information on the extent to which debt is considered a burden by individual households. This qualitative information may be used to supplement the quantitative indicators, although it is, of course, a purely subjective measure of financial pressure. The article includes a brief consideration of these qualitative indicators.

Indicators of financial pressure

The BHPS is an annual survey of households in Britain, which has been conducted since 1991. The most recent survey, released in April 2002, relates to the year 2000. Each survey is based on a nationally representative sample of adult members in around 5,500 households originally sampled in 1991. These sample members have been re-surveyed each year. If individuals leave their original households to join or form new households, the members of these households are added to the survey. New members of the original households, including children who reach the age of 16, are also interviewed.

The survey provides information on both quantitative and qualitative measures of factors affecting households' financial positions. *Quantitative measures* available in each survey include mortgage income gearing and the monthly saving ratio, both relevant to the ability of households to service their debts. Data on households' *stocks of debt and assets* are also available, but only for the years 1995 and 2000. These data can be used to calculate debt-income and capital gearing ratios for those years, providing an indication of the level of and changes in(3) the overall burden of indebtedness in relation to households' resources. *Qualitative measures* refer to the extent to which a household reports difficulties in meeting repayments, whether on its mortgage debt or on other debts. These indicators are subjective, because different households have different notions of what constitutes a payment problem. Table A summarises the indicators that can be derived from the BHPS.

In drawing conclusions from the BHPS, the extent to which the sample is representative of the household sector in aggregate is clearly crucial. The most comprehensive assessment of personal sector financial wealth in the United Kingdom is available from the Inland Revenue, based on information from estates. Comparisons suggest a close correspondence between BHPS and Inland Revenue data for all but the wealthiest 1% of households in the United Kingdom, which appear (perhaps not surprisingly) to be underrepresented in the BHPS sample.(4) Given that the assets of the very wealthy may contribute substantially to aggregate totals, direct comparisons between aggregate household sector statistics and BHPS figures are deliberately avoided in this article.

Debt-income ratios

We consider first the distribution of debt in relation to income over the sample of households, and also how debt-income ratios vary by levels of household income and the age of the household head.

(1) 'The aggregate expansion of both sides of the household sector balance sheet concealed a risk at a disaggregated level: to the extent that some households were accumulating liabilities while others were increasing their assets, there was a risk that indebted households might have to adjust their balance sheets and consequently reduce their consumption sharply in the event of an adverse shock.' Minutes of the MPC meeting, 5–6 June 2002, page 4.
(2) Testimony of Chairman Alan Greenspan, 'Monetary policy and economic outlook', before the Joint Economic Committee, US Congress, 17 April 2002.
(3) Comparisons between 1995 and 2000 need to be treated with caution. For example, the list of unsecured debts in 2000 included student loans and overdrafts, which were not separately identified in 1995 (although it is unclear whether respondents might have included them in another category in 1995).
(4) BHPS data for 1995 indicate that the wealthiest 1% of households owned 6% of total wealth. According to Inland Revenue estimates for 1995 the wealthiest 1% of households owned 19% of total wealth.

Table A
Indicators of financial pressure in the BHPS

Type	Indicator	BHPS questions and responses	Calculation of indicator
Quantitative-flow measures	Income	Respondents are asked how much their household income was in the month before interview. This measure includes income from employment, self-employment, investments, pensions and benefits, less direct taxes.	Income can be adjusted to allow for the effects of household size and composition.
	Saving	Respondents are asked: 'Do you save any amount of your income, for example by putting something away now and then in a bank, building society or post office account other than to meet regular bills? Please include share purchase schemes and Personal Equity Plan schemes.' If respondents do save some money each month they are asked how much.	A household saving ratio is calculated. The amounts saved each month by all members of a household are summed and divided by household income.
	Mortgage income gearing	Respondents who have a mortgage are asked to state the size of their last total monthly instalment on the mortgage.	Total monthly mortgage and loan instalments are divided by household monthly income, on the equivalent basis for a standard family unit.
Quantitative-stock measures	Unsecured debt	Respondents are asked to state the total amount of unsecured debt they owed, including: hire purchase agreements; personal loans (from a bank, building society or other financial institution); credit cards; store cards; DSS Social Fund loans; any other loans from a private individual; overdrafts; student loans.	Household unsecured debt as a percentage of income is calculated. The amounts owed by all members of a household are summed and divided by household income.
	Secured debt	Respondents are asked to state the total amount of outstanding loans on all property they or a member of their household own.	Household secured debt is added to household unsecured debt and divided by income to give total household debt as a percentage of household income.
	Savings	Respondents are asked how much they currently hold in: saving accounts with banks, the post office and building societies; TESSAs and ISAs; National Saving Certificates.	The amounts held in savings by all members of a household are summed.
	Other financial investments	Respondents are asked how much they hold in: premium bonds; unit trusts/ investment trusts; Personal Equity Plans; shares (UK or foreign); National Savings Bonds (capital, income or deposit); other investments, government or company securities.	The amounts held in financial investments by all members of a household are summed and added to household savings to give total household financial assets.
	Housing wealth	Households who own their home or who are buying it with a mortgage are asked to provide an estimate of the current value of their house.	A household's housing wealth is summed with household financial assets to give total household assets.
Qualitative measures	Housing payment problems	All respondents are asked: 'In the past twelve months would you say you have had any difficulties paying for your accommodation?' We analyse the results for mortgage-holding households only.	A mortgage-holding household is considered to have mortgage payment problems if it answers yes to this question.
	Unsecured debt payment problems	All respondents are asked: 'Do you or anyone in your household have to make repayments on hire purchases or loans? Please do not include mortgage loans but do include DSS Social Fund loans.' If respondents do make such repayments they are asked: 'To what extent is the repayment of such debts a burden on your household? Would you say it is a heavy burden, somewhat of a burden or not a problem?'	An individual is considered to be under financial pressure if repayments on these debts are considered either 'somewhat of a burden' or a 'heavy burden'.
	Pension schemes	If a respondent's company runs a pension scheme the respondent is asked if they are a member of the scheme. Respondents are also asked whether they have a private pension scheme.	

Table B summarises the distribution of secured (ie mortgage) and unsecured debt-income ratios across households with gross debts in 1995 and 2000.(1) For mortgage holders, the total (mortgage plus unsecured) debt-income ratio for the top decile of households (ie those with the highest debt-income ratios) was twice that of the median household in 2000 (286% and 142% respectively), and nearly six times higher than for the bottom decile (49%). The variation in unsecured debt-income ratios was even more pronounced in 2000, ranging from over 50% for the top decile to less than 10% at the median and less than 1% for the bottom decile.

The ratio of total debt to income was almost the same in 1995 and 2000 for the median mortgage-holding household. But, importantly, the total debt-income ratio fell a little among the households with the highest such ratios, while rising modestly at most other points of the distribution. By contrast, unsecured debt-income ratios rose more significantly throughout the debt distribution.(2)

Turning to debt-income ratios by the age and income of the household head, standard life cycle considerations suggest that young and relatively low-income households would tend to have the highest debt-income ratios. This is confirmed by the BHPS data, summarised in Tables C and D.(3) Total debt-income ratios of mortgage-holding households, and unsecured debt-income ratios of all households with unsecured debt commitments, were both broadly inversely

(1) An advantage of disaggregated data is that we can focus on the distribution of debt among indebted households only, as well as among all households (whether indebted or not). Aggregate statistics provide information only on all households.
(2) It should be noted that households are likely to have moved within these groups between 1995 and 2000.
(3) Similar data to those presented in Tables C and D and Charts 2 and 4 were reported in the *Financial Stability Review*, June 2002, pages 81–83.

Table B
The distribution of mortgage and unsecured debt of borrowers(a)

Variable	Sample	Year	Percentiles of the population				
			90th	70th	50th	30th	10th
Total debt (mortgage debt plus unsecured debt) as a percentage of income (%)	Mortgage holders	1995	294.4	183.8	141.5	95.9	45.4
		2000	285.9	191.9	142.4	98.8	49.0
Unsecured debt as a percentage of income (%)	Households with unsecured debt (b)	1995	32.9	13.5	6.3	2.3	0.6
		2000	51.5	20.7	9.8	3.9	0.8

Sources: BHPS and Bank calculations.

(a) Percentiles shown range from the most indebted (90th) to the least indebted (10th).
(b) Here households with unsecured debt include all households with unsecured debt, whether mortgage holders or not.

correlated with household income and age in both 1995 and 2000. But it should be noted that the debt held by the youngest and lowest-income households accounted for only a small proportion of total household debt in the BHPS sample, and that proportion fell between 1995 and 2000.(1)

The comparison between 1995 and 2000 shows that total debts relative to income rose most rapidly for the lowest-income mortgage-holding households.(2) Moreover, unsecured debts more than doubled in relation to income between 1995 and 2000 for the lowest-income households. The higher levels, and in some cases more rapid growth, of debt-income ratios among the youngest and lowest-income households are important findings, given that BHPS data also indicate that these are the households most vulnerable to financial and other shocks likely to increase financial stress, such as spells of unemployment or unexpected increases in interest rates.

Income gearing measures

While high levels of debt in relation to income may make households more vulnerable to adverse financial shocks, they will not impose immediate financial pressure if the cost of servicing debt remains modest in relation to incomes.

The BHPS data allow the construction of a measure showing the distribution of mortgage income gearing (see Chart 1) from 1991. As with the distribution of total debt-income ratios among mortgage-holding households, stability at the median hides variation at other points in the distribution. Just as the debt-income ratio fell between 1995 and 2000 for the mortgage-holding households with the highest such ratios, so financial pressure, as measured by debt-service costs, has eased over the past decade among the households with the highest income gearing ratios. Mortgage income gearing at the 90th percentile (that is, the decile of households with the highest mortgage income gearing) fell from 38% in 1991 to 28% in 2000,

Table C
Total debt as a percentage of income (mortgage holders only)(a)

	1995		2000	
	Contribution to total debt of sample	Average debt as a percentage of income	Contribution to total debt of sample	Average debt as a percentage of income
Household income (£)				
Up to 11,499	6.9	334.3	4.9	432.0
11,500–17,499	10.4	210.6	6.9	208.5
17,500–24,999	20.6	155.8	15.2	182.2
25,000–34,999	26.5	132.5	22.1	146.4
35,000–49,999	21.6	119.2	28.3	127.6
50,000+	14.0	104.2	22.7	106.9
Age of household head				
16–24	4.1	187.4	3.2	182.8
25–34	34.1	171.4	30.4	172.3
35–44	35.1	145.5	39.9	153.3
45–54	20.7	111.6	19.7	104.0
55–64	4.8	85.2	5.5	97.5
65+	1.1	86.7	1.3	109.4

Sources: BHPS and Bank calculations.

(a) The total debt of the sample was calculated by summing the total debt of all households with a mortgage in the BHPS sample. The contributions of the debt of different income and age groups to the total sample debt were calculated by summing the total debt of all mortgage-holding households within each age or income group and dividing by the sample total.

Table D
Unsecured debt as a percentage of income (households with unsecured debt)(a)

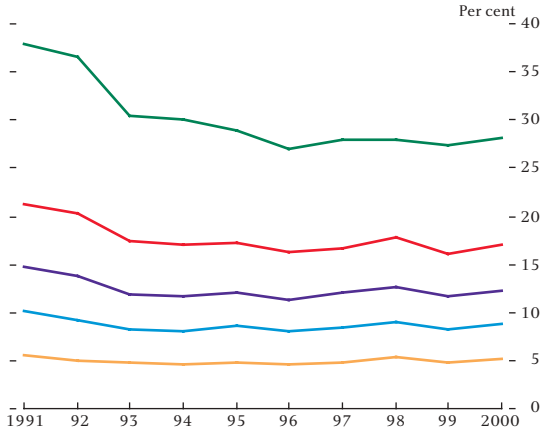
	1995		2000	
	Contribution to total debt of sample	Average debt as a percentage of income	Contribution to total debt of sample	Average debt as a percentage of income
Household income (£)				
Up to 11,499	8.7	16.3	10.2	35.9
11,500–17,499	12.2	15.1	8.4	19.1
17,500–24,999	21.1	12.9	15.9	19.7
25,000–34,999	26.7	11.1	22.3	17.0
35,000–49,999	19.8	9.7	25.5	16.1
50,000+	11.5	9.2	17.8	12.6
Age of household head				
16–24	8.6	17.4	11.2	29.7
25–34	29.7	12.3	27.9	19.1
35–44	28.3	11.3	30.5	17.2
45–54	23.0	11.3	19.3	13.8
55–64	7.5	8.5	8.1	13.6
65+	2.8	7.8	3.0	13.4

Sources: BHPS and Bank calculations.

(a) The total unsecured debt of the sample was calculated by summing the total unsecured debt of all households in the BHPS sample. The contributions of the debt of different income and age groups to the total unsecured debt of the sample were calculated by summing the total unsecured debt of all households within each age or income group and dividing by the sample total.

(1) This fall, however, is of limited significance given the small sample size of this group.
(2) There is little evidence to suggest that these increases were due to the rise in the number of students and the introduction of university tuition fees between 1995 and 2000. Excluding students from the sample lowers average unsecured debt as a percentage of income in the 2000 sample from 9.5% to 9.3%. Changes in unsecured debt as a percentage of income are similarly small across income and age groups when students are removed from the sample.

Chart 1
Mortgage income gearing(a)



Sources: BHPS and Bank calculations.

(a) 10th, 30th, 50th, 70th and 90th percentiles shown.

with all of this fall concentrated in the first half of the decade. It should be emphasised, however, that nominal measures of mortgage debt service do not take account of movements in the real cost of servicing a mortgage.(1)

It is also significant that mortgage income gearing did not pick up substantially at any of the percentiles shown in the late 1990s, despite the rapid accumulation of secured debt over that period. This reflects buoyant household income growth and low and declining effective interest rates between 1995 and 2000.

Balance sheet indicators

The aggregate household sector balance sheet and indicators derived from it, such as capital gearing, are also frequently used to assess the financial health of the sector. In recent years, households in aggregate have been rapidly acquiring both assets and liabilities. The issue raised in the minutes of the June 2002 MPC meeting was that aggregate data cannot reveal whether it is the *same* households acquiring debt *and* building up assets. This section looks at information from the BHPS on both sides of the balance sheet of particular groups of households.

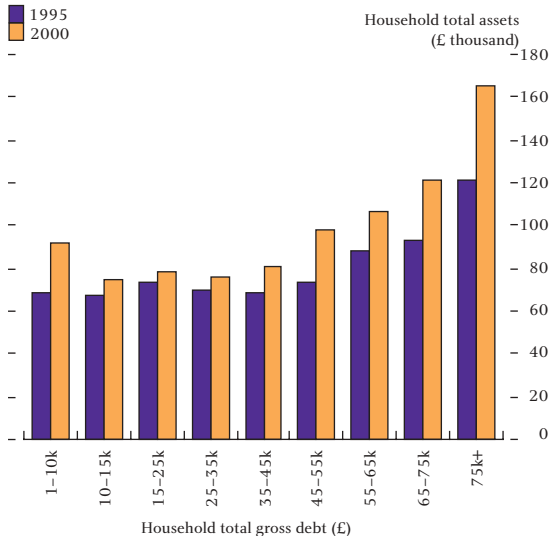
The BHPS suggests that, for mortgage holders, the most indebted households (with gross debts of more than £75,000) also had the highest levels of gross assets in both 1995 and 2000 (see Chart 2).(2) Furthermore, the gross assets of these households rose more rapidly between 1995 and 2000 than the gross assets of less indebted households. For households with unsecured debt, whether mortgage holders or not, those with the largest amounts of unsecured debt (more than £10,000) also had the highest levels of gross assets (Chart 3).(3) These households' assets fell somewhat between 1995 and 2000, however, unlike the assets of other households (except the least indebted).

Total gross assets, of course, include housing assets. The rapid growth of house prices in recent years will have directly raised the value of these assets, but will also have increased the liabilities of those households 'moving up', or entering, the housing market, through the need for larger mortgages in order to finance house purchase. It is perhaps more instructive to consider households' *net* asset positions to understand the crucial role of housing in the household sector's balance sheet. The BHPS reveals that the most indebted households, whether mortgage holders or not, had the highest levels of net assets in 2000, as well as the highest levels of net financial liabilities (including mortgage debts but excluding housing assets) (Chart 4). At the level of house prices prevailing in 2000, positive net housing equity more than offset non-housing debts for the most indebted (and indeed other groups of) households (Chart 5).

The finding that the most indebted mortgage-holding households also held the largest amounts of total assets may not be surprising because it accords with intuition and casual observation—those households with large mortgages tend to own more expensive houses. So it helps to account for the finding that those households that have been building up debt on the one hand are the same households as those who have been accumulating assets on the other.(4) But the two other

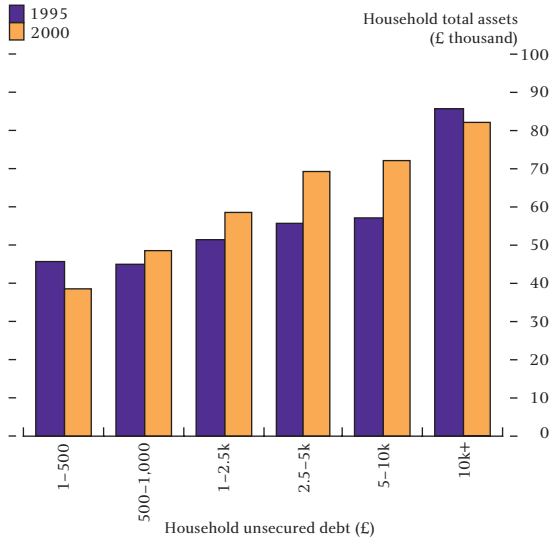
(1) Nominal measures of debt-servicing costs remain useful indicators of cash-flow pressure. The difficulties of measuring and comparing indicators of income gearing over time are discussed in 'Box 9: Measures of household income gearing' in the *Financial Stability Review*, June 2002, page 82. Note that the BHPS measures of mortgage income gearing include principal repayment as well as debt interest elements, unlike the National Accounts measures.
(2) To prevent outliers distorting averages any observations over the 99th percentile were replaced by the 99th percentile. This was done for all asset and debt data.
(3) It could be argued that if the number of households in each debt and asset group is different then Charts 4–7 fail to reflect the relative importance of these different groups in the BHPS sample. But average asset levels across different percentile ranges of household debt (to ensure similar numbers of households in each group) show similar patterns as in Charts 2 and 3. The majority of households with debt within certain percentiles of the debt distribution also had assets in the same or adjacent percentiles of the asset distribution. The extent to which the distribution of debt and assets in these charts represents the distribution in the United Kingdom as a whole also depends on how representative the BHPS sample is, see footnote 4 on page 411.
(4) This conclusion also holds if we compare changes in stocks of assets with changes in debt-to-income ratios.

Chart 2
Average total assets at different levels of household indebtedness (mortgage holders only)



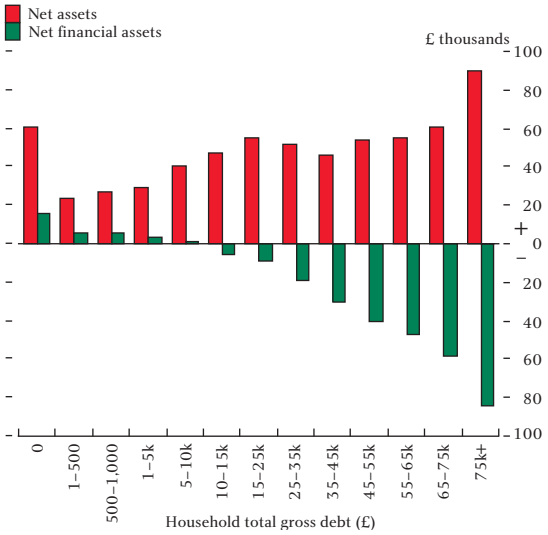
Sources: BHPS and Bank calculations.

Chart 3
Average total assets at different levels of household unsecured debt (households with unsecured debt)



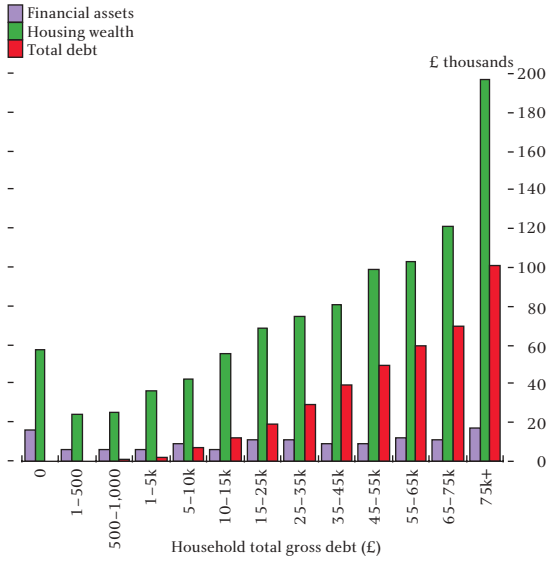
Sources: BHPS and Bank calculations.

Chart 4
Average net assets at different levels of household indebtedness in 2000



Sources: BHPS and Bank calculations.

Chart 5
Average financial assets, housing wealth and debt at different levels of household indebtedness (2000)(a)



Sources: BHPS and Bank calculations.

(a) The values of housing wealth used in Charts 4 and 5 are not directly comparable with those in Charts 2 and 3. In 2000, households who owned any property other than their current home were asked the value of the additional property. This question was not asked in 1995. To enable accurate comparison between the two years Charts 2 and 3 do not include the value of any additional property. However, Charts 4 and 5, which are for 2000 only, include the value of *all* property owned by households.

main BHPS findings in this area are much less obvious: that households with the highest levels of unsecured debts should also have the highest gross assets; and that the most indebted households should also have the most net assets. These results are significant and suggest that gross indebtedness is concentrated among the wealthiest households, who in most circumstances may be able most easily to liquidate assets as necessary to pay off debts.

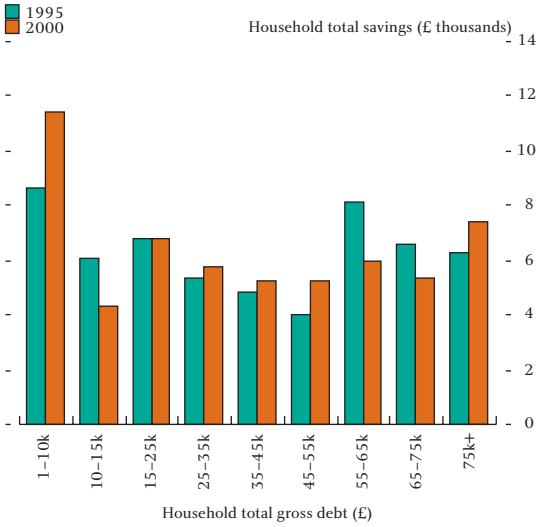
A crucial qualification, however, is that the heavily indebted mortgage-holding households could be vulnerable in the event of a major correction in the housing market, notwithstanding their higher net assets, especially if that correction were accompanied by falling incomes. Since 2000, rapid house price rises, together with the associated strong growth in households' mortgage borrowing, will have further inflated both sides of the aggregate household sector balance sheet. As noted in the November *Inflation Report*, recent rates of

house price inflation are unsustainable. The Monetary Policy Committee's central projection in November was for a marked slowdown in house price inflation, with prices likely to be broadly stable in two years' time. But the Committee noted that there were major risks around this central projection, including the possibility of continuing high house price inflation in the near term, followed by a subsequent sharp correction. In the event of a sharp fall in house prices, highly leveraged households would experience a correspondingly greater deterioration in their net worth.

Moreover, if households also experience a fall in their incomes, say because of a rise in unemployment, they may then find it more difficult to realise some of their housing equity, either by selling their property or by increasing secured borrowing. In such circumstances their ability to maintain spending levels would depend upon their available liquid assets (ie assets excluding housing and equity wealth). If it is assumed that households' savings (as defined in the BHPS), as opposed to financial investments, are liquid, it is possible to assess liquidity at different levels of household indebtedness (see Charts 6 and 7).(1) The distribution of these liquid assets across mortgage-holding households suggests that the least indebted such households had the highest levels of liquid assets in 1995 and 2000. More generally, average levels of liquid assets among more indebted mortgage-holding households were not substantially different from liquid asset holdings of less indebted such households. And for some of the more indebted such households (but not the most indebted group), liquid asset holdings fell between 1995 and 2000. The distribution of liquid assets across households with different levels of *unsecured* debt was also fairly flat in 2000. These data tend to reinforce the concerns about the possible vulnerability of the more indebted households to corrections in the housing or equity markets.

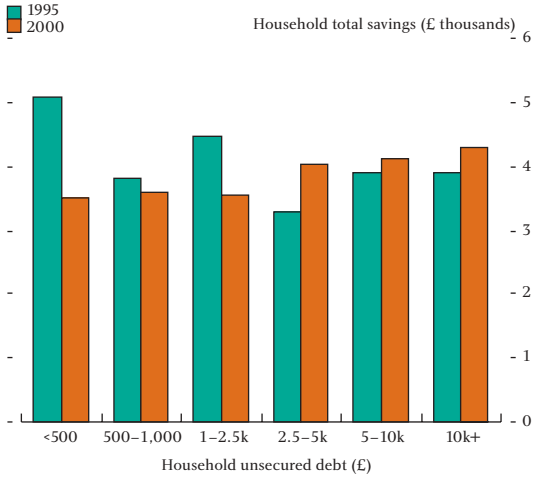
In addition to their gross and net total and liquid asset positions, the BHPS also permits an analysis of the incomes of households with differing levels of gross debts. This is also crucial to their ability to repay and, in particular, service debts. Households with higher levels of debt had higher incomes than those with lower levels of debt both in 1995 and 2000 (see Charts 8 and 9). And the incomes of the most indebted households

Chart 6
Average liquid assets at different levels of household indebtedness (mortgage holders only)



Sources: BHPS and Bank calculations.

Chart 7
Average liquid assets at different levels of unsecured debt (households with unsecured debt only)



Sources: BHPS and Bank calculations.

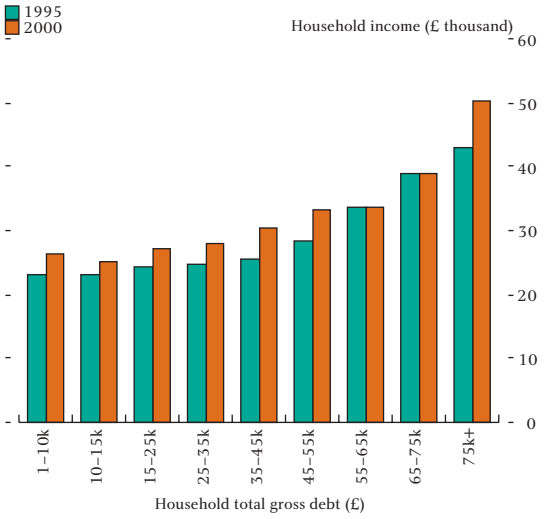
generally rose by more (in absolute terms) than those of most other household groups between 1995 and 2000.

Qualitative indicators of debt sustainability

Although debt-income ratios, income gearing and balance sheet indicators are widely used measures of financial vulnerability or stress, movements in these ratios should be interpreted with caution. Higher debt-income ratios may represent a desired adjustment to lower inflation and interest rates by households confident of servicing their increased debts. The qualitative information available from the BHPS is based

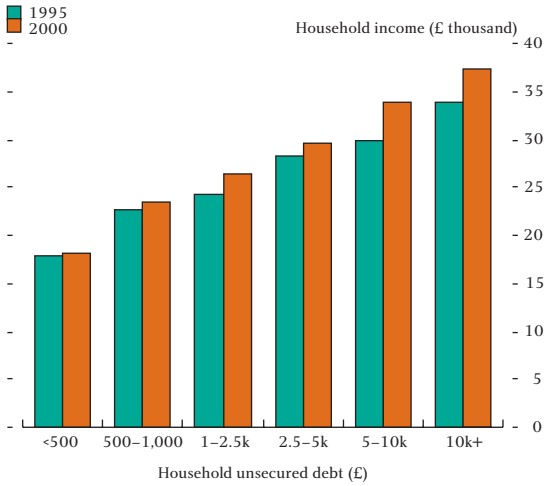
(1) Savings (as defined in the BHPS, Table A) may include notice accounts or other saving vehicles where early withdrawal of funds may incur penalties. However, these savings are in general more liquid than the financial investments defined in Table A.

Chart 8
Average household income at different levels of household indebtedness (mortgage holders only)



Sources: BHPS and Bank calculations.

Chart 9
Average household income at different levels of unsecured debt (households with unsecured debt)



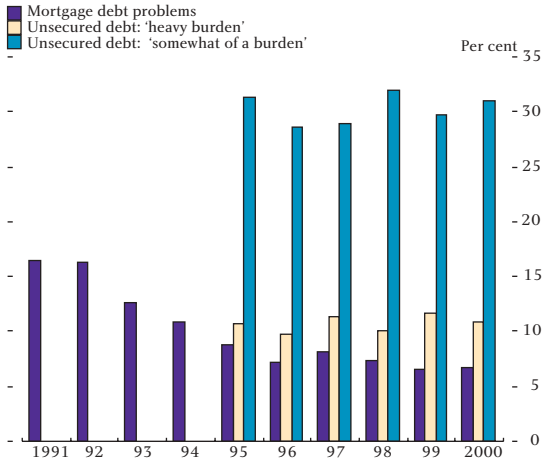
Sources: BHPS and Bank calculations.

on households' own assessments of the burden of their debt.

According to responses to the BHPS questionnaires, the proportion of mortgage-holding households reporting mortgage debt problems fell from 16.5% in 1991 to 6.7% in 2000 (Chart 10). The proportion of households with unsecured debt commitments that found them either a 'heavy burden' or 'somewhat of a burden' remained broadly stable at around 11% and 30% respectively between 1995 and 2000 (Chart 10).

Among those households who reported *no* difficulty meeting their unsecured loan commitments, the average

Chart 10
The proportion of households reporting secured or unsecured debt payment problems(a)



Sources: BHPS and Bank calculations.

(a) Households reporting mortgage debt payment problems are given as a percentage of all households with mortgages. Households reporting unsecured debt payment problems are given as a percentage of all households with unsecured debt commitments.

unsecured debt-income ratio rose from 11.9% in 1995 to 15.6% in 2000 (Table E). The average unsecured debt-income ratio among those households who considered their unsecured debt to be a 'heavy burden' was 22.3% in 1995; five years later in 2000 a similar level of debt in relation to income was considered to be only 'somewhat of a burden', while the average debt-income ratio considered to be a 'heavy burden' had risen to 36.3%. A similar pattern is apparent among those who thought their debt burdens were 'somewhat of a problem'.

Table E
Perceived sustainability of debt burdens

			Average level of unsecured debt as a percentage of income	
			1995	2000
Unsecured debt	Unsecured loan commitments are:	A heavy burden	22.3	36.3
		Somewhat of a burden	16.9	23.5
		Not a problem	11.9	15.6
			Average level of total debt as a percentage of income	
			1995	2000
Mortgage debt	Have you had difficulty meeting mortgage repayments:	Yes	213.7	206.2
		No	134.7	136.4
			Average level of mortgage income gearing	
			1995	2000
Mortgage debt	Have you had difficulty meeting mortgage repayments:	Yes	26.1	23.4
		No	14.2	15.2

Sources: BHPS and Bank calculations.

Combining quantitative and qualitative disaggregated data in this way permits an assessment of whether the level of debt that households perceive as sustainable has changed over time. It is, of course, likely that any such perceptions will reflect the macroeconomic environment and be sensitive to changes in that environment. For example, households' perceptions that their sustainable debt burdens have risen may reflect their confidence that a low interest rate environment can be maintained. If interest rates were to rise significantly, their views on the sustainability of current debt levels could rapidly become less sanguine (although much would depend on the reasons for any such rise in interest rates).

Conclusions

Financial pressure reflects the difficulty that households experience in repaying debts. The willingness of households to take on new debt and the burden of servicing debt play an important role in the transmission mechanism of monetary policy and the risks for financial stability in the event of an adverse shock. In this article, we have taken three measures of household financial stress—debt-income ratios, debt-service burdens and debt-asset relationships derived from household balance sheets—and used disaggregated data from the latest British Household Panel Survey to look at the level of and changes in the distribution of financial stress over time.

Among the main conclusions to emerge from these data are the following:

(i) Total debt-income ratios of mortgage-holding households generally rose in the second half of the 1990s, except for a fall among those households with the highest such ratios. The increases were largest for the lowest-income households.

(ii) In contrast, unsecured debt-income ratios rose significantly more over this period at all points of the distribution, and by most (in percentage points) for the households with the highest such ratios, again generally the lowest-income (and youngest) households. These households are likely to be more vulnerable to financial and other shocks, such as unexpected increases in interest rates or spells of unemployment.

(iii) Debt-servicing burdens in the mortgage market fell by most in the first half of the 1990s among households with the highest levels of income gearing, and have been broadly stable at all points of the distribution in the second half of the 1990s.

(iv) The households with the highest absolute levels of both mortgage and unsecured debts tended also to have the highest levels of income and net wealth in both 1995 and 2000.

(v) Comparisons between 1995 and 2000 suggest that rapid growth of both sides of the aggregate household sector balance sheet over that period was more associated with the same households accumulating both liabilities and assets, rather than with some households mainly accumulating liabilities while others were mainly increasing their assets. This reflects the rapid growth of house prices in recent years; the most indebted households may therefore be somewhat more vulnerable in the event of a major correction in the housing market, notwithstanding their greater net assets.

(vi) More indebted households did not, overall, have substantially greater liquid assets than less indebted households, leaving the former potentially more exposed in the event of an adverse shock to income or an increase in interest rates.

(vii) According to responses to the survey questionnaires, the proportion of mortgage-holding households reporting problems in meeting their mortgage obligations fell significantly in the 1990s, while the proportion reporting problems in meeting their unsecured debt obligations was broadly stable. In both cases, households perceived themselves as being able to sustain significantly higher levels of debt in relation to their incomes. But these perceptions could rapidly become less sanguine if interest rates were to rise substantially or incomes fall.

In some respects, these conclusions imply that, given the changes in the distribution of household debt in recent years, the sector overall may be somewhat more vulnerable than the aggregate measures might suggest. And two important qualifications should be emphasised. First, the survey covers a period that ended some two years ago. Since 2000, household sector borrowing, in particular, has continued to grow rapidly, as has housing wealth, while financial wealth has declined with the falls

in equity markets. These developments are likely to have reinforced some of the trends highlighted in this article. Second, we have not in this article looked at heterogeneity within the various household groups examined: it is possible, for example, that some of the most indebted groups might not have particularly valuable houses or large incomes.

The BHPS provides a rich seam of material for further research. Other indicators might be tracked, for example ratios of net assets to income. And changes in the financial characteristics of individual households over time, in particular households in the 'vulnerable' tails of the distributions, could also be analysed. This might permit more research into the factors determining the evolution of individual household indicators of financial stress, and their responsiveness to shocks such as unexpected falls in house prices or rises in interest rates. Such work might in particular seek to determine how such scenarios might affect the proportion of households in distress. Finally, research might also look at the extent to which movements in aggregate data can be explained by the behaviour of different disaggregated groups of households. The Bank hopes to consider several of these avenues for further work in the months ahead.

Money market operations and volatility in UK money market rates[1]

By Anne Vila Wetherilt of the Bank's Monetary Instruments and Markets Division.

The Bank of England implements UK monetary policy by influencing short-term interest rates in its money market operations. The way in which the Bank operates in the market has changed significantly over time, but the aim throughout has been to ensure that the behaviour of short-term interest rates is consistent with monetary policy decisions, whether made by the Chancellor of the Exchequer or, since 1997, by the Bank's own Monetary Policy Committee. Operational choices by the central bank, together with developments in the markets themselves, are likely to have affected the volatility of short-term interest rates. This article outlines various measures of volatility in sterling money markets.

Introduction

In different countries and at different times, monetary policy has had various strategic objectives—including targets for inflation, the exchange rate or monetary growth, or more general aims for growth and price stability. But in recent years, irrespective of their strategic aims, most major central banks have chosen to pursue them either by operating at a set official interest rate or by targeting a short-term money market rate. In setting rates, central banks have a choice of instruments, typically grouped under three headings: open market operations, standing facilities, and reserve requirements.

A simple model of operational policy[2]

To understand how central banks influence short-term market interest rates, it is useful to consider the market for commercial bank balances at the central bank. Its market-clearing rate is closely related to the central bank policy rate.[3]

Commercial bank balances at the central bank are the ultimate means of settlement. Commercial banks have a demand for such balances in order to be able to settle transactions among themselves or between their respective customers. And it is from these balances that commercial banks pay for central bank notes, if their customers wish to withdraw cash from their accounts. Central banks may also require commercial banks to maintain these balances at a defined level, either on a daily basis or on average over a period (reserve requirements). By trading with each other in the interbank market commercial banks can manage the liquidity needs that arise from customer transactions, and can, individually, seek to avoid costly overdrafts on their end-of-day balances with the central bank.

But for the system as a whole, the supply of balances at the central bank stems from the central bank itself, which is the sole supplier. In many cases, central banks manage their own balance sheets so that commercial banks are short-term debtors to the central bank. As this debt matures, if commercial bank balances are to be maintained at the required level, the central bank needs to provide new finance, typically through its money market operations. In this way, the central bank implements monetary policy by setting the rate at which these funds are provided.

But some items in central banks' balance sheets are typically not controlled directly. These items (often called 'autonomous factors') include changes in the note issue and, in some systems, changes in net foreign assets (brought about by exchange market intervention). These autonomous factors can cause significant day-to-day variations in the central bank's balance sheet, and potentially affect the equilibrium interest rate in the market for commercial bank balances.

If the demand for commercial bank balances exceeds the supply, a shortage arises, and banks will bid for funds in

(1) A more technical version of this article appears as a *Bank of England Working Paper* (Vila Wetherilt (forthcoming)).
(2) See Borio (1997) for a summary of theoretical models of central bank operational policies.
(3) The model most easily applies to situations where the policy rate is an overnight rate. If the policy rate is of a longer maturity, then a richer model is needed to explain the link between the policy rate and the overnight rate.

the market at higher interest rates. The central bank will need to supply funds if it wants to avoid a large departure of the market rate from its policy rate. If the demand for central bank reserves falls short of supply, a surplus arises and the central bank will need to drain funds from the market to prevent the market rate from falling too much. Hence an important part of the central bank's task is the forecast of future demand for commercial bank balances, reflecting movements in autonomous factors.

The past decade has witnessed a number of changes in the operational framework for monetary policy across developed countries. Most noteworthy are the trend towards reducing or removing reserve requirements, changes in the mix of assets used in open market operations and the preference for greater transparency in official rate setting instead of signalling through open market operations.

The operational framework in the United Kingdom

Since March 1997, the Bank of England has implemented its monetary policy via the official two-week repo rate.(1) This is the rate at which the Bank conducts repo transactions with its counterparties as part of its daily open market operations (OMOs). Commercial banks with settlement accounts at the Bank of England are required to have a positive balance on their accounts at the end of each day, and otherwise pay a penalty rate. The Bank of England manages its own balance sheet to ensure that on most days the banking system needs to borrow from the Bank. In the daily open market operations, the Bank's OMO counterparties can submit bids for funds at the official repo rate up to the size of the forecast of this liquidity shortage announced by the Bank every day. The Bank supplies sufficient funds to leave the settlement banks collectively with small positive end-of-day balances.

Although the Bank's OMO counterparties include settlement banks, which hold balances on accounts at the Bank, a settlement bank does not need to be a counterparty and an OMO counterparty does not need to be a settlement bank. Irrespective of the type of organisation that takes the funds in the Bank's money market operations, those funds will eventually find their way on to a settlement bank's account at the Bank. In this way, the Bank's operations provide to the market the net amount of liquidity needed by the system as a whole.

Counterparties have the choice between entering into repo agreements with the Bank, or selling securities on an 'outright basis'. The use of repo in the open market operations has grown markedly in recent years. This is partly the result of the 1996 reforms that removed restrictions on the development of an open gilt repo market.(2) Most of the open market operations are undertaken at a two-week maturity, though variations occur, depending on the time profile of the market's liquidity needs.(3)

Prior to 1997, open market operations were mainly conducted with discount houses via outright purchases or sales of eligible bank bills and sterling Treasury bills. A key rate was the so-called minimum Band 1 dealing rate, which was the minimum rate at which the Bank was willing to discount bills with up to 14 days maturity. After the September 1992 Exchange Rate Mechanism crisis when foreign exchange intervention caused a massive drain of liquidity from the market that had to be recycled, the Bank introduced temporary repo facilities for assets including gilts, available to a wider range of counterparties. These were re-offered on a number of occasions thereafter, and from January 1994, became a regular part of the Bank's open market operations. They were conducted twice a month with a maturity generally of two or four weeks, and were open to a selected group of market participants. When in 1997 two-week repo operations were introduced into the Bank's daily operations, the twice-monthly repo facility was put into abeyance.

