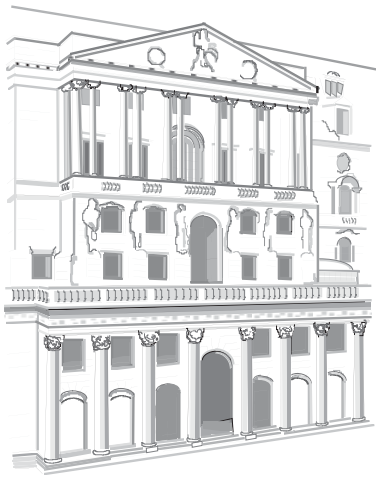
Bank of England Quarterly Bulletin



August 2000

Volume 40 Number 3

Bank of England Quarterly Bulletin

August 2000

Volume 40 Number 3

Printed by Park Communications

ISSN 0005-5166

The Quarterly Bulletin and Inflation Report

Inflation Report
(published separately)

The *Inflation Report* reviews developments in the UK economy and assesses the outlook for UK inflation over the next two years in relation to the inflation target. The *Report* starts with a short overview section. The following four sections analyse developments in money and financial markets, demand and output, the labour market, and costs and prices respectively. The concluding sections present a summary of monetary policy since the May *Report* and an assessment of inflation prospects and risks. The *Bank of England Agents' Summary of Business Conditions* is appended to the *Report*. Minutes of recent Monetary Policy Committee meetings are attached as an annex.

Markets and operations
(pages 217–32)

This article reviews developments in international and domestic financial markets, drawing on discussions with the Bank of England's market contacts, and describes the Bank's market operations in the period 31 March to 7 July 2000. Official interest rates were raised in the euro area and the United States by 75 and 50 basis points respectively during the review period, and were left unchanged in the United Kingdom. At the same time, short-term interest rate expectations for 2000 and 2001 were revised up by almost 50 basis points in the euro area, but were lowered by around 20 and 50 basis points in the United States and United Kingdom respectively. Uncertainty about the outlook for short-term interest rates appears to have lessened; an increasing number of market participants believe that the peak in the US and UK interest rate cycles is fairly close at hand. The US and UK government bond yield curves became less inverted and euro-area yield curves became flatter during the review period; long bond yields were little changed. World equity markets remained volatile, largely as a result of further significant changes in IT-related share prices in April and May. Tentative signs of a change in sentiment towards both sterling and the euro emerged, with the former depreciating and the latter appreciating over the period.

The international environment
(pages 233–46)

This article discusses developments in the international environment since the May 2000 *Quarterly Bulletin*, as well as the outlook for inflation and output over the next two years. World GDP is estimated to have grown by 1.4% in the first quarter, an acceleration from 1.1% in the last quarter of 1999. But world industrial production growth has slowed since February 2000; growth rates have remained stable and high in the major economies, but, although still high, have fallen somewhat in the emerging market economies since the beginning of the year. In the United States, GDP grew strongly in Q1 and Q2, albeit at a slower pace than in the preceding quarters. In the euro area, GDP growth was faster in Q1 than in the final quarter of 1999 and growth strengthened in Germany and Italy. The Japanese economy grew at a quarterly rate of 2.4% in the first quarter, after a fall in measured output in the previous quarter. Oil price volatility has been high, reflecting uncertainties about the future balance of demand and supply. There have been signs of a renewed pick-up in producer and consumer price inflation in response to the oil price increases from mid-April to June. Official interest rates in the United States and the euro area have increased further since the previous *Quarterly Bulletin*. Both the FOMC and the ECB raised their rates by 0.5 percentage points, to 6.5% and 4.25% respectively. The Bank of Japan has maintained the zero interest rate policy implemented in February 1999. Projections by external forecasters are for world GDP growth to rise by around 4.5% in 2000, the highest growth rate for a decade, and by approximately 4% in 2001. Since the previous *Quarterly Bulletin*, there have been upward revisions to forecasts for GDP growth in the United States and the euro area, while for some emerging market economies, especially in South East Asia, forecasts have been scaled down slightly. The balance of risks around most forecasts is little changed from three months ago, typically indicating a balance of risks on the downside, primarily for reasons linked to the possibility of asset markets falling.

Public sector debt: end-March 2000
(pages 247–56)

Public sector net debt fell by 2.8%, at nominal value, during the financial year to end-March 2000. This was the second successive annual reduction, following seven consecutive annual increases up to 1998. At end-March 2000 public sector net debt represented 36.6% of GDP, the lowest figure since 1994 and 3 percentage points lower than at end-March 1999. This article continues the annual series in the *Quarterly Bulletin* analysing the outstanding financial liabilities of the public sector. It discusses developments during the year, and considers the implications of the current level and structure of UK government debt.

Research and analysis
(pages 257–85)

Research work published by the Bank is intended to contribute to debate, and is not necessarily a statement of Bank policy.

Age structure and the UK unemployment rate (by Richard Barwell, formerly of the Bank's Structural Economic Analysis Division). The proportion of youths in the labour force has fallen dramatically in the past 15 years, following the collapse in the birth rate in the 1970s (the 'baby bust'). Youths always have higher unemployment rates than adults, so this change in the composition of the labour force may have contributed to a fall in the aggregate unemployment rate. Based on data from the Labour Force Survey, it appears that about 0.55 percentage points of the 5.65 percentage point fall in the UK unemployment rate between 1984 and 1998 can be accounted for by changes in the age structure of the labour force.

Financial market reactions to interest rate announcements and macroeconomic data releases (by Andrew Clare and Roger Courtenay of the Bank's Monetary Instruments and Markets Division). Reactions of financial prices to news contain information about market beliefs and expectations. This article looks at reactions of a selection of UK interest rate, equity and exchange rate contracts to macroeconomic data releases and interest rate changes before and after the Bank of England was granted operational independence in May 1997. We find some differences in the nature of the reactions in the two periods, and attempt to draw out the implications for market perceptions of monetary policy.

Common message standards for electronic commerce in wholesale financial markets (by Bob Hills of the Bank's Market Infrastructure Division). An important aspect of electronic commerce is the potential for market participants to automate transaction processing fully, from the point of trade to final settlement. Such 'straight-through processing' could make wholesale financial markets more efficient, and lower the costs and risks that participants face. But it requires participants to use common message standards to exchange transaction data electronically. Several market-led initiatives to develop common standards have made substantial progress. But many trade messages are still sent by fax or using incompatible electronic networks, which means that different participants may have to re-input the same data manually at various points during the trade process. This article describes some of the initiatives to establish common standards. It then looks to economic theory to explain why market participants may find it difficult to co-ordinate to introduce a single standard, in spite of the wider benefits. It discusses how such technological changes may affect market structure. Finally, it considers whether some recent technologies, in particular eXtensible Markup Language (XML), may make it easier for market participants to adopt common standards.

The contents page, with links to the articles in PDF format, is available at www.bankofengland.co.uk/qb/a00qbcon.htm
The speeches contained in the *Bulletin* can be found at www.bankofengland.co.uk/speeches

Markets and operations

This article reviews developments in international and domestic financial markets, drawing on discussions with the Bank of England's market contacts, and describes the Bank's market operations in the period 31 March to 7 July 2000.

- *Official interest rates were raised in the euro area and the United States by 75 and 50 basis points respectively during the review period, and were left unchanged in the United Kingdom. At the same time, short-term interest rate expectations for 2000 and 2001 were revised up by almost 50 basis points in the euro area, but were lowered by around 20 and 50 basis points in the United States and United Kingdom respectively.*

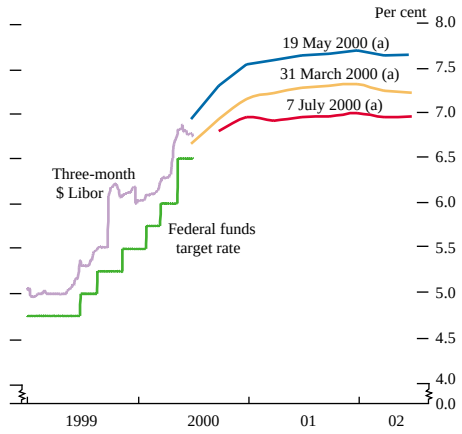
- *Uncertainty about the outlook for short-term interest rates appears to have lessened; an increasing number of market participants believe that the peak in the US and UK interest rate cycles is fairly close at hand.*

- *The US and UK government bond yield curves became less inverted and euro-area yield curves became flatter during the review period; long bond yields were little changed.*

- *World equity markets remained volatile, largely as a result of further significant changes in IT-related share prices in April and May.*

- *Tentative signs of a change in sentiment towards both sterling and the euro emerged, with the former depreciating and the latter appreciating over the period.*

Chart 1
US interest rates



Source: Bloomberg.

(a) Interest rates implied by eurodollar futures contracts at the dates specified. From July 2000 onwards, the x-axis relates to contract expiry dates.

International markets

Short-term interest rates

US short-term interest rate expectations rose through the first six weeks of Q2 and then fell back during the rest of the review period. Yields derived from eurodollar futures contracts expiring between 2000 and 2002 ended the period around 20–30 basis points lower (see Chart 1). Federal funds futures contracts followed a similar path. On 7 July, both of these futures markets implied an expectation that the Federal funds target rate would be increased to almost $6^{3}/_{4}$% by December 2000, and would remain unchanged throughout 2001–02. The Federal Open Market Committee's (FOMC) decision on 16 May to raise its target rate by 50 basis points to $6^{1}/_{2}$% was widely expected by the market, owing to stronger-than-expected activity and inflation data at the end of April and in early May. The money markets were also largely unmoved following the announcement on 28 June of the decision not to change rates.

After the FOMC's May meeting, a series of weaker-than-expected data releases led to a decline in short-term interest rate expectations through most of the remainder of the period. In particular, rates implied by the December 2000 contract fell by more than 40 basis points between 30 May and 5 June; this was initiated by weaker-than-expected labour market data and a

Table A
Forecasts for GDP growth in 2000 and 2001

Per cent; *percentage points in italics*

	2000			2001		
	April	July	Change	April	July	Change
United States	4.6	4.8	*0.2*	3.1	3.1	*0.0*
Japan	1.0	1.5	*0.5*	1.5	1.6	*0.1*
Euro area	3.2	3.4	*0.2*	3.0	3.2	*0.2*
United Kingdom	3.2	3.0	*-0.2*	2.7	2.6	*-0.1*

Source: Consensus Economics.

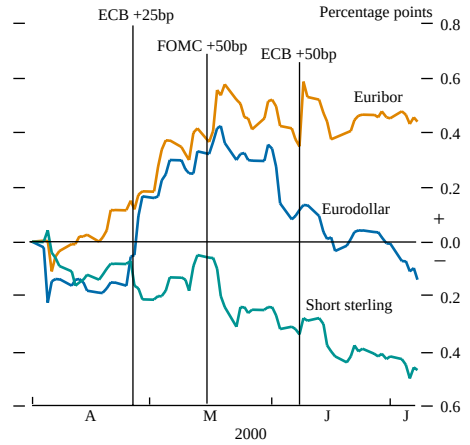
Table B
Forecasts for inflation in 2000 and 2001

Per cent; *percentage points in italics*

	2000			2001		
	April	July	Change	April	July	Change
United States	2.8	3.2	*0.4*	2.5	2.6	*0.1*
Japan	-0.2	-0.4	*-0.2*	0.1	0.0	*-0.1*
Euro area	1.7	1.9	*0.2*	1.6	1.7	*0.1*
United Kingdom	2.0	2.0	*0.0*	2.3	2.4	*0.1*

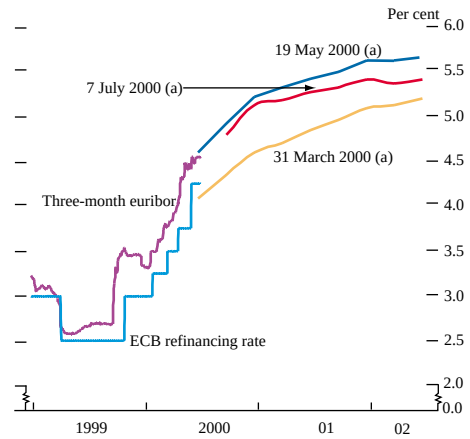
Source: Consensus Economics.

Chart 2
Cumulative changes in September 2000 futures rates since 31 March



Source: Bloomberg.

Chart 3
Euro-area interest rates



Source: Bloomberg.

(a) Interest rates implied by euribor futures contracts at the dates specified. From July 2000 onwards, the x-axis relates to contract expiry dates.

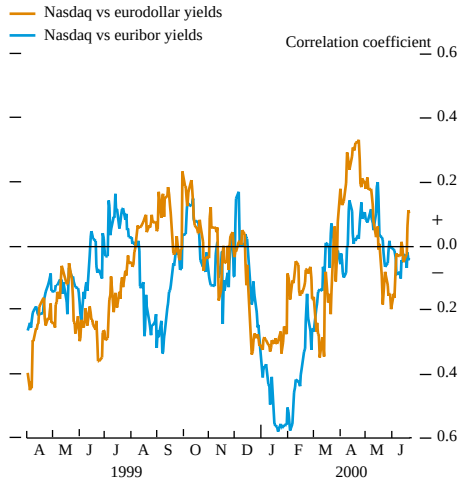
larger-than-expected fall in the National Association of Purchasing Managers' survey index. Nevertheless, over the period as a whole, most forecasters revised up their projections for GDP growth and inflation in 2000 (see Tables A and B). The 50 basis points increase in the Federal funds rate appears, therefore, to have increased the markets' belief that growth will slow, and that inflation will fall back to around 2½% in 2001.

During the first half of the period, implied interest rates from euribor futures contracts increased broadly in parallel with eurodollar futures, supported by the European Central Bank's (ECB) decision to raise its refinancing rate by 25 basis points on 27 April. But this link ended in mid-May. Thereafter, euribor contracts remained broadly unchanged, while eurodollar yields tended to decline (see Chart 2). Yields implied by euribor futures contracts expiring between 2000 and 2001 ended the period 30–55 basis points higher. Most commentators expected the ECB to raise its refinancing rate in June, in the light of evidence of rising euro-area inflationary pressures, price risks from higher oil prices and the weak euro, and stronger expectations for growth in 2000 and 2001 (see Tables A and B). But the consensus expectation was that the ECB would raise interest rates by only 25 basis points. Consequently, on 8 June, when the ECB increased its refinancing rate by 50 basis points to 4.25%, euribor rates immediately rose by 16–25 basis points. On 7 July, euribor futures contracts implied an expectation that the ECB refinancing rate would be increased to just under 5% by the end of 2000 (see Chart 3).

Some commentators argued that the Nasdaq composite equity price index was a significant influence on both US and euro-area interest rate expectations in April. Correlations between changes in stock market levels and short-term interest rates had been negative earlier in the year, possibly because rises in the cost of borrowing are generally associated with downward revisions to the profit forecasts of listed companies. During April and May, by contrast, correlations between daily changes in the Nasdaq and implied rates from eurodollar and euribor contracts were positive—falls in the Nasdaq possibly prompted downward revisions to assessments of consumers' wealth and an associated reduction in interest rate expectations. Nonetheless, the overall magnitude of this effect appears to have been relatively modest (see Chart 4). In particular, despite a 25% decline in the Nasdaq between 7 and 14 April, interest rates derived from eurodollar contracts fell by only 4–9 basis points. It seems likely, therefore, that the co-movements in US and European interest rate expectations in the first half of the period were more the result of the co-incidence of stronger-than-expected activity and inflation indicators in both regions.