The 1997 reforms also broadened the group of eligible counterparties, to include a wide range of banks and dealers that are active in the sterling money markets. Counterparties can use a range of securities as collateral in the open market transactions, including gilts and eligible bills (Treasury bills and eligible bank bills). Since 1997 the pool of securities that can be used as collateral has been extended, most notably in August 1999, when euro-denominated securities issued

(1) For more detail, see 'The Bank of England's operations in the sterling money markets', *Bank of England Quarterly Bulletin*, Summer 2002, pages 153–61.
(2) Prior to 1996, gilt repo was available to a limited group of market participants only, at fixed fees, and could only be used to cover short positions.
(3) For example, between October 1999 and February 2000, the Bank offered repos with up to three-month maturity to assist in managing liquidity needs over the millennium date change.

by governments and central banks in the European Economic Area were added to the list. After the 1997 reforms, it remained possible for the Bank to provide liquidity through channels other than the daily repo auctions, in particular via the use of foreign exchange swaps.(1)

From 1997 to 1998, there were two daily rounds where the Bank's counterparties could bid for funds (12.00 noon and 2.30 pm), and sometimes an additional early round (9.45 am) depending on liquidity conditions. In June 1998, this was modified to two regular daily rounds (9.45 am and 2.30 pm) for two-week repo and outright sales.(2) In addition, the Bank introduced two end-of-day facilities for overnight repo that could be used by market participants who found themselves with unforeseen liquidity needs towards the end of the day. At 3.30 pm, OMO counterparties can bid for the necessary additional funds at a penal rate (currently 100 basis points above the Bank's repo rate).(3) The Bank thereby effectively introduced a ceiling for the overnight rate.(4) After the close of the money markets, the 4.20 pm facility allows settlement banks that are subject to the daily maintenance requirement to obtain additional funds (at a penal rate of 150 basis points above the official repo rate) which might be needed in order to balance their account with the Bank at the end of the day.(5) In June 2001, the Bank introduced an overnight deposit facility (remunerated at 100 basis points below the Bank's repo rate). This facility is made available to the Bank's OMO counterparties at 3.30 pm. This policy change, however, falls outside the sample period considered in this article.

Operational policy and the behavior of money market rates

Some fluctuations of market interest rates around the policy rate are a normal feature of a well-functioning market. But evidence of changing longer-term patterns in the spreads of money market rates over the policy rate can be indicative of changes in the effectiveness of operational procedures. In this respect, evidence of changes in these rates and their volatility following policy reforms might be particularly illuminating.

In this article, the behavior of money market rates is viewed from two angles. First, fluctuations of market rates around the policy rate are examined, with particular attention to their volatility and their persistence. In the context of the United Kingdom, the main variable of interest is the spread of two-week market rates over the Bank's official repo rate.

But the spread of overnight rates over the official rate might also serve as an indicator of effectiveness. Those rates are affected by some aspects of the operational framework (most notably the overnight facilities). Furthermore, market participants' behaviour in the overnight market is typically influenced by their views on current and future expected policy rates, as well as the prevailing two-week market rates. For example, when market participants expect official rates to rise, they may want to borrow from the Bank for the longest possible period (ie two weeks) to lock in the prevailing official rate. This will cause demand for overnight money to fall. Overnight rates will therefore fall prior to the expected rate rise, only to catch up thereafter.(6)

If central banks implement policy in such a way that market rates remain close to the official rate, they will also keep volatility of these rates low and stable over time. Measuring the volatility of these rates is then just another way of assessing an operational policy.

Both spreads and rate volatility can also depend on market participants' perception of the central bank's attitude towards money market rate volatility. If market participants expect that the central bank will not tolerate large differences between market rates and the policy rate, then they themselves might be less inclined to trade at rates away from the policy rate. By the same token, should large divergences arise, then they would be expected to be short-lived as the central bank would be expected to act promptly.(7) Any increases in volatility of market rates would then be expected to be temporary. In other words, in assessing the impact of operational policy on the shortest money market rates, both the level and the persistence of their volatility need to be examined.

(1) See for example *Bank of England Quarterly Bulletin*, May 1999, page 110.
(2) On days when the MPC announces its repo rate decision, the early round is not held until 12.15 pm.
(3) No penalty is incurred if these liquidity needs arise from late changes to the Bank's liquidity forecast.
(4) Prior to June 1998, only a limited number of market participants had access to a late lending facility and their access was limited by quotas. Hence, the late lending rate did not effectively cap the overnight rate.
(5) Again, funds are provided at the normal repo rate if there was a late revision to the Bank's forecast of the daily shortage.
(6) This is referred to as pivoting.
(7) See for example Guthrie and Wright (2000).

A second question about overnight and two-week rate volatility is the extent to which it affects the volatility of rates further along the money market yield curve. To see how this transmission of volatility can be measured, it is helpful to use a standard model of interest rates that links the behaviour of such longer-term rates to current and future short-term rates (the expectations model with a constant risk premium). In such a model, volatility of longer rates is closely related to volatility of the shortest rates.

But variability in short rates does not always lead to proportional variability in long rates. If the variability in short rates is high, but short-lived, then the effect on longer-term variability will be weak.(1) In contrast, if short-term volatility tends to persist over time, so that prolonged episodes of high volatility occur, then even small increases in this volatility will result in high variability of longer-term rates.

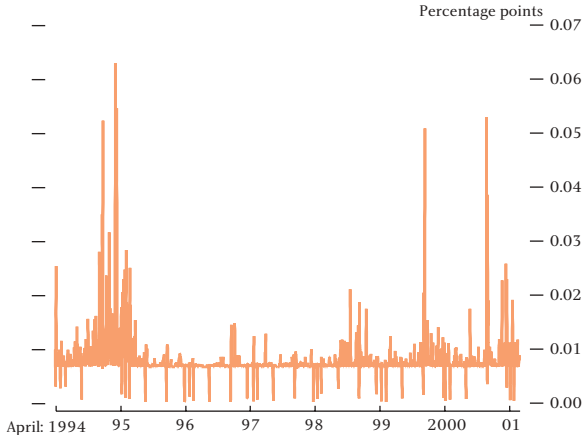
Volatility of UK money market rates at the short end

To examine volatility in UK money markets, this article employs daily data for UK unsecured interbank market rates (Libor) over a long sample period (April 1994 to June 2001) and computes spreads over the official repo rate. Rate volatility is measured using the well-established Generalised Autoregressive Conditional Heteroskedasticity (GARCH) method (see the appendix for more details).

Chart 1 shows the volatility of the two-week rate, while Chart 2 reports the spread of the two-week rate over the official repo rate. The charts show significant variations in both rate volatility and the spread over the period 1994–2001. In this period, the United Kingdom's operational framework underwent a number of important changes. Hence the data for this period might be used to examine the impact of operational choices on the behaviour of market interest rates. However, operational choices were in part a response to actual or anticipated changes in volatility, so that it might not always be possible to disentangle causal effects in the data.

In Chart 1, the most distinct change in two-week volatility was a marked break in mid-1995, as volatility fell and peaks became less frequent and shorter-lived. Two-week spreads in Chart 2 tell a similar story. They were much narrower from the second half of 1995 onwards, and whenever they widened, they seemed to return much faster to their long-run average. Hence, after mid-1995, the relationship between the two-week unsecured interbank market rate and the official rate seems more stable. It is only towards the end of the sample period that wider and longer-lived deviations between market and official rates occurred.

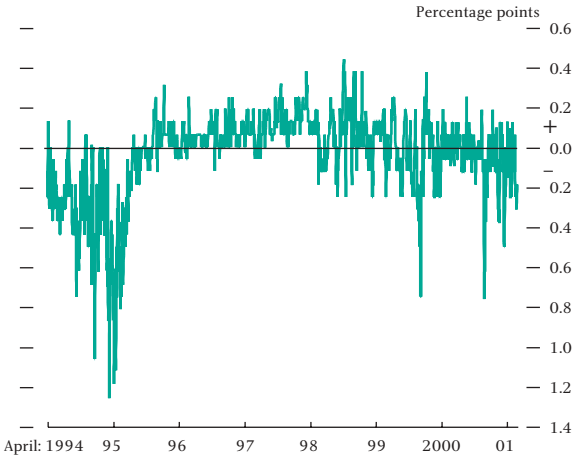
Chart 1
Volatility of two-week unsecured market interest rates, conditional variance estimated from GARCH model, April 1994–June 2001



Note: Volatility is estimated using a GARCH model (see the appendix).

Sources: Thomson Financial Datastream and Bank of England.

Chart 2
Spread of two-week unsecured market interest rate over official rate, April 1994–June 2001



Note: The spread is calculated as the difference between the two-week rate and the Bank's policy rate (the minimum Band 1 dealing rate before March 1997 and the two-week official repo rate thereafter).

Sources: Thomson Financial Datastream and Bank of England.

The ERM crisis of September 1992 and the subsequent suspension of the United Kingdom's participation in this monetary framework, together with high variability in

(1) See for example Watson (1999).

both government and private sector borrowing, had created rather volatile conditions in the money markets throughout 1992 and 1993 (not shown in Chart 1).(1) Daily shortages were often high and market participation in open market operations low, either because of expectations of official rate reductions, or because of a shortage of eligible securities. Technical changes in the Bank's balance sheet, together with the permanent adoption of the two-week repo facility in January 1994, contributed to a sharp reduction in volatility in the first half of 1994.(2) The market continued, however, to experience peaks in volatility, as can be seen from Chart 1. These occurred at the end of 1994, and again in early 1995, when in the wake of the Barings crisis, the Bank was willing to allow slightly larger deviations between the two-week unsecured interbank rate and the policy rate. By late 1995 the Bank decided to return to a less accommodative operational policy.(3) Spreads narrowed and rate volatility declined as a result.

Two-week rate volatility was relatively low and stable from early 1996 to late 1999, except for a low and short-lived peak in late 1998. Likewise, two-week spreads were narrow and stable. Summary statistics in Table A are calculated for the periods just preceding and following each of the money market reforms. From these numbers it is not possible to detect any net effects from the 1997 reforms (the withdrawal of the twice-monthly repos and the introduction of repos in the daily open market operations) on either volatility or on the average spread. The same appears to be true of the 1998 reform (introduction of the end-of-day facility). But any volatility-reducing effects of the 1997 and 1998 reforms could have been masked by other factors. First, a fortnightly repo facility was effective before 1997, especially after the 1996 introduction of the gilt repo market widened participation in this facility. And second, rates were affected by the Bank's money market tactics after the 1997 reform in the transition to the new operating framework.

Table A also shows that the persistence of volatility at the two-week maturity was unchanged. The statistics further indicate that two-week spreads became slightly more persistent after 1997, but the effect is barely visible from Chart 2. Finally, the statistics in the table seem to suggest that the 1996 introduction of the gilt repo market had a significant impact on the behaviour of two-week unsecured interbank rates. But when comparing with Charts 1 and 2, it appears that the summary statistics pick up the effect of the mid-1995 fall in volatility, rather than any effect associated with the 1996 reform.

Table A
Two-week interest rate volatility and interest rate spread (April 1994–June 2001)

	Two-week volatility		Two-week spread	
	Average (a)	Persistence	Average (a)	Persistence
Pre-1996	0.0140	0.58	-0.25	0.86
Jan. 1996: Gilt repo market	0.002	0.26	0.05	0.61
Mar. 1997: Reform to daily open market operations (OMOs)	0.002	0.24	0.11	0.77
June 1998: Late lending facility	0.005	0.24	0.06	0.77
Aug. 1999: Collateral changes	0.008	0.49	-0.05	0.79

Note: Each subperiod starts with the reform mentioned after the date and ends immediately prior to the next reform. The pre-1996 period starts in April 1994. Volatility and its persistence are estimated using the GARCH model (see the appendix). Spreads are calculated as the difference between the two-week unsecured interbank rate and the Bank's policy rate (the minimum Band 1 dealing rate before March 1997 and the two-week official repo rate thereafter). Spread persistence is calculated as the first-order autocorrelation coefficient.

Sources: Thomson Financial Datastream and Bank of England.

(a) Percentage points.

After 1999, two-week volatility increased slightly and became more persistent. Some, but not all, of this rise could be attributed to end-of-year effects, in particular the millennium changeover. Two-week spreads reflected this increased rate volatility, even though the mean was relatively unaffected. Finally, the data do not show any volatility-reducing effects that could be associated with the 1999 expansion of the pool of eligible collateral.

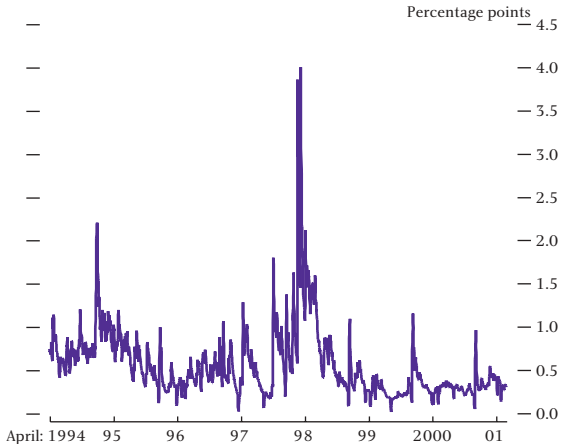
Turning to the behaviour of overnight unsecured interbank market rates during this period, Chart 3 shows that volatility of this rate has fallen since 1994, with the exception of a short-lived peak in the fourth quarter of 1997 and the first quarter of 1998. Overnight volatility declined in 1994 and 1995. As in the case of the two-week rate, a combination of balance sheet factors and policy considerations (post-Barings) contributed to a more stable overnight rate. So the precise impact of the 1996 reforms is again not visible in the data. The earlier mentioned balance sheet factors contributed to heightened overnight volatility in the final quarter of 1997, thereby undoing any volatility-reducing impact the 1997 reforms may have had.(4) This volatility may also have been related to the

(1) See 'Market operations since September 1992', *Bank of England Quarterly Bulletin*, February 1995, pages 12–13.
(2) This reform also occurred outside our sample period and therefore its impact is not formally tested.
(3) See *Bank of England Quarterly Bulletin*, August 1995, pages 225–27, and November 1995, pages 319–22.
(4) This volatility increase was attributed to large daily shortages (linked to gilt sales and government spending), which in turn led to higher-than-normal use of the late-day lending facility. See *Bank of England Quarterly Bulletin*, February 1998, pages 11–12, and May 1998, pages 109–11. Until June 1998, this facility was restricted to a small group of market participants (see above), and as such did not constitute an effective ceiling for the overnight rate.

earlier mentioned gradual phasing out of transitional arrangements that had been in place since the March 1997 reforms.

But Chart 3 reveals a clear break in the middle of 1998: up to this break, average overnight volatility was generally higher and sudden peaks occurred frequently, even though they were mostly short-lived. Thereafter, such peaks occurred less frequently (they were almost all related to end-of-year effects), and average volatility was lower. This seems to suggest that the late-round lending facility introduced in July 1998 was effective in constraining overnight volatility.

Chart 3
Volatility of overnight unsecured market interest rates, conditional variance estimated from GARCH model, April 1994–June 2001



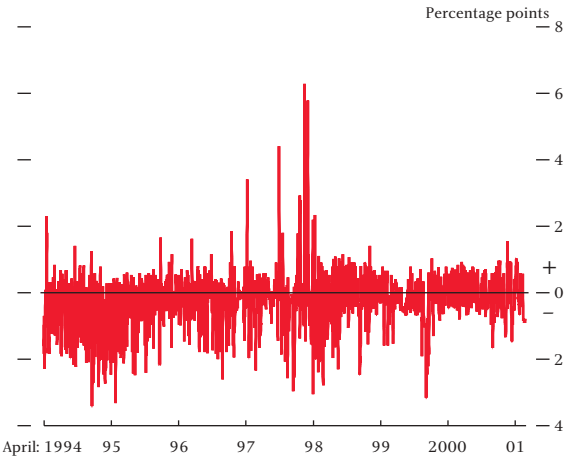
Note: Volatility is estimated using a GARCH model (see the appendix).

Sources: Thomson Financial Datastream and Bank of England.

Chart 4 and the summary statistics in Table B show that the overnight spread narrowed during the period 1994–2001. The chart also shows that overnight spread volatility declined, in line with overnight rate volatility. Throughout the 1994–2001 period, volatility of the overnight rate was generally highly persistent, meaning that a rise in volatility was not immediately reversed. In contrast, two-week volatility (shown in Table A) was much less persistent. Spreads over the policy rate show the opposite pattern. Two-week spreads over the policy rate were less negative, but more persistent than overnight spreads.

Taken together, Charts 1 to 4 suggest that, over the period analysed as a whole, the Bank of England's operational policy has resulted in greater alignment of short-term market rates with the official policy rate. This in turn has contributed to lower volatility in short-term money market rates. But within this longer period, shorter episodes of heightened volatility could be observed. Mostly, they reflected unusual market circumstances, and their effect on the money market was usually short-lived.

Chart 4
Spread of overnight unsecured market interest rate over official rate, April 1994–June 2001



Note: The spread is calculated as the difference between the overnight rate and the Bank's policy rate (the minimum Band 1 dealing rate before March 1997 and the two-week official repo rate thereafter).

Sources: Thomson Financial Datastream and Bank of England.

Table B
Overnight interest rate volatility and interest rate spread (April 1994–June 2001)

	Overnight volatility		Overnight spread	
	Average (a)	Persistence	Average (a)	Persistence
Pre-1996	0.69	0.77	-0.67	0.16
Jan. 1996: Gilt repo market	0.40	0.93	-0.29	0.06
Mar. 1997: Reform to daily OMOs	0.85	0.98	-0.25	0.11
June 1998: Late lending facility	0.42	0.90	-0.25	0.25
Aug. 1999: Collateral changes	0.25	0.96	-0.20	0.58

Note: Each subperiod starts with the reform mentioned after the date and ends immediately prior to the next reform. The pre-1996 period starts in April 1994. Volatility and its persistence are estimated using the GARCH model (see the appendix). Spreads are calculated as the difference between the overnight unsecured interbank rate and the Bank's policy rate (the minimum Band 1 dealing rate before March 1997 and the two-week official repo rate thereafter). Spread persistence is calculated as the first-order autocorrelation coefficient.

Sources: Thomson Financial Datastream and Bank of England.

(a) Percentage points.

Finally, although the trend has been for greater conformity of market rates with the policy rate, the techniques used in this article do not enable us to allocate that progress between the individual reforms, except perhaps that those of 1998 were effective in altering the behavior of overnight rates.

Volatility transmission

The transmission of volatility in the shortest rates to volatility of longer rates can be measured as follows. First, a GARCH regression model for two-week rates is estimated to obtain a measure of two-week volatility.

Second, similar regression models for the longer maturities (up to twelve months) are estimated, with the GARCH estimate of two-week volatility as an additional explanatory variable. A similar procedure is employed to estimate the transmission of overnight volatility.

For each maturity, Table C reports the proportion of volatility in longer-term interest rates that is directly related to two-week volatility (column 1) or overnight volatility (column 2).(1) The results indicate that there is little transmission of two-week volatility. Though positive at most maturities, the coefficients of the regression are very small and significant only at the one-week maturity.(2) The results in Table C further show that the impact of overnight volatility is even smaller, and never statistically significant.

Table C
Volatility transmission (April 1994–June 2001)

Impact on volatility of rates at:	Two-week volatility	Overnight volatility
1 week	0.40*	0.06
2 weeks	—	0.01
1 month	0.01	0.001
3 months	0.003	0.0001
6 months	-0.002	-0.00001
12 months	0.01	-0.003

Note: The entries in Table C are the coefficients on two-week volatility (column 1) or overnight volatility (column 2) in the regressions with volatilities of between one week and twelve months as the dependent variable. The regression coefficients are estimated using the GARCH procedure outlined in the appendix and use data for the period April 1994 to June 2001. A * indicates statistical significance at the conventional 95% level.

So during the 1994–2001 period neither two-week, nor overnight volatility contributed to volatility of the longer-dated money market rates. There is also no evidence of a change in this transmission process following any of the money market reforms during this period.(3) Even though there were short periods of higher volatility in overnight and two-week rates, this volatility was not transmitted and as such left the higher maturities unaffected. In that sense, operational policy was effective.

Conclusion

This article has illustrated how money market volatility declined between 1994 and 2001, and how spreads around the policy rate narrowed and became more stable. Short periods of sharp rises in volatility, perhaps reflecting unusual market circumstances, are shown to have become less frequent.

The research also shows that it is very difficult to identify precisely the impact of specific policy reforms in the data. The interest rates studied here are set in markets that have been influenced by many factors besides changes to central bank operations. These include not only the introduction of the repo market, mentioned above, but also changes in payment and settlement systems and in the regulatory framework for the management of banks' liquidity.(4) Moreover, changes to central bank operations have not been wholly exogenous, but have responded in part to developments in markets.

Finally, the article suggests that one measure of the effectiveness of an operational policy is whether it minimises the transmission of any short-term volatility to the remainder of the money market yield curve. Using a simple statistical model to measure this transmission process, operational policy is shown to have been successful, in that volatility of the longer UK money market rates was unaffected by volatility in very short-term rates over the 1994–2001 period.

(1) For more detail, see Vila Wetherilt (forthcoming).
(2) This significance result is highly unstable, in that it frequently vanishes when calendar dummies are added or removed.
(3) More details are in Vila Wetherilt (forthcoming).
(4) See Chaplin, Emblow and Michael (2000).

Appendix
Estimating the transmission of interest rate volatility

In this article, volatility is measured using the GARCH method. On an intuitive level, this method can be explained as follows. First, a simple regression model for daily rate changes is estimated. Second, the variance of the model's residuals is calculated. This variance is assumed to change over time, and to vary with the size of the actual errors. This represents a departure from the classical regression model, which assumes that errors have constant variance. The model also incorporates the 'volatility clustering' often observed in financial data (prolonged periods of high volatility).

To capture these features of the data, the GARCH model estimates an additional equation for the variance. This includes estimates of the variance calculated over earlier periods, together with the squared residuals from the first equation. The model also gives some (small) weight to the long-run mean of the variance process. The GARCH method is preferable to calculating a simple rolling standard deviation, as it allows the data to select the weights given to past observations.

A simple GARCH model for money market rates looks as follows:

$$\Delta r_t = \alpha + \sum_{i=1}^{m} \beta_i \Delta r_{t-i} + \sum_{i=0}^{n} \gamma_i \Delta o_{t-i} + \delta\left(r_{t-1} - o_{t-1}\right) + \sum_{s=1}^{S} \lambda_s d_s + \varepsilon_t \qquad \textbf{(1)}$$

$$\varepsilon_t \sim N\left(0, h_t\right) \qquad \textbf{(2)}$$

$$h_t = \psi_0 + \psi \varepsilon_{t-1}^{\,2} + \phi h_{t-1} + \sum_{k=1}^{K} \kappa_k d_k \qquad \textbf{(3)}$$

Equation **(1)** is the mean equation. It shows how average changes in money market rates (Δr_t) are explained by their own lags (Δr_{t-i}) and by contemporaneous and lagged changes in the policy rate (Δo_{t-i}). The long-term relationship between money market rates and the official rate is also allowed to affect the dynamic behaviour of money market rates. Indeed, if on day t, market rates deviate much from the policy rate, then one would expect them to move a lot in subsequent periods in order to restore the long-term relationship, thereby creating larger short-term movements. This is captured by the term ($r_{t-1} - o_{t-1}$). Dummies d_s are included to account for calendar effects (namely bank holidays and the end of the calendar year) that are known to produce outliers.

In the GARCH model, volatility of money market rates (h_t) is explained by the estimated variance from earlier periods and shocks to volatility observed in earlier periods (the squared residuals). In line with most finance applications, a simple GARCH (1,1) model is estimated that includes one lag only of both the estimated variance (h_{t-1}) and the squared residuals ε_{t-1} (see equation **(3)**). Estimates of h_t and ϕ are presented in Tables A and B. The higher the coefficients ψ and ϕ in equation **(3)**, the longer-lived the effect of past shocks on volatility. This is how the GARCH model can explain prolonged periods of high volatility. The estimated variance h_t is often referred to as the conditional variance, as it is conditional on information available at time t. This implies that volatility is time varying, and that estimating volatility over different sample periods is likely to produce different results. As in equation **(1)**, dummies d_k capture calendar effects.

Engle and Lee (1999), however, point out that in many cases the conditional volatility is better characterised by a stochastic trend, with short-term deviations around this trend. To capture these dynamics, they propose to decompose the variance h_t into a permanent component (trend) and a transitory component, which is mean reverting to the permanent component. The estimates presented in this article employ this approach, which is explained in detail in Vila Wetherilt (forthcoming).

To estimate the impact of two-week volatility on any of the longer-term money market rates, a two-step method is employed (see Table C). First, the conditional variance of two-week rates is estimated. Second, having obtained an estimate for two-week volatility (h_t), the same system of equations is run for selected higher maturities, with two-week volatility as an additional regressor. A similar procedure is used to estimate the impact of overnight volatility on longer-term money market volatility.

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The role of short-run inflation targets and forecasts in disinflation

Working Paper no. 167

Lavan Mahadeva and Gabriel Sterne

Globally, the majority of countries using inflation targets have done so when inflation was neither low nor stable. In low-inflation economies, the adoption of inflation targets has typically been associated with more comfortable institutional arrangements. In contrast, central banks in emerging economies have found that—notwithstanding the contribution of inflation targets towards the attainment of price stability—they have provided a relatively less comfortable nominal anchor.

In this paper we suggest reasons why the use of inflation targets may be more complicated during disinflation. The central bank may have to tread gingerly towards achieving its long-run inflation target, since:

a) the current inflation rate may be markedly different from the long-run target;
b) the output costs of moving to the long-run inflation target within one or two years are expected to be large; and
c) the short-run behaviour is driven by many large and uncertain developments.

Our simple theoretical model encompasses these features. It differs from previous work insofar as the central bank cares not just about deviations of inflation from the long-run target of price stability, but also about deviations from a short-term path, which itself may be revised in the future. The results suggest that the short-run target path may be akin to a state-contingent forecast, and that annual changes to the short-run target may be predicted given information about the anchor (the long-run target) and full knowledge about shocks hitting the economy.

We use (and publish) a new and unique cross-country dataset of targets and outcomes during the 1990s to assess how the role and contribution of inflation targets is affected by their use during disinflation. Our panel estimates support theoretical predictions that annual changes to the target are endogenous to outcomes for inflation. We estimate an equation relating the annual change in the short-run inflation target to the deviation of inflation from the long-run target, and also to the miss from the short-run target in the most recent year. Across a very broad range of countries the results suggest that policy-makers may be characterised as revising their short-run targets according to a simple forecasting rule: they tend to revise their targets down in proportion to excess of inflation above the long-run 'target' of price stability; they also revise short-run targets up or down almost in line with the miss from last year's short-run target. They may be using such a rule for revising targets in conjunction with the more familiar policy rule for revising interest rates. So models of disinflationary policies may need to take into account both of these rules.

We draw a number of policy conclusions, the first of which stems directly from our analysis:

1. *In designing roles for the legislature and the central bank in the monetary framework it is necessary to take into account the likelihood that, during disinflation, the process of setting or revising the inflation target may at times be inseparable from that of setting policy instruments.* So in contrast to low inflation countries such as the United Kingdom—where it has been possible to devise an effective monetary framework in which the government sets the target and has not changed it since it delegated the Bank of England instrument independence to meet the target—during disinflation it is more complicated to design a monetary strategy that attempts to utilise distinctions between the roles of setting interest rates and those of setting the short-run target.

We draw other policy implications by considering our results in conjunction with other work:

2. *Short-run targets (or forecasts) may contribute towards building credibility even if they are more akin to state-contingent forecasts than policy rules.* Although our simple theoretical model and empirical results do not demonstrate any benefits from using inflation targets, the expanding literature on central bank transparency suggests that forecast publication may enhance credibility and lead to lower inflation.

3. *Short-term money and inflation targets need not necessarily be seen as alternatives during disinflation.* When targets are viewed as being more akin to state-contingent forecasts than rules, the case for viewing inflation and money targets as alternatives is undermined. Publishing forecasts for more than one variable—provided they are mutually consistent—may increase transparency, since publishing a forecast for more than one variable may inform the public better about the central bank's opinion regarding the nature of recent shocks to the economy.

4. *There do not necessarily exist any prerequisites for the introduction of inflation targets.* The results discussed here lead us to argue that there may exist potential marginal benefits from increasing transparency through the introduction of inflation targets (or state-contingent inflation forecasts) even if other aspects of framework reform commonly associated with inflation targeting are not yet fully in place. We cite evidence that suggests that the transparency channel for reducing inflation may be stronger in high-inflation economies, where credibility is likely to be lower.

Financial pressure and balance sheet adjustment by UK firms

Working Paper no. 168

Andrew Benito and Garry Young

The simple arithmetic of compound interest means that high levels of indebtedness in company balance sheets can lead to an unstable spiral where high debt levels feed into high interest costs, poor cash flow, higher borrowing and so to even higher levels of debt. Without corrective action or good fortune this process leads inevitably to default and company failure. In practice, the vast majority of companies are able to keep their levels of indebtedness under control. This paper investigates the means by which this is achieved.

In principle, there are a number of means of reducing indebtedness. These include cutting costs generally by improving productivity, reducing dividend payments, paring back capital investment programmes, selling assets and issuing new equity. There is substantial anecdotal evidence that all of these methods have been used to some extent recently by heavily indebted companies. Using large scale individual company-level data, this paper looks systematically at the extent to which indebtedness and the burden of servicing debt affect a number of these aspects of corporate behaviour. More specifically, we examine how these financial pressures affect UK companies' dividend payments, their propensity to raise new equity finance and their capital investment decisions.

Company dividends are shown to respond to a number of influences, including cash flows and investment. Importantly, they are negatively influenced by the level of indebtedness of the company, highlighting their use as an adjustment mechanism to maintain gearing on a sustainable path. Moreover, we find large persistence effects in levels of dividends, suggesting that companies are slow to adjust their balance sheets through this channel. Thus, in response to a financial shock, companies will use other means in the short term to adjust their balance sheets, in addition to adjustment through the level of dividend distributed to shareholders.

Another key aspect of companies' financial policies is their decision to raise new equity. Our analysis shows that companies do not generally pay a dividend and issue new equity in the same year, or at least not on an ongoing basis. Furthermore, companies with low levels of cash flow, high levels of debt and, in particular, high levels of investment, are more likely to issue equity. The inverse relationship between a firm's propensity to issue new equity and its cash flow is especially noteworthy. This is consistent with the notion that companies are generally averse to issuing new equity: those companies that have large amounts of cash flow and are able to finance their investment programmes with internal funds are significantly less likely to use new equity finance.

This analysis of balance sheet adjustment through dividends and new share issues is relevant to a large literature that has developed examining how investment and its financing may be affected by financial constraints. This literature has focused mainly on the use of external debt finance which, if available only at a cost premium over internal funds, implies that companies forego investment opportunities following a shock to cash flow. Our analysis suggests that equity finance can play an important role in protecting investment from cash-flow shocks, but that companies may typically be disinclined to employ such finance if they have other, particularly internal, funds available to them.

Our analysis also shows that capital investment responds negatively to debt in company balance sheets, as well as the level of borrowing costs. But in this context, our results produce an interesting contrast between the financial and real aspects of corporate behaviour we consider. Whereas dividends and new shares respond to the stock of debt issued by the firm, investment appears to be more closely related to the flow cost of servicing debt. It therefore appears that dividends and new share issues respond to longer-term balance sheet pressures, whereas investment reacts to more immediate pressures. These results extend the existing literature on how financial pressure affects individual firms.

The Centre for Central Banking Studies

By Peter Sinclair, Director, Centre for Central Banking Studies.

The Bank of England's Centre for Central Banking Studies (CCBS) conducts training, seminars and collaborative research with and for central banks in the rest of the world. It enjoys contact with some 150 of these, and now averages over 1,000 training contacts each year in all. The typical medium is a week-long course in London or abroad. These cover nearly all subjects of concern to central banks, with a growing emphasis, among other topics, on forecasting and econometric modelling for monetary policy. CCBS handbooks and other publications are read all over the world; some 8,000 electronic download requests for handbooks are received each month.

Introduction

There is a very long history of co-operation between the monetary authorities of different countries. And one vital form that co-operation takes is in training and research.

The Centre for Central Banking Studies (CCBS) was founded twelve years ago. The impetus for this was the collapse of communism in Central and Eastern Europe, and the urgent need to equip central bankers in these formerly communist countries with new expertise. The Centre continues to do much of its work with these countries, but its reach now also encompasses a large range of other countries in Africa, the Americas and elsewhere in Asia and Europe too. It also continues the Bank of England's traditions by working closely with Commonwealth countries.

The problems posed by financial, currency and monetary instability are not just an intrinsic concern for the country facing them. They are all too likely to spill across international boundaries. The United Kingdom, with its traditionally outward-looking financial and commercial institutions, has a particular interest in helping to maintain stable monetary and financial conditions throughout the world. Equiping overseas central bankers with the tools needed to help achieve these aims in their own country is a task of paramount importance. Promoting monetary and financial stability in one country helps to further them elsewhere—the United Kingdom included.

So the primary function of the CCBS is to contribute to the Bank's Core purposes 1 (monetary stability) and 2 (financial stability), by helping overseas central banks to build up the human capital of their staff in these key areas. It provides seminars, workshops and technical assistance in London and abroad, as well as collaborative research opportunities, on a wide range of issues facing central banks.

A suitable motto for the CCBS would be 'learning from diversity'. The Centre is especially anxious not to give a narrow, didactic monologue, merely describing 'how the Bank of England does it' and implying that all other central banks need do is to copy us. The emphasis is on recognising that what is appropriate for one central bank may well not be apt for another, and listening carefully to participants' experiences (as well as describing the Bank's). The Centre aims to maintain a continuing dialogue with other central banks, retaining personal contacts through e-mail, post, and, increasingly, videoconferencing. It is committed to evolution, to adapting the content and format of its activities in response to changes in the priorities and needs of central banks abroad.

The Centre's main activities

Regular courses in London

The Centre delivers some 22–25 training courses at the Bank each year. Typically these last one week, and involve up to 24 central bankers drawn from different countries. Courses for 2003 embrace topics including monetary policy and operations, economic forecasting, econometric modelling, financial market structure, exchange rates and capital movements, financial stability, reserves management, debt management, payments and

settlements, human resources and strategy, financial operations, information technology, general and organisational risk management, derivatives, communications, the governance of central banks, accounting, internal auditing, and the role of the back office.

For 2003, the CCBS has decided to respond to demand by expanding the number of courses on certain topics. The biggest increase is in the area of economic modelling and forecasting. The Centre will also be introducing two Expert Fora on Operational Risk and Payments Systems. Map 1, described further below, illustrates the 152 countries that have participated in these and other CCBS events since January 2000. One of the advantages of London courses is that participants can meet and hear experts from elsewhere in the Bank of England, the City and British academia, as well as CCBS staff.

Research workshops

Research workshops were introduced in 1998, to provide more interactive, in-depth analysis of leading issues for central bankers. From 2000, the first day of each workshop has been extended into an open conference attended by large numbers of Bank of England officials, academics and other experts. Speakers in our past three have included the outgoing and new chief economists at the IMF, and distinguished academics.

Workshops are followed by a ten-week research project. A small group of overseas central bankers and a Bank of England expert conduct research together, with CCBS staff, on aspects of the material covered in the workshop. The CCBS research project group presents its findings in a one-day conference. There are two of these events each year. The subjects for 2002 were international capital movements, and financial crises and crisis resolution. Our research team looking at the former included experts from the Japanese, Korean, Polish and Thai central banks. The second subject had another strong team, with staff from Bank Indonesia, the Bank of Japan, the Bank of Mexico, the Bank of Norway, the US Federal Deposit Insurance Corporation and an academic, formerly working at the Czech National Bank. The countries represented here, and others involved in earlier research projects in 2000 and 2001, are highlighted in yellow (or orange if they also participated in regional CCBS courses) in Map 2.

Central Bank Governors' Symposium

One of the year's highlights is the Symposium, held in the middle of the year for up to 60 central bank Governors invited to London by the Governor of the Bank of England. The CCBS provides a report for this occasion on an issue of prime importance. Original papers for this report are specially prepared, many of them written in the CCBS. The report is discussed at the Symposium and is usually published later as a book. The topic for 2002 was International Financial Architecture.(1) The Symposium is preceded by a High Level Workshop, for Governors and their delegates, which the CCBS organises.

Regional away courses

The CCBS also holds courses in other countries. In the past year, the CCBS has mounted twelve regional away courses. Five of these were econometrics, modelling and forecasting courses, most recently in Mexico City. This year the Centre initiated a South-Asian central bank course, on exchange rates, held in Tehran in January, for Bangladesh, India, Iran, Nepal and Pakistan. In January 2003, another will be held there for an expanded range of countries, on inflation and monetary operations. In August 2002, another new CCBS regional course, on inflation, was held in Manila for Cambodia, India, Indonesia, Korea, Malaysia, the Philippines, Singapore, Sri Lanka, Taiwan, Thailand and Vietnam.

2002 has also seen the introduction of three regional courses for Latin-American and Caribbean countries held in conjunction with the Mexico-based Centro de Estudios Monetarios Latino-Americanos (CEMLA). CCBS courses for Southern and East-African countries, with the Southern African Development Community (SADC) continue to flourish, supplemented, in 2002, by a new course run with the Kenyan Monetary Institute. Substantial CCBS inputs into other regional courses and conferences have been made in the past twelve months in Albania, Estonia, France, Ghana, Hong Kong, Hungary, Japan, Latvia, Poland, Portugal, South Korea, Turkey and the Ukraine.

Proposals for two more new regional courses, one involving Turkey and the Balkans, and the other Russia and some Central-Asian countries, have now reached an advanced stage. CCBS staff have also contributed to seminars or given lectures in this period in another

(1) A summary of the debate and the background papers is given in Sinclair (2002).

dozen or so overseas central banks, ranging from Albania, Argentina and Australia to the ECB, Russia and Uzbekistan. Map 2 depicts the range of countries participating in CCBS away courses in 2002. These are coloured red, or orange if they also participated in CCBS recent research projects. A further range of countries that will be invited to away regional courses projected for 2003 is coloured pink.

Courses and technical assistance for specific countries, and conferences

Courses are occasionally provided for individual countries in response to demand, sometimes in London and sometimes abroad. The CCBS mounted a London course on capital market issues for the People's Bank of China in 2002, and gave others, on various monetary policy issues, in Beijing and in Hanoi in 2001. Technical assistance, geared to one country's individual needs, was provided in 2001/02 in, among others, Colombia, Estonia, Mauritius, Mozambique, Poland and Turkey. An overseas location is often more cost-effective, particularly when all instruction is given by a small CCBS team.

The Centre attracts requests from individual central banks, and from international agencies, such as the International Monetary Fund, to provide technical assistance or participate in missions. Sometimes a visit from a member of the CCBS staff, as for example recently to Belgrade, or from elsewhere in the Bank, can be arranged.

In the past 18 months, the Centre has mounted conferences in London on Islamic banking, financial development and South-East Asian economic issues—in addition to two others at the conclusion of research projects on inflation, and exchange rates.

Staff

At present the Centre has 18 members of staff. These include a director,(1) a deputy director, and six advisers, to provide technical expertise and direct the courses and workshops. Between them, these eight individuals have specialist expertise in econometric modelling and forecasting, monetary and international economics, monetary policy, financial stability, financial markets and operations, communications, and internal audit. In October 2002, the CCBS increased its modelling and forecasting team from two advisers to three. Support staff administer courses, and provide archival, information technology, research assistance and secretarial services.

Assessing quality and planning courses

Participants in each CCBS course evaluate every session. These evaluations, which are in the main highly favourable, influence the planning for future courses on the topic. In 2001, the CCBS instituted a process for scrutinising data on excess demand for all courses. Almost all turned out to be oversubscribed, some heavily so. This evidence, together with other feedback, assists the Centre in designing its future programmes. It helps the Centre to ensure that its teaching is continually improved and adapted to meet the changing needs and demands of the central banking community world-wide.

Publications

The past two years have seen additions to the CCBS series of published Handbooks. There are four new handbooks on The Issue of Banknotes, Reserves Management, Basic Bond Analysis, and Banking and Monetary Statistics. There are now 21 booklets in this series. Ten more are currently in preparation, and due to appear in coming months. Eight new ones will cover Optimum Inflation, Inflation Targeting, Central Bank Risk Management, Unit Roots in Econometric Modelling, the Econometrics of Consumption, the Econometrics of Inflation and the Phillips Curve, Communicating Monetary Policy and Excess Liquidity. There will also be updated editions of our handbooks on Monetary Operations and on Internal Audit. In 2001, a new series was initiated, Research Papers on Finance.

All but one of these handbooks can be downloaded from the CCBS section of the Bank of England's internet site. Usage is heavy. In the first nine months of 2002, there were no fewer than 73,945 downloads. The most popular, with over 10,600, was the handbook on Basic Bond Analysis.

The year 2000 saw the publication by Routledge of *Monetary policy frameworks in a global context*, edited by Lavan Mahadeva and Gabriel Sterne. In 2001 the final version of the Central Bank Governors' Symposium volume, *Financial stability and central banks*, appeared (Brealey *et al* (2001)). Its authors include Juliette Healey

(1) Mario Blejer will succeed Peter Sinclair as director on 1 January 2003 (see box on page 439).

and Peter Sinclair of the CCBS. A 2000 CCBS research workshop and project was published in 2002 (Mahadeva and Sinclair (2002)). More books are in the pipeline. Numerous academic journal articles and contributions to books have also appeared.

External contacts

The CCBS is a first port of call, and filter, for numerous requests. It is responsible for relations with the London representatives of other central banks, for whom—as well as embassies and high commissions—the CCBS hosts a quarterly *Inflation Report* briefing. Briefings for the *Financial Stability Review* will begin in 2003. Contacts that the CCBS has built up over the years offer the Bank valuable opportunities for personal links with staff inside other central banks, and additional avenues for answering queries or resolving difficulties. The CCBS now has some 8,000 alumni, many of them in senior positions.

Geographical focus: 'Learning from diversity'

The wide geographical focus of the Centre's activities may be seen from the attached maps. In the period from 1 January 2000 until 21 October 2002, the time of writing, the Centre provided training for 3,350 individuals—nearly all of them central bankers. They were drawn from 152 countries. There were just a handful of central banks, most of them in Central America, the Middle East or francophone West Africa, with which we had no contact in this period. They appear as white on Map 1. The median central bank sent eleven individuals to our events in the 2.8 years. The largest number, 153, came from the People's Bank of China. In fact, between them, the twelve successor states of the former Soviet Union had no fewer than 520 contacts with the CCBS during that period.

China, and the 37 other countries in the top quartile (ranked by the number of participants in CCBS events), are coloured red on Map 1. These 37 countries included many of the other most populous countries in the world: India, Indonesia, and the United States,(1) as well as Germany, Nigeria, the Philippines, Russia, Thailand, Turkey, the Ukraine and Vietnam. The number of CCBS contacts for the top quartile of countries over the period ranged from 153 to 29. The top quartile also embraced eleven other transitional country central banks (Armenia, Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, the Kyrgyz Republic, Latvia, Lithuania, Poland and Slovakia). Nine mid-sized and smaller Commonwealth countries are in the group too: Australia, Botswana, Ghana, Malaysia, Malta, Mauritius, Mozambique, South Africa and Sri Lanka. The others in the top 38 included 3 other OECD countries (Korea, Norway and Portugal), and two Latin-American countries (Colombia and Peru).

The second quartile ranges from 11 up to 29 CCBS contacts during the period. These countries are coloured green on Map 1. This group of 38 is dominated by countries from the Commonwealth in Africa (10) and elsewhere (5), the OECD area (10, including Canada), and a group of other transition countries (8). The remaining 76 countries with which we enjoyed contact in this period are coloured pale blue.

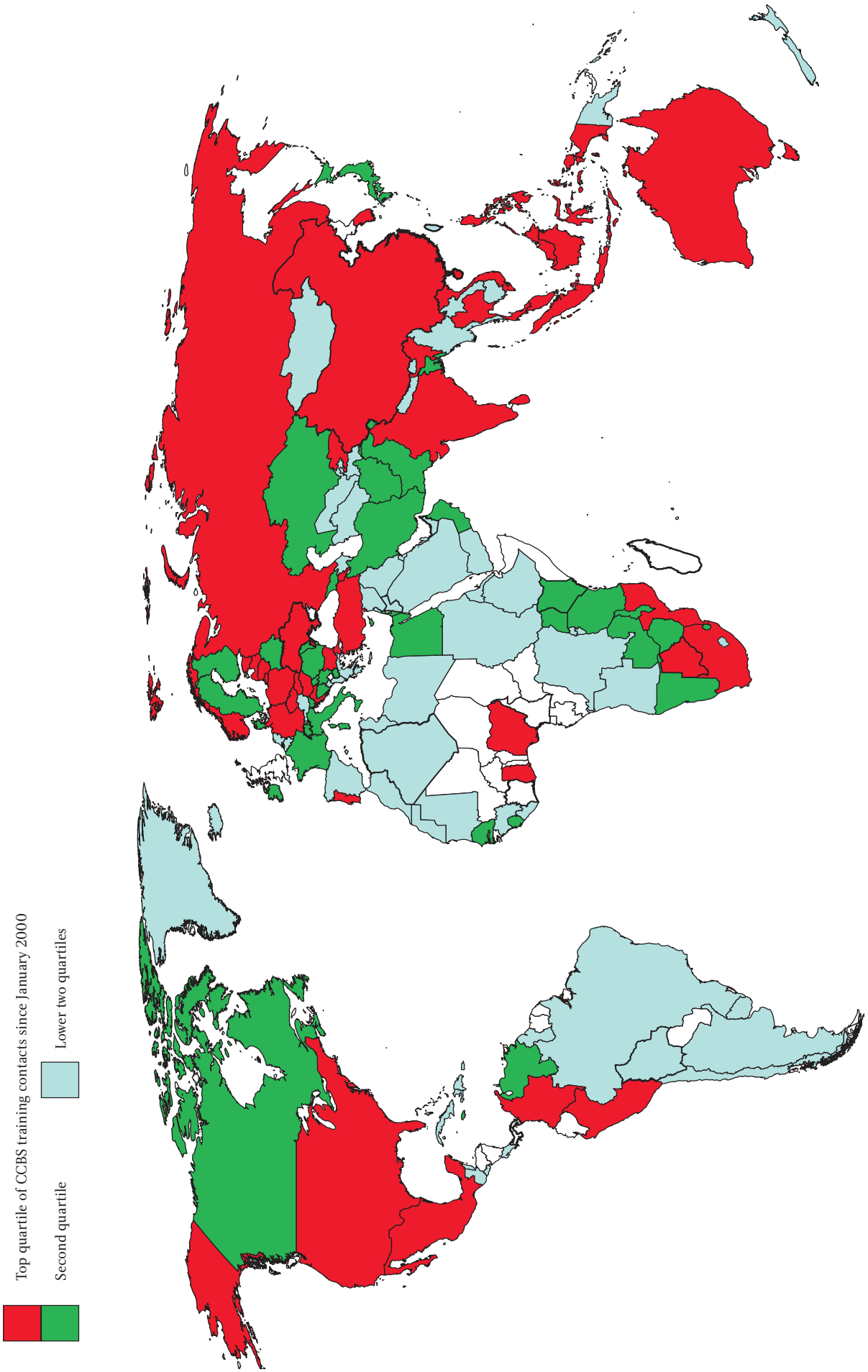
In 1999, there were 95 countries with GDP per head below the then world average of $5,020.(2) No fewer than 80 of them had some contact with the CCBS in the period under review. Together, these 80 countries accounted for 2,074 (that is 62%) of our total training contacts. These poorer countries included over half of the Centre's 38 most frequently participating countries, half of the second quartile, and well under half of the 76 countries in the lower half of countries ranked by number of training contacts. So there is a clear emphasis on the provision of training to poorer countries. And although the CCBS prides itself on multilingualism—its current staff, between them, are fluent in French, German and Spanish, and capable of some limited conversation in another 20 or more African, Asian and European languages—London lectures are delivered in English (occasionally with translation). This may account for the fact that in some parts of the world, such as Africa, demand for CCBS events is inevitably higher from central banks where English is more widely spoken.

The role of the CCBS

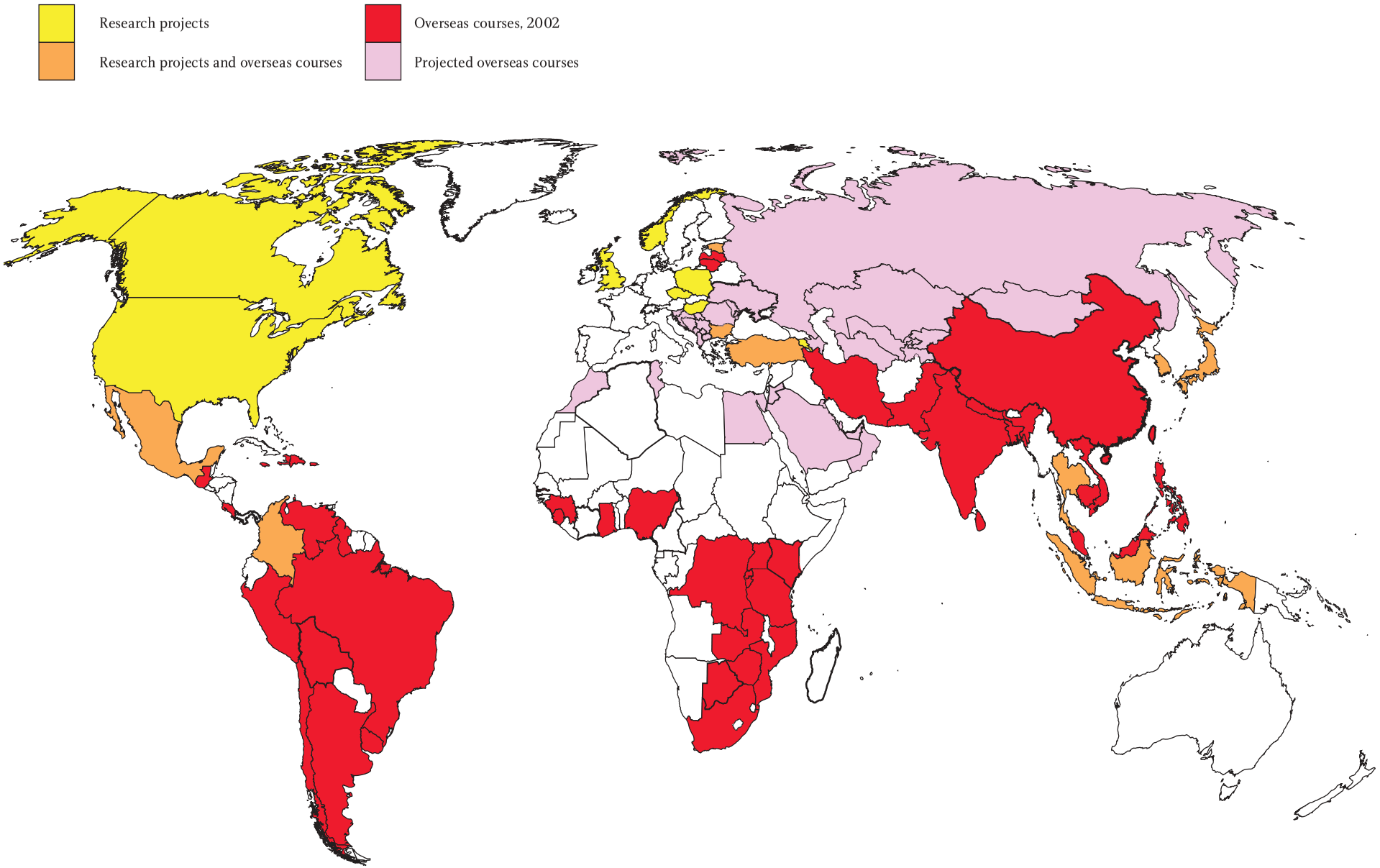
Financial and monetary disturbances may originate in just one country, but they can quickly spread to others. Of course, it is sometimes hard to tell whether a simultaneous outbreak of troubles in several countries occurs because they are exposed to a common shock—like a sudden change in world equity or oil prices—or because troubles that begin in one country get rapidly

(1) US visitors to the CCBS include periodic groups of Congressmen and Senators, and from universities.
(2) Data are drawn from World Bank (2001), Table 1.1, page 14, using statistics for GDP per head at current exchange rates.

Map 1
CCBS training contacts since 2000



Map 2
Participation in CCBS research projects and overseas courses



transmitted elsewhere. Trade, finance, cross-country banking links and capital movements over international boundaries are the main conduits here. So central banks must always keep a weather eye on events abroad. Furthermore, the relationships a central bank enjoys with its government, and the commercial institutions within its purview, are rarely straightforward. Central banks can only learn from each other's experiences. No two central banks operate in exactly the same institutional setting. But this diversity is itself an interesting source of information.

So central banks have every incentive to collaborate and pool information. They can learn a vast amount from each other. Officials can share experiences about inflation surges and currency crises, commercial banks in trouble, and bubbles and bursts in property and share markets. The CCBS can offer a forum where central bankers with personal experience of only tranquil conditions at home can listen to first-hand reports from witnesses to crisis. Those who observed crises directly can describe the lessons learnt about why some methods of resolving them appear to work better than others. Contemporary debates about how financial markets might work or should work, and the principles governing the proper scope and character of any intervention and regulation, can be illuminated by experiences of what has and what has not worked well in practice. Practical experience really is indispensable. It furnishes a laboratory where ideas and claims have been tested. It is the only laboratory we have. And why rely only on your own central bank's experiences, when there is so much to be discovered from others'?

In the realm of central bank risk management, for example, only looking inward is itself an unwarranted gamble. Extending one's horizon to datasets from other central banks gives a much fuller picture of the relevant risks and the complex interrelationships involved. Formulating monetary policy responses to shocks calls for quantitative estimates of the likely size, time profile and predictability of the effects on macroeconomic variables that a change in a policy instrument will induce. Even in a country with frequent, timely, dependable and copious data that stretch back far into the past, policy-makers find it difficult to quantify these with any precision; how much harder it is for many emerging and transitional economies, whose data are brief, spotty, and infrequent. Panel econometrics on multi-country datasets can be enormously helpful here. And there really is no substitute for some form of econometric modelling, which will offer a formal framework for predicting the effects of policy actions. Modelling is by itself no guarantee for good policy. But policy-making is liable to be less effective, and more prone to error, if conducted without a model and a forecast. Over the years, the CCBS has pioneered model-building in its work with, and for, the central banks of many transitional and emerging economies.

A central bank faces awkward policy choices. What variable should it target, for example, over what horizon, and what should it do if and when the target looks like being missed? What should its exchange rate policy be? How should its foreign exchange reserves be managed? How can it best safeguard the payments system and financial stability more generally? The academic literature is helpful, as always. But it is bewilderingly voluminous, scattered, often inaccessible, always evolving and spattered with controversy. And the practical experiences of central banks around the world provide indispensable lessons too. CCBS courses and written material aim to distil the key messages from both these sources.

The spectrum of issues that concerns today's central banks is immense. It ranges from the advantages of transparency and the importance of communicating policy, the benefits and threats posed by liberalisation and new financial instruments, the latest econometric research, and appropriate mechanisms for ensuring accountability and good corporate governance, to such topics as how best to recruit, train and retain talented personnel, ensure sound macroprudential supervision, and keep currency issuance efficient and safe from counterfeiters. The aim of the CCBS is to offer cutting-edge training on these and other subjects. In so doing, the Bank seeks to foster good practices in central banking throughout the globe.

New Director of the Centre for Central Banking Studies

Professor Mario Blejer has been appointed as the new Director of the CCBS at the Bank of England. Professor Blejer was Governor of the Central Bank of the Argentine Republic from January 2002 to June 2002 and previously Deputy Governor. Before that he was a Senior Advisor at the International Monetary Fund (1980–2001) and Walter Rathenau Professor of Economics at the Hebrew University of Jerusalem. He takes up his appointment in January 2003.

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The external balance sheet of the United Kingdom: recent developments

By Robert Westwood of the Bank's Monetary and Financial Statistics Division and John Young of the Bank's Domestic Finance Division.

The external balance sheet (or international investment position) gives the most complete picture of the stock position of a country in its financial transactions with the rest of the world. The very breadth of coverage of the data leads inevitably to problems of measurement and valuation. Nevertheless, subject to certain qualifications, the data can throw some light on macroeconomic and financial stability issues related to the United Kingdom's cross-border financial links. This article, one in an annual series, discusses the recent evolution of the United Kingdom's external balance sheet, reviewing along the way some of the main methodological issues that impinge on an interpretation of the data. It concludes that, despite a persistent current account deficit, the balance of probability is that the United Kingdom still has net external assets, or at least the capacity to generate net investment income from overseas. There are also some grounds for optimism that the structure of its assets and liabilities has left the United Kingdom in a fairly strong position to withstand financial shocks.

The external balance sheet: methodological issues

In this article the term 'external balance sheet' is used to refer to that part of the balance of payments accounts known as the international investment position (IIP).(1) Like the other balance of payments data, the IIP is compiled on the basis of residence. It represents the stock of financial assets and liabilities of UK-resident entities *vis-à-vis* counterparties in the rest of the world.(2) These include direct investment, cross-border holdings of equities, bonds and money market instruments, and cross-border assets and liabilities of banks. The data do not at present include stock figures for financial derivative instruments, although limited data on transactions in financial derivatives are now included in the financial account of the balance of payments.(3)

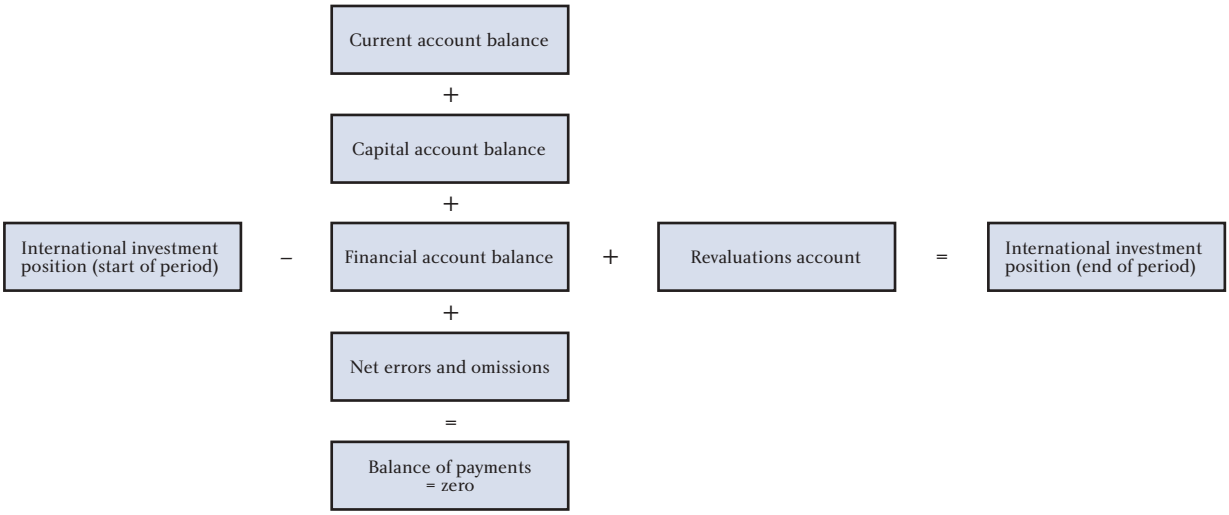
Figure 1 shows the place of the IIP in the integrated balance of payments accounts and its definitional relationship to the balance of payments flow measures.

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,(4) plus or minus net changes in the valuation of the initial stocks, recorded in the revaluations account.(5) Reading vertically, the sum of the current account and capital account balances must by definition be equal to the financial account balance. In practice, an errors and omissions term will be necessary to ensure that this is so. Nevertheless, a current account deficit must imply a net inflow in the financial account.

Another way to approach the IIP is through its relationship with national accounts concepts. The net worth of an economy, recorded in the National Balance Sheet,(6) can be considered as comprising its stock of

(1) An attempt to estimate the UK national balance sheet has been made in previous articles in this series, see 'The external balance sheet of the United Kingdom: implications for financial stability?', Senior, S and Westwood, R, *Bank of England Quarterly Bulletin*, November 2000 (page 353) and Winter 2001 (page 404).
(2) Data on the international investment position are published annually in United Kingdom Balance of Payments, *The Pink Book 2002*, published by the Office for National Statistics, Chapter 8.
(3) Some balance sheet data on financial derivatives assets and liabilities of banks and securities dealers (described as 'developmental') are reported by the ONS. See Table FD in *The Pink Book 2002*, page 117.
(4) The financial account balance equals net investment in the United Kingdom less net UK investment abroad.
(5) The United Kingdom does not at present produce a revaluations account. The Bank of England and ONS are currently working on a project to assess whether sufficiently detailed data are available to compile a revaluations account of acceptable quality.
(6) Data on the National Balance Sheet are published annually in United Kingdom National Accounts, *The Blue Book 2002*, Chapter 10.

Figure 1



non-financial assets (made up of tangible assets, such as buildings and plant and machinery, and intangible assets) plus its net financial assets or liabilities. When aggregating over the economy as a whole, financial liabilities and assets *vis-à-vis* other domestic residents will net out (one entity's asset being another's liability), so that net financial assets must be equivalent to the IIP.(1)

It is not surprising, given the comprehensive coverage of the external balance sheet, that significant problems of measurement should arise. The Office for National Statistics (ONS) and the Bank of England compile the IIP data from a number of institutional surveys and censuses. The quality of the information varies considerably. At one end of the spectrum, reliable data from the banking sector come from a well-established regular reporting structure covering all banks. At the other, data on portfolio debt liabilities are calculated as a residual item, using annual survey data. New information is incorporated as it becomes available from each individual source, so that the aggregate figures are subject to frequent revision, sometimes affecting data covering a long period. Naturally, as the difference between two very large numbers, the net IIP is subject to proportionately large revisions.

Over the years, there have been a number of initiatives at the national and international level aimed at improving the quality of balance of payments data. A recent project under the auspices of the European Central Bank has been considering ways of improving the reporting of portfolio investment data. The Bank of England has been actively involved in this work (the significance of which is outlined below), described in more detail in the box on pages 442–43.

A further measurement issue arises in relation to valuation. In principle, under the internationally accepted balance of payments methodology,(2) assets and liabilities should be measured at market prices. But in practice, market valuations are not available for important components of the balance sheet so sometimes book values are reported instead. For the banking sector, securities held in trading and banking books are measured at market value; loans are adjusted regularly for write-offs. The biggest issue arises in the case of direct investment (which for the United Kingdom accounts for about 10% of liabilities and 20% of assets), where current market values are likely to diverge considerably from the book values at which assets and liabilities are recorded. Clearly, this issue affects revaluation as well. While all foreign currency assets and liabilities will be reported at market exchange rates (and so be subject to valuation change due to currency movements) the exchange rate translation will be applied in some cases to market values and in others to book values. So an element of judgment is required in interpreting both the levels of the aggregated data and movements in these levels through time.

Trends in the UK external balance sheet

Chart 1 and Table A show developments in the external balance sheet in a long-term context. Over the past 30 years, gross external assets and liabilities have grown at an average annual (compound) rate of about 16%.

(1) See *Balance of Payments Manual*—5th edition (BPM5) published by the IMF, Chapter 3, paragraph 55.
(2) BPM5, see footnote 1 on this page.

International efforts to improve portfolio investment data

The external balance sheet is a record of stock positions at a particular point in time. Another way of approaching it is to view it as the accumulation of portfolio, direct and other investment flows and reserve asset flows up to the same point. These are the financial account flows in the balance of payments. The accurate estimation of these flows is key to the monitoring of external balance sheet positions at higher than annual frequencies—exhaustive stock positions are only estimated on an annual basis.

Of the financial account flows mentioned above, portfolio investment(1) is probably the most difficult to measure. The challenges involved in accurately quantifying these flows have been internationally recognised for some time.(2) In 2001 the European Central Bank's (ECB) Working Group on Balance of Payments and External Reserves (WG-BP&ER) established the Task Force on Portfolio Investment Collection Systems (TF-PICS) to investigate the need for, and the characteristics of, harmonised systems for the collection of portfolio investment data. The primary aim was to improve the quality of euro-area data. When dealing with a supranational aggregate, an element of harmonisation was seen as an important step towards that aim. The Final Report has now been published and is available on the ECB web site at the following link www.ecb.int/pub/pdf/portfolioinvestmenttaskforce200206.pdf. The Bank of England was represented on the Task Force.

The Task Force identified a group of what it considered to be key issues relating to the statistical reporting of portfolio investment. This included amongst others: aggregate versus security-by-security (s-b-s) reporting,(3) sampling and grossing-up techniques in the context of s-b-s reporting, multinational companies and distinguishing between direct and portfolio investment.

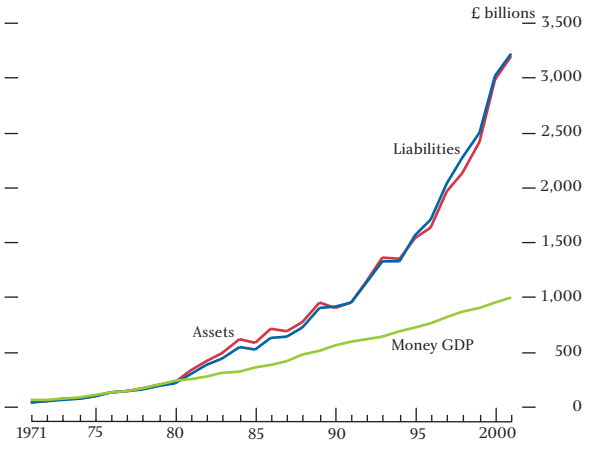
It then went on to consider the three channels through which data on portfolio investment transactions and positions can be obtained:

(1) Portfolio investment is investment in equity and debt securities issued by non-resident companies or governments. A portfolio investment—unlike a direct investment, which is defined as reflecting 'the objective of a resident entity in one economy (to obtain) a lasting interest in an enterprise resident in another economy' (paragraph 359, BPM5)—is not interpreted as giving the investor any significant influence over the operations of the company or institution.
(2) See 'Report on the measurement of international capital flows', *The Godeaux Report*, 15 June 1992, ISBN 1-55775-307-5, www.imf.org/external/pubs/cat/longres.cfm?sk=108.0
(3) In a s-b-s collection system, agents report their issues or holdings of individual securities. It is used mainly in connection with indirect reporting but can be used with direct reporting (the United Kingdom presently has an aggregate direct reporting system). In a direct reporting system end-investors report, in an indirect system an intermediary reports on the end-investors' behalf.

This reflects the general globalisation of economic activity and capital markets, reinforced by the success of the United Kingdom as an international financial centre, particularly for cross-border banking.

Chart 2 shows the growth rates in the main components of the external balance sheet over the period 1991–2001. On the assets side the strongest growth was in direct investment, which rose at an average annual rate of almost 18%. Growth in the other components was more subdued, but in all cases the growth rate has on average exceeded that of GDP. On the liabilities side the strongest growth was in portfolio equity, which rose at an average annual rate of almost 23%.

Chart 1
UK gross external assets and liabilities



Source: ONS.

- Indirect settlement-based reporting by domestic banks for their own transactions and transactions executed on behalf of their clients.
- Direct reporting by domestic issuers/ end-investors.
- Indirect reporting by custodians or other intermediaries.

The work was drawn together to produce a set of recommendations and conclusions. Their primary purpose was to provide countries with advice on how to maintain their current data collection systems and/or which issues to consider when thinking about moving to a different system. The TF-PICS took the view that none of the three channels set out above would be suitable for all types of reporting agent. Extending this line of reasoning suggested that the most suitable collection system for any individual country may combine features of both direct and indirect reporting, applying these to different institutional sectors as appropriate. The TF-PICS developed a 'cascade' of combinations of input dimensions which it divided into acceptable (and better) and unacceptable approaches—reproduced in Table 1. For example, combination (7) represents the features of a data collection system that reporters of any institutional (sub) sector should in theory be able to meet (ie a minimum benchmark). Therefore—as long as method (7) or better is used—it would be for the compiler in each individual country to decide how each reporter/institutional sector would be required to report.

Table 1
Features of data collection models: ranking of combinations of input dimensions

(1)	Monthly flows [security-by-security] + monthly stocks [security-by-security]	Ideal
(2a)	Monthly flows [security-by-security] + quarterly stocks [security-by-security]	Good
(2b)	Monthly flows [security-by-security] + annual stocks [security-by-security]	
(3)	Quarterly stocks [security-by-security] + monthly flows [aggregate]	Acceptable
(4)	Monthly stocks [aggregate] + monthly flows [aggregate]	
(5)	Monthly stocks [security-by-security] + **derived** monthly flows [security-by-security]	
(6)	Annual stocks [security-by-security] + monthly flows [aggregate]	
(7)	Quarterly stocks [aggregate] + monthly flows [aggregate]	
(8)	**Derived** annual stocks [security-by-security] + monthly flows [security-by-security]	Unacceptable
(9)	Quarterly stocks [security-by-security] + **derived** quarterly flows [security-by-security] + estimated monthly flows [aggregate]	
(10)	Annual stocks [security-by-security] + quarterly flows [aggregate] + estimated monthly flows [aggregate]	
(11)	Quarterly stocks [aggregate] + quarterly flows [aggregate] + estimated monthly flows [aggregate]	
(12)	**Derived** annual stocks [aggregate] + monthly flows [aggregate]	

Notes: 'Derived stocks' = accumulation of flows.
'Derived flows' = difference between stocks (adjusted for exchange rate and price changes).
'Estimated flows' = monthly split estimated from quarterly flows.

Part of the agreed follow-up to the TF-PICS report was that European Monetary Union (EMU) participants and a small group of other countries, including the United Kingdom, would conduct national feasibility studies to assess the costs of adopting s-b-s collection. In the United Kingdom a small group of global custodians has submitted data on a s-b-s basis to the Bank of England. The Bank is currently assessing the mechanics of compiling and analysing these data to be able to produce the required feasibility study results.

Table A
UK external balance sheet

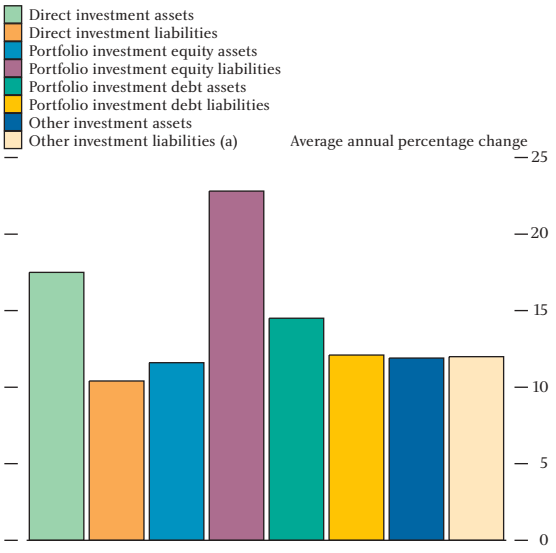
£ billions

	1971		1981		1991		2001		2002 H1	
	Assets	Liabilities	Assets	Liabilities	Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
Direct investment	9	6	45	30	128	129	645	347	672	351
Portfolio investment										
Debt	n.a.	n.a.	10	44	133	138	514	432	525	452
Equity	n.a.	n.a.	18	4	128	70	385	547	384	511
Other investment	n.a.	n.a.	n.a.	n.a.	528	608	1,620	1,889	1,628	1,920
Reserve assets	3		12		26		26		26	
Total	**40**	**37**	**326**	**299**	**943**	**946**	**3,190**	**3,215**	**3,234**	**3,234**
Memorandum items:										
Current account	1.1		4.8		-10.7		-21.1		-8.2	
Capital account	-0.0		-0.1		0.3		1.2		-0.0	
Financial account	-1.3		-5.3		5.3		14.4		4.8	
Errors and omissions	0.2		0.5		5.1		5.5		3.4	

n.a. = not available.

Columns may not sum to totals because of rounding.

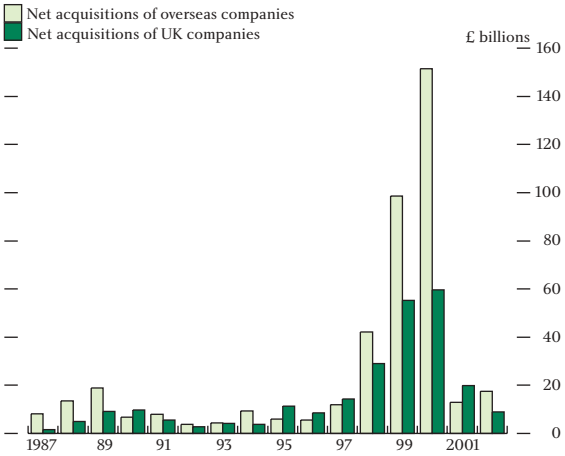
Chart 2
Growth of assets and liabilities by component, 1991–2001



(a) 'Other' assets and liabilities are predominantly those of monetary financial institutions.

The key episode driving growth in the external balance sheet in the latter part of this period was the wave of cross-border mergers and acquisitions beginning in 1998 and peaking in 2000, as shown in Chart 3. This had a strong impact on several categories of asset and liability. Overseas acquisitions by UK firms, often using their own shares, simultaneously boosted direct investment assets and portfolio equity liabilities. Foreign acquisitions of UK firms, although on a smaller scale, also boosted direct investment liabilities and portfolio equity assets.

Chart 3
International mergers and acquisitions involving UK companies

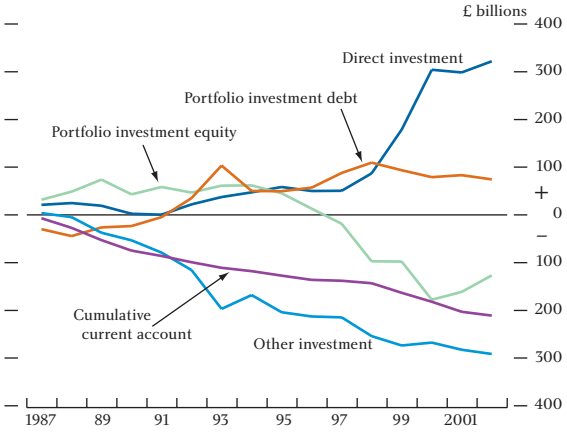


Note: 2002 data cover Q1–Q3 only.

The ability to raise funds quickly and on a large scale meant that international syndicated bank lending also played an important role in the worldwide mergers boom, at least at the immediate point of the acquisition. Opportunities for financing acquisitions were a major factor behind the acceleration of UK banks' external assets and liabilities, the growth of which peaked at rates of about 30% and 25% respectively in the year to 2001 Q1. A number of acquisitions were soon refinanced in bond markets, which is reflected in the growth in UK portfolio debt liabilities of over 25% in the same period.

The impact of this activity on net assets is shown in Chart 4. For most of the first half of the 1990s the United Kingdom had both portfolio and direct investment net assets, with a steadily growing net liability position in other investment. From 1997 there was a sharp divergence among the components representing assets and liabilities of the non-bank corporate sector. Because UK acquisitions of overseas companies were much larger than net overseas acquisitions of UK companies (see Chart 3) net portfolio equity assets swung into net liabilities, while net direct investment assets rose very sharply. This has had important implications for the subsequent evolution of recorded net assets during the bear market in equities.

Chart 4
UK net external assets by instrument type



Much of the growth in banking sector assets and liabilities has reflected the intermediation through UK banks of transactions between non-residents. Nevertheless, over time there has been a trend increase in the net external liabilities of the banking sector (included in the category of 'other' assets and liabilities), which form by far the largest component of total net liabilities. With the exception of the level shift in late 1992/early 1993—which was probably due to the combined impact of sterling's depreciation following the exit from the Exchange Rate Mechanism and the

corresponding adjustment of assets/liabilities—the banking sector's net external liabilities have tracked the cumulative current account. This suggests that UK residents without access to capital markets have been indirectly borrowing from abroad, through the domestic banking sector, to fund their net external expenditure.

Developments in 2001 and 2002 H1

In 2001, external assets and liabilities rose in value by 7.0% and 6.5% respectively, the slowest growth rate for five years in the case of assets and seven years in the case of liabilities. The slower growth was partly the result of valuation changes (see below), which reduced the value of gross assets and liabilities by £81 billion and £99 billion respectively—but the flows of international investment were also lower than in 2000.

The impact of the slower pace of international merger and acquisition activity can be seen in the fall in direct investment flows (especially outward direct investment) from the record levels of 2000. Reduced demand for acquisition finance may also have tended to depress activity in the banking sector—but in fact, although the volumes of international banking flows fell back from the previous year, 2001 was the second-strongest year on record.

Inward and outward portfolio investment flows showed opposite trends. Inward portfolio investment fell sharply in 2001 (to £42.6 billion, from £166.4 billion in 2000), especially equity portfolio investment, which fell to only £18.1 billion from £113.6 billion in 2000. This almost certainly reflected the weaker level of outward direct investment—firms were making fewer foreign acquisitions in exchange for their own shares and bonds. In contrast, outward portfolio investment rose to a record £93.4 billion, almost equally split between equity and debt securities, giving a net portfolio outflow of -£50.8 billion compared with a net inflow of £99.1 billion in 2000.

There was a net inflow of direct investment of £20 billion in 2001, after ten consecutive years of net outflow. Net outward acquisitions of equity capital slumped to £6.3 billion, from £100.3 billion in 2000 while other capital transactions resulted in an inflow of £40.5 billion. The net other investment inflow (a feature in eight of the past ten years) rose to £33.6 billion, from £6.7 billion in 2000. Overall, there was a total recorded net inflow on the financial account of £14.4 billion, similar to the £14.0 billion in 2000.

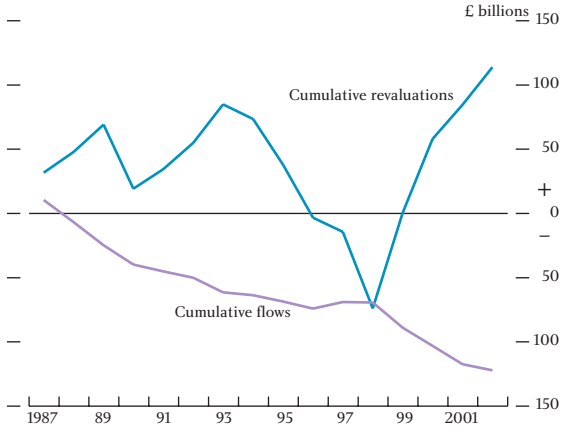
The fall in global equity markets over the year resulted in substantial valuation falls in portfolio equity gross assets and liabilities, with the overall effect of reducing net liabilities. Currency movements worked in the same direction. The overall effect of valuation changes was to reduce total net liabilities by about £18 billion. These valuation changes are discussed in a longer-term context below.

In total, UK net liabilities fell to £24.8 billion at end-2001, equivalent to 2.5% of GDP, compared with £37.0 billion, 3.9% of GDP at end-2000. In the first half of 2002, there were net financial inflows of £4.8 billion. Other investment inflows were particularly strong, and other investment net liabilities rose by a further £24 billion, to £293 billion. Nevertheless, total UK net liabilities shrank to close to zero, as further falls in equity prices eroded net portfolio liabilities to their lowest level since 1999 Q4.

The impact of valuation changes

As noted above, data availability in the United Kingdom does not at present enable valuation changes to be measured independently. What is referred to as a valuation change in this article is the calculated difference between the stock of net assets between two periods, minus the net acquisition of assets recorded in the financial account of the balance of payments. Of course, part or all of the difference could be accounted for by errors and omissions in the measurement of the flow of assets in the financial account. Leaving this consideration aside for the moment, Chart 5 shows the cumulative impact on net external assets of financial flows and valuation changes for the period since 1987. Whereas in the period from 1993 to 1998 the impact of valuation changes was strongly to reduce net assets, the

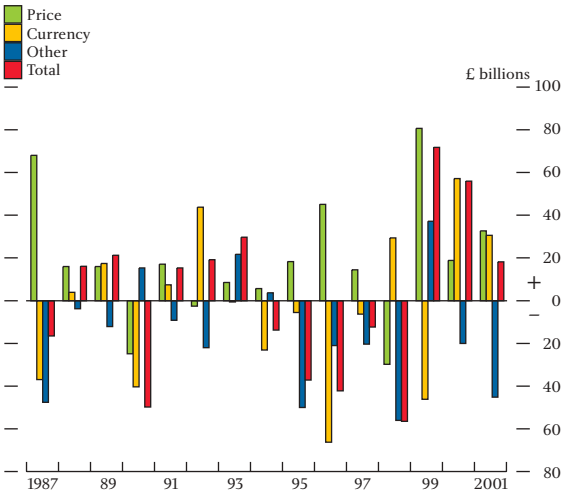
Chart 5
Effect on net external assets of net financial flows and revaluations



cumulative impact since then has been to increase them, or rather to reduce net liabilities, by almost £190 billion. This has substantially reduced total net liabilities, despite a financial account inflow of £53 billion over the same period.

The change in valuation of assets and liabilities can in principle be broken down into two parts; a change in value of the asset or liability in the currency of denomination, and a change in valuation due to the translation of foreign currency assets and liabilities into sterling at prevailing exchange rates. As in past articles in this series, valuation changes have been split *ex post* into these two components, the 'price' and 'currency' effect. This uses the most recent data for each type of instrument to identify the country location of portfolio and direct investment and the currency composition of banks' assets and liabilities. Representative stock market indices are used to proxy the movements in domestic currency terms of equity assets and liabilities. The results are shown in Chart 6.

Chart 6
Decomposition of revaluations of net external assets



The currency effect is negatively correlated with the sterling exchange rate. Whereas the United Kingdom's external assets are largely denominated in foreign currencies its liabilities are mainly denominated in sterling. So when sterling weakens, the sterling value of net assets rises and when it strengthens the value of net assets falls. This is seen, for example, in the large positive currency valuation effect in 1992 after sterling left the ERM. In fact, over the 15-year period for which estimates have been constructed, the cumulative impact of currency movements on net assets is remarkably small, reducing net assets by the equivalent of about 1% of gross assets at end-2001.

The estimated price effect has on average been smaller from year to year than the currency effect, but over the same 15-year period as a whole, it has increased net assets by the equivalent of almost 9% of 2001 gross assets. A substantial proportion of this increase has occurred over the past two years as global equity prices have fallen. However, as noted above, there is an asymmetry between the treatment of portfolio investment (recorded at market prices) and that of direct investment assets (recorded at book value). This raises issues both about the value of net assets at any instant in time and about whether valuation changes derived from marking to market only portfolio assets are an appropriate guide to changes in the value of assets and liabilities in total.

That part of the valuation change that we cannot explain is not random but tends, in a majority of years, to reduce net assets. This may be the result of a systematic error in the model—but it is interesting that there is a similar bias in the errors and omissions term in the balance of payments flow accounts. That is, recorded net inflows in the capital and financial accounts tend to be less than recorded deficits in the current account. A possibility that would account for both this and the error in our valuation estimate is that there is underrecording of the flow of liabilities. Portfolio investment is a likely area in which this may occur. The box on pages 442–43 describes efforts that are under way to try to improve reporting in this area.

Valuing direct investment

Previous articles in this series have discussed alternative approaches to deriving proxy values for direct investment.(1) The box on page 447 describes one approach, which assumes that direct investment values move in line with representative equity prices in each country. Chart A shows the results of applying this methodology over the period 1990 to 2002 Q2. The revalued series shows net direct investment assets peaking at about £860 billion in 2000, falling to just under £600 billion in June 2002. There was a particularly sharp fall in the estimated value of US assets in the first half of this year, reflecting a 14% fall in the Standard & Poor's index, combined with a 6% depreciation in the dollar against sterling. Nevertheless,

(1) See 'The external balance sheet of the United Kingdom: implications for financial stability?', Senior, S and Westwood, R, *Bank of England Quarterly Bulletin*, November 2000 (page 351) and Winter 2001 (page 390).