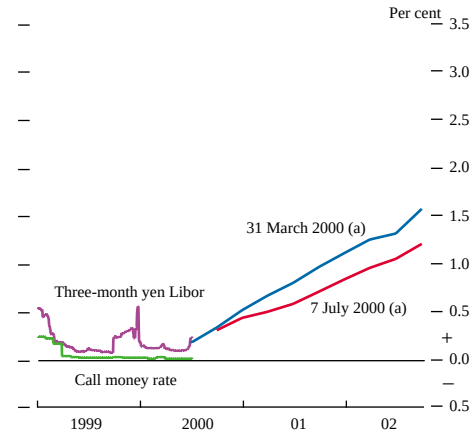
On 8 June, the ECB announced that it would begin to conduct its weekly refinancing operations using variable-rate rather than fixed-rate tenders. In a variable-rate tender banks bid for liquidity specifying both the amount of lending that they seek and the interest rate that they are prepared to pay. Successful banks then pay the interest rate that they bid. The ECB stressed that this was 'not intended as a further change in the monetary policy stance', but was designed to curb overbidding in the ECB's operations. Early evidence suggested that the change was successful, as overbidding did moderate. The euribor futures market broadly anticipated this technical change and so reacted little to the 7 basis

Chart 4
Correlations between the Nasdaq and short-term interest rate expectations(a)



(a) 30-day rolling correlation coefficients between daily changes in the Nasdaq and the front eurodollar and euribor futures contracts.

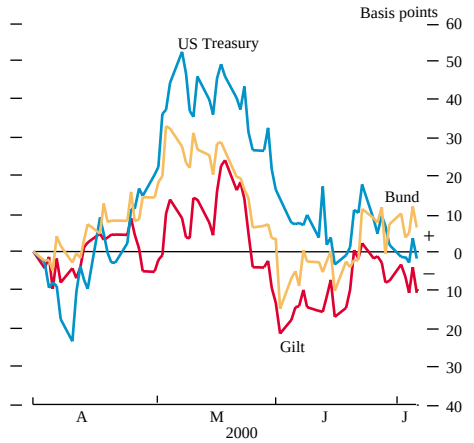
Chart 5
Japanese interest rates



Source: Bloomberg.

(a) Interest rates implied by euroyen futures contracts at the dates specified. From July 2000 onwards, the x-axis relates to contract expiry dates.

Chart 6
Cumulative changes in ten-year bond yields(a) since 31 March



(a) Zero-coupon spot yields derived using the VRP (UK/US) and Svensson (Germany) curve-fitting techniques. For further details on these techniques see Anderson and Sleath, 'New estimates of the UK real and nominal yield curve', *Quarterly Bulletin*, November 1999, pages 384–92.

point rise from the previously fixed base rate to the weighted average of the various allotted rates that resulted from the first variable-rate tender on 27 June.

Short-term interest rate expectations in Japan fell marginally during the review period (see Chart 5). This largely reflected downward revisions to inflation forecasts, following negative and lower-than-expected inflation data. However, Tibor rates rose at the very short end, as speculation grew about the ending of the zero interest rate policy following upward revisions to projections for GDP growth in 2000 and the re-election of the LDP-led coalition on 25 June.

Interest rate uncertainty, as measured by the prices of options contracts settling on euribor and eurodollar futures, appears to have fallen during the period. However, exact measures of uncertainty about the outlook for interest rates are difficult to ascertain, due to the changing horizons of options contracts and the importance of technical factors in determining their price. Nevertheless, economists' views of the future path of interest rates have also indicated reduced uncertainty—for instance, the distribution of views about the peak in euro-area official rates during this cycle, as measured by Reuters, narrowed by 75 basis points over the period.(1)

Long-term interest rates

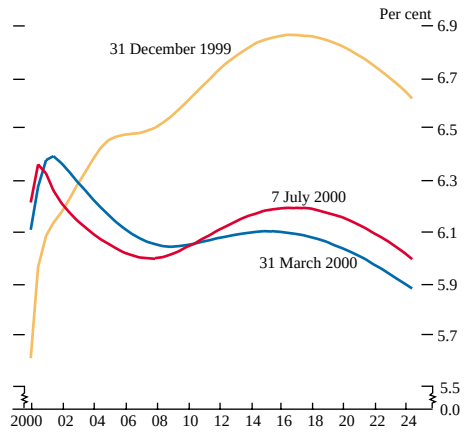
Correlations between movements in international bond markets fell in Q2 at both short and longer maturities. While the declining net supply of government bonds was a common theme in both the United States and Europe, the timing and relative sizes of such supply-related changes differed between the two regions. In Japan, by contrast, net government bond issuance continued to rise. Moreover, there was some evidence that the relative cyclical positions of the regions may have changed over the quarter as the United States showed tentative signs of a slowdown and Europe appeared to be growing faster than previously forecast.

US Treasury yields rose by around 50 basis points in the five weeks to 8 May, and gradually fell back again thereafter (see Chart 6). The yield on the ten-year Treasury bond ended the period almost unchanged, at 6%; yield changes during the period were very similar to those of eurodollar futures—both markets reacted to news about activity and inflation in broadly the same way.

Having inverted sharply in Q1, the US Treasury curve disinverted slightly in Q2 (see Chart 7): the yield spread between the two-year Treasury note and the 30-year Treasury bond fell from around 65 basis points at the end of March to around 55 basis points on 7 July. Technical factors may have contributed to this movement. In particular, a number of market participants, who had sought to take advantage of the earlier inversion trend by selling shorter-maturity Treasuries and buying longer-maturity Treasuries, appear to have unwound some of these trades and taken profits in Q2. In the light of strong cash flow, the US Treasury continued its debt buy-back programme—$13 billion of government debt dated between 2015 and 2025 was redeemed early during the period—and

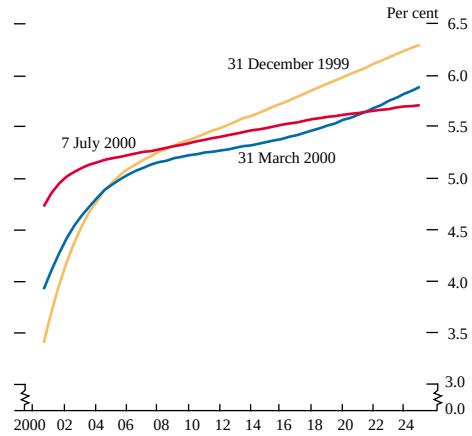
(1) Measured by the difference between the highest and lowest forecasts of a sample of 30 economists.

Chart 7
US Treasury zero-coupon yield curve(a)



(a) Derived using the Bank of England's VRP curve-fitting technique.

Chart 8
German zero-coupon yield curve(a)



(a) Derived using the Svensson curve-fitting technique.

Table C
International equity market performance

Percentage changes from previous period, in local currencies

	1999	2000	
	Year	Q1	Q2 (a)
United States			
S&P 500	19.5	3.0	-1.3
Wilshire 5000	22.1	4.3	-3.1
Europe			
CAC 40	51.1	6.2	4.5
DAX 30	39.1	13.4	-7.2
FTSE All-Share	21.3	-4.1	-0.2
FTSE 100	17.8	-5.6	-0.7
Japan			
Topix	58.4	-0.9	-6.4
IT indices			
Nasdaq Composite	85.6	10.7	-12.0
FTSE Techmark 100	56.1 (b)	14.6	-20.4
Neuer Markt	66.2	41.9	-18.9
Nouveau Marche	135.3	73.3	-30.3

Source: Bloomberg.

(a) From 31 March–7 July.
(b) For the period 4 November–30 December. The Techmark index began on 4 November 1999; earlier data are not available.

there was increasing speculation that the US Treasury would reduce issuance of shorter-dated securities, such as the two-year note and the one-year bill. These factors were supported by news that the budget surplus for the current year would be higher than previously expected, and by President Clinton's announcement on 26 June that the outstanding stock of government debt would consequently be paid off by 2012, a year earlier than previously thought.

Euro-area bond yields generally rose during the period, with the biggest changes at the short end. Two-year German bund yields rose by more than 50 basis points, to 4.99%, while the yield on the ten-year bund rose by around 5 basis points, and yields at the long end fell slightly. As a result, the German government yield curve continued to flatten during the period (see Chart 8). Other euro-area government bonds moved broadly in line with bunds, though spreads against German government bonds narrowed slightly at most maturities.

At the short end of the curve, stronger-than-expected economic data and the continued weakness of the euro in the first half of the period fuelled speculation that the ECB would have to raise rates further. In contrast, longer-dated yields were more influenced by considerations relating to the future supply of bonds. In particular, the sale of licences for the Universal Mobile Telecommunications Systems (UMTS) was expected to generate additional revenues, thereby reducing the need for German government borrowing. On 21 June, the Bundesbank surprised the market by announcing that the German government would not issue any 30-year bunds in Q3. It also announced that it would use the UMTS proceeds to buy back up to €33 billion of the Ausgleichsfonds-Währungsumstellung floating-rate note, which had been issued to East German banks on unification.

Japanese government bond yields were little changed over the period, with yields at all maturities restricted to movements within a narrow range. The Lower House election results on 25 June were in line with bond market expectations and had little effect on the yield curve.

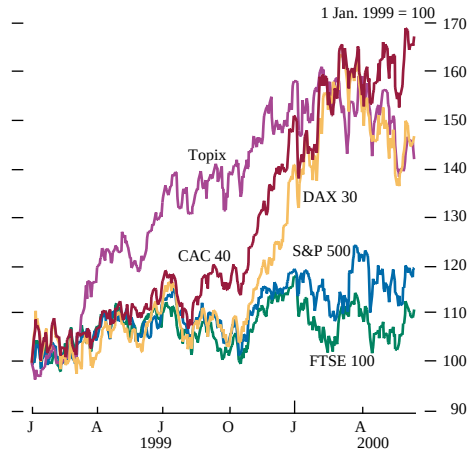
International equity market developments

Most of the major equity market indices fell between 31 March and 7 July (see Table C and Chart 9), and prices remained volatile. The FTSE All-Share, Wilshire 5000 (the broadest index for the US equity market), and the German DAX indices all fell, while the French CAC index rose. On 7 July, the FTSE 100 index stood at 6,497, 0.7% below its level at the end of March. Technology indices in the United Kingdom, United States, France and Germany fell by between 10% and 30% during the period, reflecting increased uncertainty about the appropriate value of 'new economy' stocks.

Correlations between the major equity markets generally rose in Q2. This largely reflected the strong correlations between the movements in technology-related stocks in the various equity markets.

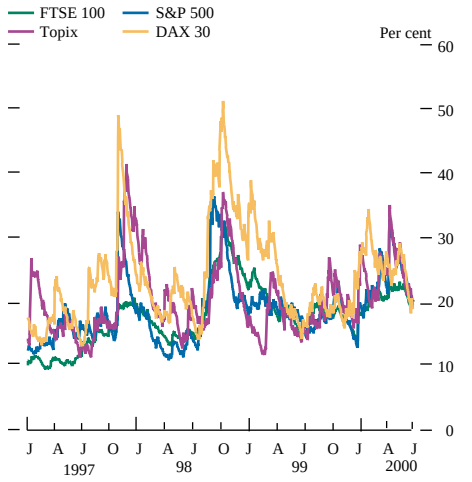
The volatility of equity markets increased in April, and, as noted above, appears to have had a small impact on interest rate expectations. However, markets were calmer in June (see

Chart 9
Selected world equity indices



Source: Primark Datastream.

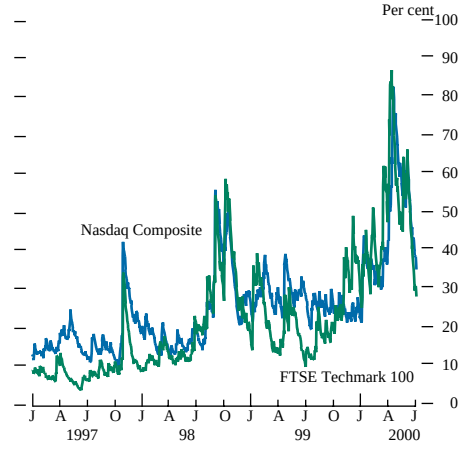
Chart 10
Volatility of international equity indices(a)



Source: Primark Datastream.

(a) Volatility calculated as 252-day rolling exponentially weighted moving averages.

Chart 11
Volatility of technology indices(a)



Source: Primark Datastream.

(a) Volatility calculated as 252-day rolling exponentially weighted moving averages.

Chart 10). Nonetheless, in the first half of the period technology stocks remained particularly volatile. The variance of the technology-heavy Nasdaq Composite index rose to record levels in mid-April (see Chart 11); the index saw the second-largest daily percentage price fall of its 29-year history on 14 April. In financial markets, unusually large price falls are sometimes followed by similarly large price rises. Such reversals occurred in Q2—the Nasdaq index recorded strong price increases in April and May, and its largest-ever daily percentage price rise on 30 May of more than 7½%. The volatility of the United Kingdom's FTSE Techmark index generally moved in parallel with the Nasdaq.

In the United States, the higher volatility of technology stocks spilled over into the broader equity indices. In April, the volatility of the S&P 500 index was similar to that observed at the time of the Russian debt default and the near-failure of Long Term Capital Management in September 1998 (see Chart 10). By contrast, the FTSE was much less affected; though the volatility of the FTSE 100 increased during the period, it remained well below previous record levels.

Looking ahead, investors remain more uncertain about the nature and direction of further price movements in high-technology indices than in broader measures. Implied volatilities derived from options contracts on the Nasdaq index rose to record levels in April. Uncertainty has diminished since then, but remains at relatively high levels by historical standards. In contrast, implied volatilities derived from options contracts on the S&P 500 and the FTSE 100 have remained fairly stable. Skewness—which tends to be negative, as options are more frequently used for hedging downside rather than upside risks—has become less negative, which suggests diminished fears of further sharp falls in share prices.

Foreign exchange markets

Over the period, sterling was the most volatile of the major currencies. Its trade-weighted exchange rate index (ERI) rose by 3.6% between 31 March and its 3 May peak, before depreciating sharply to end the period 4% lower than at the start (see Chart 12). In contrast to sterling, the US dollar and the euro appreciated in ERI terms over the period, by 2.9% and 1.6% respectively; the yen effective exchange rate index fell by 4.2%.

Sterling depreciated by around 5% against the dollar and by around 4% against the euro during the period. Reflecting these movements, the sterling ERI fell back to its trading range of the second half of 1999 (see Chart 13). However, the profile of exchange rate changes against these two currencies was somewhat different within the period (see Chart 14). Sterling's sharpest depreciation against both the dollar and the euro occurred between early May and mid-June, and coincided with a change of market sentiment towards the euro. During this interval the euro appreciated by 12% against sterling to £0.64 and by 9% against the dollar to $0.96. In contrast, the yen spent most of the period trading within a range of ¥105–¥110 against the dollar; fears of intervention by the Japanese authorities helped to prevent the yen from appreciating much beyond ¥105, while demand for yen due to the hedging activities of Japanese exporters helped to cap any depreciation.