Estimating market values for foreign direct investment (FDI)

Conceptual guidelines for the valuation of FDI are provided by BPM5 and the OECD Benchmark Definitions (third edition). BPM5, paragraph 377 'affirms the principle of using market price as the basis for valuation, (but) it is recognised that, in practice, book values from the balance sheets of direct investment enterprises (or investors) often are used to determine the value of the stock of direct investment.'

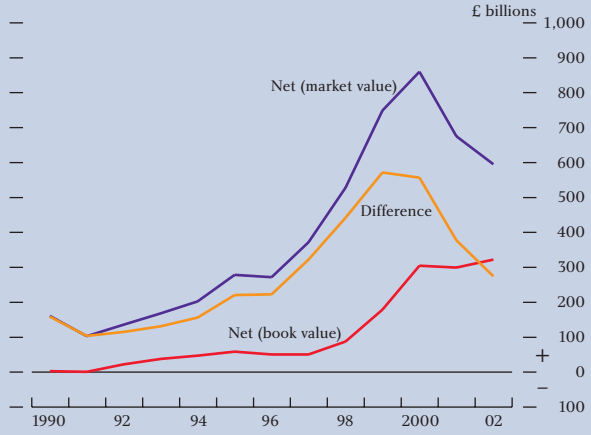
The ONS states[1] that '(the UK) FDI international investment position figures are at book values'. As most asset prices tend to increase over time, the market value of the stock of FDI is therefore likely to be significantly different from the book value once any significant amount of time has elapsed since the original reporting of the data.

The United Kingdom had net FDI assets in every year but one—1991—since the series was established in 1966. However, it is over the past ten years—and particularly in the period since 1997—that the net asset position, even on the official data, has widened sharply. It was a little above £300 billion at the end of 2002 Q2.

Over the past ten years global equity prices have generally trended upwards—notwithstanding the sharp declines since 2000 H1. The 2000 and 2001 articles in this series contained estimates of FDI based on an update of a study by Pratten.[2] In the study Pratten established ratios for market values of outward and inward direct investment to book value at end-1991. Time series can be generated backwards and forwards from 1991 using changes in domestic/international equity markets and exchange rates as a proxy for movements in the values of the FDI.

Chart A sets out the results of extending Pratten's study to include data to 2002 Q2. After rising to £570 billion at end-1999, the difference between the estimated market value and book value of the United Kingdom's net external FDI assets had fallen back to around £270 billion at the end of 2002 Q2. This decline is explained to a limited extent by the small outperformance of the UK equity market compared with its US and continental European counterparts over this two and a half year period.[3] Currency movements have had a small impact in the opposite direction. However, the key factor in the narrowing of the net position was that external FDI assets were much larger than liabilities—irrespective of the starting point for valuation—during this period. Consequently, the general and pronounced weakness in equity markets implied larger absolute falls in estimated asset values than estimated liabilities on this measurement basis.

Chart A
UK direct investment: book value and market value estimates



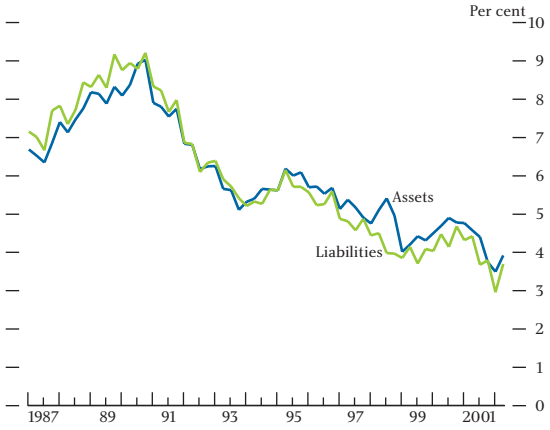
(1) Office for National Statistics, MA4 Foreign Direct Investment, Appendix A.
(2) 'The valuation of outward and inward direct investment: a report for the CSO', Pratten, C, Department of Applied Economics, University of Cambridge, 1994. The CSO was the predecessor to the ONS.
(3) UK equities outperformed Japanese equities by a greater margin between end-1999 and 2002 Q2, but because of the relatively small amount of inward/outward investment with Japan this had only a marginal impact on the market value calculation.

the estimated net direct investment asset value for June was still £270 billion higher than the book value estimate in the ONS data—and (given that recorded total assets and liabilities were exactly equal) would imply that the United Kingdom had total net external assets of this amount.

Some support for the proposition that, if accurate measurement were possible, this would show the United Kingdom has net external assets is provided by the investment income data in the current account. On an annual moving average basis net investment income has shown a continuous surplus since 1994 Q1. In the first

half of 2002 the surplus was £6.0 billion, up from £4.1 billion in the same period of 2001. The surplus on direct investment income was £11.4 billion, compared with £8.4 billion in 2001 H1. Since 1994 Q1 the ratio of total recorded income on assets to the total value of assets (which might be described as the yield on investment) has consistently exceeded the equivalent ratio for liabilities, as shown in Chart 7. Of course, the fact that assets have an *ex post* cash-flow greater than that on liabilities does not necessarily mean that they are worth more. One possible explanation for the yield difference might be that the higher proportion of direct investment in assets means that the return is innately more risky, reflected in a higher discount rate.

Chart 7
Yield on UK external assets and liabilities



The external balance sheet in a macroeconomic context

Given the balance of payments and national accounts relationships discussed earlier, the net investment position can be seen as a measure of the cumulative effect of financing current account positions. A current account deficit must be matched by financial flows that have the effect of increasing the net claims of overseas residents on the non-financial assets of the economy, either through direct ownership or through ownership of financial claims. So a persistent deficit will progressively reduce the net worth of the economy unless it is offset by a decline in the value of the stock of liabilities. Similarly, a persistent current account surplus will add to net worth unless the value of the stock of external claims falls.

Net positions built up in this way will have implications for future current account flows. For example, an increase in net liabilities is likely to result in higher future current account outflows, either through contractual obligations such as debt service payments or through profits accruing to overseas residents. So a consideration of the international investment position would be integral to a variety of macroeconomic modelling or simulation exercises, for example calculations to assess the sustainability of external sovereign debt.

Table B shows the UK international investment position in the context of the national balance sheet discussed earlier. The obvious feature is the small size of the net external position in relation to the total assets of the United Kingdom. At the end of 1998, when recorded net financial liabilities were at their peak, they were equivalent to almost 4% of the United Kingdom's total non-financial assets; at end-2001 they were less than 1%. This provides another indication that the net position is not significant in macroeconomic terms.

The external balance sheet and financial stability issues

But as noted earlier, gross assets and liabilities are large, and have grown rapidly. The value of total external liabilities has risen from below 50% of total non-financial assets in 1993, to over 70% in 2001. Analysis of the size and structure of the gross external balance sheet may be useful in assessing financial stability, insofar as it helps to identify risks from cross-border investment and borrowing.

Growth in cross-border assets and liabilities does not of course necessarily imply that individual economic agents are exposed to greater risk. Widening the potential range of investments offers opportunities to diversify risk, especially for portfolio investors and

Table B
UK national balance sheet

£ billions, end-year

	1993	1994	1995	1996	1997	1998	1999	2000	2001
Tangible assets	2,650	2,667	2,681	2,874	3,057	3,311	3,592	3,972	4,212
Intangible assets	207	176	170	184	186	212	260	300	324
Total non-financial assets	**2,857**	**2,842**	**2,851**	**3,058**	**3,244**	**3,523**	**3,852**	**4,272**	**4,536**
Total net financial assets/liabilities = net international investment position	31	18	-23	-69	-75	-135	-81	-37	-25
Total net worth	**2,889**	**2,860**	**2,828**	**2,989**	**3,169**	**3,388**	**3,772**	**4,235**	**4,511**
IIP as a percentage of total non-financial assets	1.1%	0.6%	-0.8%	-2.3%	-2.3%	-3.8%	-2.1%	-0.9%	-0.6%

financial intermediaries. It seems reasonable to suppose that at least part of the substantial growth in cross-border assets and liabilities reflects portfolio diversification aimed at enhancing the risk/reward trade-off.

That said, there are particular aspects of cross-border financial activity that will increase either the incidence of risk, or the difficulty of controlling risk, compared with an equivalent transaction within the domestic sphere.

First, cross-border investment will entail an element of country risk, in addition to the risk inherent in the asset itself. For example, the ability of a firm to service its debt obligations may be influenced by its country of domicile. Its ability to make external payments or its access to liquidity may be dependent on government actions, such as the operation of exchange controls or controls on the domestic banking system. Notwithstanding the move towards liberalisation in international payments, country risk remains a significant factor in many emerging market economies.

Second, cross-border investment may involve an element of currency risk, unless economic agents put in place an effective hedging strategy. Mismatches of foreign currency liabilities and assets, combined with large discontinuous movements in exchange rates, have been a key element in some emerging market economies' defaults affecting both governments and the private sector.

In addition, some factors that would be of interest in analysing financial stability in a domestic context are also relevant in a cross-border context. One of these is gearing. For example, a concentration of external liabilities in the form of debt, carrying contractual obligations to make regular payments of interest and to repay principal, will be suggestive of gearing risk if external assets consist primarily of portfolio equity or direct investment claims, where both income stream and capital values are uncertain.

Table C shows external assets and liabilities at end-2001 by sector and instrument. Data limitations mean that, for most categories of liability, private non-bank financial companies, private non-financial companies and households cannot be individually distinguished. They appear in the table as 'other sectors'.

Once again, the data need to be interpreted with some care. A key issue is the extent to which it is appropriate to aggregate the assets and liabilities of individual economic agents. The standard national accounts presentation, on which the external balance sheet is based, divides the economy into the public sector, household sector, monetary institutions, other financial intermediaries, and private non-financial corporations. The question is whether these sectors are sufficiently homogenous in their behaviour for the aggregate data in the external balance sheet to be a reliable guide to risks, or whether the aggregation conceals a wide variation in exposure to risk.

This question is perhaps most pertinent in the case of the non-financial corporate sector. The corporate sector is clearly a significant source of potential risk because its external assets and liabilities are large. Moreover, the opportunity to vary, in both assets and liabilities, debt and equity instruments, enables individual companies to assume a wide range of overall risk. For example, do low

Table C
UK external assets and liabilities by sector and instrument, end-2001

£ billions

	Assets								Liabilities						
	Direct investment	Portfolio equity	Portfolio bonds	Portfolio money market	Loans	Deposits	Other	**Total**	Direct investment	Portfolio equity	Portfolio bonds	Portfolio money market	Loans and deposits	Other	**Total**
Public	2	0	0	1	11	0	28	**40**	0	0	57	0	4	0	**61**
Monetary financial institutions	25	14	320	42	328	803	0	**1,532**	27	24	85	134	1,374	1	**1,644**
Other sectors	619	371	140	12	3	472	1	**1,618**	320	523	133	23	494	17	**1,510**
Of which:															
Insurance companies and pension funds	*18*	*214*	*97*	*1*	*n.a.*	*n.a.*	*n.a.*	***n.a.***	*14*	*n.a.*	*n.a.*	*n.a.*	*n.a.*	*n.a.*	***n.a.***
OFIs (a)	*40*	*135*	*34*	*5*	*n.a.*	*n.a.*	*n.a.*	***n.a.***	*27*	*n.a.*	*n.a.*	*n.a.*	*n.a.*	*n.a.*	***n.a.***
PNFCs (b)	*560*	*9*	*2*	*5*	*n.a.*	*n.a.*	*n.a.*	***n.a.***	*279*	*n.a.*	*n.a.*	*n.a.*	*n.a.*	*n.a.*	***n.a.***
Household sector	*1*	*13*	*8*	*0*	*n.a.*	*n.a.*	*n.a.*	***n.a.***	*0*	*n.a.*	*n.a.*	*n.a.*	*n.a.*	*n.a.*	***n.a.***
Total	**645**	**385**	**460**	**54**	**342**	**1,275**	**29**	**3,190**	**347**	**547**	**275**	**156**	**1,872**	**18**	**3,215**

n.a. = not available.

(a) Other financial intermediaries.
(b) Private non-financial corporations.

Totals may not sum of constituent figures due to rounding.

levels of aggregate corporate external debt indicate low external gearing in most firms—or might the debt be concentrated in particular firms? Similarly, if US dollar debt increases at the same time as direct investment assets in the United States, does this imply that the borrowing firms are the same as the investing ones and so, in an approximate way, are hedging their currency exposure? Or is the borrowing and investment being done by two separate groups? A further issue with the data is that they do not at present cover derivative instruments. A large number of both financial and non-financial companies will have external exposures through derivative instruments. These may be hedges, mitigating risk from items included in the external balance sheet, or they may add to the exposure already present. They will also enable fixed-rate liabilities to be transformed into floating or *vice versa* and foreign currency liabilities into sterling or *vice versa*.

Nevertheless, it may be possible from the aggregate numbers to form some conclusions of a probabilistic nature. The remainder of this article considers some common shocks and their likely impact on the various sectors.

Impact of financial shocks

A higher general level of global interest rates will have two effects, one on the valuation of fixed-rate portfolio debt assets and liabilities and one on the ongoing service costs of floating-rate debt. Both are likely to have adverse consequences for the United Kingdom in aggregate. Overall, the United Kingdom has net portfolio debt assets, the majority of which may be assumed to be fixed rate. A uniform global increase in interest rates is likely to result in a fall in the value of net assets. However, the impact of this will vary between sectors. The public sector's net liabilities would be reduced on a marked-to-market basis, as would those of private non-financial corporations. The burden of falling bond prices would be felt by banks and other financial institutions and by the household sector, both through direct holdings of bonds and through beneficial ownership via collective investments.

On the assumption that the larger part of the monetary institutions' assets and liabilities are floating rate, net external interest payments would rise. The effect of this would ultimately be borne by other domestic sectors that are the counterpart to the banks' external position, primarily the private corporate sector and the household sector.

The effect of a fall in the sterling exchange rate is harder to assess *ex ante*. The external balance sheet data do not permit a complete breakdown by currency. Even if they did, a net on-balance sheet external foreign currency exposure would not necessarily imply an exposure to currency risk. For example, net external foreign currency liabilities of the banking sector could be matched by net foreign currency assets *vis-à-vis* domestic sectors and/or currency swap transactions. In the case of PNFCs it would be quite common to see bond issues in foreign currencies swapped back into sterling.

But in general terms, all other things equal, a weaker sterling exchange rate is likely to result in a fall in aggregate net liabilities, since the United Kingdom (in common with other large economies) has a larger proportion of its liabilities denominated in domestic currency than its assets.

Similarly, a uniform fall in global equity prices will also reduce the value of net liabilities (all other things equal) because portfolio equity liabilities exceed portfolio assets. Effectively, foreign investors are assuming greater market risk exposure to UK companies than UK investors are taking in relation to overseas companies. But there is little information about the behaviour of direct investment values in relation to portfolio investment; and overall, the United Kingdom has a net exposure to corporate sector assets as a whole. More needs to be known about the structure of corporate assets and liabilities at the micro level in order to understand fully the risks for financial stability.

Caution is also needed in interpreting a fall in external financial liabilities due to marking to market as a positive development for the United Kingdom. Although this shows that the immediate impact of a shock has been sustained by foreign investors, it will also generally mean that the incremental cost of capital to borrowers has increased, and their ability to adjust their balance sheets has been impaired. So, for example, a company seeking to reduce gearing via a rights issue will find this harder if its share price has fallen. And it will be more expensive to switch from floating into fixed-rate liabilities if corporate bond spreads have widened.

Public sector debt: end-March 2002

By Paul Burton of the Bank's Monetary and Financial Statistics Division.

Public sector net debt (PSND)(1) stood at £310.0 billion as at end-March 2002, £4.1 billion higher than at end-March 2001. This was equivalent to 30.4% of GDP, some 0.9 percentage points lower than at end-March 2001. This annual article examines the structure of the financial liabilities of the UK public sector.

Total stock of public sector debt outstanding

PSND stood at £310.0 billion at end-March 2002, a rise of £4.1 billion on a year earlier. This was the first end-financial year rise since 1998. Although public sector consolidated gross debt fell during the 2001/02 financial year, this fall was more than offset by a lower level of public sector liquid assets (see Table A). This was largely due to a lower level of liquid assets held by the Debt Management Office. The key factor here was the rundown in short-term assets built up in 2000/01, following investment of the payments made by telecom operators to use the spectrum for third-generation mobile phones. In addition, there were redemptions of a number of foreign currency debt instruments.

PSND as a percentage of GDP fell to 30.4% at end-March 2002, compared with 31.3% the previous year. The fall continues the trend seen since 1998 (see Chart 1). And it is at a historically low level as a percentage of GDP (see Chart 2). Over the past 20 years the debt:GDP ratio has been more in line with that in the years before 1914, than at any time in between.

Analysis of public sector debt components

Central government gross debt (CGGD) accounts for almost all of public sector debt, despite significant levels of local government and public corporations' gross debt (£52.2 billion and £26.7 billion respectively at end-March 2002, see Table A). Much of local government and public corporations' debt is borrowed from central government and therefore nets out from the public sector consolidated gross debt total. And although more than £4 billion of local government debt is held outside central government, a similar amount of central government debt is held by public corporations.

Table A
Public sector net debt

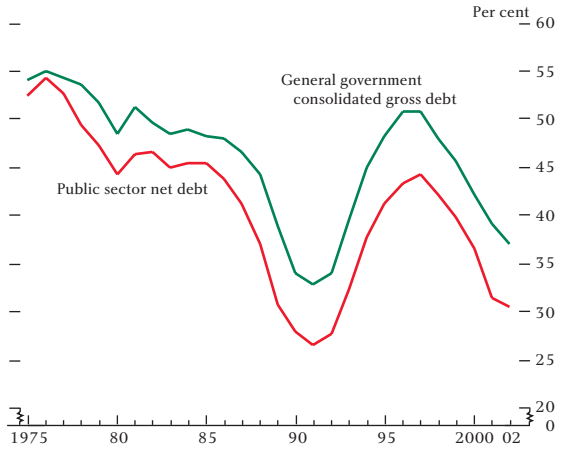
£ millions, nominal values (a); *percentages or percentage points (pp) in italics*

31 March (b)	2000	2001	2002	Change 2001/02
Central government gross debt	**387,688**	**376,719**	**372,856**	**-3,863**
as a percentage of GDP	*41.2*	*38.5*	*36.5*	*-2.0pp*
Local government				
Total gross debt	53,437	52,333	52,165	-168
less holdings of other public sector debt:				
Central government holdings of local government debt	46,771	48,026	47,762	-264
Local government holdings of central government debt	254	31	29	-2
General government consolidated gross debt	**394,100**	**380,995**	**377,230**	**-3,765**
as a percentage of GDP	*41.9*	*39.0*	*36.9*	*-2.1pp*
Public corporations				
Total gross debt	26,812	27,740	26,668	-1,072
less holdings of other public sector debt:				
Central government holdings of public corporation debt	26,453	27,181	26,335	-846
Local government holdings of public corporation debt	1	124	122	-2
Public corporation holdings of central government debt	6,301	6,363	5,096	-1,267
Public corporation holdings of local government debt	812	106	65	-41
Public sector consolidated gross debt	**387,345**	**374,961**	**372,280**	**-2,681**
as a percentage of GDP	*41.2*	*38.3*	*36.4*	*-1.9pp*
Total public sector liquid assets (Table D)	**47,228**	**69,014**	**62,240**	**-6,774**
as a percentage of GDP	*5.0*	*7.1*	*6.1*	*-1.0pp*
Public sector net debt	**340,117**	**305,947**	**310,040**	**4,093**
as a percentage of GDP	*36.2*	*31.3*	*30.4*	*-0.9pp*

(a) Figures shown may not sum to totals because of rounding.
(b) Data from 1977–2002 are published in the *Bank of England Statistical Abstract 2002*, Part 1, Table 15.1.

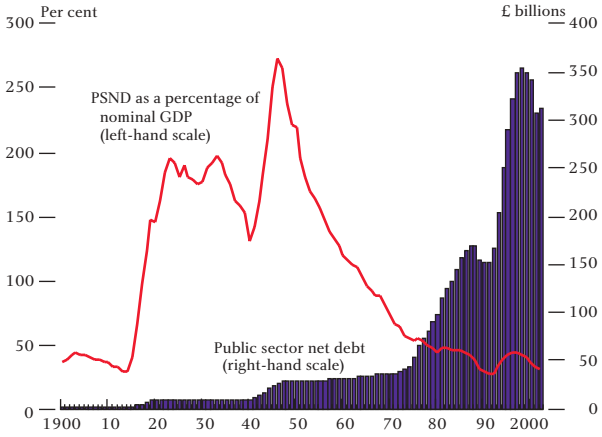
(1) Net debt is defined as gross financial liabilities at nominal value minus liquid financial assets. Marketable debt instruments are recorded at nominal value for measurement purposes. All figures are given at nominal value in this article, except where current market value is reported.

Chart 1
Measures of public sector debt as a percentage of GDP: 1975–2002(a)



(a) At end-March each year.

Chart 2
Public sector net debt: 1900–2002



British government stocks (gilts)

Gilts are the main component of CGGD, accounting for 73% of the total at end-March 2002 (see Table B and Chart 3), slightly less than in the previous financial year. The outstanding stock of conventional gilts in market hands was over £3 billion lower at end-March 2002. The stock of index-linked gilts continued to rise, albeit at a slower rate than in recent years. Including capital uplift,(1) the total held outside central government rose by £0.1 billion to £70.4 billion at end-March 2002.

The average remaining life of dated gilts outstanding was 11.0 years at end-March 2002, the same as the previous year (see Table C). The modified duration(2) figure for all stocks was 7.5 years at end-March 2002 (a fall of 0.1 from a year earlier).

Table B
Central government gross debt

£ millions, nominal values; *percentage of total in italics*

End-March (a)	2001		2002	
British Government Stocks	274,601	*72.9*	271,250	*72.6*
of which: index-linked	*70,316*	*18.7*	*70,417*	*18.8*
conventional	*204,285*	*54.2*	*200,833*	*53.8*
Sterling Treasury bills	3,521	*0.9*	9,700	*2.6*
National Savings and Investments	62,161	*16.5*	62,298	*16.7*
Certificates of tax deposits	491	*0.1*	478	*0.1*
Other sterling debt	28,244	*7.5*	26,297	*7.0*
Central government sterling gross debt	**369,018**	***98.0***	**370,023**	***99.0***
North American government loans	286	*0.1*	239	*0.1*
US$ floating-rate notes	1,407	*0.4*	–	*0.0*
US$ bonds	3,517	*0.9*	2,107	*0.6*
Euro Treasury notes	2,486	*0.7*	1,225	*0.3*
Debt assigned to the government	5	*0.0*	4	*0.0*
Central government foreign currency gross debt	**7,701**	***2.0***	**3,575**	***1.0***
Total central government gross debt	**376,719**	***100.0***	**373,598**	***100.0***

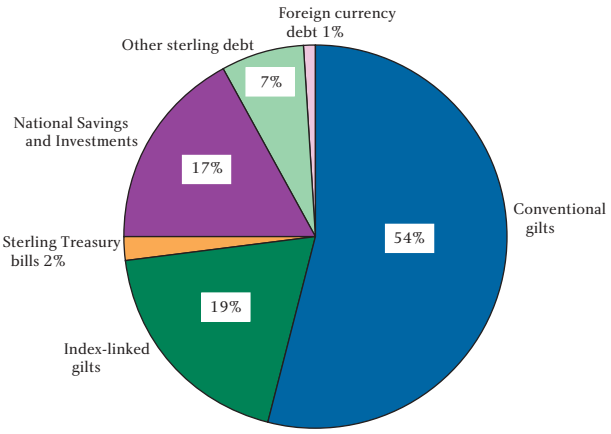
(a) Data from 1977–2002 are published in the *Bank of England Statistical Abstract 2002*, Part 1, Table 15.2.
(b) Sterling valuation rates:
31 March 2001: £1= US$ 1.4217, Can$ 2.2385, €1.6090
31 March 2002: £1= US$ 1.4240, Can$ 2.2720, €1.6320

National Savings and Investments

The outstanding balance of National Savings and Investments' instruments was £62.3 billion at end-March 2002, around £0.1 billion higher than a year earlier. The balance is projected to fall during the current financial year to £61.1 billion at end-March 2003. This largely reflects the high level of maturities on the fixed-rate products.

National Savings and Investments' instruments accounted for 17% of CGGD at end-March 2002 (see Chart 3). Over half of this was concentrated in just two

Chart 3
Composition of central government gross debt by instrument: end-March 2002



(1) The nominal value has been raised by the accrued inflation-linked valuation adjustment.
(2) Modified duration is a measure of the price sensitivity of a bond with respect to small changes in yield.

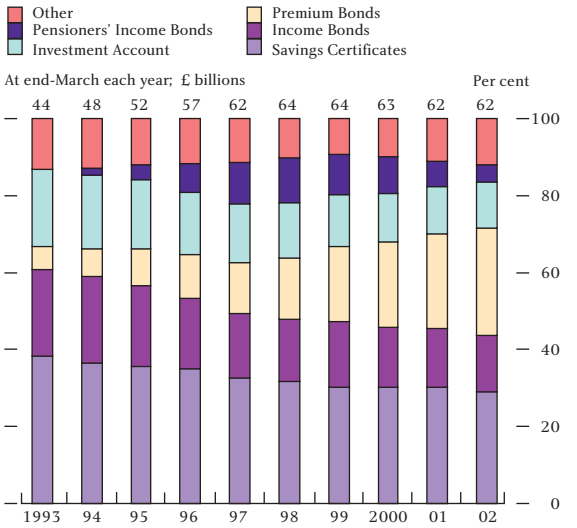
Table C
Average remaining life of gilts outstanding

Years to maturity at end-period

	Mar. 2001	Dec. 2001	Mar. 2002
Average length until redemption			
All stocks	11.0	11.3	11.0
Conventional stocks only	10.2	10.6	10.2
Index-linked stocks only	14.0	13.5	13.4
Modified duration			
All stocks	7.6	7.8	7.5
Conventional stocks only	6.6	6.9	6.6
Index-linked stocks only	11.2	10.7	10.6

Source: Debt Management Office.

Chart 4
Composition of National Savings and Investments by product



products: Savings Certificates (29%) and Premium Bonds (28%). Sales of Premium Bonds recorded a ninth consecutive annual increase. As a result, the share of other products fell during 2001/02, particularly Pensioners' Guaranteed Income Bonds, Savings Certificates and Income Bonds.

Sterling Treasury bills

Sterling Treasury bills accounted for 2% of CGGD at end-March 2002. At £9.7 billion, this was £6.2 billion higher than the previous year. That was consistent with the DMO's intention that sterling Treasury bills would play an increasingly important part in its Exchequer cash management operations.(1)

Foreign currency liabilities and assets

At end-March 2002, the sterling value of foreign currency denominated central government debt was £3.6 billion. This was £4.1 billion lower than a year earlier. Redemptions of two US dollar-denominated instruments, along with one euro-denominated Treasury note were almost entirely responsible for this fall.

The government's foreign currency reserves are an important element of the public sector's liquid assets (see Table D). Reserves (at market value) totalled £28.1 billion at end-March 2002, £2.4 billion lower than a year earlier. This largely reflected the inclusion of some of the 3G spectrum auction receipts in 2001 that were subsequently used to finance foreign currency debt redemptions (see Table E). Of the £28.1 billion, £11.4 billion was held in euros; £7.0 billion in US dollars; and £3.2 billion in yen. The sterling equivalent of the gold component of the reserves was £2.1 billion.

Table D
Public sector liquid assets

£ millions, nominal values

31 March (a)	2000	2001	2002	Change 2001/02
Central government				
Official reserves	21,498	30,423	28,055	-2,368
Other short-term assets	6,635	18,460	13,580	-4,880
Total central government liquid assets	**28,133**	**48,883**	**41,635**	**-7,248**
Local government				
Bank deposits	7,434	7,443	7,159	-284
Building society deposits	4,324	4,071	4,405	334
Other short-term assets	4,754	5,772	5,966	194
Total local government liquid assets	**16,512**	**17,286**	**17,530**	**244**
Public corporations				
Bank and building society deposits	1,455	1,633	1,895	262
Other short-term assets	1,128	1,212	1,180	-32
Total public corporation liquid assets	**2,583**	**2,845**	**3,075**	**230**
Total public sector liquid assets	**47,228**	**69,014**	**62,240**	**-6,774**

(a) Data from 1977–2002 are published in the *Bank of England Statistical Abstract 2002*, Part 1, Table 15.1.

Government balance sheet

The government's debt measured at nominal value closely reflects its financial liabilities, but there was a gap of some £20 billion at end-March 2002 between debt at market and nominal prices. The balance sheet includes debt at market prices. See Table E, which also provides a balance sheet extract of total government assets.(2) The general government (ie central and local government) is a net borrower in financial balance sheet terms, with total financial assets falling short of total liabilities by some £300 billion at end-December 2001. However, taking into account the high current market value of its non-financial assets (including buildings and infrastructure), the 'net worth' of the general

(1) Further detail is given in the DMO 'Exchequer cash management in the UK: a DMO handbook' of 20 February 2002. Available at www.dmo.gov.uk/cash/public/cmbook200202.pdf
(2) Further detail is given in *Blue Book 2002*, Office for National Statistics, June 2002.

Table E
General government balance sheet

£ billions

31 December	1999	2000	2001
Non-financial assets			
Tangible assets			
Residential buildings (a)	1.6	1.4	1.2
Agricultural assets	2.0	2.1	2.1
Commercial, industrial and other buildings	112.3	117.6	123.9
Civil engineering works	197.2	217.1	245.0
Plant and machinery	35.7	37.8	34.4
Vehicles, including ships and aircraft	3.4	3.3	5.7
Stocks and work in progress	0.3	0.2	0.1
Spectrum (b)	n.a.	22.2	20.9
Total tangible assets	**352.5**	**401.6**	**433.2**
Total intangible assets	**1.0**	**1.1**	**1.1**
Total non-financial assets	**353.4**	**402.7**	**434.3**
Total financial assets	**175.7**	**210.1**	**201.5**
Total assets	**529.1**	**612.8**	**635.8**
Total liabilities	**505.6**	**529.5**	**502.2**
Total net worth (c)	**23.5**	**83.3**	**133.6**

n.a. = not available.

Source: ONS, *Blue Book*.

(a) Council housing has now been transferred from General Government to the Public non-financial corporations sector.
(b) Following the grant of licences to mobile phone companies, the 3G spectrum is included as an asset for the first time in 2000.
(c) Net worth was previously defined as net wealth.

government sector was almost £134 billion at end-December 2001.

The Office for National Statistics (ONS) include the 3G spectrum as a general government non-financial asset, reflecting the income accruing to the Government from allowing the mobile phone companies to use it.

HM Treasury publishes a more comprehensive asset breakdown in the National Asset Register (NAR).(1) This is a list of all UK central government and public corporations' fixed assets and their valuations. The NAR does not include local government fixed assets, which belong to them rather than the central government. Included within the NAR are the following:

- all tangible fixed assets (including military and heritage assets);
- intangible fixed assets (such as intellectual property rights); and
- fixed asset investments (such as share holdings).

In deciding which fixed assets to include, government departments have to follow standard accounting rules for the recognition of assets. Contingent assets and liabilities are not included, eg pension commitments to public sector employees.

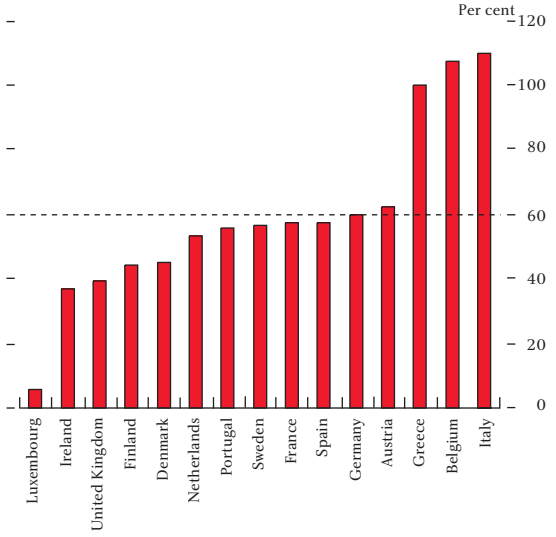
Comparisons with other EU countries

The Maastricht Treaty requires the United Kingdom, along with other EU countries, to report government finance statistics to the European Commission. These statistics are used by the Commission to monitor the sustainability (or otherwise) of fiscal positions.

The Stability and Growth Pact includes restrictions on general government consolidated gross debt, as a percentage of nominal GDP. GDP and the tax base of the economy are closely linked, and affect the government's ability to service its debt. If the government can maintain its current spending and taxation plans indefinitely, while servicing its debt, its fiscal position is considered sustainable.

The latest Maastricht figures submitted to the Commission showed that UK gross government debt accounted for 39.0% of GDP at end-September 2001 (see Chart 5). This is the third lowest in the EU countries and well below the Maastricht reference value of 60%. Debt ratios reported by Greece, Belgium and Italy remained well above the 60% reference value in 2001, although debt:GDP ratios have fallen in most EU countries in recent years.

Chart 5
General government consolidated gross debt: end-September 2001



(1) Available at www.hm-treasury.gov.uk/Documents/Public_Spending_and_Services/National_Asset_Register/pss_nar_2001index.cfm

Annex
Notes and definitions

Central government gross debt

Comprises:

British government stocks (*BGS*): sterling, marketable, interest-bearing securities issued by the British government. The nominal value of index-linked securities is increased by the amount of accrued capital uplift. The whole nominal value of all issued securities is recorded, even where outstanding instalments are due from holders. Where this is the case, the outstanding instalments are recorded as holdings of liquid assets.

Sterling Treasury bills: short-term instruments generally issued with either a one-month, three-month or six-month maturity. The bills, which can be traded on the secondary market, are sold at a discount and redeemed at par. The amount of discount depends on the price accepted by the Debt Management Office at the tender.

National Savings and Investments products: non-marketable debt comprising a variety of products available to the public.

Certificates of tax deposit: Non-marketable debt available to taxpayers generally, which may be used in payment of most taxes.

Other sterling debt: includes the following instruments. *Coin* in circulation; *Ways and Means advances* (short-term lending by the Bank of England to the Government). Also includes *NILO* (*National Investment and Loans Office*) *stocks*; these are non-marketable stocks, issued directly to the National Debt Commissioners, whose terms reflect those on existing BGS. The *temporary deposit* facility (deposits by central government bodies and public corporations with the National Loans Fund); also includes local government deposits with the Debt Management Office. Deposits with the National Debt Commissioners of *funds lodged in courts*. Market holdings of *Northern Ireland government debt* (mainly Ulster Savings Certificates). *Bank and building society lending, balances of certain public corporations with the Paymaster General, funds held on behalf of the European Commission*. Other third-party deposits (from the Insolvency Service), and the *net liabilities, guaranteed by government, of the Guaranteed Export Finance Company* (*GEFCO*), following the reclassification of its transactions to central government in 1987.

Foreign currency debt: converted to sterling at end-period middle-market closing rates of exchange. Comprises *foreign currency bonds* (denominated in US dollars), *euro notes*, *long-term post-war loans* from the governments of the United States and Canada, and *assigned debt* (debt originally drawn under the Exchange Cover Scheme and transferred to the government following privatisations of public corporations).

Public sector consolidated gross debt

This includes *central government gross debt*, as well as all *local government and public corporations' debt*. All holdings of each other's debt by these three parts of the public sector are netted out to produce a consolidated total.

The local government sector comprises all bodies required to make returns under the various local government acts. Public corporations are trading bodies which have a substantial degree of independence from the public authority that created them, including the power to borrow and maintain reserves. For further details, see the *Financial Statistics Explanatory Handbook*, published by the Office for National Statistics.

Public sector net debt

Public sector net debt is derived from the consolidated debt of the public sector by deducting the public sector's holdings of liquid (short-term) assets.

General government consolidated gross debt ('Maastricht debt')

Central government and local government gross debt, with holdings of each other's debt netted out to produce a consolidated total.

Speech at the Northwest Development Agency/Bank of England Dinner[1]

The Bank's Court of Directors (responsible for managing the Bank's affairs, other than the formulation of monetary policy) meets outside of London once each year. In October, Court was held in Liverpool and the ***Governor*** *gave a speech at the Northwest Development Agency/Bank of England Dinner in Manchester on the preceding evening. He spoke about the UK and North West regional economies and identified several key questions confronting the MPC: the sustainability of the gradual global recovery; the prospects for consumption growth; and, how much risk there might be of an abrupt retrenchment by consumers. These are all difficult questions of degree. But the* ***Governor*** *concluded that, despite these challenges, 'in terms of the overall economy—including here in the North West, things are better than they've been in a long while'.*

The Bank has excellent contacts here in the North West—as indeed we have throughout the United Kingdom. We've been represented here—both in Manchester and Liverpool—for over 175 years; and I have no doubt that our present resident Agent, Tony Strachan—and his Deputies, Graeme Chaplin and Neil Ashbridge—are well known to many of you. They report regularly each month to the Monetary Policy Committee on the business climate—frequently attending our monthly briefing meetings to tell us face to face what it is you're getting up to. You just can't imagine the tales that they tell! It's not that we don't believe them—but we still feel the need to come and see for ourselves! The members of the MPC and other senior officials of the Bank are regular visitors up here.

But this is the first occasion on which we have invaded you in such large numbers—with ten of our non-executive Directors and all nine members of the MPC plus over a dozen other officials—for a meeting of our Court (or Board) of Directors.

We're here to learn more at first hand from you what things are really like on the ground, and to give you our impressions of the state of the UK economy as a whole.

I don't suppose it will come as a great surprise if I tell you that we bring a somewhat mixed message on the overall economy. And it won't surprise us, either, if you give us the same mixed message about the regional economy. And the reason—at both national and regional level—is clear. Our overall economic performance has not been at all bad over the past decade. But for the past few years, beneath that relatively calm surface there has been a sustained imbalance, between businesses and sectors that are heavily exposed to some very cold winds blowing in from abroad, on the one hand, and the more domestically oriented businesses and sectors, which have on the whole been doing much better, on the other.

To remind you of some facts. Inflation—on our RPIX target measure—has averaged 2.6% over the past ten years, and has for the past two years been mostly modestly below our $2^{1}/_{2}$% target. But that hasn't been achieved at the expense of consistently high interest rates, and weak growth and employment, as many people feared that it would be. In fact nominal interest rates have been as low they've been for 40 years; the overall economy has grown without interruption quarter by quarter—at an average annual rate of $2^{3}/_{4}$%, which is comfortably above its long-term trend; the number of people in employment has risen fairly steadily—and is still close to its all-time high, while the rate of claimant count unemployment has fallen from 9.6% to 3.1%—the lowest it's been for more than 25 years.

And what's true for the UK economy as a whole is broadly true for every region of the United Kingdom, including the North West region. Total output in the North West increased year by year from 1992 to 1999—the latest number I have—though at a somewhat slower

(1) Given on 15 October 2002. This speech can be found on the Bank's web site at www.bankofengland.co.uk/speeches/speeches/speech179.htm

average annual rate than in the United Kingdom as a whole, at around 1¾%.

The number of people in employment in the region rose by about ¼ million from the end of 1992 to over 3.1 million in the past two years. And the rate of claimant count unemployment fell from over 10% to 3.5%—still somewhat above the rate for the United Kingdom as a whole, but again the lowest rate for over 25 years.

But I'm well aware that you don't have to look far beneath the surface to see that at the sectoral or individual business level things are a lot more uncomfortable than these aggregate figures might suggest.

To a degree that's always going to be true. Competition—at both the national and international level—inevitably means the expansion of some sectors or businesses at the expense of others. Yet it is a necessary driver of the increasing economic efficiency and higher sustainable growth rate that we need to satisfy our aspirations for improving living standards. But the stresses we've seen within our economy in the past few years go well beyond normal competitive pressures. For the most part they originate abroad, with, first, the Asia crisis and its aftermath in the late 1990s, happily substantially offset, as far as the United Kingdom was concerned, by strong growth in the United States, but then last year by the sharp, synchronised, slowdown into negative growth in most of the world's major economies.

Although the pressures were not confined to manufacturing, and were not uniform within manufacturing, manufacturing was hit harder than other sectors. Manufacturing output fell from its peaks in the year 2000, to its trough last winter by over 16% in Japan, by 7½% in the United States and by 6½% in Germany. And manufacturing employment fell by 7¼% in Japan, 9½% in the United States and 3% in Germany. In this country manufacturing output fell from peak to trough by around 7%, and manufacturing employment by some 6%. So we were not alone in what happened and the impact was not obviously worse than elsewhere. That of course is cold comfort to the manufacturing businesses that were most affected, and to the regions—including the North West, where there is a relatively high concentration of manufacturing business. And you were severely affected last year too by the impact of foot-and-mouth disease on agriculture and tourism.

The frustrating thing for us has been that there was very little that we at the Bank could do through monetary policy—or indeed that the Government could do—to address the problems at source.

That's fairly obvious when we're talking about the weakening of demand in the other major economies. Some people have suggested that we might have done more to weaken the exchange rate—particularly against the generally weak euro—by cutting our interest rates more aggressively, but it really isn't as simple as that: exchange rates don't respond predictably to relative interest rates—certainly in the short term; if anything, in recent conditions cutting them further could even have had a perverse effect.

What we were able to do, given that inflation was under control, by cutting interest rates as we did last year, was to try to compensate for the external weakness by stimulating domestic demand growth here in the United Kingdom. Given the weakness of business confidence, and therefore investment, reflecting the external pressures, that meant essentially stimulating consumer demand.