Chart 12
Effective exchange rate indices

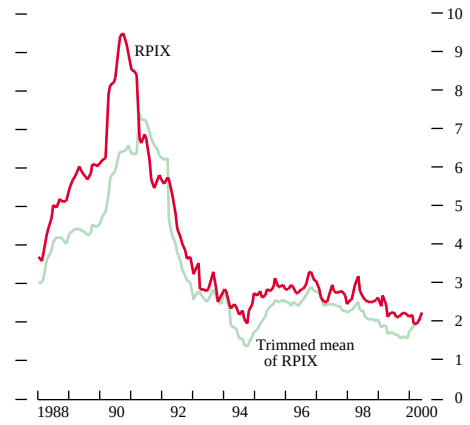


Chart 13
Sterling ERI

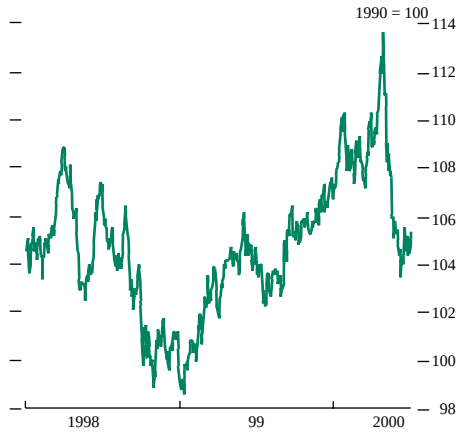
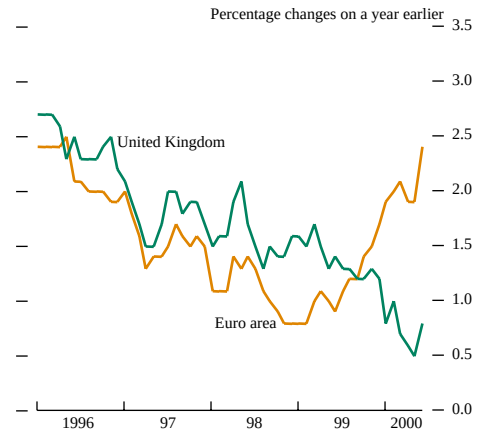


Chart 14
Sterling exchange rates



In Q2, the sterling-dollar exchange rate moved decisively out of the $1.60–$1.70 range in which it had traded during most of 1997–99 (see Chart 15). Market participants have suggested that this movement was linked to changes in perceptions about the growth prospects of the two economies. Estimates of both short-term and trend US GDP growth have been steadily revised up over the past year, whereas market estimates of UK trend growth have been little changed and forecasts of the United Kingdom's short-term growth prospects have been revised down in recent months (see Table A). However, other factors (see below) were also influential in determining the timing of sterling's sharp depreciation against the dollar in May. Elsewhere, upward revisions to euro-area growth forecasts for 2000 and 2001 were similar in magnitude to those of the United States, which may help to explain why the euro-dollar exchange rate ended the period broadly unchanged from its starting-level.

Market participants have commented that changes in short-term interest rates also appeared to have influenced exchange rate movements during the period. The widening in short-term interest rate differentials between the dollar and sterling, and the narrowing of short-term interest rate differentials between sterling and the euro, may help to explain sterling's depreciation against both currencies in Q2 (see Table D). In particular, the depreciation of sterling against the dollar occurred around the time of the MPC's 3 May decision to leave interest rates unchanged and the FOMC's 16 May decision to increase the Federal funds target rate by 50 basis points. As a result, official US interest rates rose above those in the United Kingdom. Furthermore, short-term US interest rates were expected to remain above comparable UK rates for a substantial period, for the first time since 1984. In contrast, however, it is difficult to rationalise movements in the euro-dollar exchange rate with reference to interest rate changes—despite a substantial narrowing in the US/euro-area short-term interest rate differential, the euro-dollar exchange rate ended the period broadly unchanged from its starting-point.

Economic theory suggests that interest rate differentials at all maturities should influence exchange rate movements. However, changes in longer-term interest rate differentials during the period (such as those derived from government bonds and the swaps markets) were not consistent with sterling's depreciation against the dollar and the euro; ten-year government bond yields in the United Kingdom actually rose slightly during the period while they fell in the United States and the euro area. Market participants' lack of focus on these interest rate differentials as an explanation for exchange rate movements may reflect the reduced liquidity of these markets. Changes in the supply of government bonds have tended to increase the volatility of bond prices, thereby raising the risk associated with cross-currency investment strategies using these instruments. Similarly, the volatility of UK swap rates has also increased, partly reflecting large corporate bond issuance from telecommunications companies (see Other sterling bond issues).

Market participants also cited technical factors as important influences on the timing of exchange rate movements in Q2. In particular, the sharp depreciation of sterling in the first half of May partly reflected sales related to mergers and acquisitions activity.

Chart 15
Sterling-dollar exchange rate

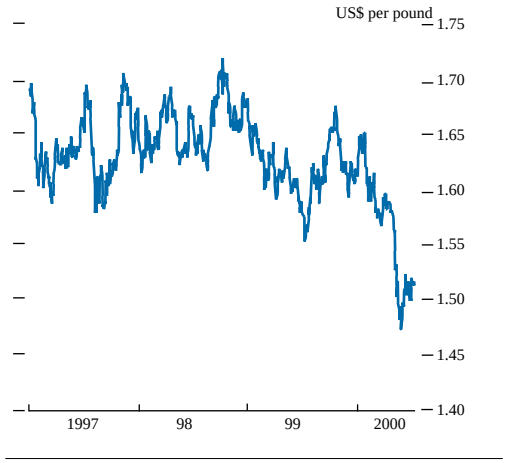
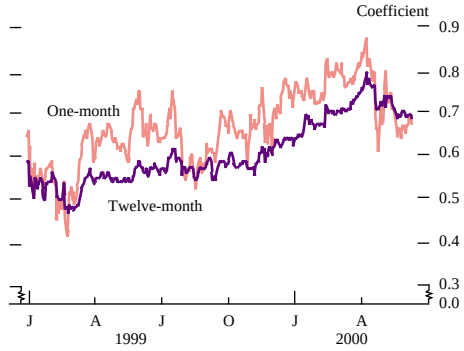


Table D
Expectations for three-month Libor interest rates in December 2000

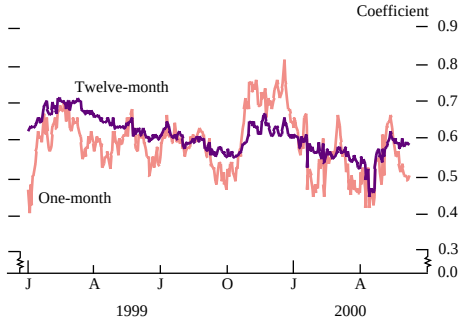
	Per cent		Change
	31 March 2000	7 July 2000	(basis points)
United States	7.16	6.95	-21
Japan	0.53	0.44	-9
Euro area	4.59	5.13	54
United Kingdom	6.92	6.36	-56

Source: Bloomberg.

Chart 16
(a) Implied correlations between euro-dollar and euro-sterling



(b) Implied correlations between sterling-dollar and euro-dollar



These flows were exacerbated by momentum traders—a group that have played a more influential role in foreign exchange markets over the past year—who started selling sterling after the initial depreciation. Momentum trading is also likely to have been a factor in the depreciation of the euro. By early May, the euro was increasingly seen as undervalued. Furthermore, many investors were reported to have been underweight in euro-denominated assets relative to their benchmark portfolio allocations. The change in sentiment towards the euro may have prompted them to increase their holdings of euro-denominated assets to return their portfolios closer to a balanced position.

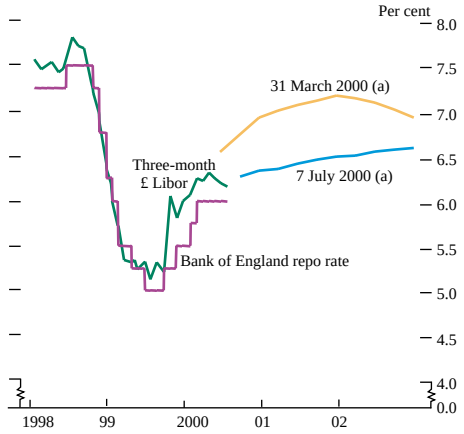
The fall in sterling against the dollar to its lowest level since February 1994 has led to some speculation about an ending of the relative stability of this exchange rate. Chart 16 shows implied correlations between euro-dollar and euro-sterling exchange rates and implied correlations between sterling-dollar and euro-dollar exchange rates. These correlations are derived from options markets and measure the extent to which market participants expect currencies to move together one month and twelve months ahead.(1) Chart 16(a) shows the degree to which markets expect the dollar and sterling to move against the euro. As can be seen, generally the relationship has been positive and fairly strong, suggesting that the dollar and sterling are expected to move together against the euro. However, the one-month implied correlation dipped sharply in late May, as the sterling-dollar exchange rate moved out of its 1997–99 trading range, and it has been quite volatile since then. The twelve-month correlation also declined during the period but generally remained above the one-month correlation, suggesting that market participants expected the dollar and sterling to move together more closely in the longer run than in the near term. This appears broadly consistent with a temporary decoupling of sterling from the dollar, as market participants adjusted their expectations about the sterling-dollar exchange rate to a new trading range.

Chart 16(b) shows implied correlations between sterling-dollar and euro-dollar and measures the extent to which sterling and the euro are expected to move together against the dollar. Since the start of the year, these correlations have generally been more volatile and smaller in magnitude than those between euro-dollar and euro-sterling. Taken together, the correlations in Charts 16(a) and 16(b) suggest that sterling is expected to be influenced by both the euro and the dollar exchange rates but with the dollar continuing to be a slightly more important factor.

In summary, tentative signs emerged of a change in sentiment towards sterling and the euro during the period, with the former depreciating and the latter appreciating. Market participants suggest that sterling's depreciations against the dollar and the euro in Q2 were influenced by movements in short-term interest rate differentials and revisions to growth expectations. Technical factors, such as momentum trading and exchange rate flows related to M&A activity, also appear to have influenced the timing of exchange rate movements. In contrast, however, changes in short-term interest rate differentials appear to have had little influence on movements in the euro-dollar exchange rate.

(1) See Butler, C and Cooper, N, 'Implied exchange rate correlations and market perceptions of European Monetary Union', *Quarterly Bulletin*, November 1997, pages 413–23.

Chart 17
UK interest rates



Sources: Bank of England and Bloomberg.

(a) Interest rates implied by short sterling futures contracts at the dates specified. From July 2000 onwards, the x-axis relates to contract expiry dates.

Recent developments relating to the currencies of the newly emerging market economies of Asia are discussed in the box opposite.

Sterling markets

Short-term interest rates

The MPC left the Bank's repo rate unchanged at 6% over the review period and short-term interest rate expectations for the rest of 2000 and 2001 fell quite sharply (see Chart 17). Ahead of the April MPC meeting, market expectations for the decision were balanced between no change and a 25 basis points rise, with a slight bias towards the former. A Reuters poll of economists conducted before the May meeting suggested that an average probability of 60% was attached to a 25 basis point rise in the Bank's repo rate. In both cases, rates implied by short sterling futures contracts fell by a few basis points immediately after the announcements. Market participants' uncertainty about the likely outcomes of the June and July meetings was considerably less, with the central expectation being no change in rates: Reuters polls ahead of the meetings suggested that the average probabilities attached to rates being left unchanged were 70% and 80% respectively.

Interest rates implied by short sterling futures contracts for dates in 2000 and 2001 fell by around 45–70 basis points over the review period. On 31 March, the futures market projected that three-month Libor would reach a peak of around 7¼% in December 2001; by 7 July the shape of the short sterling futures curve had become much flatter, with the market projecting Libor to rise to 6½% by 2002 (see Chart 17).

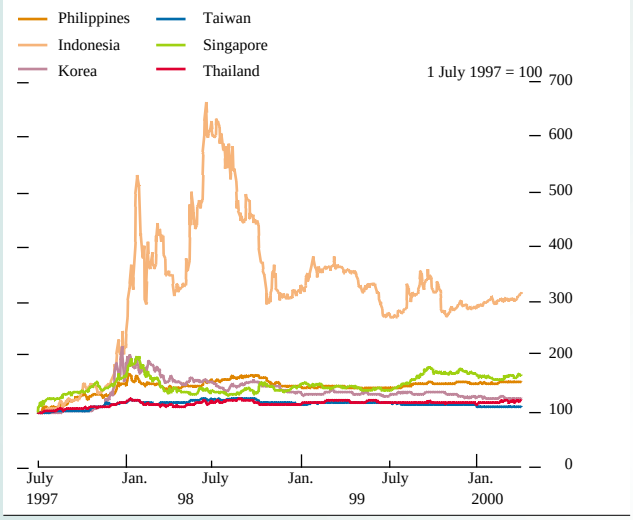
Much of the fall in interest rate expectations reflected weaker-than-anticipated domestic activity and inflation indicators, particularly in April and June. In April, this primarily reflected the weaker-than-expected industrial production and Q1 GDP data, monthly falls in house prices, the MPC's decision to leave rates unchanged, and survey evidence showing a decline in consumer and business confidence. The strength of sterling also contributed to lower interest rate expectations. During the first two weeks of May, short-term interest rate expectations increased, owing to stronger-than-expected UK industrial production and US labour market data and sterling's sharp depreciation. Sentiment then changed again, following the release of weaker-than-expected average earnings and retail sales data for March and April respectively. The publication of the MPC minutes also led to a decline in interest rate expectations—the minutes showed that the Committee had voted unanimously for no change in rates at the May meeting, whereas most market commentators had expected that some MPC members would have voted for a rate rise. UK short-term rate expectations continued to fall for most of the rest of the period.

Concerns about the inflationary impact of higher oil prices arose periodically but had little effect on interest rate expectations. International factors occasionally influenced UK rate expectations but their overall impact was somewhat smaller than usual. Revisions to consensus forecasts of GDP growth since April—downwards in the United Kingdom and upwards in the United States and euro area—help to explain why interest rate expectations

Asian currencies

Since January 1999, the exchange rates of the Asian emerging market economies have been relatively stable (see the chart) and have appeared to track movements in the US dollar more closely. What empirical evidence is there to substantiate this?

Asian exchange rates against the US dollar



The methodology outlined by Frankel and Wei (1994)(1) can be used to examine the relationship between the six regional currencies and the US dollar, Japanese yen and the Deutsche Mark (all in terms of the Swiss franc). Four arbitrary sample periods were chosen:
(a) pre-crisis: January 1995 to June 1997;
(b) crisis: July 1997 to December 1998;
(c) post-crisis 1: January 1999 to date; and
(d) post-crisis 2: January 2000 to date.

Post-crisis 1 was chosen on the basis of the first signs of economic recovery while post-crisis 2 only covers the first six months of this year, a period when the recoveries were more firmly established.

The results are shown in the table. Each entry represents the percentage change in the regional currency with respect to a 1% change in the major currency. For example, during the pre-crisis period, a 1% depreciation of the US dollar *vis-à-vis* the Swiss franc was typically associated with a 0.8% depreciation of the Singaporean dollar against the Swiss franc on the same day.

Regression results

	Pre-crisis Jan. 1995–June 1997	Crisis July 1997–Dec. 1998	Post-crisis 1 Jan. 1999–July 2000	Post-crisis 2 Jan. 2000–July 2000
Thai baht				
US$	0.91 (a)	0.75 (a)	0.89 (a)	0.83 (a)
Yen	0.14 (a)	0.34 (a)	0.09 (a)	0.13 (a)
Indonesian rupiah				
US$	1.00 (a)	0.77 (a)	0.94 (a)	0.88 (a)
Yen	-0.11	0.38 (a)	0.24 (a)	0.17
Korean won				
US$	1.02 (a)	1.11 (a)	0.98 (a)	0.96 (a)
Yen	0.02	0.16	0.08 (a)	0.08
Philippine peso				
US$	1.00 (a)	0.84 (a)	0.98 (a)	0.99 (a)
Yen	-0.02	0.29 (a)	0.04	0.04
Taiwanese dollar				
US$	0.99 (a)	0.93 (a)	0.98 (a)	1.01 (a)
Yen	0.05	0.06 (a)	0.00	-0.05
Singaporean dollar				
US$	0.80 (a)	0.65 (a)	0.82 (a)	0.79 (a)
Yen	0.11 (a)	0.36 (a)	0.13 (a)	0.16 (a)
DM	0.14 (a)	0.25 (a)	0.07	0.00

(a) Significant at the 95% level.

In the pre-crisis period, Thailand and Singapore operated a currency basket system, while the other countries' currencies were more tightly linked to the US dollar. But even in the case of Singapore, the weight of the US dollar in the basket (or the elasticity) was as high as 0.8. During the crisis, the behaviour of the regional currencies, apart from the Korean won and Taiwanese dollar, was more flexible; the elasticity with respect to the yen typically rose to around 30%. However, the pattern has changed since the beginning of 1999 with an increased weight for the US dollar for all the currencies studied. In particular, the Taiwanese dollar, the Philippine peso and the Korean won now appear to follow movements in the US dollar very closely.