We recognised that this was not without risks—risks in terms of the build-up of household debt and of an unsustainable rate of increase in house prices, if not an actual bubble—which, if persisted in for too long, or if carried too far, could lead to an uncomfortable retrenchment further ahead. In a virtual world where we could control these things precisely, we could no doubt readily agree that we would like to see stronger growth in other major industrial countries, a stronger euro, more business investment in the United Kingdom and more moderate growth of consumer spending and household debt. That would offer a more certain prospect of better balanced, and therefore more sustainable, growth. But we live in the real world! We expected the global economy to begin a sustained recovery in the latter part of last year which would allow us to return to better balanced growth in this country, and so we took the view essentially that for the time being at least unbalanced growth was better than no growth at all.

In the event, our economy as a whole did just about keep moving forward through the winter, and the global economy—including manufacturing output—bottomed out around the turn of the year. By the early summer both the MPC and financial markets were contemplating

the possibility that we might soon need to act to moderate the growth of domestic demand, if that did not happen of its own accord, in order to accommodate a pick-up in external demand.

But we had not reckoned with the further nervous breakdown suffered by international equity markets during the summer! This seemed to be largely unconnected with developments in the global economy where a gradual recovery—including a gradual recovery in manufacturing output—seemed to be continuing, even if the pace of recovery was slower than was earlier anticipated. In part it no doubt reflected a belated correction of earlier 'irrational exuberance' but it seemed to be exaggerated by fears of possible further terrorist attacks following on from 9/11, by a series of corporate governance and accounting failures in the United States, and by the possible implications of war with Iraq. But whatever the causes, the sharp further falls in equity prices have given rise to concerns about the strength of business and consumer confidence, and to doubts as to the sustainability of the global recovery. Internationally, and here in the United Kingdom, both in financial markets and within the MPC, the monetary policy debate has shifted back to the possible need for further monetary stimulus. One helpful consequence of this is that market interest rates have in fact fallen significantly, which will help sustain the recovery.

We find ourselves nevertheless—not for the first time—in something of a quandary.

The key questions confronting us then are:

First—to what extent do we expect the gradual global recovery—which is critical for our manufacturing sector—to be sustained?

Second—depending on the answer to that, to what extent do we expect the consumption growth, that we have recently been relying upon to keep overall, aggregate, demand increasing in line with our underlying supply capacity, to continue to sustain our overall economy of its own accord?

Third—depending on the answer to that, how much risk—of an abrupt retrenchment by consumers, and a significant shortfall on our inflation target, further ahead—would we be taking, and should we take, by cutting interest rates further now, to sustain consumer demand at the expense of a further build-up of household debt and continuing increases in house prices, in order to maintain the growth of the overall economy?

These are all difficult questions of degree.

But you can be sure that my colleagues on the MPC will continue to monitor both the global and the domestic situation with their usual vigilance—and with an open mind.

There's no doubt that these are challenging times for all of us. But that should not obscure the fact that in terms of the overall economy—including here in the North West, things are better than they've been in a long while. And I am reasonably confident that we will find a way through the macroeconomic, demand management, challenges.

In the meantime there is a great deal that you can do—and are doing—yourselves, here in the North West, under the leadership of the NWDA, in partnership with the other public authorities, the universities, and the private business sector, to identify—on the basis of your local knowledge—the particular obstacles to, and the particular opportunities for, creating a more positive and flexible supply-side environment for the future. In thanking you, Bryan, once again for joining with us in hosting this dinner this evening, I wish you all possible success.

The inflation target ten years on[1]

In this lecture to the London School of Economics, Mervyn King, Deputy Governor,[2] re-examines the case for price stability ten years after Robin Leigh Pemberton asked the same question in the first LSE-Bank of England lecture. Mervyn King asks three questions. Did the benefits of low inflation promised ten years ago materialise? What does price stability mean in practice? And finally, what are the challenges for monetary policy over the next decade?

Introduction

Ten years ago, in this very room, Robin Leigh Pemberton (then Governor, now Lord Kingsdown), delivered the first LSE-Bank of England Lecture. It was entitled 'The Case for Price Stability'. In the 25 years prior to that lecture, prices had risen by over 750%, more than over the previous 250 years. So the audience on that evening in November 1992 had grown up in a world in which rapidly rising prices appeared inevitable. They were the inflation generation. To them price stability seemed remote. Inflation was simply taken for granted.

But that LSE-Bank of England Lecture coincided with the introduction of a new monetary framework—the inflation target. Since then price stability has become a reality. Over the past decade inflation has averaged 2.5%, and has been no lower than 1.5% and no higher than 3.3%.

Alan Greenspan defined price stability as when 'expected changes in the average price level are small enough and gradual enough that they do not materially enter business and household decisions'. With inflation expected to remain close to 2.5%, it is no longer a material concern to families and businesses in this country. Alan Blinder, who was Alan Greenspan's deputy at the Federal Reserve Board, put it even more clearly. Price stability, he said, was when ordinary people stop talking and worrying about inflation. And so successful has been the pursuit of low inflation that some commentators have talked about the 'death of inflation' and others have become increasingly concerned about the prospect of deflation.

Tonight I want to re-examine the case for price stability, and ask the following questions. Did the benefits of low inflation promised ten years ago materialise? Is the case for price stability the same as in 1992? What does price stability mean in practice? Finally, what are the challenges for monetary policy over the next decade?

Ten years of the inflation target: what has it achieved?

Since Britain's departure from the Exchange Rate Mechanism in September 1992, monetary policy has been based on an explicit numerical target for the rate of inflation—now 2.5%—and a high degree of transparency and accountability. Indeed, it was in his LSE lecture that Lord Kingsdown announced that the first *Inflation Report* would appear in February 1993. And last week's *Report* completes exactly a decade of *Inflation Reports*—40 assessments of the outlook for growth and inflation in the British economy.

Although inflation targeting in the United Kingdom is now ten years old, the most significant institutional changes occurred five years ago. Decisions on interest rates were taken out of the political arena in May 1997 and delegated by the Chancellor to the new Monetary Policy Committee. It is too soon to compare the

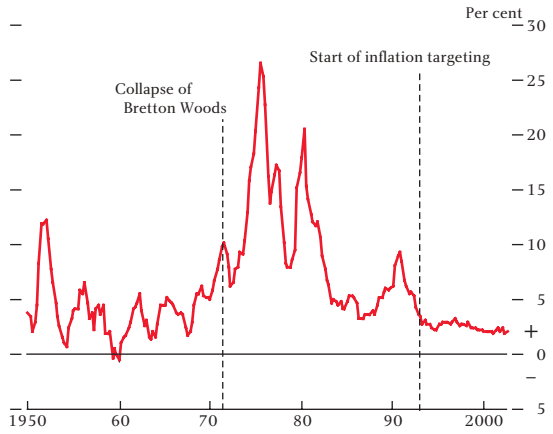
(1) Speech delivered to the London School of Economics, 19 November 2002. This speech can be found on the Bank's web site at www.bankofengland.co.uk/speeches/speech181.pdf

(2) I would like to thank Jens Larsen and Jan Vlieghe for their excellent research support and for many of the ideas in this lecture. I am grateful also to Luca Benati for help with interpreting the macroeconomic statistics, to Richard Geare and James Cookson for their efforts in compiling the data on historic Harrods prices and to Kath Begley for help in identifying material on retail prices in the early 20th century. I have also benefited from comments, help and advice from Peter Andrews, Hasan Bakhshi, Sebastian Barnes, Charlie Bean, John Campbell, Enzo Cassino, Philip Evans, Katie Farrant, Guillermo Felices, Neal Hatch, Rishi Kansagra, Ben Martin, Jack McKeown, Michael McMahon, Alan Mankikar, Peter Rodgers and Greg Thwaites.

nine-member Monetary Policy Committee with the Council of Nine that ruled Siena during the 14th century. Exactly 660 years before the Chancellor created the MPC, the Council of Nine commissioned Lorenzetti to paint the marvellous frescoes in the Palazzo Pubblico showing the virtues of Good Government and the vices of Bad Government. There are few more convincing representations of the case for stability than those frescoes. Since the MPC has not, at least yet, discovered a modern Lorenzetti, I shall present the case for price stability in a more orthodox, if less compelling, visual form.

Chart 1 shows consumer price inflation in this country over the past 50 years. The decade of inflation targeting stands out as a period of low and stable inflation. Table A shows that not only has inflation been lower since inflation targeting was introduced, but that, as measured by its standard deviation, it has also been more stable than in recent decades. Moreover, inflation has been less persistent—in the sense that shocks to inflation die away more quickly—under inflation targeting than for most of the past century.(1)

Chart 1
Annual inflation in the United Kingdom



Source: ONS.

Four-quarter growth rate of the quarterly retail price index (RPI) until 1974, and four-quarter growth rate of the quarterly retail price index excluding mortgage interest payments (RPIX) after 1974. Note that the RPI methodology before 1974 did not include mortgage interest payments, so the RPI series before 1974 is equivalent to RPIX in that sense. Data up to 2002 Q3.

Now this fall in inflation has led to sharp reductions in nominal interest rates, at both short and long time horizons, as shown in Table B. That reflects both lower inflation expectations and smaller risk premia to compensate for future inflation uncertainty. The total inflation premium—the sum of expected inflation and

Table A
Inflation in the United Kingdom

	Mean	Standard deviation
1950–59	4.14	1.06
1960–69	3.65	0.72
1970–79	13.07	1.81
1980–92	6.40	1.14
1993–2002	2.49	0.24
1950–2002	5.93	1.41

Source: Bank of England calculations based on ONS data.

Mean inflation is the total increase in the quarterly price level (RPI until 1974, RPIX after 1974) over the period indicated, expressed as a four-quarter growth rate. Standard deviation is calculated on quarterly inflation rates (not annualised) over the period indicated. Data up to 2002 Q3.

the inflation risk premium—is measured by the difference between yields on conventional and index-linked government securities. Chart 2 shows that the total inflation premium fell significantly on the announcement of Bank of England independence and the creation of the MPC. It is highly suggestive of a fall not just in expected inflation but also in the inflation risk premium. In principle, the behaviour of businesses and households depends on real interest rates—nominal

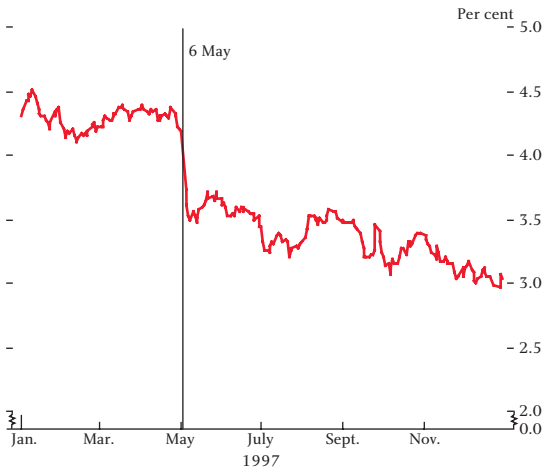
Table B
Short and long interest rates in the United Kingdom

	Short rate		Long rate	
	Mean	Standard deviation	Mean	Standard deviation
1950–59	2.87	1.67	4.40	0.88
1960–69	5.51	1.31	6.58	1.07
1970–79	8.92	2.81	11.94	2.41
1980–92	11.28	2.23	10.83	1.88
1993–2002	5.58	0.88	6.38	1.59
1950–2002	7.09	3.59	8.19	3.32

Sources: Global Financial Data, Inc. and Bank of England calculations.

Short rates are three-month Treasury bill yields. Long rates are 20-year gilt yields. Data are monthly, and use the rate at the close of the last business day of the month. Data up to September 2002.

Chart 2
Total inflation premium expected in ten years' time, United Kingdom 1997



Source: Bank of England.

The total inflation premium is measured as the difference between implied forward nominal rates on conventional gilts ten years hence and implied real rates on index-linked gilts ten years hence.

(1) The conclusion reflects statistical tests including first-order autocorrelations of consumer price inflation over ten-year rolling windows, and estimated spectral densities for inflation from a random coefficient AR (4) and GARCH (1,1) model. The only periods in which persistence was lower than in the 1990s was in the early 1930s and early 1960s.

interest rates less the expected increase in prices.(1) To the extent that the inflation risk premium falls, then so too does the level of real interest rates. The evidence in Chart 2 suggests that real rates have fallen too, although by less than nominal rates.

So price stability appears to have led to a more stable macroeconomic environment, with fewer surprises to inflation, less inflation uncertainty, and a lower level of real interest rates. Has this improved nominal performance led to greater stability of the real economy? Table C shows that since 1992, output has grown at a little above its 40-year average, and has been much more stable than before. The standard deviation of quarterly growth rates over the past decade was less than half that in earlier periods.

Table C
Real GDP growth in the United Kingdom

	Mean	Standard deviation
1956–59	2.42	1.22
1960–69	3.15	0.92
1970–79	2.12	1.42
1980–92	1.86	0.84
1993–2002	2.76	0.36
1956–2002	2.42	0.98

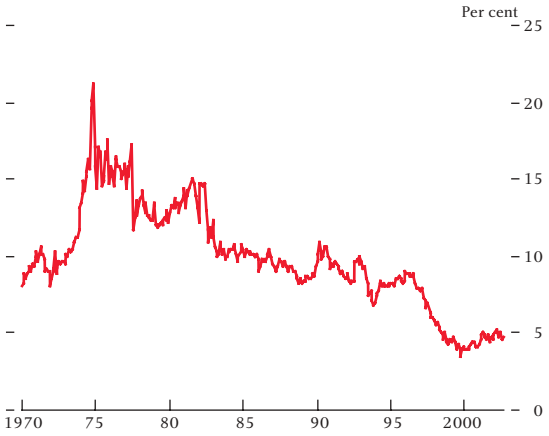
Source: Bank of England calculations based on ONS data.

Mean GDP growth is the total increase in real quarterly GDP over the period indicated, expressed as a four-quarter growth rate. Standard deviation is calculated on quarterly growth rates (not annualised) over the period indicated. Data up to 2002 Q2.

Can these gains in terms of greater stability be attributed to a more stable monetary regime? After all, a sceptic might argue that the causation runs from a more stable economic environment to lower inflation. But some of these alternative explanations, such as the rise in the share of services in total output and better inventory management, are part of longer-term trends and do not fit well with the observation that volatility has fallen sharply over the past decade. And shocks to the United Kingdom from the world economy and from the sterling real exchange rate have been as large, if not larger, over the past five years as in earlier periods.(2)

It is, of course, difficult to identify the effect of changes in the monetary policy regime on the path of total output. One approach is to consider long runs of data which make it easier to identify structural breaks in the behaviour of output. Luca Benati of the Bank of England has been investigating the statistical properties of inflation over long periods for a number of countries. He finds that changes in the behaviour of inflation appear broadly to coincide with changes in the monetary policy regime. Some tentative evidence that this general conclusion applies to the United Kingdom can be found in the behaviour of ten-year forward interest rates on UK government bonds. At this horizon, high and variable interest rates are signs of high expected inflation and a large inflation risk premium. As shown in Chart 3, the ten-year forward interest rate has fallen significantly in recent years, and has been less variable since inflation targeting, and especially the MPC, were introduced.

Chart 3
Ten-year forward rates in the United Kingdom, 1970–2002



Source: Bank of England.

Implied forward nominal rates on conventional gilts ten years hence, calculated on the last business day of the month.

What is the mechanism by which monetary policy contributes to a more stable economy? I would argue that monetary policy is now more systematic and predictable than before. Inflation expectations are anchored to the 2.5% target. Businesses and families expect that monetary policy will react to offset shocks that are likely to drive inflation away from target. In the jargon of economists, the 'policy reaction function' of the Bank of England is more stable and predictable than was the case before inflation targeting, and easier to understand.(3) More simply, monetary policy is not adding to the volatility of the economy in a way that it did in earlier decades.

(1) If index-linked contracts were widely used the relevant real rate would be the index-linked rate. And if the risk premium were determined largely in an integrated world capital market without frictions then again the real rate would be the riskless index-linked rate.
(2) Most of the evidence on the link between inflation and stability comes from the United States where the greater stability of output is evident over the past two decades. A number of recent studies have concluded that at least part of the explanation for greater stability can be attributed to better monetary policy, for example Taylor (1998).
(3) The behaviour of monetary policy in the United Kingdom after 1992 more closely resembles a 'Taylor Rule' that has been shown to fit data in the United States than was the case before 1992. See the work of Ed Nelson of the Bank of England (Nelson (2001)).

The case for price stability: what have we learnt over the past ten years?

The costs of departing from price stability—either inflation or deflation—depend upon whether it is expected or comes as a surprise. In his 1992 lecture, Lord Kingsdown distinguished three costs of unanticipated inflation and four of anticipated inflation. I shall focus on the former, commenting on the latter only briefly. Although none of the ideas are new, research since 1992 has thrown new light on both the theoretical and the empirical relevance of the costs of inflation. The main costs of unanticipated inflation are:

(i) Distortions to production and investment resulting from mistakes in distinguishing between relative and absolute price changes

The crucial link between price stability and production and investment is that high inflation is associated with more volatile and uncertain inflation. I showed earlier that as inflation has fallen in Britain, so too has its variability. The same link can be seen in cross-section data. Chart 4 shows the relationship between average inflation and its variability, measured by its coefficient of variation, over different time horizons for a sample of 144 countries. In all cases it is clear that inflation uncertainty increases with the average inflation rate.

But does this link between inflation and its volatility mean that higher inflation results in greater variability of relative prices? Chart 5 provides the answer for the United Kingdom. For each (approximate) decade for which the data on 80 subcomponents of the retail prices index are available, the chart shows the relationship between the standard deviation of those relative prices and the inflation rate in each month. At low inflation rates, say up to 4% a year, it appears that it is the absolute value of changes in relative prices that is linked to the inflation rate. This would be the case, as in Britain recently, where changes in relative prices, whether up or down, were largely responsible for short-term fluctuations in the inflation rate around a relatively stable long-run level. Variability in relative prices might lead inflation to be either above or below the inflation target, but not systematically in one direction or the other. Increases in house prices move the inflation rate up and falls in oil prices move it down. In both cases, an increase in the variability of relative prices leads to movements of inflation away from the target, but not in a systematic direction. But at higher rates of inflation (or deflation) the deviation of inflation from zero is positively correlated with the variability of relative prices. Hence, outside a range close to price stability, the higher the inflation rate, the greater is the variability of relative prices.

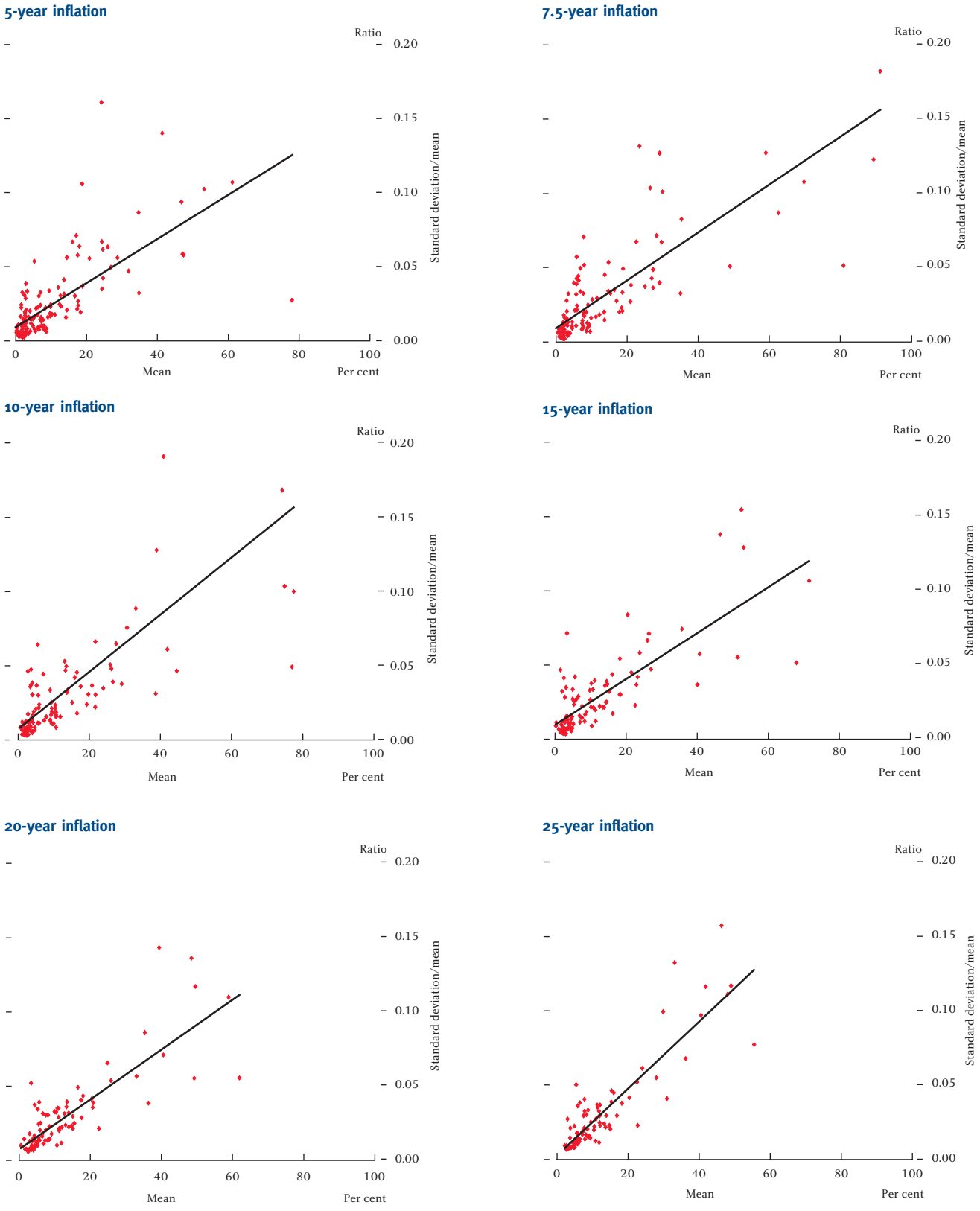
So inflation makes it more difficult for firms and households to work out whether the prices of the products they buy and sell have changed relative to other goods, or whether there has been a change in the overall price level. Such confusion can lead firms to produce, at least temporarily, the wrong level of output. And if many firms make these mistakes at the same time then the result is an unnecessary fluctuation in aggregate output.

Another decision affected by uncertainty about prices is investment. Many investments are specific to a particular model or product, and so they become sunk costs. For such irreversible investments it may pay to wait before investing since time will resolve some of the uncertainty. A Premiership football team may decide to postpone the construction of a new stadium until their survival in the League is assured. Or a car manufacturer may postpone a decision about opening a new plant to see if a rise in demand is temporary or appears likely to last. And that uncertainty could stem from a difficulty in disentangling relative from absolute prices. In the language of finance, there is an option value to waiting when there is uncertainty about the returns on an irreversible investment.

So a project must offer a rate of return sufficient not only to cover the cost of financing of the project, but also the option value to waiting. That may explain why surveys of firms show that their hurdle rates of return are often well in excess of the cost of either equity or debt finance. For example a CBI survey last year found that the average real hurdle rate for UK firms was 11.3%—down from rates of around 15% in surveys conducted in 1994—but still well above the cost of financial capital. If uncertainty about inflation creates an option value to waiting, then it will reduce investment. And there is growing empirical evidence that inflation is a key explanatory variable for cross-country differences in investment to output ratios.(1)

(1) See, for example, Pindyck and Solimano (1993). Examples of how the option value to waiting can lead to significant increases in required rates of return are given in Dixit and Pindyck (1994).

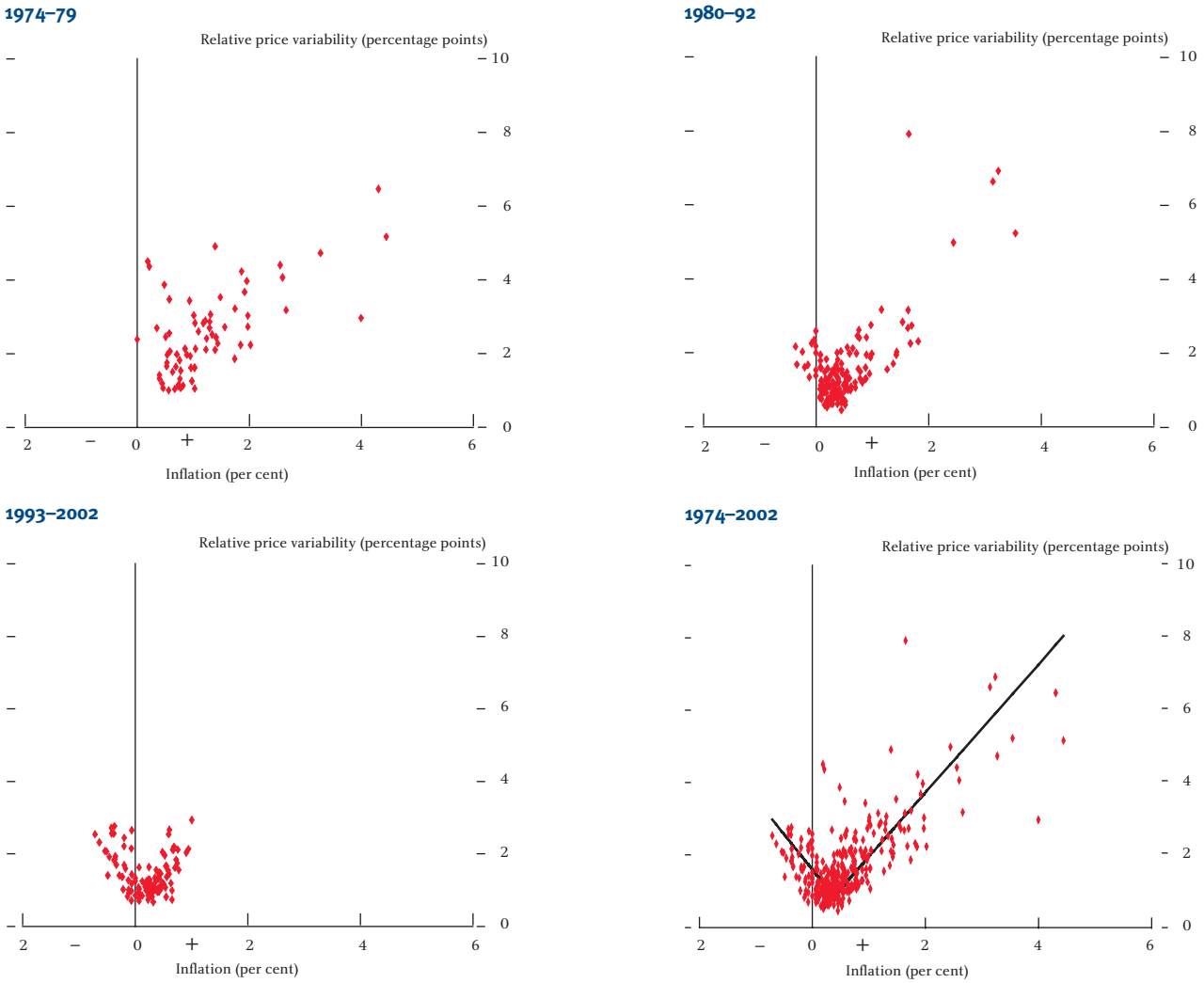
Chart 4
Cross-country relationship between level and variability of inflation



Sources: IMF *International Financial Statistics*, data item 64, and Bank of England calculations.

Mean inflation is the total increase in the quarterly consumer price index, expressed as a four-quarter growth rate, over the indicated horizon ending in 1999 Q4. The variability of inflation is the coefficient of variation (standard deviation divided by the mean) of the gross inflation rate (ie 1 + growth rate) over the indicated horizon ending in 1999 Q4. Each panel covers all the countries for which a consumer price index was available over the indicated horizon. The largest sample size is 144 (for the five-year horizon), the smallest sample is 85 (for the 25-year horizon).

Chart 5
Inflation and relative price variability in the United Kingdom



Source: Bank of England calculations based on ONS data.

Inflation is the monthly percentage change in total RPIX. Relative price variability is the cross-sectional standard deviation of the monthly percentage changes of the approximately 80 subcomponents of the RPIX in each month. Data end in August 2002.

(ii) Redistribution of wealth between debtors and creditors

Unexpected changes in the price level—the standard of value used to define contracts—produce arbitrary redistributions of wealth. As Keynes wrote in his powerful advocacy of price stability in *A Tract on Monetary Reform*, 'We leave saving to the private investor. We leave the responsibility for setting production to the business man. These arrangements have great advantages. But they cannot work properly if the money, which they assume as a stable measuring-rod, is undependable. Unemployment, the precarious life of the worker, the disappointment of expectation, the sudden loss of savings, the profiteer—all proceed, in large measure, from the instability of the standard of value'.

Or, as Lenin remarked, the best way to destroy capitalism is to debauch the currency. It is arguable as to whether it is high inflation or serious deflation which results in the greater economic damage. In Europe in the 1920s hyperinflation undermined economic and social arrangements, as it has done more recently in Latin America. But deflation has proved just as unpopular as inflation. In 274 A.D. the Roman Emperor Aurelian tried to restore the integrity of the coinage which had been adulterated by workmen in the Mint. Aurelian exchanged good money for bad, and ordered the destruction of accounts drawn up in the devalued currency. In the long run the operation restored the value of money. But in the short run it caused hardship. Gibbon, in his *Decline and Fall of the Roman Empire*, observed that 'a temporary grievance of such a nature can scarcely excite and support a serious civil war'.

Unfortunately, taking a different and more Keynesian view that in the long run we are all dead, the population at the time rose in insurrection. Many of them found that they were dead in the short run as well, with 7,000 soldiers and countless civilians perishing during the suppression of the uprising.

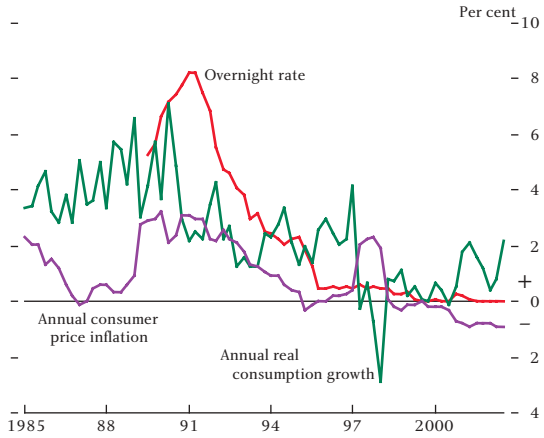
So let us consider the costs of wealth redistributions arising from unanticipated deflation. Such redistributions can lower aggregate demand. Why? Since it is difficult either to borrow or insure against uncertain future employment and earnings opportunities, current assets act as a buffer stock to make it possible to smooth consumption in the face of shocks to future prospects. When net worth is small it is risky to run down the buffer stock even further, and so the marginal propensity to spend out of wealth is much higher for households with low net worth than for families whose assets comfortably exceed their liabilities. If significant numbers of debtors have little net worth—recent first-time house-buyers with high debt-to-value ratios are a prime example—then an unanticipated deflation could cause a sharp fall in aggregate consumption spending.

Such effects can be amplified if spending—consumption or investment—depends on the value of the assets that are used as collateral for loans. A fall in prices can produce a vicious circle in which the initial fall in demand lowers asset prices, reducing the value of collateral, which in turn leads borrowers to repay debt, exacerbating the original decline in aggregate demand. This 'debt deflation' was first formulated clearly by Irving Fisher in the 1930s, and has recently been revived in a more sophisticated form by Nobu Kiyotaki and John Moore, here at the London School of Economics.

Because deflations are, fortunately, few and far between, there is a lack of hard empirical evidence on the quantitative significance of debt deflation. In 1993, I argued that the depth of the recession in the United Kingdom and the United States in the early 1990s was the result of debt deflation. Consumption fell more sharply than would have been expected given movements in incomes and interest rates, reflecting an unexpected fall in inflation and asset prices. The effects on consumption of negative equity in housing were particularly severe.

The experience of Japan may add to our knowledge in this area, although, as shown in Chart 6, despite a stagnant economy over the past decade, deflation of consumer prices has not been especially large. And I am confident that all central banks will do their best to prevent the sample size of countries suffering from serious deflation from increasing.

Chart 6
Consumption, inflation and interest rates in Japan, 1985–2002



Source: Thomson Financial Datastream.

Inflation is measured using the consumer price index excluding foodstuffs.
The overnight interest rate is the nominal overnight uncollateralised call rate.

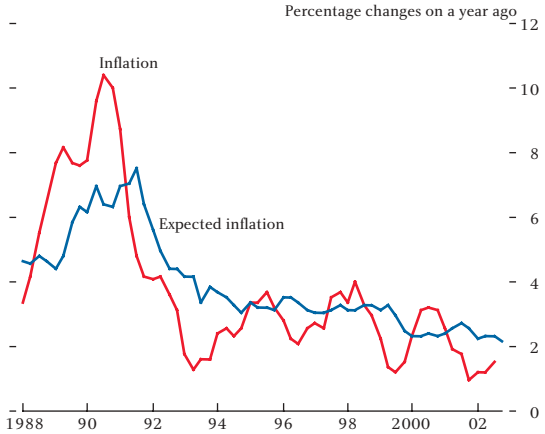
(iii) Aversion to long-term contracts and excessive resources devoted to hedging inflation risks

As we have seen, high inflation goes hand in hand with greater uncertainty about future inflation. Inflation is, therefore, associated with a positive risk premium to compensate investors for that uncertainty. The longer the time horizon, the greater the risk premium is likely to be. That discourages long-term contracts and interest rates in such contracts will often depend upon future spot interest rates. Floating-rate mortgages are a good example. With a floating-rate mortgage the borrower is exposed to the risk of sharp fluctuations in the proportion of income that is devoted to debt service, as many households in Britain still remember from the late 1980s when interest rates doubled to 15%. Fixed-rate mortgages eliminate that risk, but at the cost of introducing a new risk: the real value of the outstanding debt may change relative to the value of the house. John Campbell and João Cocco (2002) have suggested that a superior contract would be a fixed-rate mortgage where the principal was index-linked. That would reduce both income and capital risk. For whatever reason the market has not generated many private-sector index-linked contracts, despite the encouragement of high inflation in the past. Perhaps that is because the risks are generated not by some exogenous process, but by policy decisions. In any event, price stability is a good alternative to indexation.

The move from a regime of high inflation to one of price stability can have consequences which again are best illustrated by the housing market. A credible move to inflation targeting can bring down inflation expectations relatively quickly, even if with a lag. Chart 7 shows that inflation expectations, as measured by surveys, fell steadily following the introduction of inflation targeting, and are now anchored on the 2.5% target. But a move to low inflation has other consequences that may be less easily understood. Price stability means lower nominal interest rates, and lower mortgage interest payments. It may also mean lower real interest rates if the inflation risk premium falls. But the fall in nominal rates is likely to be much larger than the fall in real rates. The lower mortgage payment largely reflects a rise in the effective duration of the loan because inflation no longer erodes the real value of the debt as quickly as before. In a low inflation world, nominal incomes rise more slowly than before and the real burden of servicing the debt persists. It may take longer for households to work out the impact of low inflation on real interest rates than to realise that the rate of increase of prices of everyday purchases has fallen. Learning takes time.

One possible consequence of a slow adjustment to low inflation is that households may mistake too much of the reduction in nominal interest rates for a permanent fall in the real rate. As a result, asset prices are bid up to levels that prove unsustainable when learning finally occurs—and at the LSE you know that in time we do learn. How far this theoretical argument applies to the British housing market at present is difficult to say, but it demonstrates the risks from current house price to earnings ratios that are close to the peaks reached in the late 1980s.

Chart 7
One-year ahead inflation expectations and inflation outturns in the United Kingdom, 1988–2002



Sources: ONS and Basix.

Inflation is the four-quarter change in the RPI. Expected inflation is based on the quarterly Barclays Basix survey of inflation one year ahead. It is the weighted average across all surveyed subgroups, excluding the general public. Expected inflation is lagged one year in the chart, so that expectations and outturns for the same period can be compared.

So much for the costs of unanticipated inflation. What are the costs of anticipated inflation? Time permits me to comment only briefly on the four costs of anticipated inflation noted by Lord Kingsdown.

(i) Distortions to cash balances

Money—notes and coin—may no longer, as Sally Bowles claimed, make the world go round, but, even in a world of plastic, it oils the wheels of transactions. Cash still accounts for a large number of transactions, albeit a smaller fraction of the value of all transactions. The opportunity cost of holding cash is the interest rate on deposits. Inflation raises nominal interest rates and hence this cost. So agents economise on their real money balances, and incur additional costs in the form of more frequent trips to the cash dispenser—the so-called 'shoe-leather costs' of inflation. The traditional view was that these costs could be measured by the area under the money demand curve. Such estimates were typically small, and left researchers wondering if the costs of inflation were really all that important. But high inflation rates can affect more than just money demand. If agents economise on money balances, transactions costs may rise in markets for goods, labour and assets. As argued by Hahn (1965) and more recently articulated by Wallace (2001), many monetary models contain hidden inconsistencies in the sense that they ignore the credit or trade frictions—in particular, imperfect monitoring and enforceability—that give to money an essential role in the first place. To assess the welfare implications of inflation we need a theoretical framework that takes seriously the role of money in all these transactions. I have discussed elsewhere (King (2002)) the potential importance of money in reducing the transactions costs of firms by reducing liquidity premia in a wide range of financial markets. There is much to learn here.

(ii) Incomplete indexation of the tax system

A second cost of anticipated inflation is the added inefficiencies that arise when an already distortionary tax system is incompletely indexed. Martin Feldstein (1999) has edited a major study of the costs of incomplete indexation which includes a detailed analysis of the tax distortions to saving, consumption and investment in several major countries, and to which the

Bank of England contributed. The benefit of reducing inflation in an already low inflation environment is estimated to be lower in the United Kingdom than in some other countries because some parts of the tax system are indexed. Nevertheless, the authors estimate that a reduction in inflation by 2 percentage points would bring an annual benefit equivalent to 0.2% of GDP. That may sound small, but it is a large absolute number. Against that, the end of mortgage interest deductibility will have lowered the impact.

(iii) Front-end loading of debt burdens

A third distortion is that of front-loading of the real debt burden when debt contracts are fixed in nominal terms. Inflation reduces the amount that households borrow because it raises the cost of servicing the loan in the early years. In this way decisions on consumption and investment may be distorted.

(iv) Costs of changing price lists

The costs of changing price lists and catalogues—so-called menu costs—are generally agreed to be of little direct consequence. But they may produce a degree of nominal rigidity in wages and prices which takes on greater significance. Inflation now causes relative price variability as not all firms are able to change their prices at the same time. The cost of greater relative price variability was discussed above, and continues to be an active field of research. Recent work at the Institute for Fiscal Studies (2002) shows that when inflation is higher, there is a larger dispersion in the inflation rates faced by individual households. This finding points strongly to the role of nominal rigidities in contributing to relative price dispersion.

Taken together, the verdict of economics, history and common sense is that inflation and deflation are costly. It is clear that very high inflation—in extreme cases hyperinflation—can lead to a breakdown of the economy. There is now a considerable body of empirical evidence that inflation and output growth are negatively correlated in high-inflation countries. For inflation rates in single figures, the impact of inflation on growth is less clear. But in a study of 133 market economies over the past 50 years, Stanley Fischer and his co-authors (2002) concluded that 'the old idea that in some sense inflation may be good for growth or is perhaps an inevitable part of the growth process should remain buried in the cemetery of harmful policy ideas'.

Price stability: what does it mean in practice?

So there is a strong case for price stability. But what does price stability mean in practice? Recall that the definitions of price stability offered by Alan Greenspan and Alan Blinder are rather general in nature and make no reference to particular indexes of prices or precise numbers for inflation. There are good reasons for this. The prices of the goods that I buy may rise at a different rate from the goods that you buy. Relative prices are always changing. And the basket of goods and services that you buy today is very different from the basket you could or would have bought 50 or 100 years ago. The official retail price index now includes computers and cable TV, but no longer bowler hats or the price of admission to cricket matches. Measurement problems mean that there is no unique way to calculate inflation.

Information on prices of individual commodities in the past can be found in Harrods catalogues which were published from the mid-1890s until 1930, catalogues for the Army and Navy Stores from 1872 to 1940, and the advertising records for Selfridges which go back to 1909. To illustrate the problems of measuring inflation, I shall draw largely on historic price material kindly provided by Harrods—mainly the Catalogues, Harrods News, and Harrods Food News. No records were published after 1970, so we have supplemented the historical data by our own researches. And I am very grateful to the young Bank of England economist who was apprehended in the Food Hall, suspected of comparing prices for a competitor who was opening a store across the road.

The richness of this information can be seen from the size of the Catalogue for 1907—weighing over six pounds and containing 1,375 pages. In those days the telegraphic address of Harrods was 'Everything, London'. The Internet has nothing on Harrods in 1907 when a telephone service with real people answering was available to take orders right through the night which were despatched early the next day with free local delivery (as far as Windsor) and by mail elsewhere.

According to the catalogues, a record player in Harrods cost £11 in 1910 (approximately £627 in today's money). That would have bought you a hand-cranked machine that provided low-quality sound. Today, you could buy a record player for as little as £39 on the Internet, and at Harrods a better quality model for £250. How much have record players increased in price? Ignoring quality

changes, the price rose by a factor of 3.5 (that is, £39/£11). But ignoring the vast quality improvements would surely overstate this increase—a *quality change bias*. So how do we quantify the increase in the quality of today's record player relative to the one in 1910? Statistically, there are a number of ways of dealing with this issue: one is to determine the price as a function of characteristics that do not change over time. The prime example of such hedonic pricing techniques in use today is for pricing computers, where the quality characteristics—performance in terms of speed and memory—can be fairly accurately measured. But hedonic pricing is not the only way to deal with this measurement issue, and recent research suggests that these techniques may overstate the extent to which quality has improved.

Is a record player still the relevant product, since record players today are only used by a small group of enthusiasts of—now outdated—vinyl records? Perhaps a computer or CD (or DVD or MP3) player is the relevant product today. From about £34 you can buy a CD player on the Internet today. This is a much more sophisticated piece of equipment than even today's record player, and its features are impossible to compare with those of a 1910 record player. If we ignore the invention and marketing of new products, we introduce a *new product bias*.

To illustrate the quality change and the new product bias, imagine that we go shopping in Harrods both today and in 1910. Suppose that we are given £350 to spend—the same amount in both years. In 1910 you could have bought a vacuum cleaner, a record player, an iron, a camera, and a telephone. The vacuum cleaner would have spread as much dust as it removed, the record player would have been hand-cranked and the iron would need to be filled with coal. The camera would have been bulky and awkward to set up, and the telephone would have been largely silent because so few people owned one. Today you can buy a similar bundle of goods for the same total outlay, but all would be of vastly superior quality. So for durable goods it is not clear that the cost of living has increased at all.

But if we buy food, however, the results are very different. Unlike appliances, many of the food items in 1910 are unchanged today—McVitie's digestive biscuits, Quaker oats, Rose's Lime Juice, Bournville cocoa, Frank Cooper's Oxford marmalade, Marmite, Heinz baked beans and Colman's mustard are only some of the familiar items for which precise comparisons over the years are possible. In 1910 you could have fed yourself on 10p a day by eating Marmite on Hovis toast for breakfast; eggs, bacon and toast for lunch; Heinz beans on toast for dinner; with a pint of milk to drink. The same menu, consisting of exactly the same brand products, would cost £4.80 today. The food basket has increased in price by a factor of 48.

A vacuum cleaner, if you wanted one in 1910, cost £229. That is more than six years worth of food based on the menu used in the previous example. A vacuum cleaner was an item of such luxury that owners would invite their friends round to 'Hoover parties' to show off their prized possession. Over the years, the price of food increased in nominal terms by a factor of 48, but the price of vacuum cleaners stayed roughly the same. Today you can still buy a vacuum cleaner for £229. But that is only 47 days of food shopping, rather than six years. As vacuum cleaners became cheaper relative to food, people bought more of them—ignoring such change would introduce a *substitution bias*. If there is any degree of substitutability between products, then rational consumers would have taken account of such changes in relative prices, and the weight of this particular good in the consumption bundle may have changed. The overall result of the substitution is that the expenditure share of electrical appliances(1) has not changed much, at least not in the past 50 years. If we ignored the fact that vacuum cleaners were a rare luxury item in 1910 and applied today's quantities to calculate the 1910 consumption basket, we would greatly understate the increase in the average cost of living.

And, of course, Harrods today is not exactly the typical place to go shopping—there was not much talk in 1910 of suburban shopping centres, or of Internet shopping. Ignoring developments in retail practice introduces an *outlet bias*. Had the bias remained constant over the years, this would have been less of an issue for measuring retail price inflation, but it clearly has not.

Quality change bias, new product bias, substitution bias and outlet bias—these are some of the issues that the Boskin Commission discussed in its report on measuring inflation in the United States.(2) The finding of the

(1) Electrical appliances and audio-visual equipment share was 0.021 in 1956 and was 0.018 in 2002.
(2) See Boskin, M *et al* (1996), 'Towards a more accurate measure of the cost of living', *Final report to the Senate Finance Committee from the Advisory Committee to Study the Consumer Price Index*.

report, which generated wide national and international interest, was that the US CPI might have overstated changes in the cost of living by between 0.8 and 1.6 percentage points per year. The examples I have given show how difficult it is to measure changes in the price level over time. Precision is not to be had. According to the official retail prices index, the general level of retail prices rose by a factor of 52 between 1910 and 2002. But changes in the nature of the goods and services available, and the nature of retail selling, make such comparisons treacherous.

Does this matter for price stability? Probably not. The Greenspan-Blinder definitions of price stability suggest that we know price stability when we see it, or rather, when we stop hearing about inflation. There is nothing mystical about the RPIX measure of inflation, nor the figure of 2.5%. But it is important to have a precise numerical target which is easy to understand in order to provide an anchor for inflation expectations and to which the MPC can be held accountable.

Monetary policy over the next decade: what are the challenges?

Although inflation targeting has delivered many of the benefits from low inflation that were promised ten years ago, there remain real challenges for monetary policy over the next decade. Two questions have been prominent recently. First, is inflation targeting enough? Second, is deflation, not inflation, the main threat at present?

Is inflation targeting enough? Do rapid increases in asset prices pose a threat to stability, even though inflation targeting has delivered steady growth with low inflation? Some commentators have suggested that monetary policy target asset prices in addition to inflation.(1) But which asset prices, and what would that mean for interest rates? House prices have been rising rapidly, and as a ratio to average earnings have reached the previous peak in the late 1980s. That might suggest that interest rates should have been higher. Sterling has for six years now been around 30% higher against the euro (or its predecessors) than before, the trade deficit has grown and the profitability of manufacturing has fallen by two-thirds. That might suggest that interest rates should have been lower. Equity prices rose by 120% between 1995 and 2000, before falling 40% subsequently. Presumably that would have implied first higher and then lower interest rates. What this means is that asset prices cannot sensibly be viewed in isolation, but only in the context of the economy as a whole. I believe that, although there are justifiable concerns about recent movements in asset prices, the policy dilemma can be analysed within the framework of inflation targeting that we have in the United Kingdom.

No honest person actually knows the 'equilibrium' level of asset prices. They are dominated by expectations of the prices that other investors will pay for those assets in future. The relevant uncertainties can rarely be quantified by observing the frequencies of events in the past. And the response of asset prices to changes in monetary policy is also unpredictable. So targeting asset prices directly is virtually impossible. But changes in asset prices can have a major impact on levels of spending and the MPC devotes considerable time to the question of how such changes should affect policy.

The immediate question is whether changes in asset prices have led to an imbalance within the economy that poses the risk of a large negative demand shock at some point in the future. I believe the answer is yes; but how big is that risk is extremely difficult to judge, and so the appropriate policy response is far from clear. Beneath the surface of overall stability in the UK economy lies a remarkable imbalance between a buoyant consumer and housing sector, on the one hand, and weak external demand, on the other. As a summary statistic of this imbalance, Table D shows that in the United Kingdom the growth of real domestic demand exceeded the growth of output by no less than 7½ percentage points over the five years to 2002 Q1, more than over any five-year period in the 1980s and more than in any other major country during the recent past. Even the optimistic Mr Micawber would realise that this cannot continue indefinitely. How then, and over what timescale, will these imbalances unwind?

Table D
Domestic demand and output growth

	United Kingdom	United States	Euro area	Japan
Output growth (1997–2002 Q1)	2.4	3.2	2.5	-0.4
Domestic demand growth (1997–2002 Q1)	3.8	3.9	2.3	-0.6
Cumulative difference	-7.5	-4.2	0.8	0.9

Sources: ONS (for UK data) and Thomson Financial Datastream (for data on the euro area, United States and Japan).

Growth rates are calculated as the total increase in output (and domestic demand, respectively) over the period 1997 Q1–2002 Q1, based on quarterly data, expressed as a four-quarter growth rate. Cumulative difference is the cumulative growth rate, in percentage points, of output less domestic demand.

(1) The most rigorous statement of the case for stabilising asset prices is Dupor (2002).

Three possibilities deserve consideration. First, the rapid growth in household consumption—averaging over 4% for the past five years—may reflect an adjustment to higher real disposable incomes. Consumption growth would then slow naturally as spending and debt reach their new levels. The imbalance between domestic demand and output would unwind as steadily as it built up, with no reason to fear a sudden correction. For this to occur the source of higher disposable incomes must be permanent. In part the increase in recent years has resulted from the improved terms of trade—7% up on five years ago—which raise real national income for any given level of output. The main threat to the persistence of that improvement is the possibility of a fall in sterling that may be a necessary part of the rebalancing of the UK economy. It is very hard to assess the risk of that over any given time horizon. So far the path of consumer spending is not inconsistent with this benign outcome.

The second possibility is that the level of debt taken out by households—the debt-to-income ratio is now at an all-time high—makes households sensitive to any adverse future shock to their employment or income prospects. In that event the risk is of a sharper adjustment of consumption to the shock than might otherwise have occurred. Monetary policy would respond, but a large negative demand shock might result in an undershoot of the inflation target for some considerable time.

The third possibility I touched on earlier. Households may adjust more quickly to the implications of a low inflation world for the prices of goods and services than for nominal interest rates or the future growth of nominal incomes. A mistaken underestimate of real interest rates or overestimate of nominal income growth may raise borrowing, spending and asset prices temporarily. Eventually households learn and consumption adjusts, again possibly sharply.

The policy dilemma is that by allowing consumption and demand to grow rapidly there is a risk that there will be a sharp correction of demand later. The essence of the argument is well put by Borio and Lowe who, in a BIS Working Paper, argued that, 'lowering rates or providing ample liquidity when problems materialise, but not raising them as imbalances build up, can be rather insidious in the longer run. They promote a form of moral hazard that can sow the seeds of instability and of costly fluctuations in the real economy'. In practice it is difficult to know whether an 'imbalance' does contain the seed of a future negative demand shock on a scale that would leave inflation below the target for some considerable time, or whether it will unwind of its own accord.

The fact that growing imbalances might cause sharp deviations of inflation from target at some point in the future, raises the possibility of a trade-off between deviations of inflation from target over the next year or so and deviations of inflation from target further ahead. That, I believe, is the right way to think about the challenge to monetary policy posed by asset price movements. Although there are no simple answers I hope I have shown that inflation targeting is enough, provided that one thinks carefully about the horizon over which policy can hope to affect inflation.

The second challenge for monetary policy over the next decade is the possibility of deflation. That prices are now rising at the slowest rate for decades is, of course, a positive achievement of which the Bank is proud. But is the real threat now deflation? It is important to recognise that falling prices of manufactured goods are not the same as general deflation. In fact price stability, in the sense of an inflation rate overall of around 2½% a year, is likely to mean that the prices of manufactured goods will, on average, not rise at all. Faster productivity growth in manufacturing than in services, averaging around 2 percentage points over the past 20 years, means that the prices of services will rise faster than those of manufactured goods. And the rise in sterling over the past five years increased the difference between inflation rates in the two sectors.

Table E shows the inflation rates for goods and services in the major economies. Positive rates of inflation for services, which account for around half of consumer spending, show deflation in most of the world economy is still some way off. In all countries over the past decade the gap between goods and services price inflation reflects productivity differences. That gap has widened somewhat in recent years as increasing competition from new producers has driven down prices of tradable goods. But the striking feature of the table is the extent to which the difference has increased to no less than 5.7 percentage points in the United Kingdom, much more than in the United States where in turn the gap is larger than elsewhere. Exchange rate movements are largely responsible for these differences. The extent to which services inflation has risen relative to goods

Table E
Total, goods and services inflation

	United Kingdom	United States	Euro area	Japan
CPI inflation (year to Aug. 2002)	1.9	1.7	2.2	-0.9
CPI goods	-1.1	-0.1	1.4	-1.6
CPI services	4.6	3.1	3.3	0.0
Services - goods inflation	5.7	3.2	1.9	1.6
Services - goods inflation (1990–97)	1.6	1.6	1.6	1.3
Services - goods inflation (1990–2002)	2.3	1.8	1.3	1.3

Sources: ONS (for UK data) and Thomson Financial Datastream (for data on the euro area, United States and Japan).

Inflation rates are calculated as the total increase in the price index over the indicated period, based on monthly data, expressed as a twelve-month growth rate.

inflation is another manifestation of the imbalance within the UK economy.

Deflation—in the sense of a sustained fall in the aggregate price level—can be found among the G7 economies only in Japan, where the consumer price level has been falling almost continuously for four years and by a cumulative total of 4%. Elsewhere, deflation is remote.

All of this serves to remind us that, with a single instrument, monetary policy cannot ensure that inflation is at target and output on trend all of the time. To suppose otherwise is to believe in the 'myth of the straight line', as Nigel Lawson described it. Monetary policy can reduce, but not eliminate, fluctuations in output. Cycles in real activity sometimes reflect behaviour outside the influence of monetary policy. As Lawson (1994) put it, 'I find it wholly unconvincing to believe that the credit cycle is caused simply by mistakes in monetary policy. Of course, such mistakes can exacerbate the cycle; but the cycle would be there without them. There is no way in which the monetary authorities can fine-tune bank lending, any more than they can fine-tune expectations'.

That is why the framework introduced in 1997 explicitly recognises that the MPC would not attempt to bring inflation back to the target immediately following a large shock. As a result inflation might deviate from the 2.5% target by more than 1 percentage point. That would require the Governor to write an open letter to the Chancellor. Ed Balls explained in his Oxford lecture in 2001, 'Some have assumed it [the requirement to write an open letter] exists for the Chancellor to discipline the MPC if inflation goes outside the target range. In fact the opposite is true. In the face of a supply-shock, such as a big jump in the oil price, which pushed inflation way off target, the MPC could only get inflation back to 2.5 per cent quickly through a draconian interest rate response—at the expense of stability, growth and jobs. Any sensible monetary policymaker would want a more measured and stability-oriented strategy to get inflation back to target. And it is the Open Letter system which both allows that more sensible approach to be explained by the MPC and allows the Chancellor publicly to endorse it.' That applies not just to a supply shock, but also to a demand shock that might follow a large movement in asset prices.

Both challenges to policy in the future have one aspect in common: they make us think carefully about the consequences of current policy for inflation well into the future. Asset prices raise the question of how far one should err on the side of caution while imbalances are building up. Deflation makes us aware of the risk that the zero lower bound on interest rates might bind in the future. They imply that while, in normal circumstances, monetary policy should focus on meeting the inflation target 18 months or two years ahead, in practice it may be necessary to look even further ahead about the consequences of present actions. But that should not deflect monetary policy from its task of keeping inflation on track to meet the target in the medium term, in other words achieving price stability.

Conclusions

When Lord Kingsdown addressed the LSE ten years ago, he said that departure from the Exchange Rate Mechanism offered an opportunity—'An opportunity to demolish the image of the United Kingdom as a second-rate inflation-prone economy'. I believe that opportunity was taken. Today the United Kingdom has low and stable inflation. And that has not come at the expense of either output or employment. Britain has now experienced 41 successive quarters of positive economic growth. And unemployment in this country is lower than in any other G7 country. This greater stability is no accident. It is the product of a commitment to price stability as reflected in an institutional design encompassing a clear inflation target and a transparent and accountable process for reaching decisions on interest rates embodied in the Monetary Policy Committee.

At the beginning of my lecture I referred to the frescoes of Good and Bad Government by Lorenzetti. If today you go to the Palazzo Pubblico in Siena to see these wonderful paintings in the Sala della Pace, which I translate as the Room of Stability, you will see the results of allowing daylight to fall on the walls. Yes, greater

transparency—more daylight—has damaged the paintings. But if you look carefully, you will see that whereas daylight has caused no harm to the paintings of Good Government, it has indeed damaged Bad Government on the opposite wall. Even today, Lorenzetti's frescoes tell us about the benefits of transparency and the importance of careful institutional design.

Five years ago I delivered, again in this room, a lecture on the inflation target five years on. I argued that the new requirement on the Governor to write an open letter to the Chancellor whenever inflation deviated from target by more than 1 percentage point would provide ample opportunity for the Bank to restore the lost art of letter-writing. No letter has so far been required. But given Alan Blinder's definition of price stability—when ordinary people stop talking about inflation and converse instead about more important matters—I hope that the MPC, by remaining focused on its task of meeting the inflation target, will be more successful in restoring the equally lost art of good conversation. In that way the inflation generation will give way to a new generation able to devote its energies to the wider economic and social policies from which our attention has so often been diverted by the need to control inflation.

The lesson of the past ten years is that it is stability—price stability and the broader economic stability which it generates—that is the platform for the deeper satisfaction portrayed so well in Lorenzetti's frescoes.

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The MPC and the UK economy: should we fear the D-words?

In this speech,(1) Charles Bean, Chief Economist, looks at two sources of risk to the economic outlook: those associated with deflation and debt. He notes that falling prices can reflect a variety of influences and need not indicate the onset of a deflationary spiral. As a result some recent commentators have overstated the threat of widespread deflation. The accumulation of household debt presents a more immediate threat to the UK outlook, as increasing debt burdens potentially make some households more vulnerable to adverse shocks. That has implications for the successful pursuit of the inflation target.

Good evening. In my talk tonight I want to start by giving a thumbnail sketch of how the MPC sees the economy evolving in the next year or two. But I will focus the bulk of my talk on a couple of issues that have been absorbing rather a lot of newsprint in recent weeks: Deflation; and Debt.

The current conjuncture

Given the slowdown in global activity over the past two years, the UK economy has not been doing too badly. Growth was the highest among the G7 economies last year. And after stagnating around the turn of the year, growth has picked up to around its trend rate in the second and third quarters. Unemployment is only fractionally higher than at its trough in May last year. And though RPIX inflation has been running a little below 2½% for much of the past year, it is now moving back up towards the target.

But the picture is more complex when one scratches below the surface, as conditions have differed greatly across sectors. Against a background of intensified global competition, slowing world activity and a weak euro, manufacturing has been struggling. Manufacturing output rose in the third quarter, but that followed six consecutive quarters of contraction. Moreover, the pattern in the official data has been distorted by the Jubilee holidays, and the underlying trend appears to have been little better than flat since the first quarter. On the other hand, businesses in the service sector, taken as a whole at least, have experienced underlying growth at close-to-trend rates. This is reflected in their respective profit rates: in the second quarter the rate of return on capital in manufacturing was just 4%, while that in services was 14%.

What lies behind this difference in sectoral fortunes? In essence it reflects the uneven pattern of demand growth in the UK economy. Annual household spending growth has averaged nearly 4¼% a year since 1996, while total UK domestic demand has grown at an average rate of more than 3½%. That is somewhat higher than both the actual and trend rate of growth of output. In fact domestic demand has grown faster than output in each of the past six years, the first time this has happened since the 1870s. But the rapid growth in domestic spending has not fuelled higher inflation, because the relative strength of sterling has helped to hold down the price of imports, boosted the volume of imports and retarded exports. And that has been associated with a persistent, though not excessively large, deficit on the current account of the balance of payments. In essence, domestic demand has been heating the economy up, while external demand has been cooling it down.

Now just as I can spend more than I earn by borrowing, but cannot keep doing so indefinitely—to repay the debt either my income will need to rise or else I will have to cut my spending—so the same is true for nations. At some stage UK domestic demand growth will have to slow to around, or below, the rate of growth of output. That could well be associated with some falling back of the exchange rate, which would help to redress the divergence between manufacturing and services. But the longer the imbalances persist, and the larger the

(1) Delivered to the Emmanuel Society, on Monday 25 November 2002. This speech can be found on the Bank's web site at www.bankofengland.co.uk/speeches/speech182.pdf

divergence becomes, the more difficult that eventual adjustment may prove.

Furthermore, the imbalances have become starker during the global slowdown, which has impinged most heavily on businesses that produce for export. The MPC has deliberately sought to compensate for the disinflationary implications of the global slowdown by reducing interest rates in 2001 and keeping them at historically low levels through this year. The primary consequence has been to boost consumer spending and domestic demand even further.

What are the prospects going forward? The MPC's most recent forecasts, conditional on interest rates remaining at their current level of 4%, were contained in the Bank's November *Inflation Report*. Our central projection is for a continuation of growth at close-to-trend rates over the next two years. That is sustained in the near term by continued buoyancy in household spending. Further down the road, some slowing on the consumer side is projected, but that is offset by increased public sector spending, a recovery in external demand and a modest pick-up in business investment.

Annual RPIX inflation is expected to move above the target by the year-end, because of the effect of higher house prices on the part of the index that captures housing depreciation and as sharp falls in petrol prices a year ago drop out. These effects are likely to be temporary, so that inflation may then drop back a little bit below the target in around a year's time. The big picture is one of underlying inflation continuing to run fairly close to the 2$^{1}/_{2}$% target.

But there is a lot of uncertainty about future developments—something we seek to emphasise by always presenting our projections in the form of probability distributions rather than point forecasts. There are many risks to the outlook, but in the rest of this talk I want to focus on two of these: the risk of deflation; and the problems posed by the accumulation of household debt.

The threat of deflation

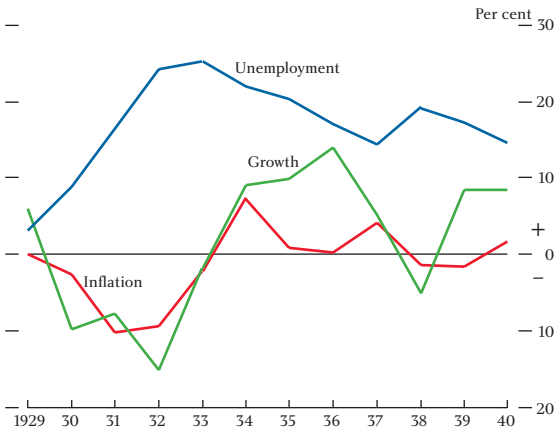
Although recent performance has been patchy, our central expectation in the *Inflation Report* is that the world recovery will gradually pick up steam. But to some commentators this is altogether too rosy a view, for they see deflation as a serious threat to the world economy. Japan has already experienced falling consumer prices for most of the past four years, and some see the United States and Germany as being in danger of going the same way. Even the United Kingdom is talked about as a candidate for the deflationary club, given that retail goods price inflation has been close to, or below, zero for the past year.

So is there a threat of deflation? And if there is, should we be worried about it? Some of you may be old enough to remember Professor Cyril Joad of the BBC's *Brains Trust*, who would no doubt have declared: 'It all depends what you mean by deflation'. At its simplest, deflation is a sustained period over which the general price level is falling. But just as there are many different strains of influenza, some of them lethal, and some of them producing just temporary discomfort, so it is with deflation. And just as a bad cold may generate 'flu-like symptoms, so economies may exhibit some of the symptoms of deflation without necessarily suffering from the virus.

Deflation in the Thirties

How might a sustained period of falling prices come about? And why might it be a problem? A good place to start is with the Great Depression, probably the best-known example of the deflationary process in action. The tail end of the Roaring Twenties was marked by a booming stock market and abnormally high levels of investment, especially in real estate. But demand began to slow during 1929, culminating in the stock market crash. The depression that followed was extreme in its magnitude. Between 1929 and 1933, output in the United States fell by nearly a third, while the price level fell by nearly a quarter (see Chart 1).

Chart 1
Growth, unemployment and inflation: United States, 1929–40

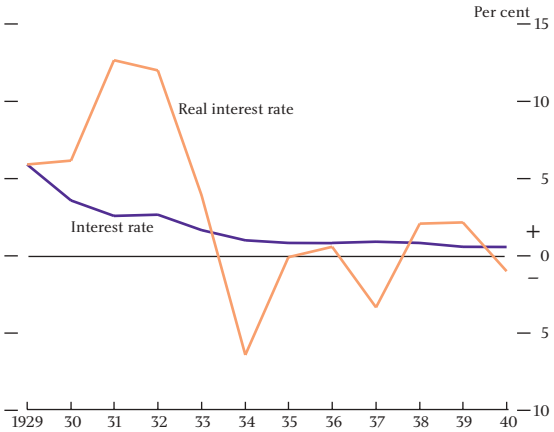


Source: *Historical Statistics of the United States, Colonial Times to 1970, Parts I and II*, Washington, DC: US Department of Commerce, Bureau of the Census, 1975.

According to the conventional wisdom of the time, such systematic underutilisation of resources could result from the exercise of monopoly power in product or labour markets—in other words constraints on supply—but not from a lack of overall demand. Keynes's great insight was that there were circumstances in which demand drove supply, and not the other way round. A fall in demand, say because of lower investment, could lead to lower output and incomes, reducing consumer spending and output yet further. But the puzzle is not why there was a downturn after the excesses of the Twenties and the stock market crash of 1929. Rather why was the slump so great?

Part of the reason was the amplifying role played by falling prices. Now nominal interest rates can never be negative, as if they were, then people would just prefer to hold cash instead;(1) there is thus a natural zero lower bound to interest rates. Consequently even if nominal short-term interest rates are cut to the bone, real interest rates will still be positive if inflation is negative. And it is real interest rates that determine the level of demand. The essential feature of a deflationary trap is thus that the real interest rate is unable to fall to the level necessary to keep demand in the economy in line with supply. Chart 2 illustrates this graphically: even though the US Federal Reserve did cut short-term nominal interest rates during the 1929–33 downturn, *real* interest rates rose sharply.

Chart 2
Nominal and real interest rates: United States, 1929–40



Source: *Historical Statistics of the United States, Colonial Times to 1970, Parts I and II*, Washington, DC: US Department of Commerce, Bureau of the Census, 1975.

Furthermore, deflation that is unanticipated increases the real value of any debt that is denominated in nominal terms. It therefore redistributes wealth from debtor to creditor. The 'unanticipated' qualification is important because, if the deflation had been anticipated, then the borrower would have expected to pay a lower nominal interest rate to compensate. If, as seems likely, debtors have a higher propensity to consume out of their wealth, then unanticipated deflation will tend to reduce overall demand.(2) Moreover, increasing real debt burdens juxtaposed against falling activity is likely to lead to insolvencies and worsening bank balance sheets. In the 1930s this led to bank failures, bank runs and a breakdown in the process of financial intermediation.(3)

Will history repeat itself?

The experience of the United States in 1929–33 illustrates pretty graphically why policy-makers should fear deflation. What are the chances of a recurrence today?

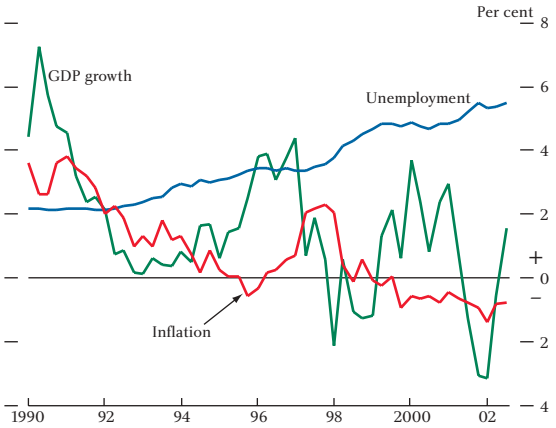
Japan

To some extent history has already repeated itself in Japan, where consumer prices have been falling for much of the past four years and short-term nominal interest rates are, to all intents and purposes, zero. But it is worth pointing out that Japan's problems pale into insignificance compared with the inter-war US experience. Outright contraction was experienced in just 1998 and 2001 and even then the falls in activity appear to have been relatively mild (Chart 3). Consumer prices in Japan are today just 3% lower than at their peak, and real interest rates are still at relatively low levels (Chart 4). This is not (yet, at least) a vicious deflationary spiral of the inter-war variety, but rather a picture of relative stagnation.

Moreover, while the ability to achieve lower real interest rates would no doubt have helped to boost demand and activity, Japan's problems stem from the legacy of the eighties' boom in equity and land prices and the associated overinvestment. The byproduct has been a build-up of non-performing loans in the financial sector. Restoring the full effectiveness of monetary policy in

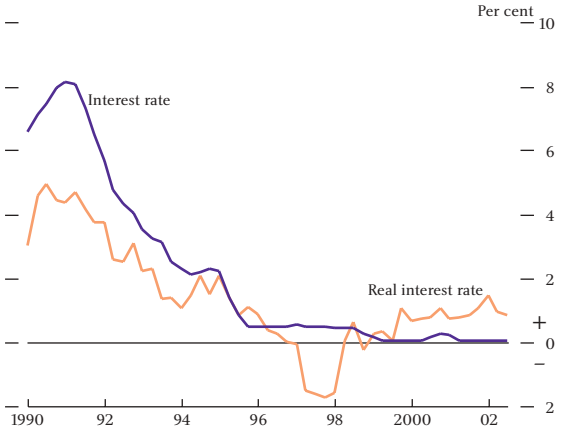
(1) Technically money could pay negative interest, if it had to be exchanged periodically for new money at which time a fraction was also confiscated. This suggestion is originally due to Gesell.
(2) The mechanism at work here applies more generally to any change in real indebtedness, whether brought about through changes in the price level or otherwise, and is sometimes referred to as 'debt deflation'. See King, M A (1994), 'Debt deflation: theory and evidence', *European Economic Review*, for a fuller discussion.
(3) See Bernanke, B (1983), 'Non-monetary effects of the financial crisis in the propagation of the Great Depression', *American Economic Review*, for a discussion of the role of financial collapse in the Great Depression.

Chart 3
Growth, unemployment and inflation: Japan 1990 to 2002 Q3



Source: Japanese Cabinet Office, Statistics Bureau, and Ministry of Public Management, Home Affairs, Posts and Telecommunications.

Chart 4
Nominal and real interest rates: Japan 1990 to 2002 Q3



Note: Uses the overnight uncollateralised call money rate. The real interest rate is estimated using consumer price inflation.

Source: OECD.

Japan depends to a significant extent on seeing through the necessary writing down of such debts, together with an appropriate restructuring of both the financial sector and the real economy. But as much as anything, the economic stagnation in Japan reflects the difficulty of reaching a political agreement about how to tackle Japan's economic problems and who will bear the associated burden, rather than the ineffectiveness of economic policy *per se*.

United States

Today it is the United States that, on the surface at least, bears the most obvious similarities to the United States in 1930 and to Japan in 1990. As in those cases, a stock market boom was followed by a subsequent correction. Furthermore the boom period was associated with relatively high rates of corporate investment and household spending.

As in the 1920s, the driver during the period of 'exuberance' was optimism about the future. In the case of the United States at the end of the 20th century that was fostered by the pick-up in trend productivity growth associated with the exploitation of information and communication technology. Now the rational response to a sustained increase in productivity growth is to increase both investment (to take advantage of the higher productivity of capital) and consumption (to take advantage of higher expected future incomes). In an open economy the consequence will be a deterioration in the current account of the balance of payments. That is exactly what we saw in the United States.

The correction to equity markets since their peak in the middle of 2000 has highlighted the extent to which those expectations were overly optimistic, at least in the corporate sector, and the consequence of the downward revision to earnings expectations has been a sharp decline in investment. The downturn has so far been relatively mild as consumer spending has held up better than would normally have been the case. A continuation of the current rates of consumer spending requires households to remain relatively optimistic about the future—and the fact that productivity growth has held up well through the slowdown is a positive sign. But *if* households were to revise their expectations down markedly, then a sharp deceleration in household spending would result. The fraction of household income that is saved in the United States is still just 4% as compared to its historical average of nearer 8%. A sharp return to historical norms could potentially provide the shock necessary to push the economy into deflation.

There are a number of reasons why a move into deflation is unlikely, though not impossible. First, consumer price inflation was still comfortably positive at 2.1% in October. With the official interest rate now down to 1.25%, the short-term real interest rate is now in negative territory and monetary policy is strongly expansionary. And although nominal interest rates are low, the Federal Reserve still has some further room for manoeuvre. Moreover, as indicated in the January 2002 minutes, the Federal Open Market Committee has shown that it is aware of the dangers of deflation and prepared to countenance unorthodox measures if necessary (what these might be is discussed briefly below). In addition fiscal policy is expansionary, and may well become more so. Finally, it is likely that there would be greater transparency about the existence of any non-performing

loans, encouraging a faster writing down of such loans and more rapid restructuring of enterprises than has been the case in Japan.

Germany

Some commentators suggest that Germany is also a candidate for the slide into deflation. Consumer price inflation is just over 1% and growth has been lacklustre; it seems that it would not take much to push inflation into negative territory. But this is a case where the symptoms could prompt an incorrect diagnosis. Inflation in the euro area as a whole is currently still a little above the 2% ceiling of the range that the European Central Bank regards as consistent with price stability. The counterpart to low inflation in Germany is higher inflation elsewhere: currently around 4% in Greece, Ireland, the Netherlands, Portugal and Spain. But within a monetary union, any required change in regional relative prices necessarily must occur through differences in inflation rates. The relatively low inflation in Germany is simply the natural working out of such an adjustment process.

There are at least two reasons why Germany should be inflating less quickly than are her neighbours. First, monetary union arguably commenced with a somewhat overvalued German real exchange rate, relative to the other members of the euro area. Since reunification, German annual growth has averaged just 1.4% compared with 2.2% for the rest of the euro area. That relatively weak growth performance in part reflects relatively high labour costs: according to the ILO, hourly labour costs in manufacturing in 2001 were roughly 45% higher than in France and 66% higher than in Italy. But these cost differences are not reflected in higher productivity: GDP per hour in 2001 was actually about 10% lower than in France and Italy. Although international comparisons are hazardous, these cost differences are reflected in relatively low German profitability—in fact the lowest in the G7 in 2000, the latest year for which data are available for a wide set of countries.(1) These are all symptomatic of an economy with an overvalued real exchange rate, stemming originally from the task of absorbing the eastern Länder, with their relatively low productivity. And in a monetary union such a misalignment of relative prices gets corrected through a temporary divergence in inflation rates, rather than through a change in the nominal exchange rate.

Second, the poorer countries of a monetary union should in any case exhibit faster consumer price inflation as living standards catch up with those in richer ones. Suppose that there is a single integrated market, and therefore a single price, for internationally traded goods (think of them as manufactures). Now the more rapid productivity growth in the countries that are catching up will also be associated with a higher rate of growth in the demand for goods that are not traded internationally (think of them as services). Consequently the relative price of services to manufactures must rise more in the high productivity growth country (this is known as the 'Balassa-Samuelson effect'). It follows that inflation is also higher in the high productivity growth country.

There have been attempts to evaluate the likely size of this effect. For the present membership the maximum annual inflation differential is likely to be of the order of 2%–2.5%.(2) This is pretty much the same as the current inflation differential between Germany on the one hand and the four recipients of the Cohesion funds on the other. Thus if the European Central Bank maintained inflation around, say, 2%, Germany, as one of the highest productivity countries in the euro area, should expect to experience an average inflation rate of around 1% so long as other countries in the monetary union are catching up.

So to summarise: Germany may be seeing low inflation—and may well experience falling prices—but that is part of a necessary and natural adjustment in relative prices within the euro area, not a deflationary spiral.

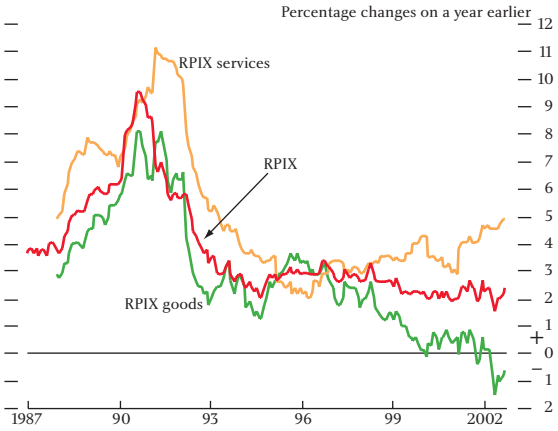
United Kingdom

A few commentators have also suggested that the United Kingdom is a suitable candidate for deflation, citing the fact that the price of manufactured goods is already falling and arguing that other prices will soon follow suit. Thus in October, retail goods prices were down 0.7% on a year earlier. But the counterpart to falling retail goods prices is rapid inflation in the price of retail services: up 4.8% in the year to October (Chart 5).

Now some divergence between the rate of increase in goods prices and the rate of increase in services prices is

(1) See Citron, L and Walton, R (2002), 'International comparisons of company profitability', *Economic Trends*, October.
(2) See eg Canzoneri, M, Cumby, R, Diba, B and Eudey, G, 'Productivity trends in Europe: implications for real exchange rates, real interest rates and inflation differentials', forthcoming in *Review of International Economics*. Similar estimates appear in the European Commission's own economic analysis of monetary union, *One Market, One Money*.

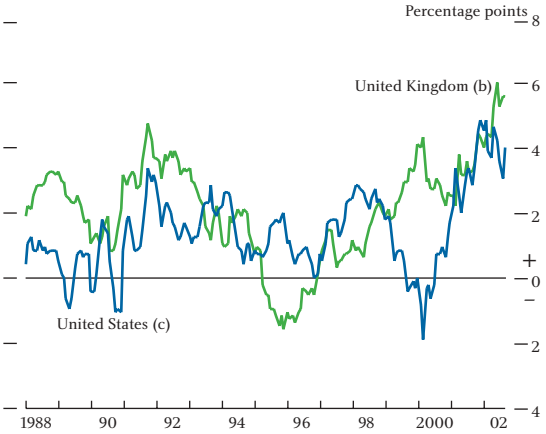
Chart 5
RPIX goods and services



Source: ONS.

to be expected, as productivity typically rises 1½ to 2 percentage points faster in manufacturing than in the service sector. Given that pay tends to rise at roughly the same rate across all industries, that implies prices should tend to rise, on average, about 1½ to 2 percentage points faster in services. And that has indeed tended to be the case over the past, although there have been periods where the gap has sometimes been a bit smaller or a bit bigger than this. Moreover, this is a phenomenon that is common to the United States and other developed economies (Chart 6).

Chart 6
The gap between annual retail service inflation and retail goods inflation(a)



Sources: ONS and US Bureau of Labor Statistics.

(a) Defined as retail services inflation minus retail goods inflation.
(b) RPIX inflation.
(c) CPI inflation.

What is unusual is the size of the current gap in inflation rates, which is too big to be purely the result of sectoral productivity differences. Now the price falls have been concentrated in three sectors: clothing and footwear; leisure goods (which importantly includes audio-visual equipment); and motor vehicles. But the share of nominal consumer spending on these three categories is actually slightly higher today than it was in 1996, and that at a time when overall consumer spending has been rising rapidly. So an overall lack of demand for these particular products is not the problem.

It is noticeable that global competition has been particularly important in all three industries. What we are witnessing is the working out of the principle of comparative advantage as the developing and industrialising economies with access to relatively cheap labour displace labour-intensive domestic producers, while the United Kingdom moves into more skill-intensive manufacturing and tradable services. And the downward pressure on prices in the labour-intensive tradable sectors will have been intensified by the strength of sterling.

Once again what appears to be deflation is really better thought of as an adjustment to relative prices. Just as low inflation in Germany should be seen as regional relative price adjustment across the euro area as a whole, so the low rate of UK goods price inflation is part of a process of sectoral relative price adjustment.

Policies to deal with deflation

It should be apparent now that deflation can come in a variety of forms, some of which should be of more concern than others. But policy-makers need to be alive to the dangers of the most virulent form of the disease. And as with any disease, prevention is better than cure.

What policies are available? First, and probably foremost, inflation has been close to the 2½% target. As a consequence inflation expectations, in both financial markets and those held by the public, have also become entrenched around the 2½% level. That means that any decline in inflation need not be immediately reflected in either *expected* real interest rates or in wage settlements. That will help to retard any potential slide into deflation in the face of an adverse demand shock. Moreover, if consumer price inflation did start to fall below target, the MPC could be expected to take action by further reducing interest rates in order to bring inflation back to the target.

Furthermore, in the unlikely event that short-term official rates did reach their lower bound of zero, monetary policy would not become totally impotent. The Bank of England operates primarily through

short-term lending against eligible collateral (known as repurchase agreements, or repos). The interest rate at which the Bank conducts these operations then directly influences short-term market interest rates. Frequently it is longer-term interest rates that matter more to private agents, but they in turn are heavily dependent on expected future short-term interest rates. So committing to keep future short-term official rates at zero should help to drive down longer-term interest rates as well. If necessary this could be complemented by outright purchases of longer-term government securities, or even *in extremis* operations in corporate debt and equity. Furthermore the resulting increase in liquidity may have the effect of raising inflation expectations, thus interrupting the deflationary cycle.

Finally—as recommended by Keynes—fiscal policy could play a role in boosting demand. The Chancellor's fiscal rules, which require that the budget deficit on current account balance over the cycle and public sector net debt be maintained at a prudent level, permit the operation of the automatic fiscal stabilisers in full as well as leaving scope for appropriate additional discretionary fiscal action if that were necessary.

Household debt and house prices

The second issue I wish to discuss relates to the behaviour of the UK consumer. As I mentioned at the outset, one key aspect of the imbalances in the UK economy has been the buoyancy of household spending which has consistently grown faster than output over the past six years. And associated with that has been a build-up of household debt and rapid house price inflation. The MPC has been grappling with how to assess the potential problems that these factors could pose to the economic outlook going forward.

In addressing this question, it is helpful to ask why consumer demand has been so buoyant in the first place. Standard economic theory suggests that it should be 'permanent' income—in essence the average expected income over one's lifetime—rather than current income that drives consumer spending. If future income is expected to be higher than today's income, households tend to borrow in order to boost consumption today. And if they expect income to drop in the future, they tend to save more in order to maintain their consumption levels tomorrow. But the extent to which they will shift consumption backwards or forwards in time will also depend on the cost of borrowing and the return to saving.