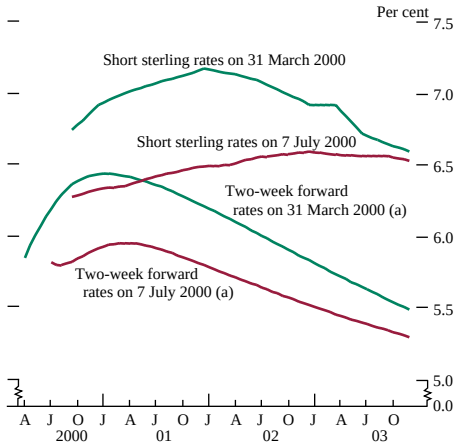
There is little difference between the results in the two post-crisis periods. Both suggest that movements in the regional currencies have reverted to a closer association with the US dollar.

(1) Frankel, J and Wei, S J (1994), 'Yen bloc or dollar bloc? Exchange rate policies in the East Asian economies', in *Macroeconomic linkage: savings, exchange rates, and capital flows*, University of Chicago Press.

fell by more in the United Kingdom than elsewhere (see Table D and Chart 2).

Other measures of expectations for the future path of short-term interest rates include forward rates derived from the gilts market and the overnight interest rate swaps market, as well as survey-based indicators. There are some differences between these measures: futures contracts settle against three-month Libor; surveys are typically based on the Bank's two-week repo rate; the

Chart 18
Short sterling and two-week gilt forward curves



Sources: Bank of England and Bloomberg.

(a) Derived from GC repo rates and conventional gilt yields.

Table E
Summary of interest rate expectations (selected dates)

Per cent

	5 Jan.	30 Mar.	30 June
Dec. 2000			
Short sterling (a)	7.13	6.69	6.19
Forward gilt yield (b)	6.82	6.59	6.16
Poll of economists (c)	6.32	6.43	6.24
Overnight interest rate swaps (d)	6.94	6.64	6.00
Peak			
Short sterling (a)	7.22 Dec. 2001	6.69 Dec. 2001	6.42 Dec. 2002
Forward gilt yield (b)	6.85 2001 Q1	6.59 2001 Q1	6.20 2001 Q2
Poll of economists (c)	6.52 2000 Q3/4	6.52 2000 Q3/4	6.34 2000 Q4

Sources: Bloomberg, Reuters and Bank of England.

(a) Implied three-month Libor rate, adjusted for typical difference between three-month Libor rate and the Bank of England's repo rate.
(b) Implied two-week forward rates, adjusted for typical difference between gilt repo rates and the Bank's repo rate.
(c) Mean expectation for Bank's repo rate.
(d) Implied overnight interest rate.

two-week forward rate that the Bank derives from the gilt market most closely approximates two-week general collateral (GC) repo rates;(1) and the expectation derived from the overnight interest rate swap market is a daily rate.(2)

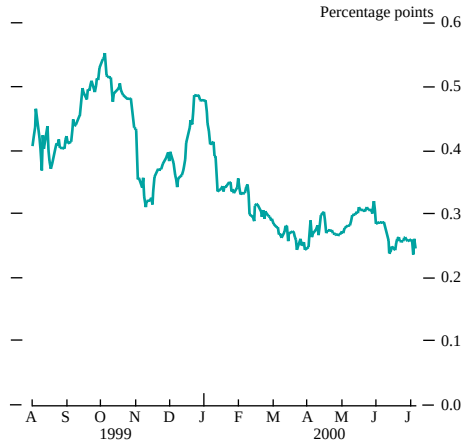
Interest rate expectations derived from each of these measures fell over the review period (see Chart 18 and Table E). In addition, there was a further convergence of the rates implied by futures contracts toward the rates implied by the other three measures. The main factor that contributed towards this is likely to have been hedging activity, which often occurs in the short sterling market rather more than in other markets. As interest rate expectations declined, market participants saw less need to hedge against the risk of higher interest rates by selling futures contracts against their holdings of other assets, such as bonds. The *ex ante* supply of futures contracts therefore fell, causing their price to rise and the interest rates derived from these contracts to fall.

In addition, market participants typically only use the front short sterling contracts, which are the most liquid, to speculate on the future course of interest rates. These contracts are more likely to represent genuine market views about interest rate expectations than futures contracts with a longer maturity. Liquidity in these longer-term contracts has fallen since the financial market turbulence of late 1998, and their rates tend to be influenced to a much greater extent by hedging activity, so they give less information about 'true' market interest rate expectations. Consequently, the short sterling futures curve will tend to give a more reliable indication of the expected peak in rates as the date of the peak draws nearer. On 7 July, futures rates suggested that the peak in rates would arrive by mid-2002. At this maturity, futures contracts are likely to be more influenced by hedging activity, suggesting that survey evidence and gilt forward rates may give a better indication of the level and timing of the expected peak in short-term interest rates. Gilt forward rates and the survey of economists indicated an expected peak in the Bank's repo rate of around 6¼%,(3) though the timing of this peak differed—gilt forwards pointed to a peak in rates in April next year, whereas the Reuters poll suggested a peak at the end of this year.

In addition to the fall in interest rate expectations, there was also a decline in interest rate uncertainty over the review period. Chart 19 shows the implied standard deviation (a measure of market uncertainty derived from the prices of options contracts) of short sterling futures contracts three months ahead, on a constant-horizon basis.(4) The relatively high level of uncertainty in December last year was related to concerns about the century date change, though

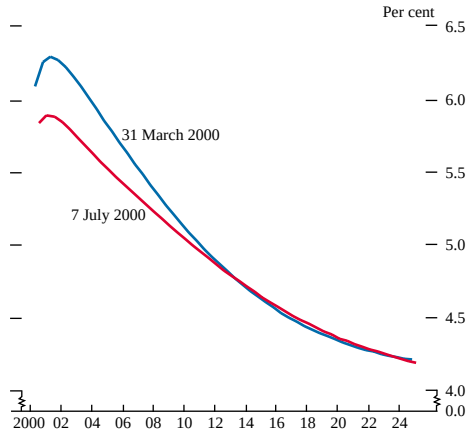
(1) GC repo typically trades at rates slightly below the Bank's repo rate, mainly because the Bank accepts a wider pool of collateral than just gilts in its money market operations, and also allows subsitutions of collateral.
(2) Typically the overnight rate varies around the Bank's repo rate. The floating leg of the swap is calculated by taking a one-month average of the overnight rate, one month from when the swap begins.
(3) Gilt forwards have been adjusted here to reflect the typical difference between GC repo rates and the Bank repo rate. On average, the two-week GC repo rate trades at around 15 basis points below the Bank's repo rate.
(4) Short sterling options contracts have fixed expiry dates corresponding to the maturity of the underlying futures contracts. This feature can make comparing volatility over time difficult, because the implied volatility naturally decreases as the expiry date of the option draws nearer. The constant-horizon approach allows for this by interpolating across the volatilities of contracts with different maturities. For a fuller explanation, see Clews, R, Panigirtzoglou, N and Proudman, J, 'Recent developments in extracting information from options markets', *Quarterly Bulletin*, February 2000, page 50.

Chart 19
Interest rate uncertainty(a)



(a) Standard deviation of three-month constant-horizon short sterling probability density function.

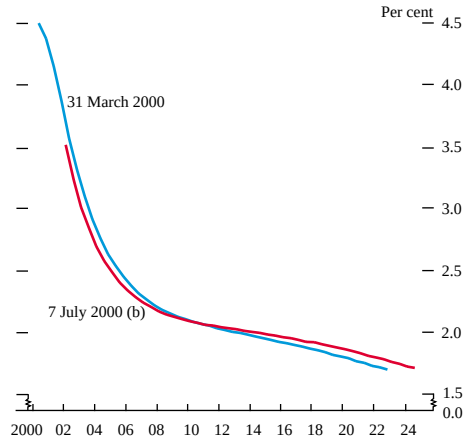
Chart 20
Gilt yield curve(a)



Source: Bank of England.

(a) Derived using the Bank's VRP curve-fitting technique.

Chart 21
Index-linked gilt yield curve(a)



Source: Bank of England.

(a) Derived using the Bank's VRP curve-fitting technique.
(b) The curve starts at 2002 because 2½% Index-linked Treasury Stock 2001 is not included, given its closeness to maturity.

this uncertainty receded before the year-end as markets became increasingly confident that the date change would pass smoothly. The main fall in uncertainty over the review period happened in the second half of May, coinciding with a significant fall in interest rate expectations.

Longer-term interest rates

The gilt yield curve became less inverted over the review period, as yields at shorter maturities fell while those at longer maturities remained broadly unchanged (see Chart 20). The declines in short-maturity bond yields were driven mainly by the same data and policy-related news noted in the short-term interest rate section above. While this information was also occasionally influential at other maturities, medium yields were affected to a greater extent by international bond movements (see Chart 6).

Another influence on long-maturity gilt yields was speculation about the publication of the review of the Minimum Funding Requirement. A common view among market commentators was that the review would allow the liabilities of pension funds to be valued by reference to yields on assets other than gilts, such as corporate bonds. This would give pension funds an incentive to invest a greater proportion of their assets in non-government bonds, thereby reducing the downward pressure on long gilt yields and helping to narrow swap and corporate bond spreads. On occasion, this view gained in prominence and contributed to a small rise in long gilt yields. However, the review had not been made public by the end of the period that this article considers.

Proceeds from the government's auction of the Spectrum mobile phone licences, of £22.5 billion, led HM Treasury to publish a revised financing remit for the Debt Management Office (DMO) on 12 June, in which they lowered planned gilt sales for 2000/2001 by £2.2 billion, cancelled all medium-dated conventional stock sales, and dropped the conventional gilt auction planned for September. After accounting for reduced gilt sales and contingency measures (that were set out in the previous DMO remit), the remaining licence receipts of £10.7 billion will be used to reduce net short-term debt or to increase the amount of stock repurchased by the DMO through debt buy-back auctions. This news might ordinarily have been expected to produce a fall in gilt yields. However, the market had expected the medium-dated auction to be cancelled and the remaining two long-dated auctions to go ahead as planned. Consequently, reaction to the announcement was limited.

Index-linked gilts

The real interest rate curve generated from index-linked gilts became slightly less inverted over the review period (see Chart 21). This was similar to the change in the shape of the conventional gilt yield curve, though the fall in short-maturity conventional yields was greater. The divergent performance mainly occurred in May. On 16 May, publication of the RPI data (showing a monthly rise of 1%) caused calculated real yields to rise. This was mainly because of a statistical consideration. In order to calculate the real yield on an index-linked gilt an assumption must be made about the rate of inflation between now and the maturity of the gilt. This assumed rate is used to project the value of future coupons and the final redemption value. When new RPI data are released, they are substituted into the calculation. Unless the monthly change in RPI

is equal to the assumed rate, the reported real yield will change—the published RPI rate on 16 May was higher than the assumed rate and real yields consequently rose. There was a similar, but smaller, effect from the published RPI data in April. In addition, in the second half of May, the international rally in bond markets affected conventionals more than index-linked bonds.

Gilt auctions

During the review period, the DMO held one index-linked and one conventional auction and completed a gilt switch auction. On 3 May, the DMO sold £375 million (in nominal terms) of 2½% Index-linked Treasury Stock 2020. The DMO then sold £2.5 billion (nominal) of a new stock, 4¼% Treasury Stock 2032, on 24 May. This auction was 1.6 times covered and the coupon was the lowest on a conventional gilt stock for 13 years. Finally, on 22 June, the DMO switched £1.5 billion of 8% Treasury Stock 2015 into 4¼% Treasury Stock 2032, increasing the latter's size to £4.55 billion (nominal).

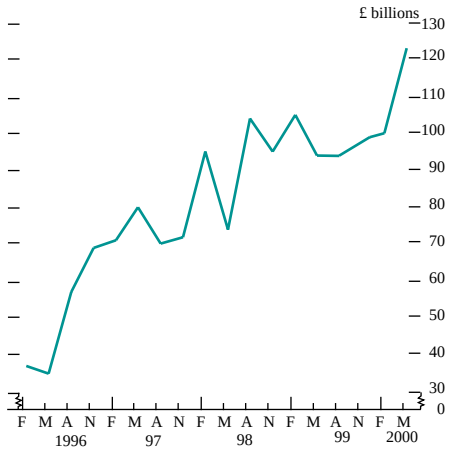
The sterling money market

The sterling money market grew by 11% between end-February and end-May to stand at £516 billion.(1) Gilt repo, interbank deposits and certificates of deposit continued to account for the largest shares of the money market in terms of size outstanding (see Table F).

The largest growth over the quarter was in gilt repo. According to the Bank's latest quarterly survey, the amount of gilt repo outstanding rose by £23 billion in the three months to end-May, to £123 billion. This is the highest outstanding amount since the market was introduced in 1996 (see Chart 22). Nearly half of this increase was in the on call and next-day maturity category. The rise over the quarter appears to have reflected a number of factors. First, the DMO made significant use of gilt repo in its cash management operations. Second, there was a rise in the average daily money market shortage (implying a greater need for refinancing in the Bank's open market operations). And third, the share of gilt repo in the Bank's daily open market operations continued to increase, reaching 65%.

There was a slight widening in the spread between secured (GC repo) and unsecured (interbank) interest rates at the one-month

Chart 22
Gilt repo outstanding



Source: Bank of England's Repo Stock Lending quarterly survey.

Table F
Sterling money markets(a)

Amounts outstanding: £ billions

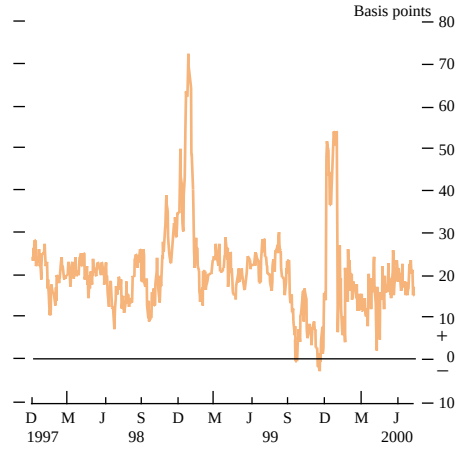
	Interbank	CDs	Gilt repo	Treasury bills	Eligible bills	Stock lending	Commercial paper	Sell/ buy-backs (b)	LA bills (c)	**Total**
1990	89	53	n.a.	9	23	n.a.	5	n.a.	2	**181**
1995	93	66	n.a.	8	20	n.a.	6	n.a.	2	**195**
1998	150	122	95 (b)	1	17	35 (b)	10	2	1	**433**
1999	155	135	99 (b)	4	14	49 (b)	13	3	0	**472**
2000 Feb.	155	127	100	2	14	51	13	2	0	**464**
May	165	138	123	2	14	54	17	3	0	**516**

n.a. = not available.

(a) 1990 and 1995 data are end-March; other data are end-period.
(b) End-November data.
(c) Local authority bills.

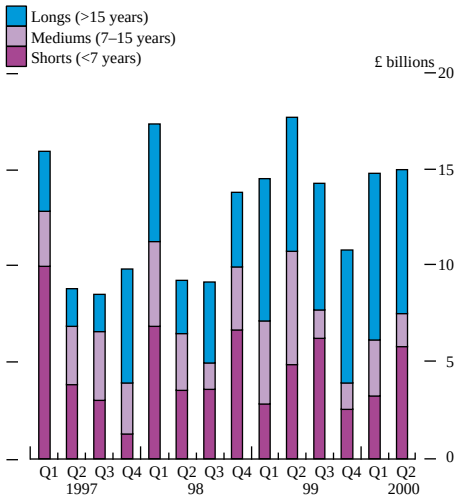
(1) The sterling money market is defined for this purpose as the sum of the outstanding amounts in the interbank, certificate of deposit, gilt repo and stock lending, sell/buy-backs, Treasury bill, eligible bank bill, local authority bill and commercial paper markets.