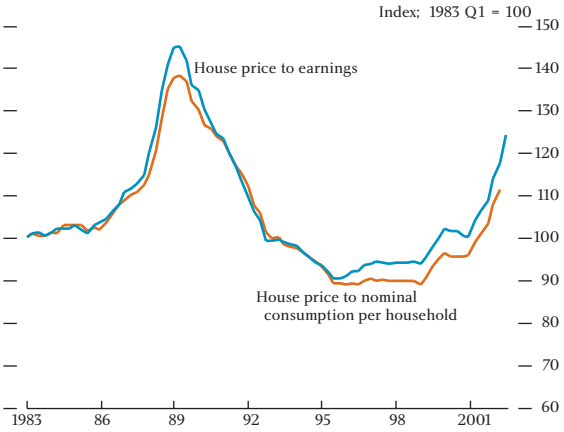
Now the recent strong growth in consumption has coincided with strong growth in real disposable household incomes and falling unemployment, and for a while also with rising equity prices (I will come to the role of house prices later). So one explanation is that households have been revising up their assessment of their permanent income. But a significant fraction of the increase in real household incomes has been associated with the substantial improvement in the terms of trade—up 12% since 1996. An important issue is whether the improvement from this source is permanent, reflecting the exploitation of comparative advantage, or whether it is associated instead with a temporarily high level of the exchange rate, in which case real incomes and consumption will eventually both drop back.

To the extent that there has indeed been an increase in households' permanent income, then we would expect consumption growth in due course to fall back in line with—or strictly speaking a little below—the rate of growth of their income, with the extra accumulated debt being gradually repaid. But if expectations prove to be overoptimistic then a sharper future correction to consumer spending is likely.

A second explanation for the rapid growth in consumer spending and debt is easier access to, or cheaper, borrowing. This is where house prices enter the picture. Now, unless I am expecting to trade down to a cheaper property, a rise in house prices does not make me as an owner-occupier any better off. So housing does not represent household wealth in quite the same way as equities do. But housing does represent collateral against which I can borrow. So the higher house prices of recent years have allowed owner-occupiers to increase their borrowing, using the proceeds in part to boost spending.

But why has the price of houses risen? The demand for housing services should be driven by the same factors that drive the demand for consumer goods and services, ie permanent income. Chart 7 shows the evolution of house prices relative to the nominal value of consumer spending per household (a proxy for consumers' estimates of their permanent income). That ratio has risen sharply in recent years, although the picture is not quite as dramatic as when house prices are compared with earnings.

Chart 7
House price to nominal consumption per household ratio and house price to earnings ratio



Sources: Halifax, Office of the Deputy Prime Minister, ONS and Bank of England.

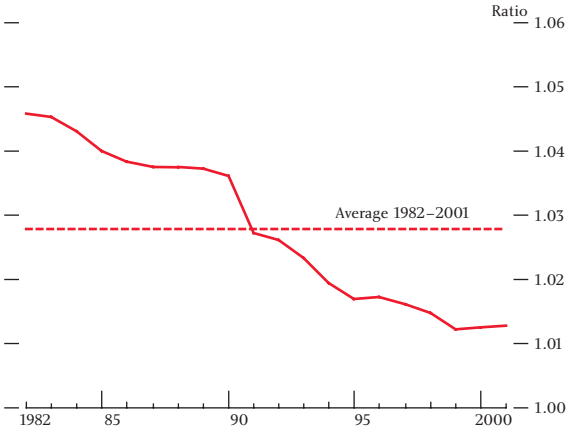
So something else has also been driving house prices, and the value of the collateral against which owner-occupiers can borrow. There are at least three reasons why the demand for housing might have risen more than might be suggested simply by looking at permanent income.

First, the transition to an environment of low and stable inflation implies that nominal interest rates should be lower on average than they have been in the past. Standard mortgages usually entail an even level of nominal payments (interest plus repayment of principal) over the life of the mortgage. Consequently the initial *real* payments for a given nominal debt will be smaller than they would be if inflation and interest rates were high, though the real burden of payments towards the end of the loan period will conversely be somewhat greater. Shifting the pattern of real payments into the future in this way makes households who are constrained by their cash flow more willing or able to borrow, thus driving up the demand for housing. But a concern is that borrowers may not yet have fully factored in the fact that the share of future income taken up by mortgage payments will be higher now that inflation is low.

Second, increased competition amongst lenders and the application of better credit-scoring techniques may also have increased the supply of loans. And third, population growth and demographic developments—more people wanting to live alone and an increased desire for second homes—will also have boosted demand.

In addition, on the supply side of the market the rate of construction of new dwellings has lagged behind the expansion in the number of households, in part because of a shortage of land and the impact of planning restrictions. This is indicated in Chart 8 which shows the ratio of dwellings to households—a measure of spare capacity in the housing market—has been steadily falling over the past two decades.

Chart 8
Ratio of dwellings to households(a)



Source: Office of the Deputy Prime Minister.

(a) Figures for the stock of dwellings are for 31 December each year prior to 1991 and 31 March from 1991 onwards. This may account for most of the fall in the ratio in 1991.

So there are reasons why a higher house prices-to-consumption ratio (or house prices-to-earnings ratio) might be warranted by underlying economic developments. But it should be recognised that there are factors that work in the opposite direction: the tax advantages of owner-occupation are lower in a low inflation environment; and housing loses its advantage as a hedge against inflation. So it has to be acknowledged that there is very considerable uncertainty about all of this.

Our central expectation is that the rate of increase of house prices will slow sharply over the next year, with prices becoming broadly stable in two years' time. And if that happens consumption growth should slow too, although the presence of some unexploited housing collateral may mean that slowdown will only follow with a lag.

But this is not a view we hold with great confidence, and there are risks on either side. We have been consistently surprised by the strength of house price inflation over the past year, and in the near term there is a possibility that house price inflation may continue to exceed our expectations. That would put upward pressure on demand and inflation in the short term, other things

equal. But against that, the longer current rates of house price inflation persist, the greater the likelihood of a subsequent sharp correction.

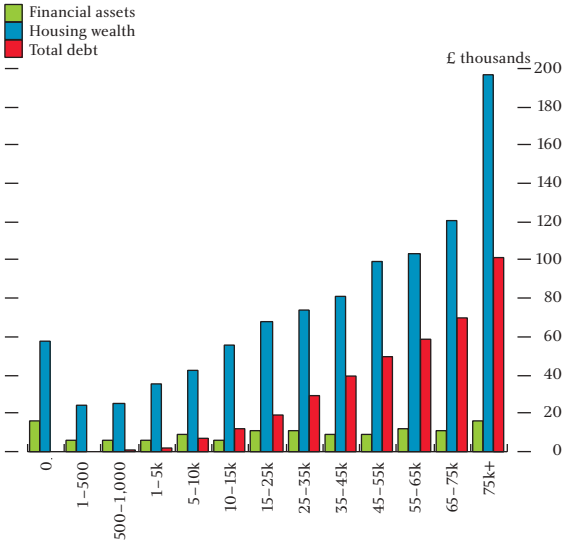
The MPC's strategy during the slowdown has been to offset the weakness of external demand by boosting consumer demand through lower interest rates. What light does the above discussion shed on the dangers of this strategy? In particular, should we be worried about encouraging households to build up more debt?

The sanguine view is that all that has happened is that lower real interest rates have encouraged households rationally to shift spending from the future to the present by increasing their borrowing. The counterpart to this will be somewhat lower growth in spending in the future, but there is no particular reason for this to occur in abrupt fashion. And if necessary we could go on encouraging this intertemporal substitution of spending by further reducing rates until such time as nominal interest rates reach the zero lower bound.

But high debt levels may also increase the impact on consumer spending of an adverse shock, such as a delayed recovery in the world economy that leads to higher unemployment. Households with adequate liquid assets or who can still access the credit market would not need to cut back their consumption much if they experience a spell of unemployment (I am assuming the spell without a job does not harm their future earning potential). Instead they simply run down their savings or borrow more. On the other hand, households with no assets, and who cannot borrow more, would be forced to cut back their spending in line with their reduced income, net of any repayments on outstanding debt. So the impact of this adverse shock on aggregate consumption will be greater, the higher is the fraction of constrained households. Furthermore that fraction will tend to be higher, the greater is the amount of debt already extended.

So a key question is whether those who hold the debt are particularly likely to be exposed to adverse shocks, such as job loss, and whether they have other assets that they could run down. The good news is that it is those households who hold the most debt who also tend to have higher income and more assets (see Chart 9). This is not very surprising as most of the debt is in the form of mortgages and typically bigger mortgages are associated with more expensive houses!

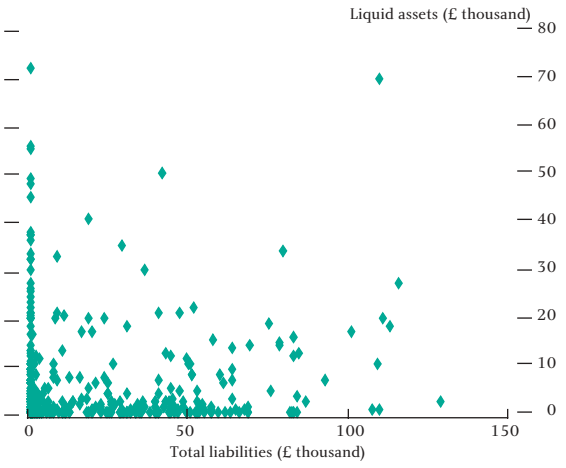
Chart 9
Average financial assets, housing wealth and debt at different levels of household indebtedness (2000)



Sources: British Household Panel Survey and Bank calculations.

Perhaps more relevant in assessing the potential vulnerability of the household sector to shocks is the matching of debts to liquid assets. Here the news is not quite so good. Chart 10 illustrates the distribution of total liabilities and liquid assets across individual households, drawn from a 10% random sample of the 5,000 households in the 2000 British Household Panel Survey. A large number of households are positioned on one or other axis: 40% had no liabilities and 33% no liquid assets. This suggests that the financial position of

Chart 10
Distribution of total liabilities and liquid assets across individual households(a)



Source: British Household Panel Survey, 2000.

(a) The full BHPS survey for 2000 contains information on the total liabilities and the liquid assets of more than 5,000 households. Households in the upper percentile of either the liquid assets or the total liabilities distribution were removed. This chart is based on a random 10% sample of the remaining households, with each dot representing one of those households.

the household sector is rather less resilient than might be suggested by merely looking at aggregate balance sheet data.

How should all this affect the conduct of monetary policy? In the Committee's central projection, the imbalances in the economy correct themselves relatively smoothly over time. But as already explained, the build-up of debt would potentially aggravate the impact of any adverse shock, such as a delay to global economic recovery. We would presumably seek to offset the disinflationary impact of such a shock by lowering interest rates. That would reduce the debt service required of indebted households—indeed the higher debt levels would actually make monetary policy more potent than usual. But any deterioration in employment prospects might encourage precautionary saving by presently unconstrained households who feared the prospect of job loss, and also lead to a tightening of credit conditions if lenders became more concerned about bad debts. There could, as a consequence, be considerable uncertainty about the dosage required.

So boosting demand today may raise the likelihood of a sharper, or at least more unpredictable, fall in spending at some stage in the future. Consequently, if one starts with inflation below the target, there may be something of a trade-off between getting back to the target in the near term, and staying close to it further out. Quantifying the importance of this argument requires further work, however.

Concluding remarks

I hope that my talk tonight has persuaded you that some of the more alarmist commentary about the threat of global deflation is overdone. Although Japan is already experiencing falling prices with zero interest rates, it is still a long way from falling into the sort of cumulative deflationary spiral that characterised the United States during the Great Depression. And while a sharp contraction in consumer spending would pose a threat to the US recovery, there are good reasons for believing that the US economy is unlikely to follow Japan into deflation.

As for Germany, low inflation there is better thought of as part of a process of regional relative price adjustment in the context of monetary union, rather than the beginnings of a classic deflationary process. And a similar argument applies in respect of the low rate of goods price inflation in the United Kingdom—again it represents part of a process of relative price adjustment rather than general price deflation. But while these are reasons to discount some of the more alarmist commentary, it is important that we, and other central banks, are alive to the possibility of deflation however remote that may be, and stand ready to act pre-emptively if warranted. After all, the minor discomfort of inoculation against the 'flu beats a week of suffering any day!

The build-up of consumer debt does, however, present us on the MPC with a more immediate threat. Our central expectation is that the growth in consumer spending will ease back over the next year or two and the rate of increase in house prices will slow markedly. But it is possible that we may continue to be surprised on the upside in the near term, which raises the possibility of sharper adjustment in the future. So there are upside risks in the near term, but downside risks further out. And the continuing build-up of household debt makes consumer spending more vulnerable to adverse shocks, and with it the outlook for inflation. But, as ever, the Committee will stand ready to act in order to ensure that the United Kingdom's recent relatively satisfactory macroeconomic performance continues for a while longer.

Macroeconomic policy rules in theory and in practice

In this paper,[1] Christopher Allsopp of the Monetary Policy Committee discusses the two-way interaction between policy and academic enquiry regarding rules for monetary policy. The emerging consensus on monetary policy is described; in that context, some of the features of the current UK system are outlined, which seem particularly important. From a political-economy point of view, what really matters is that an appropriate policy framework should be instituted with the right general properties; a second set of questions, about improving or even optimising performance, can then be considered. Early worries that publicly expressed disagreements, and public knowledge of closely split votes, would work against the credibility of the UK system, now appear unfounded. The relevant meaning of 'credibility' of policy is a reputation for competence and trust in the system, and it is argued that the UK system has achieved this reputation. In addition, the monetary policy system in the United Kingdom is as transparent and accountable as any in the world. It is argued that the potential costs to credibility and transparency weigh heavily against giving the interest rate another role (eg responding to asset price bubbles) beside pursuit of the inflation target. The paper concludes with some remarks on forecasting procedures in the face of structural change, and on the appropriate combination of monetary and fiscal policy.

I Introduction

It is a great pleasure to address this distinguished conference on policy rules. My task, as I understand it, is to set the scene from the standpoint of someone engaged in the monetary policy process—with an emphasis on the two-way interaction between policy and academic enquiry. Certainly, as compared with the situation a decade or so ago, there is a recognisable consensus, with developments in policy, in macroeconomic theory, and in empirical analysis pulling, so to speak, in the same direction.

I will structure my presentation as follows. Section II is my take on the emerging consensus. In that context, I will outline some of the features of the current UK system which seem particularly important as well as indicating some areas of continuing difficulty. Section III goes back to consider the wider historical and theoretical debate over policy rules. Whereas the consensus has it that interest rate policy reaction functions should be 'rule-like' (Taylor (1993), Meyer (2002)), it is equally true that systems such as that in the United Kingdom can be described as embodying 'constrained discretion' (Bernanke and Mishkin (1997, page 106); King (1997a, page 440); Balls (2001)). Where does this leave the 'rules versus discretion' debates of the past? And how rule-bound should central banks be in practice? Section IV returns, in a highly selective way, to some of the unresolved issues. How, for example, should policy-makers treat fluctuations in asset prices? What difference does openness make? How can forecasts and policy reactions be improved in the face of various types of uncertainty? What is the role of fiscal policy? Section V concludes.

II The consensus

A rough characterisation of the developing consensus on macroeconomic policy design would include the following:

1. There is no long-run trade-off between nominal developments (inflation) and the real economy.

2. It is essential to establish a credible, non-accommodating policy to control the price level and inflation.

3. The primary responsibility for the control of inflation should be assigned to monetary policy.

(1) Presented at the conference on 'Policy rules—the next steps', Cambridge, 19–20 September 2002. I am extremely grateful to Amit Kara and Ed Nelson for assistance and useful discussions in the course of the preparation of this paper. I also thank Jagjit Chadha for useful comments on a previous draft. 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.

4. Monetary policy should be carried out by an independent central bank.

5. The principal instrument of policy is the short-term interest rate.

6. The central bank's responsibilities in controlling inflation in the medium term should be carried out at minimum cost in terms of deviations of output from potential and deviations of inflation from target.

Clearly, different parts of the consensus have different status. Thus, though 1 and 2 may be regarded as fundamental, 3, 4 and 5 are instrumental and more contentious—alternative choices and arrangements could be made and have existed in the past. The important qualification, 6, requires some scheme for weighting together different costs.

Recent legislation, defining mandates for central banks, reflects these complex objectives. Thus, the European Central Bank (ECB) is charged with maintaining price stability and without prejudice to that, to support the policies of the European Commission as laid out in Article II of the Treaty—which include growth and employment. The Bank of England Act, similarly, adopts a hierarchical or lexicographic ordering, charging the Monetary Policy Committee (MPC) with maintaining price stability and, subject to that, with supporting the government's policies for employment and growth. In the United States, there are multiple objectives, but given the widespread agreement on 1 and 2 above, there has, in recent years, been a hierarchical ordering there too.

In the economics literature, the monetary authority's behaviour is typically described in terms of the abstract concept of its reaction function, which delineates how the instruments of policy are adjusted in response to (a) its targets, and (b) its assessment of the current and future state of the economy. Assuming that the instrument of policy is the short-term nominal interest rate, the interest rate reaction function can thus be seen as an algorithmic rule describing how the monetary authority attempts to home in on its objectives. Simple versions of such reaction functions abound, including the Taylor rule (where the interest rate is taken as responding to current deviations of inflation from target and output from potential) and that implicit in inflation forecast targeting regimes, where interest rates react to deviations of forecast inflation from target.(1) In practice, the reaction function is embedded in an institution—usually the central bank together with associated constitutional and other arrangements—and may involve a complex set of procedures and judgments. It is unlikely to be expressible as a single simple rule—at the least it would involve a set of anticipated contingent responses.(2)

The reaction function approach brings out several intertwined aspects of the current practice of monetary policy. The first might be termed the nominal anchor function: the assignment of medium-term responsibility for the control of the price level or inflation to the monetary authority. This function, in turn, has two dimensions. The first is the target itself—which may be explicitly quantified (as in the United Kingdom) or implicitly defined, eg as price stability. The practical question of how the target should be made operational and measured is not as straightforward as sometimes appears. The second dimension is the instrument of policy and the feedback system, which together must be sufficiently powerful to achieve the medium-term objective for prices and inflation.

The second general aspect of current practice is the stabilisation function, capturing the idea that the medium-term objective should ideally be achieved at minimum cost (eg in terms of deviations of inflation from target and output from potential). The optimum reaction function clearly depends on the characteristics of the economy, on the shocks anticipated, and on the welfare judgments made. Since the optimum reaction function is likely to be highly sensitive to alternative models and specification of shocks, there is interest in simple rules which produce reasonably good results and which appear robust. The practical policy analogue is the search for a set of procedures which delivers a sensible reaction function with desirable properties in a wide range of possible circumstances.

The monetary policy reaction function is thus an extremely important part of the way in which the economic system as a whole functions; and for the

(1) See Svensson (1997) for pioneering academic work on inflation forecast targeting, and Batini and Haldane (1999) for a discussion of incorporating inflation forecasts into policy rules with emphasis on the United Kingdom.
(2) In the simplest approaches involving demand shocks and price shocks (often described misleadingly as 'supply shocks'), policy involves offsetting demand shocks completely, whereas price level Phillips curve shocks involve a trade-off between variability of the output gap and inflation.

system to function well, it must have, and be perceived to have, appropriate properties. With forward-looking behaviour, it is the credibility of policy as embodied in the reaction function that stabilises expectations of inflation. But there is more to it than that. Combined with a standard 'natural-rate' or 'accelerationist' view of inflationary pressure, an 'appropriate' reaction function should lead to the anticipation of longer-term economic growth at potential rates and the understanding that deviations of output from potential and inflation from target will (in some sense) be as small as possible given the shocks hitting the economy. This 'two-for-one' aspect of inflation target regimes has been stressed (in the context of euro-area monetary policy) by, for example, Alesina *et al* (2001). From a political-economy point of view, the idea that well designed inflation-targeting regimes are also 'employment friendly', is of the utmost importance in gaining acceptance of the framework. The same general line of argument points to the importance of transparency—on which more below.

So far I have been speaking rather generally about a certain type of monetary policy regime that combines longer-term control of inflation with activist stabilisation in the short term. Within such a framework, one can imagine many different institutional arrangements—many different reaction functions, some no doubt, better than others. Like other matters of definition, it is hard to define exactly what is meant by an appropriate regime, but we mostly recognise it when we see it. (Just as we recognise cats and distinguish them from dogs, though most of us without a degree in biology would be hard pressed to define the difference.) Again from a political-economy point of view, what really matters is that an appropriate policy framework should be instituted with the right general properties. That then leads on to a second set of questions about improving or even optimising performance. To use another analogy, a boat without a helmsman is an indeterminate system. With a helmsman in place, there is a good chance that the boat will move across the bay in the direction desired by the operator. The big question is whether there is a helmsman in the boat or not. But, of course, the boat would function much better and more predictably with a skilled steersman than a novice. The debate about policy rules has now moved, it may be argued, beyond the question about how to pin down the rate of inflation and provide a nominal anchor, to centre on how to become better at steering the economy.

Characteristics of the UK system

UK post-war history is littered with attempts to design a macroeconomic framework to provide a nominal anchor against inflation combined with a reasonable amount of stabilisation. Most ended in failure, usually with serious conflict between internal and external objectives. Inflation targeting was introduced in 1992 after sterling was ejected from the ERM. The present regime, with monetary policy delegated to the Monetary Policy Committee at the Bank of England, was instituted in May 1997.

UK policy clearly owes much to the 'demonstration effect' from the perceived reaction function of the independent Federal Reserve in the United States. US experience could not, however, be simply transplanted. The Federal Reserve is both goal-independent and instrument-independent and, in formal terms, the reaction function is hardly pinned down at all. One of its objectives is 'price stability', but the nearest anyone has come to defining what is meant by price stability is Greenspan's (2002a, page 6) famous remark that '…price stability is best thought of as an environment in which inflation is so low and stable over time that it does not materially enter into the decisions of households and firms.' Instead, the perceived reaction function is reputational—deduced from historical behaviour since the early/mid-1980s. The original Taylor rule was put forward as descriptive of Federal Reserve behaviour, though Taylor himself has argued (eg (1999, 2000)) that it has desirable properties across a wide variety of possible models of the economy. In the United Kingdom, although the experience of inflation targeting from 1992–97 had been favourable, the reputational route to the establishment of a credible reaction function was not really available in 1997. Not only was there a new government, but also there was a history of monetary failure, reflected in financial market expectations and risk premia, despite the relatively good inflation performance from 1992–93 onward. What was needed was the establishment of a credible monetary policy—a credible and appropriate reaction function—via institutional design. It goes without saying that academic work on policy rules, on credibility, and on the kinds of properties that interest rate reaction functions should have (including, of course, studies of successful versus unsuccessful historical experiences), were crucial inputs into that process—and that they remain crucial in the adaptation of the MPC process over time.

I am not going to give a long account of the UK system, the broad characteristics of which are well known.(1) But I do want to pick out a few points which seem important from the point of view of system design.

1. The target

The general commitment to price stability (and, subject to that, to supporting the government's policies for growth and employment) is defined in the Bank of England Act 1998, where it is also laid down that it is the Chancellor of the Exchequer's responsibility to set the target. A well-known feature is that the target is set as a single number (not a range), and that it is set in a forward-looking but effectively time-independent manner. The target could change, but in practice has been maintained at 2.5% for the annual rate of change of the series RPIX since inception in 1997. An oft-cited reason for retaining governmental responsibility for setting and defining the target is that it is the government that is democratically accountable to the public. It also means that the delegation of responsibility for meeting the target to the MPC is particularly clear-cut.

With a point target which defines an aspiration in a timeless way, it is obvious to all that it will not be exactly met, so that ideas of shocks, uncertainty, and constrained discretion are, arguably, built-in from the start. The symmetry of the objective, whereby shortfalls in inflation are treated as of equal importance to overshoots, is appropriate to a reaction-function type of feedback system and, as already noted, has proved extremely important in gaining public acceptance of the inflation target regime.(2)

2. Central bank independence and delegation

Thus the Bank of England is instrument-independent not goal-independent. It has long been recognised in the United Kingdom that the principal instrument of monetary policy is the short-term interest rate,(3) so the task of the MPC is, in principle, very straightforward: to use its control of the short-term interest rate to meet, as far as possible, the externally given objective. But what is the reason for delegation?

It is tempting to see the answer in terms of the academic literature on time inconsistency and the inflation bias, in particular the argument made famous by Rogoff (1985) that the bias would be reduced by delegation to a conservative central banker. I would not want to deny that this literature was, in general terms, influential, but it does not really ring true as the reason for the institutional change. If there were an inflation bias, it could still apply to the target-setters—the government—though the institutional change can be seen as a form of commitment technology, with costs involved in opportunistically changing or abolishing the target. But, as far as the monetary authority itself is concerned, it is widely argued that the time-inconsistency problem is not an issue. Bean (1998a) simply removes the temptation to 'cheat' or 'renege' from the central bank's objective function,(4) a procedure which can be seen as supported by statements by Blinder (1998), who, writing about the United States, sees no temptation to generate surprise inflation, and, more recently by Meyer (2002), who also downplays any importance of time-inconsistency issues.(5) Vickers (1998), writing as the Bank of England's Chief Economist and a member of the MPC, suggested further that no Walsh (1995)-type incentives are necessary, as there is no incentive to want to generate inflationary surprises or to run the economy at anything other than at its natural rate of output/unemployment.

What this means is that the main point of delegation is not to employ conservative financiers, nor to set up a system of compensating incentives, but simply to hand over responsibility for the 'reaction function' to a technically competent authority charged with doing the

(1) There are many accounts of the operation of the Monetary Policy Committee in the United Kingdom. See especially King (1997a, 2002), Balls (2001), Balls and O'Donnell (2001), and Bean and Jenkinson (2001).
(2) An 'open letter' system operates, also symmetrically, if the divergence from target in any given month exceeds 1 percentage point, and should be regarded more as an 'enabling device' in the event of major shocks (such as oil crises) than as a sanction in the event of divergence from target. Surprisingly, given historical experience in the United Kingdom, no open letter has been triggered since the inception of the new system. Even more surprisingly, the nearest it has come to being triggered was on the downside in July this year when annual RPIX inflation for June came in at 1.5%.
(3) There was a brief flurry of debate in the United Kingdom over monetary base control in the early 1980s, which fizzled out. Monetary targeting in the United Kingdom was of the 'indicator' variety, with interest rates used to try to meet the intermediate objective. From this point of view, the chosen aggregate was unfortunate in that broad money was not easily controllable by the instrument (since it was interest-bearing), and the relationship between the monetary aggregate and the final objectives was weak, unreliable, and changing over time.
(4) This practice does not preclude the possibility that the steady-state value of potential GDP is inefficiently low from society's point of view, due to eg monopolistic distortions, but effectively delegates responsibility for eliminating the effects of these inefficiencies to microeconomic policy (as advocated by eg Meade (1951), and Rotemberg and Woodford (1997)).
(5) See also Posen (1993), McCallum (1995), King (1996, 1997b), and Taylor (1997) for related discussions.

job as well as possible. Credibility is important, but credibility here has little to do with the meaning derived from the inflation-bias literature, and a great deal to do with clearly specified objectives and with competence and trust that the job will be done as well as possible. This means that explanation of procedures, transparency and accountability are key aspects of the system.

3. The operation of the MPC

Arguably, the system in the United Kingdom is as transparent and accountable as any in the world. The nine members of the MPC (five 'internal' and four 'external') are individually accountable under the Act for their votes: interest rate decisions are by simple majority: the votes of each member are published within the Minutes, which appear after two weeks. Moreover, the MPC is responsible for the quarterly *Inflation Reports*, and the assessments and two-year-ahead forecasts for GDP growth and inflation published therein. (The forecasts are published as fan charts, with probability ranges, to emphasise the inevitable uncertainty.) There are other checks and balances, such as appearances before Parliament's Treasury Select Committee and supervision of procedures by the Court of Directors of the Bank of England.

As far as the operation of policy is concerned, the process can be described as an inflation forecast target regime—a process which, along with the institution of the *Inflation Report*, was taken over from the system in place in 1992–97. The usual justifications for the focus on future inflation (eg Svensson (1997, 2002)) are lags in the transmission mechanism, and the need to take account of a potentially large number of influences on the inflation process. Decisions are taken at relatively high frequency on a monthly timetable, with procedures in place for additional meetings if necessary.(1) The forecasts are quarterly. Pragmatically, it is sometimes useful to see the process as divided into two: the assessment of the current and future state of the economy on the one hand; and the response or reaction to that assessment on the other. Given the structure of the MPC, there are, in principle, nine different assessments, nine potentially different reaction functions, and a majority-voting procedure that translates all that into an interest rate decision. Despite the underlying complexity, the broad characteristics of the overall reaction function (using the term rather generally) are discernible and relatively predictable.

A feature of the UK system with individual accountability and transparency is that it leads to publicly expressed disagreements and dissent as well as, obviously, public knowledge of closely split votes. Early worries that both of these would work against credibility and be destabilising now appear unfounded. If, as argued, the relevant meaning of 'credibility' is a reputation for competence and trust in the system, then this should not be surprising. Given large uncertainty, it is presumably reassuring rather than otherwise that disagreements and differing assessments occur, are discussed and are resolved as far as policy is concerned by the decision-making procedures.

The discernibility and predictability of monetary policy in the United Kingdom have, I would argue, been greatly enhanced during the operation of the new system. I want to stress two aspects. The first is the consequence of the successful offsetting response to the Asia crisis and the Russian Default (the latter occurred in late August 1998). Interest rates were substantially cut in stages against the developing consensus perception that a quite serious recession was more or less inevitable in 1999. In the event, that incipient recession was headed off; the reaction function worked. Perhaps even more importantly, it led to public understanding that the reaction function really was intended to operate symmetrically—and, relatedly, that inflation targeting also involved output gap stabilisation. The second point is that in innumerable speeches, presentations and discussions by members of the MPC, it has been commonplace to stress the conditionality of policy. Thus, it is well understood that lower growth, should it eventuate, would (other things being equal) trigger a monetary easing. It is well understood that, should inflationary pressure arise, whether for demand-side or for supply-side reasons, monetary tightening would ensue—and if that proved insufficient, there would be further interest rises until it was sufficient. It is also understood that, should fiscal policy change, there would be compensating interest rate reactions to maintain consistency with the inflation target. (Thus, doubts about the monetary response to a fiscal tightening, which have been expressed, for example, about the system in place in the euro area, do not seem to be a problem in the UK context.) All this means that the broad features of the reaction function in place in the United Kingdom increasingly seem to be publicly understood and built into expectations. The reaction function could not easily be expressed as a policy rule—

(1) This has happened once since inception—after the terrorist attacks of 11 September 2001.

but appears 'rule like' in the sense of Taylor (1993), with the caveat that the rule-like behaviour involves contingent responses.

Indeed, success in stabilising medium-term anticipations of growth, unemployment and inflation could itself be the source of problems if, as recently, offsetting strategies contribute to imbalances between sectors and rising prices for assets such as houses.

4. Did it work?

On the face of it, in terms of outcomes for inflation and growth, the UK system has worked well—though it is usual to qualify such remarks with the observation that it is too soon to tell. Chart 1 displays the record on annual RPIX inflation. It suggests that there has been a remarkable improvement in inflation since inflation targets were adopted in 1992 and a moderate undershoot in the past few years. If anything, the chart suggests that it was the adoption of an inflation-targeting regime that was important rather than the radically new arrangements introduced in 1997.

Chart 1
UK inflation performance under different monetary regimes

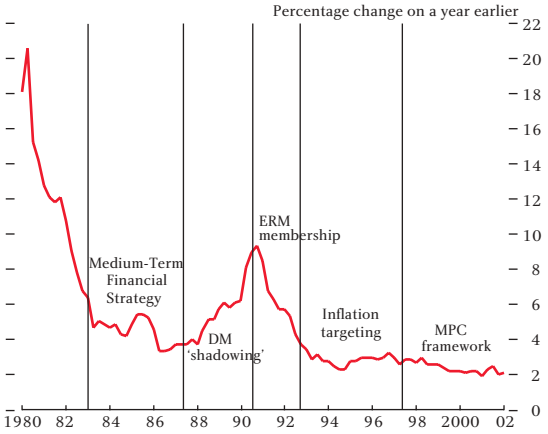
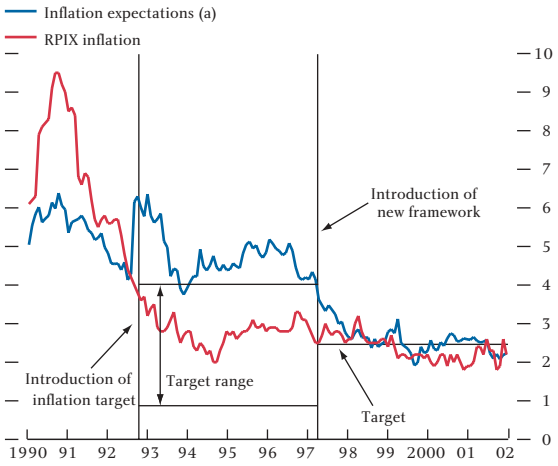


Chart 2, taken from HM Treasury (2002), shows much more clearly the effect of the new arrangements. There was a marked effect on inflation expectations at the time of the announcement of the new regime, suggesting that institutional change had indeed had a substantial effect on the credibility of macroeconomic policy. Other evidence, not detailed here, confirms a slower but highly favourable effect on public expectations and anticipations. And, as noted above, the more qualitative impression is that the reaction function in the United Kingdom has come to be increasingly well understood and that the regime change commands a degree of public support.

Chart 2
Inflation performance and expectations



Source: HM Treasury (2002), *Budget 2002*.

(a) Ten-year-ahead market inflation expectations.

5. Some issues

All this suggests that the UK system can be seen as a monetary regime of the right sort, embodying a reaction function (using the term generally) of the right type. To revert to an earlier analogy, the boat has a helmsman and the objectives are clear. This is a very big change. But a caveat is again necessary. Most previous attempts at redesigning UK macroeconomic policy were also put forward as solutions to the problem of combining inflation control with economic stability—and failed. Why should the new system fare differently? The answer, I believe, is that the system is better designed, since it incorporates not only some of the major lessons from history, but also the major insights that have come from theoretical and empirical research on monetary policy and monetary policy rules.

None of this, of course, means that the system could not be improved or that difficulties have not arisen. Some difficulties concern the reaction function, such as how policy should react to exchange rate movements, which have been large, or asset price changes, which have also been large. Some relate to uncertainty, both regarding the data and about how the economy functions. Some relate to forecasting—both as to how it should best be done, and the relationship between the forecast process and policy formation. I have some remarks about all these later in this address.

III Rules versus discretion

The debate over rules versus discretion has been going on for a very long time—but, for present purposes, a convenient starting point is Friedman's (1968) advocacy

of a fixed (3%–5% per annum) growth for the money supply. Clearly, one aspect was the advocacy of the money supply as the medium-term nominal anchor of the system. The other, more negative, aspect was to eschew activist short-term stabilisation via money supply changes. In modern (or semi-modern) dress, we would say that the policy would set up an interest rate reaction function against price and output disturbances—the interest rate responses depending on the demand for money function. But would it be a good reaction function in the sense I have been describing? There are a number of reasons, with long historical pedigrees, why it might not be, even if the paradigm of the money supply as the policy instrument is accepted. As is well known, Keynes, in the *General Theory*, argued that the 'self-regulating' mechanism of price flexibility may work badly, and may even be unstable if all that policy does to anchor the system is to fix the money supply. If price rises trigger increases in inflation expectations, real interest rates could even fall in the short run, a perverse response.(1) An extreme version of this type of story is the familiar hyperinflation model of Cagan (1956). If we think of the monetary base as the control instrument, potential instabilities could be magnified by procyclical movements in the velocity of circulation of money or of the quantity of commercial bank deposits. Patinkin (1969) argues that the inter-war Chicago tradition (as represented, for example, by Henry Simons) favoured countercyclical monetary policy for these reasons.(2) There is a danger that money supply rules would fail to meet the 'Taylor principle': that is, expressed in the form of interest rate reaction functions of the type studied empirically by Clarida, Galí and Gertler (1998), the monetary policy arrangements should have the property that real interest rates rise with any increase in inflation.(3) There is a clear danger too that the nominal anchor function would be compromised if the demand for money function was unstable over time—which turned out to be the case for the principal aggregates targeted.

The Friedman paradigm was influential in the widespread adoption of monetary targets in the 1970s. One reason was that the central bank practice of operating on nominal interest rates risked producing falls in real interest rates, a perverse and destabilising response, in the face of price shocks—such as occurred in the 1970s. Switching to a fixed money supply rule would, it was claimed, lead to real interest rate rises—a better (though not necessarily optimal) response. In fact, however, the practical adoption of monetary targets also involved using the short-term interest rate as the instrument of control. There is really no dispute—nor was there in the 1970s—that the central bank's control over money in developed financial systems is indirect, via the short-term interest rate.

With the interest rate as instrument, the reaction function approach gives a coherent account of how monetary targeting works in practice. The reaction function involves the monetary authorities using the interest rate to meet a target for the quantity of money (the term 'money supply' is to be avoided). If the chosen aggregate really is related causally to the price level, this would provide an appropriate nominal anchor. But it is not necessary for there to be a causal link. Even if money is endogenously supplied (given the interest rate) by the private banking sector, the policy could work so long as the chosen aggregate were a good indicator of the state of the economy and so long as, in the longer term, the quantity of 'money' was closely related to the final objective (the price level, for example)—that is, so long as there were a reasonably stable money demand function. The system could even work if the monetary target were completely meaningless causally in determining prices (eg, if the chosen target were notes and coins in the hands of the public, which are supplied on demand). The interest rate reaction function would be doing the work, with the monetary aggregate performing the role of indicator.

The abandonment of monetary targeting in most countries reflected the bitter experience that monetary aggregates, notably Sterling M3 in the United Kingdom, turned out to be a very poor basis for a monetary policy reaction function designed to provide a nominal anchor and to stabilise the economy. Other reaction functions, such as those based on targeting the exchange rate, also

(1) Keynes, in Chapter 19 of (1936), was more concerned with the problem of real interest rates rising during price deflation—a pathology now familiar in Japan.
(2) Friedman (1967) and King (1997b, page 85) also discuss Simons's views on monetary policy. It should be noted that Simons specifically rejected a monetary policy framework based on targeting future inflation. He advocated targeting current values of a cyclically sensitive price index: 'The index must be highly sensitive; otherwise, the administrative authority would be compelled to postpone its actions unduly after significant disturbances or (Heaven forbid!) obliged to use discretion in anticipating changes.' (Simons (1948, page 329).)
(3) The idea that non-inflationary stability can be achieved by fixing the money supply is still extraordinarily influential. Hicks wrote in 1967: 'We still have a Currency School, seeking in vain—but one sees why—for a monetary system that shall be automatic.' (Hicks (1967, page viii).) This is much less true now in policy circles.

failed, sometimes spectacularly as with the ejection of the pound sterling from the European Monetary System in 1992.

In fact the abandonment of monetary targeting did not lead to a wholesale return to government discretion and judgment, but progressively to the adoption of inflation target-type regimes based on interest rate reaction functions and 'constrained discretion' of the general type I have been discussing. This does not represent the abandonment of the objectives of monetary rules. On the contrary, the recognition of the need for a medium-term nominal anchor has, if anything, been strengthened. The automatic function of 'money' as nominal anchor has had to give way to policy targets for inflation itself and the instrument of policy is seen as the short-term interest rate rather than the money supply. Automatic responses to shocks have been replaced by a policy-determined feedback system. Finally, with the reintroduction of Keynesian stabilisation concerns, there is recognition that the reaction function needs to be designed to provide the medium-term nominal anchor at minimum cost in terms of output gap and price fluctuations.(1)

I have already referred to the other main strand of the rules literature, stemming from the seminal article by Kydland and Prescott (1977). The problem, which applies equally to a strict monetary target and to inflation or price level targets supported by reaction functions, is that such policies might not be 'credible'. In practice, there are many reasons other than time inconsistency why this might be so—including perceptions of lack of competence or lack of instruments. The huge literature on time inconsistency focuses, however, on one particular problem: the possibility that if the inflation target were achieved, the policy-maker would face a temptation to cheat, leading, in simple models, to an 'inflation bias'. One kind of solution to such a problem would be to remove discretion via commitment to a fixed money supply rule, with the danger, however, that other aspects of credibility would be compromised.(2) I have already noted that it is part of the policy consensus that the inflation bias problem is effectively removed by the delegation of monetary policy to an independent central bank with clearly specified objectives and responsibilities.

Assuming that this is so as far as the operation of monetary policy is concerned, the split UK system, with the target set by the government, is interesting. In principle, as noted above, the time-inconsistency problem could continue to apply due to the government's control over the target itself, or, more generally, the government could renege and be seen to be likely to renege, by abandoning the system itself. I argued, above, that such behaviour was constrained, and can be seen to be constrained, by the reputational and political losses involved in opportunistically changing the target or weakening the system. This, however, is subject to the major caveat that such costs must actually be present. Arguably, they will be present and highly constraining, if the system itself is publicly understood and commands general support—and not otherwise. The practical point here is that a constituency of general support for non-accommodating policies and inflation control is necessary for the system to work as intended. Others concern the interaction with other policies. This is another aspect of transparency and accountability, which needs to be taken extremely seriously by central banks and governments alike.

IV Some issues

Thus, arguably, the system in the United Kingdom is well designed, both institutionally and in terms of some of the main lessons from the policy rules literature. It may not have been fully 'tested in adversity'—though it has survived some pretty major shocks since inception. That said, there are a number of issues of continuing concern. The following is a selective account of three of them.

A. Asset prices: the stock market and house prices

What might be described as the prevailing central bank consensus on this issue is well set out by Vickers (1999). He argues that (a) asset prices should not be part of the definition of the target for inflation or of the loss function of the monetary authorities; (b) that asset prices contain considerable information relevant to forecasting the future state of the economy; and (c) that in an inflation forecast targeting regime, 'it is neither necessary nor desirable for monetary policy to respond to changes in asset prices, except to the extent that they help to forecast inflationary or deflationary pressures' (Bernanke and Gertler (1999, page 115)).