Chart 23
Spread between repo and interbank rates at one month[a]



(a) GC repo (bid) rate minus interbank offer rate.

Chart 24
Sterling non-government bond issuance



Source: Bank of England.

Table G
Sterling bond issuance in 2000 Q2

	Number of issuers	Amount (£ billions) Total	By credit rating AAA	AA/A	BBB and below
Fixed-rate issues					
UK corporates	12	2.4	1.3	0.7	0.4
UK financials	5	0.9	0.0	0.8	0.1
Supranationals	6	3.5	3.5	0.0	0.0
Overseas borrowers	15	3.2	1.5	1.6	0.1
Total	**38**	**10.0**	**6.3**	**3.1**	**0.6**
FRNs					
UK corporates	1	1.0	0.4	0.4	0.2
UK financials	10	2.8	1.1	1.7	0.1
Overseas borrowers	7	1.2	0.1	0.9	0.2
Total	**18**	**5.0**	**1.6**	**3.0**	**0.5**

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

maturity in May and June, to around 20 basis points (see Chart 23). In the first four months of 2000, the spread had declined to around 15 basis points, having previously widened considerably in the run-up to the Y2K period. Market participants attributed the increase to three factors. First, a greater demand for gilts, as a result of the increased collateral acquired by the DMO in its cash management operations arising from the extra government receipts from the Spectrum mobile telephone auctions. Second, the strong increase in issuance of certificates of deposit during the quarter, which may have led to a more general rise in unsecured lending rates. And third, there was some degree of balance sheet adjustment by market participants as the half year end approached.

Issuance of certificates of deposit rose by £11 billion over the quarter. This offset the previous quarter's decline, which had been associated with Y2K liquidity management. Although the stock of Treasury bills was largely unchanged over the quarter, the DMO has issued a greater range of maturities since assuming responsibility for Exchequer cash management in April. In addition to issuing bills of a one and three-month maturity at its weekly auctions, the DMO has also held tenders for shorter-dated Treasury bills on an *ad hoc* basis in order to smooth the Exchequer's net cash position.

Other sterling bond issues

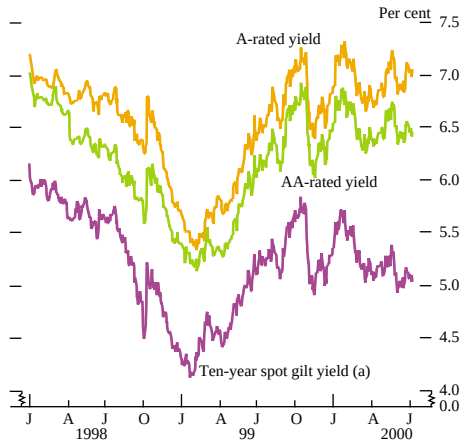
Gross sterling bond issuance (other than gilts) increased to £15.1 billion in the second quarter, the highest level since 1999 Q2 (see Chart 24). Longer-dated issues made up half of the total, as demand from UK institutional investors remained focused on longer maturities. Issuance of short-dated bonds rose to £5.8 billion as the decline in short-term interest rate expectations led to greater demand for these bonds. Fixed-rate issuance declined relative to Q1 but remained broadly in line with the average quarterly issuance level observed in the past two years. In contrast, issuance of floating-rate notes rose sharply to £5.1 billion in Q2, up from £3 billion in Q1. This primarily reflected greater issuance by UK and overseas financials to finance their loan and mortgage books, as well as a £1 billion asset-backed bond for a UK corporate.

Fixed-rate issuance by UK firms fell to £3.3 billion in Q2, down from £5.6 billion in Q1, while issuance by overseas firms and supranationals increased slightly to £6.7 billion (see Table G). Overseas borrowers continued to be attracted by the relatively wide spreads that exist between sterling swap rates and the par yields they pay on their sterling-denominated bonds.(1) Deutsche Telecom was the largest single bond issuer during the period, raising $14.5 billion from bonds denominated in US dollars, euro, sterling and yen.

The United Kingdom's auction of Spectrum mobile phone licences, completed on 27 April, had a significant impact on bond yields over the quarter. The auction proceeds were £22.5 billion, well in excess of the £3 billion assumed in the Chancellor's March Budget. As noted earlier, there has been a consequent reduction in this year's forecast for net gilt supply. Though the DMO has taken steps to maintain long gilt issuance, yield spreads over gilts widened during the quarter due to rising swap and corporate bond rates (see Charts 25 and 26).

(1) For further details, see the box on page 130 of the May 2000 *Quarterly Bulletin*.

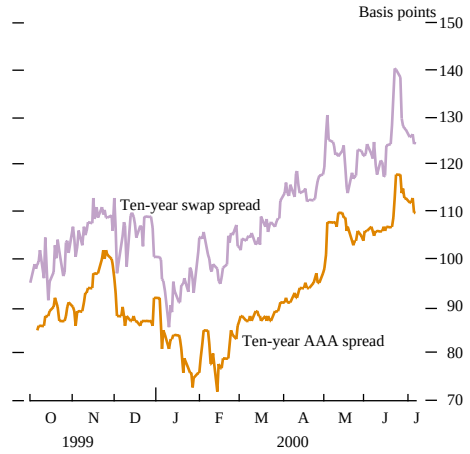
Chart 25
Ten-year corporate yields



Source: Bloomberg.

(a) Derived using the Bank's VRP curve-fitting technique.

Chart 26
Ten-year credit spreads versus gilts



Sources: Bank of England and Bloomberg.

The increase in corporate bond yields reflected two main considerations. First, the higher-than-anticipated bids for the mobile phone licences led to an associated expectation of heavy corporate bond issuance by telecommunications companies. Increases in the supply of corporate bonds tend to lower their price, thereby raising corporate bond yields. Second, the high cost of the licences has also led to increased fears about the credit risk of telecoms firms, due to the associated rise in their financial gearing levels and the potential impact on future earnings. Reflecting these fears, some telecoms firms were put on credit watch during Q2 while others had their credit ratings downgraded.

Market participants have reported that much of the increase in sterling swap rates in Q2 reflected the swapping of proceeds from dollar bond issues into sterling. Given the poor relative liquidity of the sterling swap market at ten years' maturity and beyond, a large increase in the demand to pay fixed in long-dated sterling swaps can have a significant short-term impact on swap rates.

As mentioned above, the review of the Minimum Funding Requirement (MFR) was also a focus of attention for the sterling bond market over the quarter. A number of speculative trades (anticipating a narrowing in corporate bond spreads) had been put in place prior to its expected release in late May. However, the delay in publication, and the widening in swap spreads related to the financing of mobile phone licences, forced the unwinding of these trades and contributed to the rise in swap rates. Anticipation of greater pension fund demand for corporate bonds has, however, encouraged corporate issuers of index-linked bonds; a further three such issues were brought in the quarter, raising just over £300 million.

Market operations

Open market operations

The DMO assumed full responsibility for managing the Exchequer's daily cash position on 3 April. The level of the government's outstanding Ways and Means advance on the Bank's balance sheet has been frozen and the DMO now offsets the Exchequer's cash position with the money market each day. Rather than varying the size of the Ways and Means advance to balance the Exchequer's short-term financing needs each day, the DMO now aims to achieve a small, unchanged precautionary deposit at the Bank. Consequently, the Bank's balance sheet has become more stable and predictable and the money market's need for refinancing from the Bank is no longer influenced by the Exchequer's net cash position. Following the cash management transfer, the two principal factors that influence the money market's need for refinancing from the Bank are changes in the note issue and maturing refinancing operations. In Q2, the stock of money market refinancing held at the Bank averaged £14 billion and daily money market shortages averaged £1.9 billion (see Table H and Chart 27). As the quantity of refinancing required by the money market was stable during the second quarter, the Bank did not use foreign exchange swaps as an additional means of supplying liquidity.

Over Q2, the sterling overnight index average (SONIA) generally traded closer to the Bank's repo rate than in Q1 (see Chart 28). This was partly because January was affected by Y2K

Table H
Average daily money market shortages

£ millions

1996	Year	900
1997	Year	1,200
1998	Year	1,400
1999	Year	1,200
2000	Q1	1,800
	April	2,000
	May	1,800
	June	2,000

Chart 27
Stock of money market refinancing and daily shortages

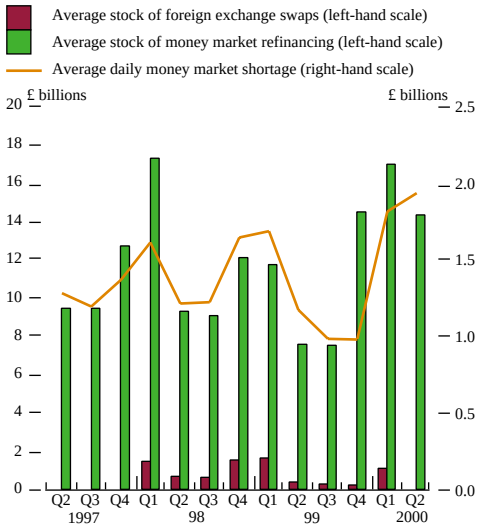
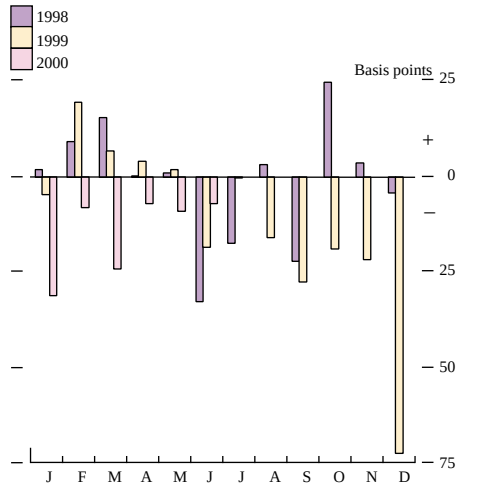


Chart 28
Monthly averages of SONIA minus the Bank's repo rate



considerations. However, the size of the spread between SONIA and the Bank's repo rate also diminished when comparing the average for Q2 with the average for February and March. Nevertheless, there were some periods in the second quarter when short-dated market rates traded further below the Bank's repo rate than was desired. The Bank responded to this development by increasing, in stages, the amount by which it left the market short after the 9.45 am round of operations, even when the available refinancing was fully bid for by market participants. This led to a narrowing of the spread between short-dated market rates and the Bank's repo rate.

The Bank's counterparties continued to make use of euro-denominated eligible securities(1) as collateral in repo operations in Q2. These accounted for an average of 11% of the collateral taken by the Bank in its open market operations during April, May and June. By the end of Q2, gilts accounted for around 70% of the stock of collateral held by the Bank (see Chart 29).

As well as announcing changes to the DMO's gilt remit on 12 June, the Treasury stated that the remaining proceeds from the Spectrum licence auction would be used to reduce its net short-term debt, which may include repaying some of the Ways and Means advance. Decisions about the composition of the reduction in net short-term debt will be made at the time of the Pre-Budget Report, when any revision to the forecast net cash requirement can also be taken into account.

At the beginning of July, gilts settlement migrated from the Central Gilts Office to CREST, the UK system for the electronic transfer and settlement of dematerialised equities. This was a step towards the aim of a single settlement system for gilts, money market instruments and equities. A small number of non-British government sterling securities ('bulldogs') did not migrate to CREST, and the Bank of England's list of eligible bulldogs has been amended to reflect this change.

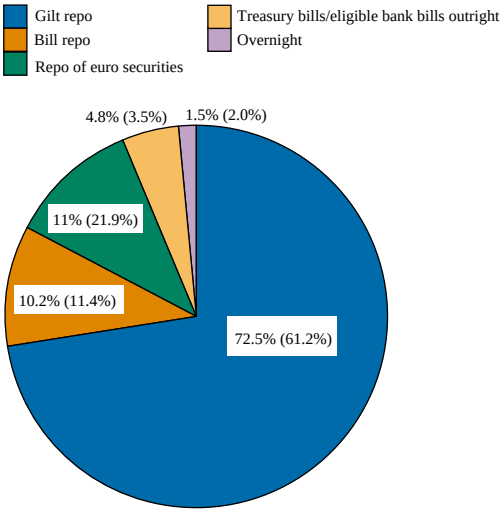
HM Treasury and Bank of England euro issues

The Bank of England continued to hold regular monthly auctions of €1 billion of bills during the second quarter of 2000, comprising €200 million of one-month, €500 million of three-month and €300 million of six-month Bank of England bills. The stock of euro bills outstanding was therefore maintained at €3.5 billion throughout the quarter. The auctions continued to be oversubscribed, with issues being covered an average of 5.2 times the amount on offer in Q2. During the quarter, bids were accepted at average yields of around the euribid rate for the relevant maturity.

On 18 April, the Bank reopened the UK Government euro Treasury note maturing on 28 January 2003 with a further auction for €500 million, raising the amount of this note outstanding with the public to €1.0 billion. Cover at the auction was 2.2 times the amount on offer and accepted bids were in a range of 4.71%–4.78%. The total of notes outstanding with the public under the UK euro note programme thus rose from €4.5 billion at the end

(1) A list of eligible securities is available on the Bank's web site at www.bankofengland.co.uk/markets/money/eligiblesecurities.htm

Chart 29
OMOs—instrument overview(a)



(a) The chart shows the average share of the various instruments held by the Bank as a result of open market operations in 2000 Q2. Figures in brackets relate to 2000 Q1. Figures may not sum to 100% because of roundings.

of Q1 to €5.0 billion in Q2. Further reopening auctions of the 2003 note will be held on 18 July and 17 October 2000.

UK gold auctions

On 3 March, HM Treasury announced plans for a programme of six gold auctions in the financial year 2000/01. The first auction in this series took place on 23 May: 25 tonnes of gold were sold at a price of $275.25; the auction was 2.7 times covered. The second auction in this programme took place on 12 July and the remaining auctions will take place in September and November of this year and in January and March 2001.

The international environment

- *This article discusses developments in the international environment since the May 2000* Quarterly Bulletin,[1] *as well as the outlook for inflation and output over the next two years.*

- *World GDP is estimated to have grown by 1.4% in the first quarter, an acceleration from 1.1% in the last quarter of 1999. But world industrial production growth has slowed since February 2000; growth rates have remained stable and high in the major economies, but, although still high, have fallen somewhat in the emerging market economies since the beginning of the year.*

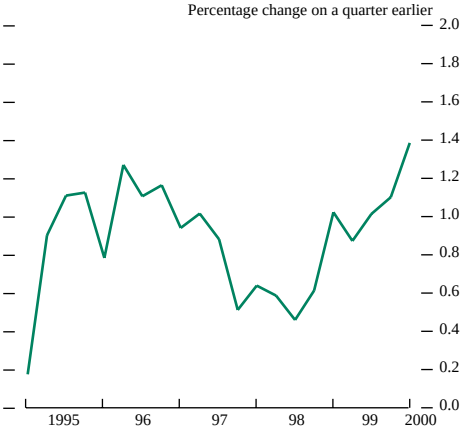
- *In the United States, GDP grew strongly in Q1 and Q2, albeit at a slower pace than in the preceding quarters. In the euro area, GDP growth was faster in Q1 than in the final quarter of 1999 and growth strengthened in Germany and Italy. The Japanese economy grew at a quarterly rate of 2.4% in the first quarter, after a fall in measured output in the previous quarter.*

- *Oil price volatility has been high, reflecting uncertainties about the future balance of demand and supply. There have been signs of a renewed pick-up in producer and consumer price inflation in response to the oil price increases from mid-April to June.*

- *Official interest rates in the United States and the euro area have increased further since the previous* Quarterly Bulletin. *Both the FOMC and the ECB raised their rates by 0.5 percentage points, to 6.5% and 4.25% respectively. The Bank of Japan has maintained the zero interest rate policy implemented in February 1999.*

- *Projections by external forecasters are for world GDP growth to rise by around 4.5% in 2000, the highest growth rate for a decade, and by approximately 4% in 2001. Since the previous* Quarterly Bulletin, *there have been upward revisions to forecasts for GDP growth in the United States and the euro area, while for some emerging market economies, especially in South East Asia, forecasts have been scaled down slightly. The balance of risks around most forecasts is little changed from three months ago, typically indicating a balance of risks on the downside, primarily for reasons linked to the possibility of asset markets falling.*

Chart 1
World GDP



Source: Bank of England.

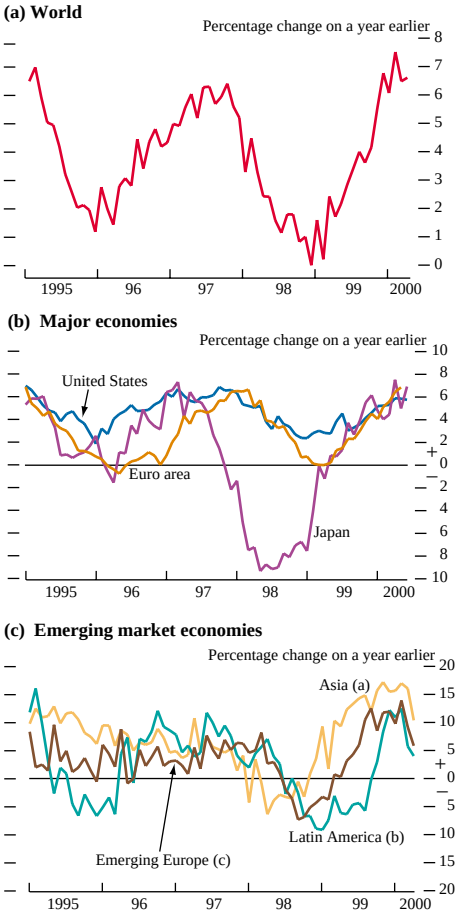
Demand and output

Output growth

World GDP is estimated to have grown by around 1.4% in 2000 Q1, the fastest rate for more than five years (see Chart 1).[2] Growth was positive in most parts of the world. But world industrial production growth slowed to 6.6% in the year to April, from 7.5% in the year to February (see Chart 2a).[3] Industrial production growth has remained strong in the major economies, especially Japan (see Chart 2b), but has moderated somewhat in the emerging market economies from the fast pace seen over the past

(1) Based on data up to 28 July (the article in the May *Quarterly Bulletin* was based on data up to 27 April 2000).
(2) The numbers for world GDP growth are estimates based on quarterly data from national sources or quarterly data estimated from annual data reported in the April 2000 IMF *World Economic Outlook.*
(3) The numbers for industrial production growth are estimates based on data from the IMF *International Financial Statistics*.

Chart 2
Industrial production



Sources: Primark Datastream and Bank of England.

(a) India, Malaysia, South Korea, Taiwan and Thailand.
(b) Argentina, Brazil, Chile, Mexico, Peru and Venezuela.
(c) Czech Republic, Hungary, Poland, Russia and Turkey.

Table A
Forecasts for GDP growth

Per cent

	OECD (a)				Consensus (b)			
	2000		2001		2000		2001	
United States	4.9	*+1.8*	3.0	*+0.7*	4.8	*+0.2*	3.1	*+0.0*
Euro area	3.5	*+0.7*	3.3	*+0.5*	3.4	*+0.2*	3.2	*+0.2*
Japan	1.7	*+0.3*	2.2	*+1.0*	1.5	*+0.5*	1.6	*+0.1*
North East Asia (c)					7.8	*+0.6*	6.6	*+0.0*
South East Asia (d)					5.1	*+0.0*	5.2	*-0.1*
Latin America (e)					3.7	*+0.2*	4.1	*-0.1*
Eastern Europe (f)					3.8	*+0.6*	4.0	*+0.1*

(a) OECD *Economic Outlook*, June 2000; (differences from December 1999 in italics; percentage points).
(b) *Consensus Forecasts*, July 2000; (differences from April 2000 in italics; percentage points).
(c) Peoples' Republic of China, Hong Kong SAR, South Korea and Taiwan.
(d) Indonesia, Malaysia, Singapore, Thailand and the Philippines.
(e) 14 countries, including Argentina, Brazil, Chile, Colombia, Mexico, Peru and Venezuela.
(f) 19 countries, including the Czech Republic, Hungary, Poland, Russia and Turkey.

year or so, when many countries staged a rapid recovery from the 1998 crisis (see Chart 2c). In the year to April 2000, industrial production grew by about 11% in Asia, by about 6% in emerging Europe and by 4% in Latin America. These rates are close to those observed in early 1998, before the main effects of the Asian crisis.

As in previous quarters, world growth in 2000 Q1 was supported by the continuing expansion in the United States, which now extends to almost ten years, although the rate of expansion slowed in the first quarter. The steady recovery in the euro area continued, with GDP growth of 0.9% in the first quarter. Japan grew by 2.4% in the first quarter, partly boosted by leap year effects, for which the authorities make no statistical adjustment. GDP is estimated to have grown by 1.8% in non-Japan Asia, with several economies growing faster than expected. In Latin America, where the recovery from the emerging market crises has been slower, GDP growth strengthened to 1.2%, supported by strong export growth.

The strong growth of GDP in the first quarter has led to upward revisions in almost all forecasts for GDP growth in 2000 (see Table A). The OECD[1] forecast for GDP growth in the United States has been revised upwards to 4.9%, 1.8 percentage points higher than the previous OECD forecast six months ago, and 0.5 percentage points higher than the most recent forecast by the IMF.[2] Forecasts for the euro area have been revised up by less; GDP growth is now expected to be around 3.5% this year and between 3% and 3.5% next year. Forecasts have also been revised upwards for Japan, where GDP is expected to grow by around 1.5% in 2000 and by slightly more than 1.5% in 2001. These forecasts are broadly in line with the MPC's central projection in the August 2000 *Inflation Report*.

Forecasts for GDP growth in the emerging market economies have also been revised. Consensus forecasts have been revised upwards for Latin America, Eastern Europe and North East Asia for 2000, while forecasts for GDP growth in 2001 have been revised downwards somewhat for Latin America and South East Asia (see Table A). The OECD forecasts growth in South Korea to be 8.5% in 2000 and 6% in 2001.

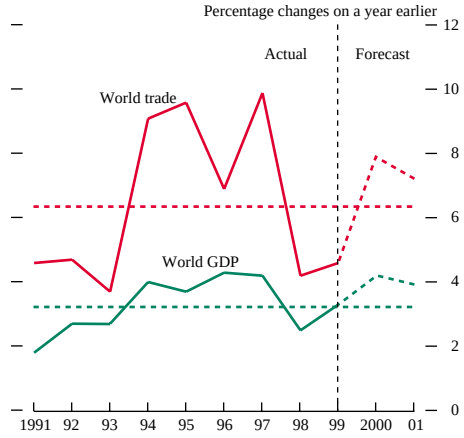
A feature of recent forecasts is a strong rebound in world trade, which increased by 4.6% in 1999, compared with an average annual growth rate of 6.4% for the period from 1991 to 1999 (see Chart 3).[3][4] The latest forecast by the IMF is for world trade to grow by about 8% in 2000 and by about 7% in 2001, while the OECD forecasts world trade to grow by about 10% in 2000 and by about 8% in 2001. This broad pattern is reflected in the MPC's central projection for the growth of UK export markets.

The United States

As in previous quarters, growth in the United States in Q1 was supported by buoyant private consumption, which on its own fully accounted for the 1.2% rise in GDP in the quarter (see Chart 4). Inventories made a negative contribution, possibly due to an unwinding of stocks following the millennium date change, and so did net trade, reflecting the strength of consumption and the dollar.

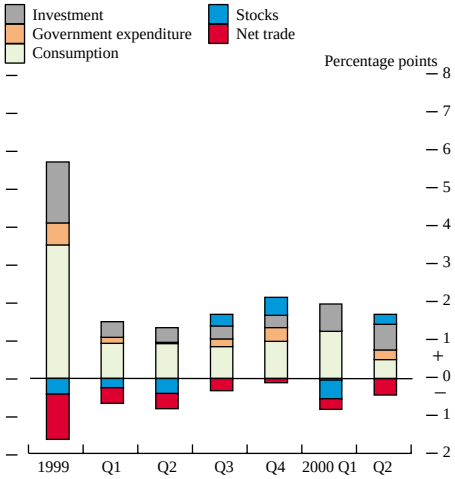
(1) OECD *Economic Outlook*, June 2000.
(2) IMF *World Economic Outlook*, April 2000.
(3) IMF *World Economic Outlook*, April 2000.
(4) Global capital flows are discussed in the note on pages 244–46.

Chart 3
World trade and GDP growth



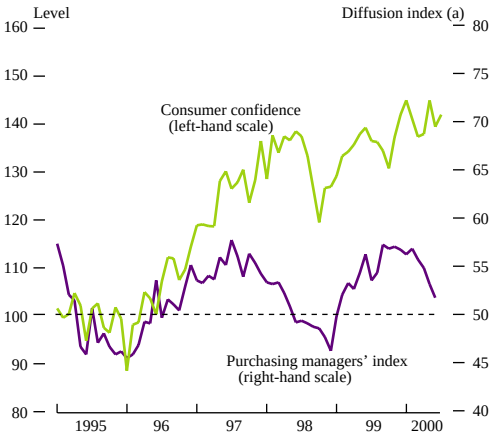
Source: IMF.

Chart 4
United States: contributions to GDP growth



Source: Primark Datastream.

Chart 5
United States: confidence measures



Source: Primark Datastream.

(a) A reading above 50 suggests expansion. A reading below 50 suggests contraction.

The large contribution from government spending in the previous quarter was partly reversed, and investment turned out markedly stronger, perhaps reflecting a delay of investment expenditure until after the turn of the century.

Industrial confidence, as measured by the National Association of Purchasing Managers' index, however, fell in June, for the fourth month running (see Chart 5), despite an increase in industrial production growth. Among the indicators for consumption, retail sales rose in June, but for the second quarter as a whole retail sales growth slowed compared to the previous quarter. And, on most measures, the housing market slowed; for example housing permits fell by 10.9% in the year to June. But the Conference Board's measure of consumer confidence rose in July, largely due to a more positive assessment of current economic conditions, and has remained at historically high levels for the past few months (see Chart 5).

According to the advance release of GDP for Q2, consumption has been relatively weak in the second quarter, which could be linked to equity price driven increases in spring tax payments leading to a temporary slowdown in consumption growth. In previous years, however, consumer spending has not been particularly weak in the relevant quarters, so it is not clear whether this is an important factor. The preliminary data, if confirmed, also suggest an end to the pattern observed in 1998 and 1999 of generally markedly slower GDP growth in the second quarter, with GDP growing by 1.3%, supported by strong investment.

Productivity growth in the United States slowed in 2000 Q1. Non-farm labour productivity rose by 0.6%, compared with 1.7% in the previous quarter, which was the highest quarterly growth rate since 1992 Q4. In Q1 the annual growth rate was 3.7%—above the average growth rate of 2.6% since 1996. Although it is possible that productivity growth will remain at these levels, a slowing rate of growth would be consistent with the usual pattern of weakening productivity during the later stages of the economic cycle.

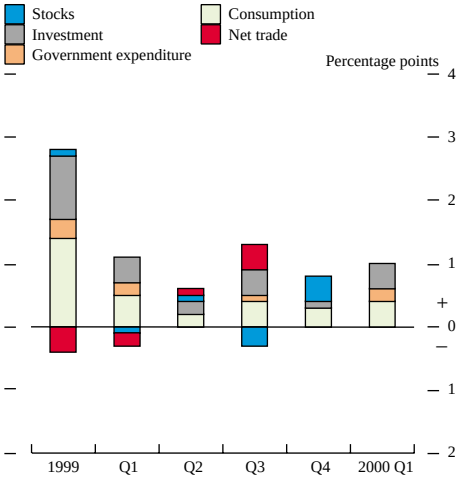
The euro area

Economic recovery continued in the euro area in the first quarter, with GDP growth of 0.9%, the same as in 1999 Q4. Consumption and investment made the largest contributions, and the contribution from government was 0.2 percentage points, which was greater than in previous quarters (see Chart 6).

Consumption growth in the euro area in Q1 reflected high levels of consumer confidence and falling unemployment (see Charts 7 and 11). Consumption was strong despite the late timing of Easter, which suggests that there may be a further strengthening in the second quarter. This proposition is supported by data on euro-area retail sales, which fell by 0.8% in March but then rose by 1.5% in April, and by consumer confidence, which remained at historical highs in the second quarter.

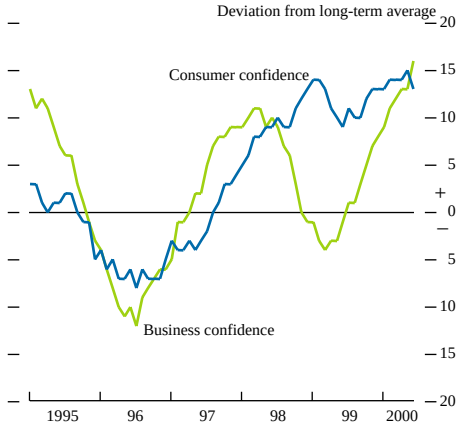
In line with the expansion of world trade noted earlier, euro-area exports and imports have increased strongly since the second half of 1999. In the first quarter, exports were 11.8% higher than a year earlier and imports were up by 10.3%. But net trade did not

Chart 6
Euro area: contributions to GDP growth



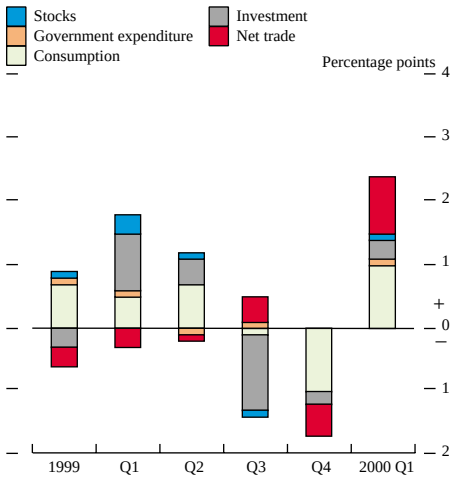
Source: Primark Datastream.

Chart 7
Euro-area business and consumer confidence



Source: Primark Datastream.

Chart 8
Japan: contributions to GDP growth



Source: Primark Datastream.

contribute strongly to GDP growth in 1999 Q4 and 2000 Q1, despite the depreciation of the euro effective exchange rate and robust growth in euro-area export markets.

Looking ahead, the outlook for activity in the euro area is favourable. Business confidence and export orders in June reached the highest levels recorded since the start of the series in 1985 (see Chart 7). The outlook for investment appears especially favourable; capital goods production has been strong and the July European Commission manufacturing investment survey suggested continued robust investment growth.

The previous *Quarterly Bulletin* noted that growth had been weak in Germany and Italy relative to the euro area for the past three years. In the first quarter, growth rates for these two economies picked up, especially in Italy, where GDP grew by 1% on the quarter. This continues the pattern of a narrowing dispersion of growth rates in the euro area (as measured by the standard deviation) over the second half of 1999.

Japan

In Japan, GDP rose by 2.4% on the quarter in 2000 Q1. In contrast to the pattern in recent years, growth was supported by private sector spending and investment, rather than government spending (see Chart 8). Net trade also contributed positively.