(1) Recall that Friedman's argument against short-term stabilisation, or a countercyclical money supply policy, was unknown and variable lags—a form of model uncertainty.
(2) The lack of discretion in the face of shocks might then lead to serious instabilities, lowering the credibility of the system. Locking the steering wheel on a vehicle is not a good way of committing to a destination.

This baseline view, which the late Rudi Dornbusch labelled 'the received wisdom' (Dornbusch (1999, page 129)), has been challenged by Cecchetti *et al* (2000, 2002), who argue that it is consistent with inflation-forecast targeting for monetary policy to react to contain bubbles or other departures from the fundamentals. These authors are also reasonably optimistic that such departures can be identified in practice—they suggest that the problem is probably no worse than the problem of identifying the natural rate or NAIRU. Clearly, the question of whether boom/bust cycles in asset prices should be headed off by monetary policy is highly topical—focusing, obviously, on the behaviour of the stock market in the United States and, to a lesser extent, on the house price boom in the United Kingdom. Moreover, there have been spectacular episodes in the past where boom/bust cycles have been associated with major instability and economic problems—notably, as far as stock market prices are concerned, the Great Crash in the United States in the inter-war years and, more recently, the asset price bubble in Japan in the late 1980s with its deflationary aftermath which is still continuing. (See, for example, Borio and Lowe (2002).) And as far as house prices are concerned, the UK boom of the late 1980s and subsequent bust is still regarded as an exemplar of bad macroeconomic policy.(1) There is no doubt that asset price movements of the boom/bust type are perceived as a problem by policy-makers and, unfortunately, there is no particular reason to believe that the potential problems would simply go away just because a successful inflation-targeting regime had been established. There is an issue, however, as to whether the monetary authorities should alter their behaviour as a result.

Suppose we think of the problem, in stripped-down terms, as involving the anticipation of a large positive shock followed by a large negative shock with the negative shock (roughly) balancing the positive shock—so that the negative shock is larger, the larger the preceding positive shock. (Such a pattern could result, for example, from some stock/flow adjustment process.) The baseline position is that the consequences would be taken into account in the forward-looking procedures of the monetary authority and that the consequences for output and price instability would then be minimised in terms of some loss function. That is the end of the story as far as interest rates are concerned.

Clearly, however, if there were some other policy instrument capable of lowering the magnitude of the first shock (and by construction therefore the second shock as well), it would be desirable that that policy should be used.(2) The task of the monetary authorities would be eased and, of course, short of completely successful offsets by the monetary authorities, the instability of the economy would be reduced and welfare would be increased. The first-best response—which may of course be unrealistic or costly for other reasons—is that sources of instability should be tackled at source, removing or lowering the magnitude of the negatively correlated shocks themselves. As a practical example, consider the house price boom in the United Kingdom. If the rising house prices are regarded as a problem because they are likely to reverse and pose problems in the future, there are many who would argue that a first-best solution is that the factors behind such destabilising behaviour in the housing market should be tackled directly rather than by interest rates.

From the inflation-targeting perspective, the interesting question is what should be done in the absence of alternative policies. As second-best, should interest rate policy be diverted from its normal role, not to target an asset price, but to check some cumulative process early on—in effect, to lower the magnitude of the correlated shocks under discussion? The argument for so doing would be that the variances of inflation and the output gap would be thereby reduced—which is perfectly consistent with standard interpretations of the loss function.(3) But there is a trade-off involved (Bordo and Jeanne (2002)). The reduction in the shocks likely to hit the economy, if it can be achieved (it is quite a big if), takes the monetary authorities closer to their objective. But the diversion of the instrument from its normal role takes them further away (effectively imposing additional variability on the economy). The first needs to be bigger than the second for the policy to be desirable.

One can see why much of the discussion in favour of central banks using interest rates in this way is conducted in terms of heading off bubble-type phenomena. The presumption is that the longer a

(1) Similar experiences took place in several Scandinavian countries.
(2) It is perhaps notable, that, in his newspaper column, Krugman (2002), criticising Chairman Greenspan for having allowed the US stock market boom to develop to the point where a destabilising bust was likely, suggested that margin requirements to discourage speculation should have been introduced early on in the boom. He did not suggest that the interest rate instrument should have been used.
(3) Vickers (1999, page 434) notes that, since the variance matters, 'expected inflation somewhat under target with moderate inflation uncertainty might be better than expected inflation on target with high inflation uncertainty'.

bubble path goes on, the bigger the bust when it comes. There is an easy-to-make assumption that a timely upward move in interest rates, even though not justified in terms of the inflation target and the normal reaction function, would prick the bubble, lowering both the upward and downward aspects of the shock. Typically, it is further assumed that the upward movement of the interest rate is not too large and that it is short-lived (so the costs from this aspect of the policy are small) and the benefit in terms of shock reduction is large. Such arguments are usually helped by 20/20 hindsight.

In practice, the difficulties in reliably identifying bubbles or other persistent departures from the 'fundamentals' are acute and the risks involved in such a strategy may be considerable (Greenspan (2002b)).

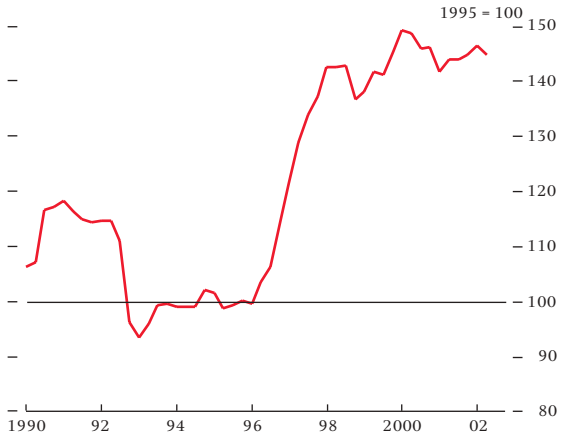
In my view, the most persuasive argument against using interest rates to moderate destabilising processes (even if they can be identified) is one of credibility and transparency. It is hard enough to establish a credible reaction function based on clear objectives with the interest rate being used to meet the inflation target and, consistent with that, to offset shocks—including shocks from the endogenous processes of the economy itself—as far as possible. If the interest rate has another role as well, being used to moderate the shock structure (eg by heading off bubbles from time to time), the reaction function is far less rule-like and predictable, and the system is likely to be less transparent and accountable. There may be cases where interest rates should be used to reverse some cumulative process. But the potential costs to credibility and transparency weigh heavily against.

This puts me (nearly) in the baseline camp familiar from the policy rules literature that the direct and indirect effects of asset prices on inflation should be taken into account, but that otherwise they should not normally be given special significance. I am sure, however, that the issue will continue to be the subject of research—and I do not regard it as settled. I think, however, that there is a bit more to be said, and I come back to this topic in my closing remarks.

B. Open-economy issues and the exchange rate

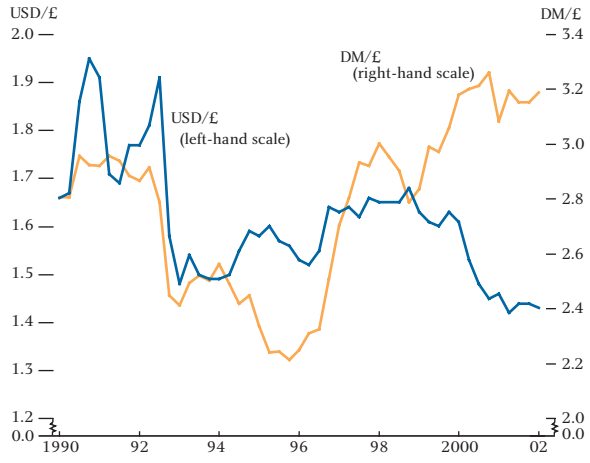
The exchange rate can be treated as an asset price—so much of the above can be thought to apply to exchange rate misalignments as well (Cecchetti *et al* (2002)). However, the UK context over the past decade illustrates the difficulties regarding 'misalignments' and 'fundamentals' rather well. In a nutshell, it is very hard to be at all sure what the equilibrium rate for sterling actually is, especially, it may be added, when the dollar versus the European currencies—since 1999, the euro—is swinging about as well. Charts 3 and 4 show the sterling real effective exchange rate (unit labour cost basis) and sterling against the US dollar and the Deutsche Mark (which, of course proxies the euro since 1999). Sterling declined substantially on exit from the ERM in 1992, which was widely seen as a reversion towards fundamental value. That hypothesis worked until about 1996, after which it rose very substantially—in fact to levels well above those pertaining to the ERM period—and, by and large, has stayed there since. Views about the 'equilibrium' have changed (perhaps as a lagged response to movements—or, perhaps more accurately, non-movements—in the actual exchange rate), but there is very little in the way of good

Chart 3
Sterling real effective exchange rate (unit labour cost based)



Source: *International Financial Statistics.*

Chart 4
Nominal bilateral sterling exchange rates



Source: *International Financial Statistics.*

explanation of the changes that have occurred, and the changes were not generally predicted *ex ante*. What is more, predictions of reversion have proved false—so far.

What does one do, given that one of the chief transmission mechanisms from monetary policy to the economy is (according, for example, to the Bank of England's macroeconomic forecasting model) through the exchange rate?

In fact, forecasts and assessments are based on 'technical assumptions'. For a start, some of the noise in exchange rate movements is removed by basing the starting point of forecasts on the average during a 15-day window.(1) Second, forecasts are now made using a simple average of the path predicted by uncovered interest parity (UIP) and a no-change assumption (the random walk hypothesis). The possibility of reversion—modelled as a probability each period of a step change downwards in the exchange rate—has, however, been a feature of the risks and skews presented in the fan charts published in some recent *Inflation Reports*: *per se* this factor introduces an upward skew to the inflation forecast. All in all, this illustrates the practical point that interest rate policy would be a great deal easier if we had better models of the exchange rate and a better handle on the elusive concept of its longer-term equilibrium value.

The question of how interest rate policy should react to the anticipation that there might be a downward 'correction' of the exchange rate is not simple. Suppose that interest rates are exactly right on the assumption that the exchange rate remains (over the forecast horizon) where it is. Now impose an upward skew on anticipated inflation due the anticipation that the exchange rate might fall. This suggests that interest rates should be raised. But this risks prolonging the assumed overvaluation. A 'bubble-pricking' strategy would lean against the wind in the opposite direction, lowering interest rates in the short term against the anticipation that they would have to be raised when and if this caused the exchange rate to fall. All this raises the credibility issues referred to above—and suggests that a strategy of reacting to large exchange rate movements only when they occur has considerable attractions.

Turning to the question of how policy should react to an exchange rate change when it does occur, the answer should depend, conventionally, on why it occurred and on the model adopted (as well as, of course, on whether the change is expected to be permanent or transitory). That is not terribly helpful and not very transparent. And yet, contingent policies are important in perceptions of the reaction function. The underlying question also relates to the rules literature in terms of whether the rule should include a term in the exchange rate (eg Ball (1999)) and in terms of what aggregate should be targeted. (Thus, Clarida, Galí and Gertler (2001), for example, suggest targeting domestic goods price inflation, thereby excluding the import price component from the CPI, whereas Engel (2002) suggests targeting the exchange rate.)

A natural way of approaching the issue is in terms of the procedures followed by the MPC. In broad terms, it is clear that an exchange rate depreciation (assumed persistent) would feed through the Bank's forecasting procedures to import prices and thence, directly onto RPI inflation. The pass-through to import prices would lead (ignoring the dynamics) to a step change upward in the price level. There would be further effects on aggregate demand—negatively in the short run because of the effect on real incomes and positively from expenditure switching effects. There would also be potential wage and price pressure as real wage falls were resisted and from effects on inflation expectations.

Thus, the prediction that an exchange rate fall would lead (other things being equal) to a compensating rise in real interest rates appears pretty safe on the basis of the target inflation rate set by the Chancellor and the known procedures of the MPC—including the characteristics of the Bank's forecasting model, which is published.

I have argued before (Allsopp (2001)) that, in the face of a real impact, such as the one described, the ideal strategy for controlling inflation is to 'accept' the price level effect, without accommodating the second-round effects via wage price pressure and via effects on inflation expectations. (See also Balls (2001) and Meyer (2002), who take a similar line for the United Kingdom and United States respectively.) This is on the grounds that the 'level effect' is not really 'inflation'. Such a view is in line with Meltzer (1977, page 183), who argues: 'a one-time change in tastes, the degree of monopoly, or other real variables changes the price level… [W]e require a theory that distinguishes between once-and-for-all price changes and maintained rates of price change.' It is also in line with those who argue, on

(1) From time to time a different 'window', such as five days, has been used if the 15-day window was judged misleading.

New Keynesian grounds (with the assumption that price stickiness applies to domestically produced goods) that monetary policy should not attempt to insulate the CPI from short-run fluctuations arising from terms-of-trade movements (Clarida, Galí and Gertler (2001)). It needs to be recognised, however, that a policy of allowing level effects, while curtailing second-round effects, would be practically difficult and would require a considerable degree of explanation and transparency if credibility were to be maintained.

But are the effects as assumed? Kara and Nelson (2002) demonstrate that the stylised facts for the United Kingdom are that, although there is considerable evidence of exchange rate pass-through to import prices, there is no correlation of exchange rate changes with RPIX inflation. If this is the case, then it throws doubt on whether there would be a large effect on RPIX inflation from an exchange rate fall, should it occur.

These questions of pass-through and of the appropriate design of policy in the face of exchange rate changes are of immense practical importance and are under continual discussion. They are already being illuminated by what Taylor (2001, page 263) has termed the 'new normative economic research', and it is certain that the results of this ongoing research will feed through to the practical implementation of policy.

C. Forecasting

Clearly, forecasts—interpreted generally to include the procedures and techniques that lie behind forward-looking assessments of the economy—are a key part of an inflation-targeting regime. I want to make a few brief remarks about two aspects of a very large subject. The first is about the consequences of non-stationarity—especially about the consequences of possible 'structural shifts' in key parameters. A number of authors in discussing policy rules have pointed to the large uncertainty about key parameters and data moments, such as trend productivity, potential GDP growth (or, in the labour market, the natural rate or NAIRU), and the neutral rate of interest. (See for example Kohn (1999).) Moreover, there is an influential and developing literature which uses policy rules to illuminate the consequences of (real-time) errors of assessment in explaining past policy mistakes (including notably Orphanides (2000) on the United States, and Nelson and Nikolov (2001) on the United Kingdom).

The second is about procedure—how forecasting models and forecasts enter into the policy-making process.

Hendry and his co-authors have made the point (eg Hendry and Mizon (2000)) that if the data-generating process were stationary, one would not observe systematic forecast errors (though poor models would, of course, generate inefficient forecasts). They trace systematic forecast errors, which are observed, to 'deterministic shifts'—ie shifts in the unconditional means of key variables not accounted for by the existing forecasting model. They make a number of points of practical policy importance. The first, as is well known, is that these kinds of non-stationarities may justify *ad hoc* and informal forecasting techniques, as well as practical procedures such as intercept adjustments and overdifferencing, which are certainly a major feature of real-world forecasting and assessment exercises. A second is that the forecasting performance of a model may be a poor and misleading criterion for selecting a policy model—and *vice versa*: that good models for policy analysis may not be good forecasting models.

Any practical forecaster knows the potential importance of 'deterministic shifts'. In an important sense, there is little that can be done about them—since they are unforecastable from within the model. If they do occur, forecasts will go wrong. There is, however, an extremely important question about how quickly they are detected and how quickly they are taken into account. In the MPC process, for example, a large proportion of the time is typically spent on the question of whether new data should be treated as 'noise' or 'news' and, if the latter, what should be done about it.

The response to this might be an intercept adjustment, or, it might lead, over a longer time period, to the re-estimation of important relationships, or even to the adoption of a new model as a forecasting/policy tool. This means that when it comes to understanding the practice of monetary policy, one is not concerned just with the process of forecasting and policy formation at a moment in time but also with the 'meta' reaction function which describes how the institution adapts and changes as information accrues, as mistakes are made, and as learning occurs—including the embodiment of the results of new research as they accrue (Allsopp and Vines (2000)).[1] As with other

(1) Though formal analysis of such learning processes is difficult, it is not really that much more difficult conceptually than the process by which people learn to drive unfamiliar vehicles. But see Sargent (1999) on US monetary policy and inflation.

aspects of the 'reaction function', it is important that this aspect be transparent, and as far as possible, publicly understood, as well.

Forecasting errors have been an important reason for major policy errors in the past—for example in the late 1980s in the United Kingdom.(1) There is also a developing debate as to whether overoptimistic or, for that matter, overpessimistic assessments of productivity performance have been a feature of US experience since the mid-1990s. An important question, however, is whether a well-functioning system should operate to moderate the effects of possible systematic forecasting errors. In principle it should.

The basic point is that, with a high-frequency policy-making process, targeted on future inflation, forecasting errors should reveal themselves, triggering appropriate reactions. In the ordinary course of events this means that policy errors, due to poor data or forecast mistakes, should not cumulate. A mistake made one month should not be repeated the next—and, arguably, so long as the error is not great, does not matter very much. With systematic errors, the process is more complicated and it is useful to illustrate what I have in mind in the simple case of a shift in a parameter such as the equilibrium unemployment rate. Suppose it has shifted down. Undetected, this leads to too high an interest rate, and inflation should start to undershoot. If the same error is repeated, systematic undershooting would be observed—whereas forecasts further out would indicate, period by period, that the interest rate was appropriate. It would not lead, however, to cumulatively expanding error—as might be expected on the basis of the misassessment of the equilibrium unemployment rate, as the starting-point is updated each month. Moreover, it should trigger responses, such as intercept adjustments and reassessments of model properties, which should work to curtail and eliminate the systematic error. The crucial point is that the forecasting system itself needs to react quickly and appropriately to the signals provided by the economy. The authorities are committed to an objective for inflation, not to a particular forecasting model or set of procedures (Svensson (2002)).(2)

A potential difficulty is that the economy may not give good signals. It has been suggested, on these grounds, that with successful policies of low inflation—leading to rather flat Phillips curve responses—policy needs to react to other indicators, for example to prospects for demand or unemployment (Begg *et al* (2002)). A low-inflation environment with high inertia may also increase the likelihood of bubbles in asset prices and other cumulative phenomena because, with the authorities focused on inflation, interest rate responses appear unlikely to market participants.

It is clear that forecasting needs to be seen as a process and as one that adapts through time. The role of forecasts in the policy process varies greatly between different systems. In the United States, a staff forecast and assessment is available to members of the FOMC and is one input into the decision-making process.(3) In the United Kingdom, however, the MPC is responsible for the *Inflation Report* and the forecasts. The process is iterative—or back and forth (Vickers (1998))—between Bank of England staff and the MPC. It is well recognised that nine MPC members are unlikely to agree on prospects for inflation, let alone on the details, and they are intended to represent the centre of gravity of individual views.(4) The iterative and interactive process is widely regarded as an extremely important part of the formation of policy in the United Kingdom. Clearly, though, it raises intricate issues about the exact status of forecasts as well as other difficulties—issues detailed in a report by Don Kohn of the Federal Reserve (now a member of the FOMC) (Kohn (2000)).

With an interactive process such as that in the United Kingdom the choice of models and procedures is particularly important. But how should models be chosen and what kinds of models should be used? In practical terms, there may be a tension between theoretical sophistication and the needs of the

(1) Hendry and Mizon (2000) ascribe this to a 'deterministic shift' applying to the models of the consumption function then current. Of course, recognition of the problems may lead on to better models which 'explain' the deterministic shifts—eg in terms of previously omitted variables. Overoptimistic assessments of the productivity trend were another reason for policy error (Nelson and Nikolov (2001)).
(2) Svensson goes on to argue, more contentiously, that inflation-targeting frameworks entail (or should entail) publicly specified objective functions with explicit announcements of the functional form and numerical weights in the functions.
(3) One disadvantage of staff forecasts is that it is, in bureaucratic terms, difficult to make them public since the policy-makers might be seen to be disagreeing with their own staff. In the United States, the full forecasts are published after five years.
(4) The explanation at the beginning of the *Inflation Report* reads: 'Although not every member will agree with every assumption on which our projections are based, the fan charts represent the MPC's best collective judgment about the most likely paths for inflation and output, and the uncertainties surrounding those central projections.'

interactive process of forecasting and assessment—which can be seen as mirroring the point made above that the best forecasting model may not be the best policy model—and *vice versa*.

D. Interaction with other policies

The establishment of a monetary policy reaction function clearly does not mean that other policies are unimportant in inflation control and stabilisation: it remains the overall stance of macroeconomic policy that matters. Here, I touch on some aspects of the interaction with fiscal policy.

As with monetary policy, there appears to be a developing consensus over important aspects of fiscal policy. First, it is widely agreed that there needs to be some fiscal closure rule or feedback system to rule out explosive debt/GDP trajectories over the longer term—though the form that that commitment should take is highly contentious, as illustrated by the debates over the Stability and Growth Pact in the European Union (eg Allsopp (2002), Buiter and Grafe (2002)). Second, there is, in practical terms, agreement too that fiscal policy should have a stabilisation role in the short term, usually involving the pragmatic compromise of allowing the automatic stabilisers to operate 'over the cycle', whereas discretionary fiscal policy is frowned upon—on the grounds that it has in the past often proved destabilising and asymmetric. Thus the 'fiscal policy reaction function', like the monetary policy reaction function, can be seen as combining a longer-term commitment (here, to sustainable debt and deficits) with an important role in stabilisation.

It is now part of the consensus that there is not much hope of establishing a credible monetary policy reaction function if fiscal policy is out of control—eg in the sense of involving an explosive debt/GDP ratio. The Governor of the Bank of Canada argues, for example, that, in Canada, the new monetary arrangements only started to work as intended with major changes in the fiscal framework (Dodge (2002)). He also supports the view that in a single country, with monetary and fiscal arrangements being designed together, coordination difficulties should not arise, a view also put forward by the UK Treasury (Balls and O'Donnell (2001)). Bean (1998b) has suggested that, in a system such as that in the United Kingdom, the fiscal authorities are effectively in the position of a Stackelberg leader, free to set fiscal policy, but constrained by the monetary policy reaction function (which operates at high frequency). Formal coordination is not necessary so long as the interest rate reaction function is predictable. Moreover, the monetary arrangements mean that fiscal policy cannot generate 'surprise inflation', which deals with a potential time-inconsistency problem.

Clearly, as far as stabilisation is concerned, the optimal monetary policy reaction function needs to take account of the fiscal system in operation. For example, if the automatic stabilisers are allowed to operate, and these help to offset demand shocks, less work needs to be done by the monetary authorities.

Formal analysis of fiscal policy rules is, however, relatively underdeveloped compared with that of monetary policy rules—reflecting, no doubt, the consensus referred to earlier that it is monetary policy that should be assigned to the twin aims of providing a nominal anchor and of stabilisation. It was not always so. Under the Bretton Woods system, with monetary policy outside the United States assigned to meeting the exchange rate commitments, stabilisation was typically assigned to fiscal 'fine tuning'. Fiscal fine tuning, however, fell into disrepute, partly because the evidence suggested, in the United Kingdom at least, that it was frequently destabilising (Dow (1964)) and partly because the system failed to provide a nominal anchor against rising inflation as prices and wages rose in the United States and as the Bretton Woods system itself broke down. The design of fiscal policy rules and procedures is likely, however, to become an increasing concern within countries who are members of EMU. In this respect, it is interesting that a recent Swedish report by a group of experts (Committee on Stabilisation Policy (2002)), studying the implications of possible EMU entry, recommends giving a substantial public role regarding stabilisation to a fiscal policy council.(1) The arguments used draw heavily on the monetary policy rules literature and on the institutional experience of inflation target regimes. In principle, fiscal, rather than monetary, instruments could be used to support a non-accommodating policy against inflation as well.

V Concluding remarks

I have argued that monetary policy in the United Kingdom has succeeded in setting up a reaction

(1) For the United Kingdom, Wren-Lewis (2000) has suggested that macroeconomic policy could be improved if control over some fiscal variables were assigned to the MPC.

function which is recognisably of the appropriate type. I have also suggested that the new system should be reasonably robust, largely because its design reflects both the lessons of history and some of the main insights from the policy rules literature.

Performance so far has been good—indeed, remarkable by historical standards. However, though the system has survived some considerable shocks, there remains an important sense in which it has not been tested in adversity. So far, the accent has been on stabilisation. The MPC has not yet been called on to react to a major increase in inflationary pressure, threatening the nominal anchor objective, which would involve decisive and, presumably, unpopular action. Yet the perception that such action would be taken, if necessary, is a crucial part of the system. The hope, of course, is that the commitment to take such action if necessary makes it less likely that it will be necessary.

I have noted that, in normal times, the perceived reaction function should stabilise expectations of both inflation and of growth. The confidence that policy will work in a particular way alters the way the economy works (including perceptions of risk). To an extent, 'thinking makes it so', and the private sector does much of the work via the effect of the policy framework on expectations. A rather dramatic illustration of how the system can function is provided by experience since the end of last year. After the previous cuts, policy interest rates have remained completely unchanged this year in the United States, the euro area, and in the United Kingdom. Though this looks like central bank inertia of an extreme kind, the anticipation of policy interest rate rises—which were strongly present with the bounce in the US economy at the beginning of the year—has gone away (especially following the large stock market falls across the world, though much of that probably reflected the same re-evaluation of prospects). In the process, the yield curve has shifted, and there has been a market-induced offsetting reaction, first to improving and then to deteriorating prospects. Effectively, monetary policy has eased, despite no change in policy rates. In my view, this shows a system that is alive and well, even though actual policy decisions have resulted in no change in official rate settings. The crucial point is that the private sector can anticipate stabilising policy reactions and, in broad terms, believes they will work as intended.

The system requires a high degree of credibility or trust—which could be threatened from several directions. Clearly, credibility would be threatened if the policy-makers were seen to be likely to cheat. Equally, however, it would be threatened if policy-makers were perceived to be incompetent, or to lack appropriate instruments. (This latter issue is one of the reasons why the possibility of deflation with nominal interest rates reaching their lower bound, as in Japan, is worrying.) The better the system functions and the more public understanding of how it is supposed to function, the more credible it is likely to become.

I have discussed a number of issues of current concern. One of these is asset prices. I have subscribed to the 'received wisdom' that generally it is neither necessary nor desirable for interest rates to respond to asset prices except to the extent that they contribute to inflationary or deflationary pressures, but with the recognition that there could be cases where diverting the interest rate instrument to reducing particular kinds of shocks could be justified on second-best cost-benefit grounds, if destabilising shocks can thereby be reduced. Considerations of credibility—hard enough to establish anyway—weigh heavily against such policies. A far better strategy would be to tackle the destabilising dynamic processes, eg those involved in bubble-type phenomena, more directly with other policies.

There is a worry, however, that the perception that economic policy will not react to phenomena such as asset price bubbles or exchange rate misalignments might encourage the phenomena themselves. This is most likely to be the case if there is a perceived 'disconnect' between the phenomena and prospects for growth and inflation—since then the interest rate consequences implicit in the normal reaction function are, in effect, shorted out, making destabilising cumulative processes the more likely. There are historical instances, for example, where 'benign neglect' of the exchange rate (with the concentration of policy on the domestic economy) has appeared to lead to exchange rate misalignments and instability. This is not to argue for giving a special role to asset prices in inflation targeting, still less should it be seen as an argument for altering the target. It should serve, however, to reinforce the point that the successful establishment of an inflation-targeting regime does not mean that all macroeconomic policy problems are dealt with. On the contrary, it is likely to highlight other aspects of the overall policy regime.

This is particularly true with fiscal policy. There is consensus that a credible monetary policy requires a

credible fiscal framework to go with it. So far, however, research on fiscal policy reaction functions seems relatively underdeveloped.

Finally, if I were asked what would make the most difference to the procedures of practical monetary policy making, it would be better and more reliable data and better understanding of key economic relationships. Given the uncertainties, the process of assessment and forecasting is bound to be judgmental—and in that sense, not rule-like. But if the goals are clear and the process is open and transparent, it is, to a large extent predictable, which is what matters for the stabilisation of expectations.

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Bank of England speeches

Speeches made by Bank personnel since publication of the previous *Bulletin* are listed below.

Six months on the MPC: a reflection on monetary policy.
Speech by Marian Bell, member of the Monetary Policy Committee, to the CBI South East in Crawley, Sussex on Monday 9 December 2002.
www.bankofengland.co.uk/speeches/speech186.pdf

16th European Finance Convention.
Speech by The Rt Hon Sir Edward George, Governor, in London on Friday 6 December 2002.
www.bankofengland.co.uk/speeches/speech185.htm

A picture of European unemployment: success and failure.
Speech by Stephen Nickell, member of the Monetary Policy Committee and Professor at the London School of Economics, at the Centre for Economic Studies in Munich, Germany on Friday 6 December 2002.
www.bankofengland.co.uk/speeches/speech184.pdf

The MPC and the UK economy: should we fear the D-words?
Speech by Charles Bean, Chief Economist, to the Emmanuel Society in London on Monday 25 November 2002.
www.bankofengland.co.uk/speeches/speech182.pdf Reproduced on pages 475–84 of this *Bulletin*.

The inflation target ten years on.
Speech by Mervyn King, Deputy Governor, to the London School of Economics on Tuesday 19 November 2002.
www.bankofengland.co.uk/speeches/speech181.pdf Reproduced on pages 459–74 of this *Bulletin*.

Association of Corporate Treasurers Annual Dinner.
Speech by The Rt Hon Sir Edward George, Governor, in London on 13 November 2002.
www.bankofengland.co.uk/speeches/speech180.htm

Northwest Development Agency/Bank of England Dinner.
Speech by The Rt Hon Sir Edward George, Governor, in Manchester on 15 October 2002.
www.bankofengland.co.uk/speeches/speech179.htm Reproduced on pages 456–58 of this *Bulletin*.

Monetary policy—a perpetual dilemma?
Speech by Kate Barker, member of the Monetary Policy Committee, to the Charities Consortium in London on 14 October 2002.
www.bankofengland.co.uk/speeches/speech178.pdf

West Midlands Conference '20–20 Vision'.
Speech by The Rt Hon Sir Edward George, Governor, in Birmingham on Friday 20 September 2002.
www.bankofengland.co.uk/speeches/speech176.htm

Macroeconomic policy rules in theory and in practice.
Speech by Christopher Allsopp, member of the Monetary Policy Committee, to the conference on 'Policy rules—the next steps', Cambridge University, Cambridge on 19 September 2002. www.bankofengland.co.uk/speeches/speech175.pdf Reproduced on pages 485–504 of this *Bulletin*.

Contents of recent Quarterly Bulletins

The articles and speeches which have been published recently in the *Quarterly Bulletin* are listed below. Articles from November 1998 onwards are available on the Bank's web site at www.bankofengland.co.uk/qbcontents/index.html

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The new economy and the old monetary economics (S)
The impact of the Internet on UK inflation (S)
Monetary policy and the supply side (S)

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Parliamentary scrutiny of central banks in the United Kingdom and overseas

Ageing and the UK economy

The balance-sheet information content of UK company profit warnings

Money and credit in an inflation-targeting regime

International Financial Architecture: the Central Bank Governors' Symposium 2002

The monetary policy dilemma in the context of the international environment (S)

Monetary policy issues: past, present, future (S)

Winter 2002

What do measures of core inflation really tell us?

Estimating the impact of changes in employers' National Insurance Contributions on wages, prices and employment

Equity valuation measures: what can they tell us?

Profit expectations and investment

Financial pressures in the UK household sector: evidence from the British Household Panel Survey

Money market operations and volatility in UK money market rates

The Centre for Central Banking Studies

The external balance sheet of the United Kingdom: recent developments

Public sector debt: end-March 2002

Speech at the Northwest Development Agency/Bank of England Dinner (S)

The inflation target ten years on (S)

The MPC and the UK economy: should we fear the D-words? (S)

Macroeconomic policy rules in theory and in practice (S)

Bank of England publications

The Bank of England publishes information on all aspects of its work in many formats. Listed below are some of the main Bank of England publications. For a full list, please refer to our web site www.bankofengland.co.uk/publications

Working papers

Working papers are free of charge; a complete list is available from the address below. An up-to-date list of working papers is also maintained on the Bank of England's web site at www.bankofengland.co.uk/wp/index.html, where abstracts of all papers may be found. Papers published since January 1997 are available in full, in PDF.

No.	Title	Author
126	New estimates of the UK real and nominal yield curves *(March 2001)*	Nicola Anderson John Sleath
127	Sticky prices and volatile output *(April 2001)*	Martin Ellison Andrew Scott
128	'Oscillate Wildly': asymmetries and persistence in company-level profitability *(April 2001)*	Andrew Benito
129	Investment-specific technological progress in the United Kingdom *(April 2001)*	Hasan Bakhshi Jens Larsen
130	The real interest rate gap as an inflation indicator *(April 2001)*	Katharine S Neiss Edward Nelson
131	The structure of credit risk: spread volatility and ratings transitions *(May 2001)*	Rudiger Kiesel William Perraudin Alex Taylor
132	Ratings versus equity-based credit risk modelling: an empirical analysis *(May 2001)*	Pamela Nickell William Perraudin Simone Varotto
133	Stability of ratings transitions *(May 2001)*	Pamela Nickell William Perraudin Simone Varotto
134	Consumption, money and lending: a joint model for the UK household sector *(May 2001)*	K Alec Chrystal Paul Mizen
135	Hybrid inflation and price level targeting *(May 2001)*	Nicoletta Batini Anthony Yates
136	Crisis costs and debtor discipline: the efficacy of public policy in sovereign debt crises *(May 2001)*	Prasanna Gai Simon Hayes Hyun Song Shin
137	Leading indicator information in UK equity prices: an assessment of economic tracking portfolios *(May 2001)*	Simon Hayes
138	PPP and the real exchange rate–real interest rate differential puzzle revisited: evidence from non-stationary panel data *(June 2001)*	Georgios E Chortareas Rebecca L Driver
139	The United Kingdom's small banks' crisis of the early 1990s: what were the leading indicators of failure? *(July 2001)*	Andrew Logan
140	ICT and productivity growth in the United Kingdom *(July 2001)*	Nicholas Oulton
141	The fallacy of the fiscal theory of the price level, again *(July 2001)*	Willem H Buiter
142	Band-pass filtering, cointegration, and business cycle analysis *(September 2001)*	Luca Benati
143	Does it pay to be transparent? International evidence from central bank forecasts *(November 2001)*	Georgios Chortareas David Stasavage Gabriel Sterne
144	Costs of banking system instability: some empirical evidence *(November 2001)*	Glenn Hoggarth Ricardo Reis Victoria Saporta

145	Skill imbalances in the UK labour market: 1979–99 *(December 2001)*	Pablo Burriel-Llombart Jonathan Thomas
146	Indicators of fragility in the UK corporate sector *(December 2001)*	Gertjan W Vlieghe
147	Hard Times or Great Expectations?: Dividend omissions and dividend cuts by UK firms *(December 2001)*	Andrew Benito Garry Young
148	UK inflation in the 1970s and 1980s: the role of output gap mismeasurement *(December 2001)*	Edward Nelson Kalin Nikolov
149	Monetary policy rules for an open economy *(December 2001)*	Nicoletta Batini Richard Harrison Stephen P Millard
150	Financial accelerator effects in UK business cycles *(December 2001)*	Simon Hall
151	Other financial corporations: Cinderella or ugly sister of empirical monetary economics? *(December 2001)*	K Alec Chrystal Paul Mizen
152	How uncertain are the welfare costs of inflation? *(February 2002)*	Hasan Bakhshi Ben Martin Tony Yates
153	Do changes in structural factors explain movements in the equilibrium rate of unemployment? *(April 2002)*	Vincenzo Cassino Richard Thornton
154	A monetary model of factor utilisation *(April 2002)*	Katharine S Neiss Evi Pappa
155	Monetary policy and stagflation in the UK *(May 2002)*	Edward Nelson Kalin Nikolov
156	Equilibrium exchange rates and supply-side performance *(June 2002)*	Gianluca Benigno Christoph Thoenissen
157	Financial liberalisation and consumers' expenditure: 'FLIB' re-examined *(July 2002)*	Emilio Fernandez-Corugedo Simon Price
158	Soft liquidity constraints and precautionary saving *(July 2002)*	Emilio Fernandez-Corugedo
159	The implications of an ageing population for the UK economy *(July 2002)*	Garry Young
160	On gross worker flows in the United Kingdom: evidence from the Labour Force Survey *(July 2002)*	Brian Bell James Smith
161	Regulatory and 'economic' solvency standards for internationally active banks *(August 2002)*	Patricia Jackson William Perraudin Victoria Saporta
162	Factor utilisation and productivity estimates for the United Kingdom *(August 2002)*	Jens Larsen Katharine Neiss Fergal Shortall
163	Productivity versus welfare: or, GDP versus Weitzman's NDP *(August 2002)*	Nicholas Oulton
164	Understanding UK inflation: the role of openness *(September 2002)*	Ravi Balakrishnan J David López-Salido
165	Committees versus individuals: an experimental analysis of monetary policy decision-making *(September 2002)*	Clare Lombardelli James Proudman James Talbot
166	The role of corporate balance sheets and bank lending policies in a financial accelerator framework *(September 2002)*	Simon Hall Anne Vila Wetherilt
167	The role of short-run inflation targets and forecasts in disinflation *(October 2002)*	Lavan Mahadeva Gabriel Sterne
168	Financial pressure and balance sheet adjustment by UK firms *(October 2002)*	Andrew Benito Garry Young

External MPC Unit discussion papers

The MPC Unit discussion paper series reports on research carried out by, or under supervision of, the external members of the Monetary Policy Committee. Papers are available from the Bank's web site 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
7	The future of macroeconomic policy in the European Union *(February 2002)*	Christopher Allsopp
8	Too much too soon: instability and indeterminacy with forward-looking rules *(March 2002)*	Nicoletta Batini Joseph Pearlman
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

Monetary and Financial Statistics

Monetary and Financial Statistics (Bankstats) contains detailed information on money and lending, monetary and financial institutions' balance sheets, analyses of bank deposits and lending, international business of banks, public sector debt, money markets, issues of securities and short-term paper, interest and exchange rates, explanatory notes to tables, and occasional related articles. Bankstats is published quarterly in paper form, priced at £60 per annum in the United Kingdom (four issues). It is also available monthly free of charge from the Bank's web site 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; e-mail 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 web site at www.bankofengland.co.uk/mfsd/article

Title	Author	Month of issue	Page numbers
Compilation methods of the components of broad money and its balance sheet counterparts	Karen Westley Stefan Brunken	October 2002	6–16
Assessing the reliability of monetary statistics	Chris Wright	October 2002	1–5
Economic activity of bank holding companies	Michelle Rowe	July 2002	3–5
Development of euro business of banks in the European Union	Richard Walton	July 2002	1–2

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 policy-makers 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.

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.

Economic models at the Bank of England

The *Economic models at the Bank of England* book, published in April 1999, contains details of the economic modelling tools that help the Monetary Policy Committee in its work. The price of the book is £10.00. An update was published in September 2000 and is available free of charge.

Quarterly Bulletin

The *Quarterly Bulletin* provides regular commentary on market developments and UK monetary policy operations. It also contains research and analysis and reports on a wide range of topical economic and financial issues, both domestic and international.

Back issues of the *Quarterly Bulletin* from 1981 are available for sale. Summary pages of the *Bulletin* from February 1994, giving a brief description of each of the articles, are available on the Bank's web site at www.bankofengland.co.uk/bulletin/index.html

The *Bulletin* is also available from ProQuest Information and Learning: enquiries from customers in Japan and North and South America should be addressed to ProQuest Information and Learning, 300 North Zeeb Road, Ann Arbor, Michigan 48106, United States of America; customers from all other countries should apply to The Quorum, Barnwell Road, Cambridge, CB5 8SW, telephone 01223 215512.

An index of the *Quarterly Bulletin* is also available to customers free of charge. It is produced annually, and lists alphabetically terms used in the *Bulletin* and articles written by named authors.

Bound volumes of the *Quarterly Bulletin* for the period 1960–85 (in reprint form for the period 1960–85) can be obtained from Schmidt Periodicals GmbH, Ortsteil Dettendorf, D-83075 Bad Feilnbach, Germany, at a price of €105 per volume or €2,510 per set.

Inflation Report

The Bank's quarterly *Inflation Report* sets out the detailed economic analysis and inflation projections on which the Bank's Monetary Policy Committee bases its interest rate decisions, and presents an assessment of the prospects for UK inflation over the following two years.

The *Report* starts with an overview of economic developments; this is followed by six sections:

- analysis of money, credit and financial market data, including the exchange rate;
- 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 (previously published as part of the *Inflation Report*) now appear as a separate publication on the same day as the *Report*.

Publication dates

From 2003, copies of the *Quarterly Bulletin* and *Inflation Report* can be bought separately, or as a combined package for a discounted rate. Current prices are shown overleaf. Publication dates for 2003 are as follows:

Quarterly Bulletin		*Inflation Report*	
Spring	21 March	February	12 February
Summer	20 June	May	15 May
Autumn	26 September	August	13 August
Winter	19 December	November	12 November

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*Students, **UK only***	*£9.00*	*£2.50*	*£7.00*	*£2.00*	*£3.50*	*£1.00*
European countries including the Republic of Ireland, by letter service	£33.00	£9.00	£25.00	£7.00	£13.00	£4.00
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(1) Subscribers who wish to collect their copy(ies) of the *Bulletin* and/or *Inflation Report* may make arrangements to do so by writing to the address given below. Copies will be available to personal callers at the Bank from 10.30 am on the day of issue and from 8.30 am on the following day.
(2) All countries other than those in Zone 2.
(3) Australasia, Japan, People's Republic of China, the Philippines and Korea.

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