Private investment growth was particularly strong in 2000 Q1. It is not clear to what extent the strength in investment reflects a cyclical recovery. Orders data suggest that investment growth may have peaked, but it may be sustained by the increase in corporate profits since the beginning of the year, given that it is typically financed through retained earnings. As noted in the May *Quarterly Bulletin*, further increases in profits may also boost incomes and consumption through bonus payments.

The Bank of Japan Tankan survey for June showed a further improvement in business conditions. Among large manufacturers, a majority of firms expect business conditions to improve, for the first time since 1997 (see Chart 9). As in the previous survey conducted in March, large firms were more optimistic than small firms, and manufacturers were more optimistic than non-manufacturers.

Labour markets

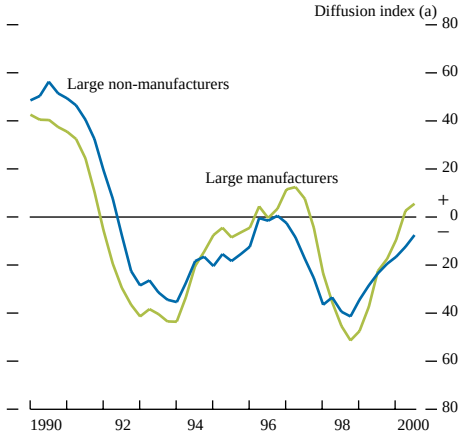
Employment/unemployment

Employment has continued to increase in the United States, but at a slower pace. Private sector non-farm payrolls increased by an average of 110,000 per month in the second quarter, after an average increase of 244,000 per month during the first quarter.(1) On the three-months-on-three-months measure, growth of private sector payrolls declined to 0.5% in June, the lowest rate since July 1999 (see Chart 10).

Employment has also continued to increase in the euro area. However, as the ECB recently noted, the rise in employment has

(1) Total employment in the months since March was boosted by temporary workers employed for the Census. The Bureau of Labor Statistics puts the change in the number of census workers at +117,000 in March, +73,000 in April, +357,000 in May and -190,000 in June.

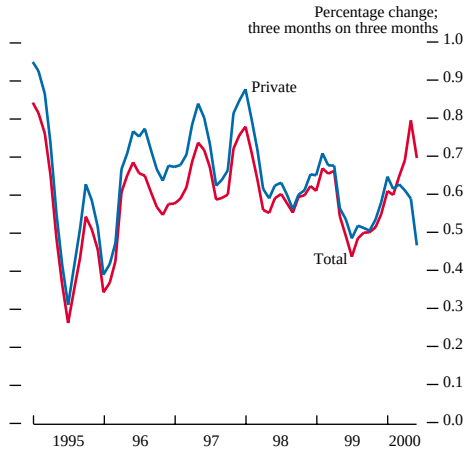
Chart 9
Japan: Tankan index of business conditions



Source: Bank of Japan.

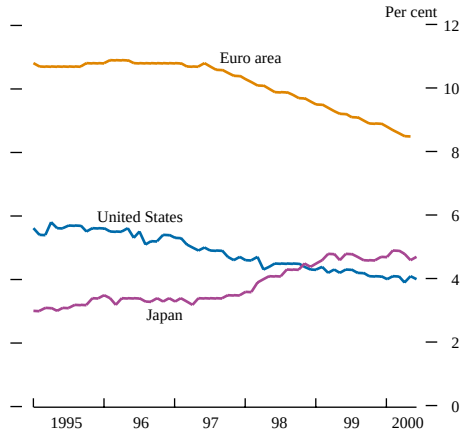
(a) A positive reading suggests expansion. A negative reading suggests contraction.

Chart 10
United States: payrolls



Source: Primark Datastream.

Chart 11
Unemployment rates



Source: Primark Datastream.

not yet increased labour force participation to the same extent as in the United States in the past three decades.(1) At the end of 1999, participation rates were about 78% in the United States and 66% in the euro area. Employment has continued to fall in Japan despite a rise in the ratio of new job offers to applicants.

The US unemployment rate was 4.0% in June, around its average over recent months (see Chart 11). The unemployment rate in the euro area continued to fall steadily, reaching 9.2% in April and May, compared with 10% a year earlier. Relative to the United States, unemployment in the euro area remains high, especially among those with low skills and the young, and this is reflected in a larger number of long-term unemployed. In Japan, the unemployment rate was 4.7% in June, at its average rate in the second half of 1999.

Labour costs

Labour cost pressures in the United States remain muted in relation to the strong employment position. Average hourly earnings rose by 3.6% in the year to June, the same as in May, and the annual growth rate of unit labour costs remained at 0.6% in 2000 Q1 for the second quarter in a row, the lowest rate of increase since 1996 Q4. This picture of moderate growth in labour costs is also reflected in the Employment Cost Index for Q2, which grew by 4.3% overall, unchanged from Q1.

In the euro area, by contrast, labour costs (based on the hours measure) rose sharply in the first quarter, by 3.5%, after 2.4% in the year to 1999 Q4. This may be partly related to bonus payments, some of which may have been linked to the century date change. But it may also be because, despite the fact that unemployment remains relatively high, labour market conditions are becoming tighter due to geographical and skill mismatches in the labour force.

Among the euro-area countries, labour cost growth was particularly high in France. This may be partly due to the reduction in the working week in France, as discussed in the May *Quarterly Bulletin*. Labour cost growth was also higher in Germany and Italy, where activity picked up relative to the other euro-area countries in 2000 Q1.

Prices

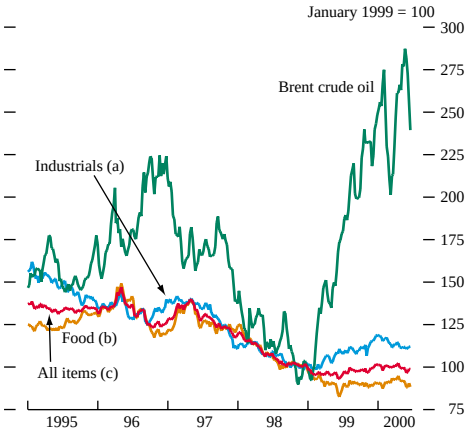
Commodity prices

Non-oil commodity prices have remained broadly unchanged in dollar terms in the period under review (see Chart 12). The *Economist* index declined by 1% due to reductions in non-oil industrial commodity prices and food prices.(2) All three indices bottomed out in the course of 1999, reflecting increased demand due to the strength of the world economy.

Oil prices have been volatile over the period and the price was $26.7 for Brent crude on 28 July, compared with $24 three months ago. The price had been higher in the intermediate period and

(1) See 'Developments in and structural features of the euro-area labour markets', ECB *Monthly Bulletin*, May 2000, pages 57–72.
(2) The chart shows the new *Economist* index, in which the weight of industrials is 42.5% and the weight of food is 57.5%. The corresponding weights in the old index were 47.4% and 52.6% respectively.

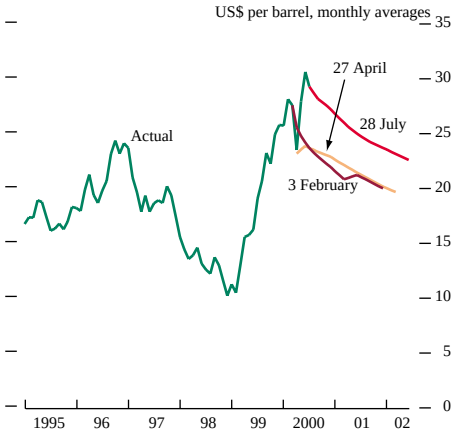
Chart 12
Commodity prices



Source: Primark Datastream.

(a), (b), (c) The *Economist* index, all items and industrials excluding oil.

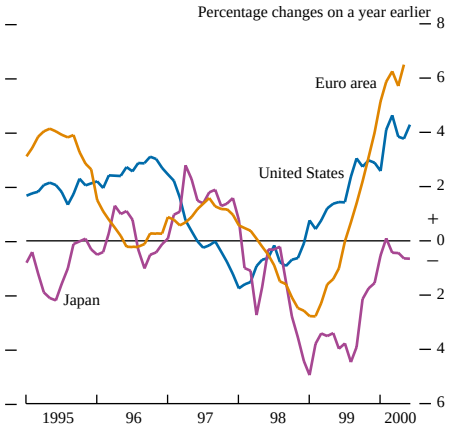
Chart 13
Oil futures



Note: The actual figure for July 2000 is the average of 1 July–27 July 2000.

Source: Bloomberg.

Chart 14
Producer prices



Source: Primark Datastream.

peaked on 3 July at $32.5, the same as the previous peak on 7 March. In June, members of the Organisation of Petroleum Exporting Countries (OPEC) agreed to a further increase in production targets to 25.4 million barrels per day,(1) and in early July Saudi Arabia announced that it might raise production by 0.5 million barrels per day if prices did not fall, although they have fallen subsequently.

Crude oil stocks have been below their long-term average for much of the past year, although the increase in production in June should help rebuild stocks and alleviate forecasts of a shortfall in supply for the remainder of 2000. Given the outlook for the oil market, most market participants now do not expect the price of Brent crude oil to fall below $20 per barrel within a two-year period. This is reflected in the futures curve of 27 July (see Chart 13), which shows price increases in contracts for all delivery dates since the previous *Quarterly Bulletin*.

Producer prices

There has been a pick-up in producer price inflation in the United States, which reflects the renewed rise in oil prices from mid-April to June. The headline producer price index increased by 4.3% in the year to June, compared with a recent peak of 4.6% in March (see Chart 14). The core index, which excludes food and energy, however, rose by 1.3% over the same period. A similar picture exists for the euro area, where the overall index increased by 6.5% in the year to May, from 5.7% in the year to April. In Japan, the wholesale price index fell by 0.6% in the year to June.

Consumer prices

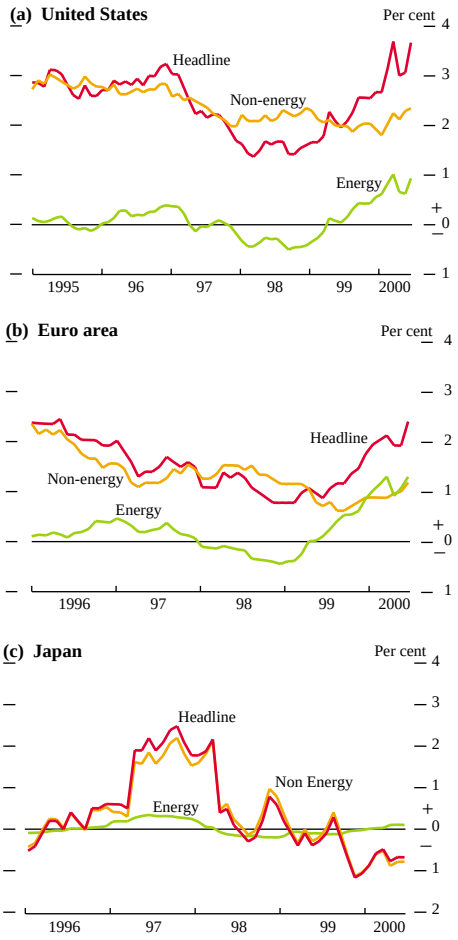
The recent fluctuations in oil prices are reflected in the contribution of energy prices to headline CPI inflation, which rose in the United States and the euro area in June after falling in April and May (see Chart 15). This suggests that oil prices have a quite rapid effect on headline consumer prices.(2)

In the United States, core and headline consumer price inflation increased in June, to 2.4% and 3.7% respectively, over the past year. In the euro area, consumer price inflation in the year to June rose by 0.5 percentage points to 2.4%, above the upper bound of 2.0% which the ECB defines as inflation consistent with price stability.(3) Core inflation was 1.2% in June, 0.2 percentage points higher than in the previous month.

In June, core HICP inflation in the euro area was highest in Portugal (2.8%) and Spain (2.7%) and lowest in France (0.2%).(4) To some extent these differentials reflect differences in cyclical positions, as noted in the May *Quarterly Bulletin*. However, another factor that may be important is the depreciation of the euro and its differential impact on effective exchange rates and import

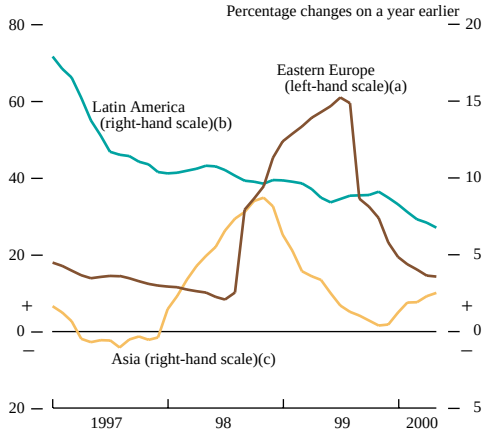
(1) OPEC press release, Vienna, 21 June 2000. This is 0.7 million barrels per day more than estimated production in 2000 Q1, but only 0.2 million barrels more than the estimated production prior to the meeting. It is estimated that OPEC production accounted for approximately 40% of world production in 1999.
(2) A note in the May 2000 *Quarterly Bulletin* looked at the question: 'What do the recent movements in oil prices imply for world inflation?'; see pages 147–49.
(3) Only one euro-area economy (France) had an inflation rate of less than 2% on the HICP measure.
(4) The highest headline CPI inflation rate currently is in Ireland (5.4%).

Chart 15
Contributions to CPI inflation



Source: Primark Datastream.

Chart 16
Emerging market consumer prices



(a) Czech Republic, Hungary, Poland and Russia.
(b) Argentina, Brazil, Chile, Colombia, Mexico, Peru and Venezuela.
(c) Peoples' Republic of China, India, Indonesia, Malaysia, South Korea, Taiwan and Thailand.

prices in different euro-area economies. This is discussed in the box on pages 240–41, which finds that the exchange rate has had a limited impact on inflation differentials so far.

In Japan, headline consumer prices were 0.7% lower in June than a year earlier. The persistence of negative consumer price inflation can be attributed to a number of factors, among them lower import prices that reflect recent yen appreciation. The decline in goods prices rise has slowed, however, partly reflecting the recent rise in petroleum-product prices.

Despite the rapid recovery in activity and the strengthening of energy prices, there have been few signs of inflationary pressures in emerging Asian economies (see Chart 16). This is partly due to exchange rate appreciation caused by increased capital inflows to these countries. But pressures may emerge as capacity utilisation returns to pre-crisis levels, and if the authorities seek to contain upward movements in the exchange rate. In Latin America, inflation rates have continued to fall in most countries, albeit from a level above the average for emerging market economies. Argentina continues to experience price deflation.

Looking forward, the OECD[1] has revised upwards its forecast for inflation in the United States in 2000 from 1.9% to 2.1% (see Table B). The OECD forecast for euro-area inflation was unchanged at 1.5% for 2000, but revised upwards for 2001, to 1.9%. Inflation is expected by the OECD and Consensus Economics to remain negative in Japan, at least for 2000.

Consensus forecasts for CPI inflation in 2000 in the emerging market economies have been revised upwards only for North East Asia, by 0.4 percentage points (see Table B). In other cases, forecasts have been revised downwards, in line with downward revisions to growth rates and reflecting the continuing shift in monetary regimes towards tighter inflation control.

Monetary policy and financial markets[2]

Official interest rates in the United States and the euro area increased by 1.25 and 1 percentage points respectively from their troughs in the first half of last year to the time of the May *Quarterly Bulletin*. Since then, they have been raised by a further 0.5 percentage points, to 6.5% and 4.25% respectively. Interest rate futures contracts suggest that, as of 27 July, markets expect short-term interest rates in the United States and the euro area to rise to about 7% and to between 5.25% and 5.5% respectively by mid-June 2001. Three months ago, expectations were for these interest rates to rise to about 7.25% and 4.75% respectively by the end of the year.

On 16 May, the FOMC raised the Federal funds target rate from 6% to 6.5%, the first rise of 0.5 percentage points since early 1995 (see Chart 17). The FOMC stated that 'increases in demand have remained in excess of even the rapid pace of productivity-driven gains in potential supply, exerting continued pressure on resources'.[3] It said it believed that 'the risks are

(1) OECD *Economic Outlook*, June 2000.
(2) For details on movements in foreign exchange, equity and bond markets, see the 'Markets and operations' article on pages 217–32.
(3) FOMC press release, Washington DC, 16 May 2000.

Euro depreciation and inflation differentials

Euro-area economies vary widely in their exposure to non euro area trade. This implies that the depreciation of the euro since the start of EMU may give rise to differing imported inflationary pressures between the economies within the euro area, at least in the short run. Empirical work suggests that so far the euro depreciation has not had a clearly identifiable effect on inflation. But a macroeconomic model simulation that also takes account of some of the indirect effects suggests that the depreciation of the euro could cause inflation differentials to increase in the short term.

Although nominal exchange rates between members of EMU are fixed, effective exchange rates still vary. The exposure of individual euro-area economies to trade with non euro area countries, and so to movements in the euro exchange rate, varies significantly.

Table 1 shows the share of total imports of goods accounted for by non euro area countries for each euro-area economy. Imports from non euro area countries ranges from 81% in Ireland to 31% in Portugal.

Table 1
Euro area (goods) imports' shares

Per cent

	Imports from non-EU11 as share of total imports	Share of non-EU11 imports in GDP	Change in NEER (a) 1 January 1999 to 26 July 2000
Ireland	81.4	42.3	-8.5
Finland	64.6	16.3	-7.1
Germany	56.8	12.2	-6.2
Netherlands	52.9	24.8	-5.1
Italy	47.8	8.5	-4.9
France	46.7	9.3	-5.0
Spain	42.8	9.8	-4.3
Belgium	41.3	27.1	-4.4
Austria	35.8	11.6	-3.2
Portugal	31.1	10.7	-4.0

Sources: OECD, Eurostat and Bank of England.

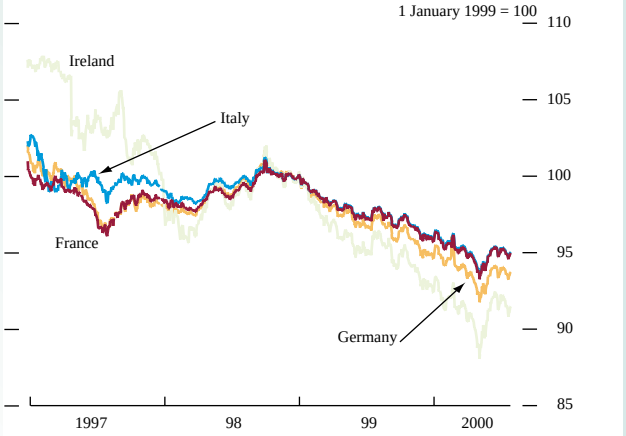
(a) Nominal effective exchange rate.

These differing trade weights have given rise to differing movements in the nominal effective exchange rates (NEERs) of euro-area countries as the euro has depreciated (see Chart A). The depreciation in Ireland's NEER was around 8.5% from the beginning of 1999 until July 2000. In contrast, over the same period, France's trade-weighted exchange rate depreciated by 5.0%.

The direct effect of the euro depreciation on import prices in each euro-area country will depend upon the share of non euro area imports in total imports.

But the final direct effect on consumer prices will also depend upon the share of total imports in output. As Table 1 shows, extra euro area imports comprise 42.3% of GDP in Ireland, but only 24.8% in the Netherlands and less in larger countries.

Chart A
Nominal effective exchange rates



Sources: Primark Datastream and Bank of England.

The increases in import prices will also have indirect effects on consumer prices via the boost in net trade from the depreciation, and any increase in wage pressures. A simple simulation on NIGEM,(1) in which the euro depreciates by 10% against the dollar, illustrates these effects more fully.

Since the import price increase that follows the devaluation is essentially a price level shock, the effects on inflation differentials within the euro area should be a fairly short-run phenomenon. But, as Table 2 and Chart B show, these short-run price level changes are different across the EU11 after the first and second years of the simulation.

Table 2
Simulation results

Percentage change from base

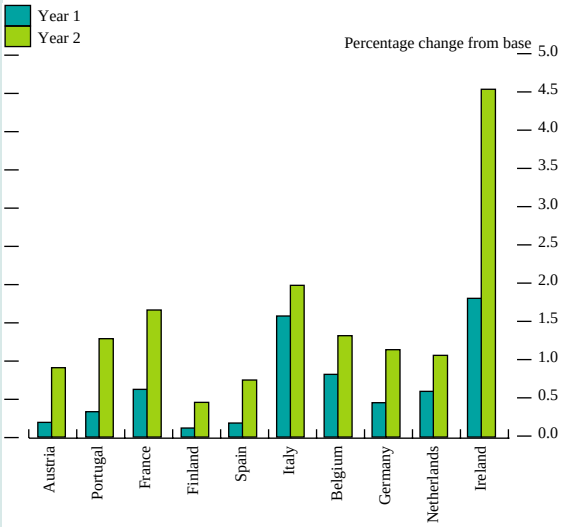
	Import prices		Consumption deflator	
	Year 1	Year 2	Year 1	Year 2
Austria	1.3	4.5	0.2	0.9
Portugal	4.5	4.7	0.3	1.3
France	5.0	5.0	0.6	1.6
Finland	5.0	5.0	0.1	0.4
Spain	5.2	5.2	0.2	0.7
Italy	5.3	5.3	1.6	2.0
Belgium	5.4	5.5	0.8	1.3
Germany	6.0	5.7	0.4	1.1
Netherlands	6.0	5.8	0.6	1.1
Ireland	7.5	6.8	1.8	4.5

Ireland, the most exposed economy in the euro area to non euro area imports, experiences by far the

(1) The macroeconomic model of the National Institute for Economic and Social Research.

largest short-run price level increase following the currency depreciation. Spain, which is one of the least exposed economies to non euro area trade and has a relatively small share of non euro area imports to GDP, has one of the smallest price level increases.

Chart B
Consumer expenditure deflator



Source: Bank of England.

How do the simulated changes in inflation differentials compare with the changes observed so far in the data? During 1999 and the first half of 2000, oil price increases and the weakness of the euro have been the main influences on euro-area inflation. These factors have put upward pressure on import and consumer prices, making it difficult to disentangle exchange rate effects from energy price increases. Nevertheless, it is possible to draw some broad conclusions.

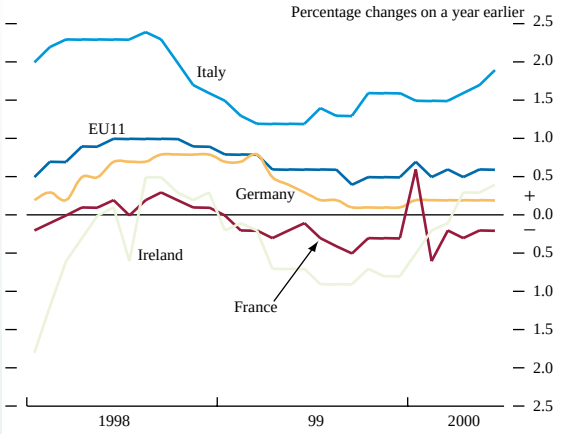
Euro-area import prices increased by 0.2% over 1999. The average depreciation in the euro effective exchange rate was 5.7%. Import price inflation has generally been less strong than may have been expected: the results from the NIGEM simulation would have suggested a higher rate of pass-through into euro-area import prices in the first year. And a significant part of the observed rise in import prices may also reflect energy price increases, suggesting an even lower exchange rate pass-through.

The reduced pass-through from euro depreciation to import price rises provides an interesting comparison with the United Kingdom, where sterling's appreciation appears not to have been passed through fully into lower import price inflation. One possible explanation for these muted pass-throughs may be that the depreciation of the euro against sterling has been viewed as temporary. Consequently importers into the euro area and the United Kingdom may have held back on increasing and reducing import prices respectively.

Further along the price chain there is also only limited evidence of marked exchange rate pass-through in the euro area. Most of the change in annual inflation on the harmonised measure (HICP) between January 1999 and June 2000 in each of the euro-area economies reflected changes in goods inflation rather than services. But, once again, these changes also reflect energy price movements.

The clearest sign of a *specific* exchange rate effect is likely to be found in the non-energy industrial goods component of HICP. But, as shown in Chart C, there has been no noticeable increase in inflation rates in this category in the EU11 over the past year, although there is some evidence for rising inflation in Ireland and, to a lesser extent, Italy. And the dispersion of these inflation rates, as measured by the standard deviation, was unchanged over 1999. So it is difficult so far to see a marked increase in inflation differentials in the euro area that could be attributed to the euro depreciation.

Chart C
Non-energy industrial goods inflation



Source: Eurostat.

But effects as large as those produced by the model simulation are perhaps unlikely to appear in practice. This is partly because the euro depreciation has occurred over a period of more than twelve months rather than as an instantaneous shock. The pass-through may also be more muted if the relative weakness of the euro has partly been seen as a temporary phenomenon. Under these circumstances, importers into the euro area may have allowed their margins to fall in order to maintain market share.

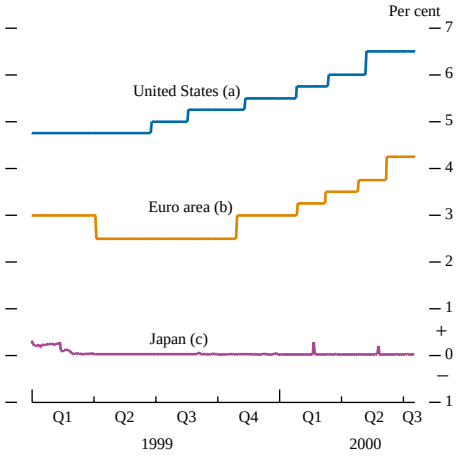
Table B
Forecasts for CPI inflation

Per cent

	OECD (a)				Consensus (b)			
	2000		2001		2000		2001	
United States	2.1	*+0.2*	2.3	*+0.0*	3.2	*+0.4*	2.6	*+0.1*
Euro area	1.5	*+0.0*	1.9	*+0.3*	1.9	*+0.2*	1.7	*+0.1*
Japan	-0.8	*-0.3*	-0.1	*+0.2*	-0.4	*-0.2*	0.0	*-0.1*
North East Asia (c)					1.2	*+0.4*	2.3	*-0.2*
South East Asia (d)					3.3	*-0.3*	4.3	*-0.2*
Latin America (e)					7.0	*-0.4*	5.8	*-0.4*
Eastern Europe (f)					23.6	*-1.6*	15.0	*-0.6*

(a) OECD *Economic Outlook*, June 2000; (differences from December 1999 in italics; percentage points).
(b) *Consensus Forecasts*, July 2000; (differences from April 2000 in italics; percentage points).
(c) Peoples' Republic of China, Hong Kong SAR, South Korea and Taiwan.
(d) Indonesia, Malaysia, Singapore, Thailand and the Philippines.
(e) 14 countries, including Argentina, Brazil, Chile, Colombia, Mexico, Peru and Venezuela.
(f) 19 countries, including the Czech Republic, Hungary, Poland, Russia and Turkey.

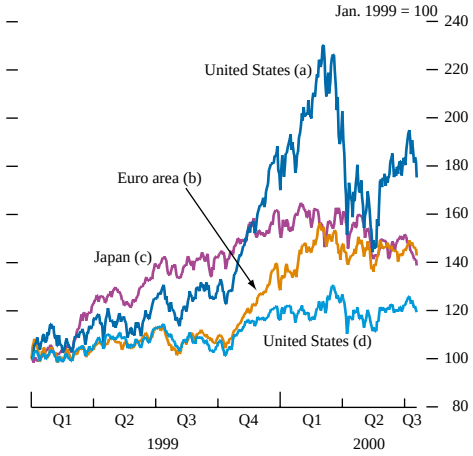
Chart 17
Official interest rates



Sources: Bank of Japan, ECB and Federal Reserve.

(a) Intended Federal funds rate.
(b) Refinancing rate.
(c) Uncollateralised overnight rate (market rate).

Chart 18
Equity prices



Sources: Bloomberg and Primark Datastream.

(a) Nasdaq.
(b) Euro Stoxx.
(c) Topix.
(d) Wilshire 5000.

weighted mainly toward conditions that may generate heightened inflation pressures in the foreseeable future', a view that it maintained when it decided at its June meeting to leave rates unchanged.(1)

The ECB raised the refinancing rate for the euro from 3.5% to 3.75% on 27 April and to 4.25% on 8 June (see Chart 17). With effect from 28 June, the main refinancing operations have been conducted as variable-rate tenders, with 4.25% as the minimum bidding rate. The ECB has pointed out that 'the switch to variable rate tenders ... is not intended as a further change in the monetary policy stance of the Eurosystem', but 'a response to the severe overbidding which has developed in the context of the ... fixed rate tender procedure'.(2)

The Bank of Japan (BoJ) has maintained the zero interest rate policy adopted in February 1999 and, as a result, the overnight rate has continued to fluctuate in a narrow range close to zero (see Chart 17). Following the meeting of the Monetary Policy Board on 17 July, the BoJ noted that 'Japan's economy is coming to a stage where deflationary concerns are dispelled, which the Board have clearly stated as the condition for lifting the zero interest rate policy'.(3)

During the period under review, there has been no obvious trend in the major equity indices. Volatility has been moderate, except for technology-intensive indices like the Nasdaq index in the United States (see Chart 18), where the relatively high volatility probably reflects uncertainties about the outlook for the technology sector. The sharp falls in the Nasdaq index during April and the associated equity market volatility were accompanied by a fall in emerging market equity prices. The levels of volatility of emerging market equity and bond prices have fallen back after rising during this period, and are now below the levels recorded at the time of the Russian and Brazilian crises.

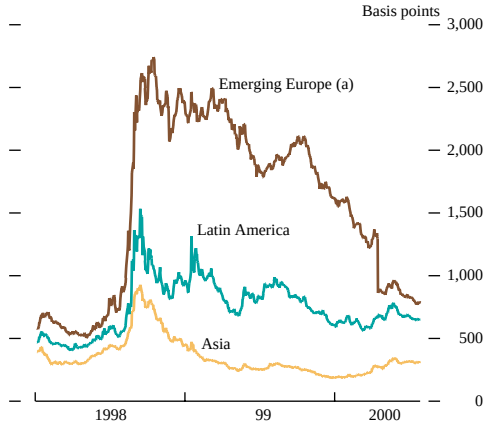
Despite the strong growth in the emerging market economies since the height of the Asian crisis, the cost of external finance remains higher than the pre-crisis levels. Similarly, average credit ratings have not yet returned to their pre-crisis levels. Since the May 2000 *Quarterly Bulletin*, spreads over US Treasuries have been broadly unchanged for Latin America and emerging Europe, and have increased slightly for Asia (see Chart 19). Aggregate spreads, excluding Russia and Ecuador, however, have risen by around 100 basis points since the start of the year.(4)

External balances

In the United States, the current account deficit widened further to 4.2% of GDP in 2000 Q1 (see Chart 20). The current account has been in deficit since 1991 Q3. In the euro area, the current account moved to a deficit of 0.5% of GDP in 2000 Q1, compared with an average surplus of 0.4% over the past year. In Japan, the current

(1) FOMC press release, Washington DC, 28 June 2000.
(2) ECB press release, Frankfurt am Main, 16 March 2000. The variable rate operations to date allotted funds at a marginal rate of 4.29% and a weighted average rate of 4.30%.
(3) Bank of Japan press release, Tokyo, 17 July 2000.
(4) Spreads have been volatile for Ecuador, which defaulted on Brady bonds last year, and Russia, following the resolution of debt negotiations with its London Club creditors.

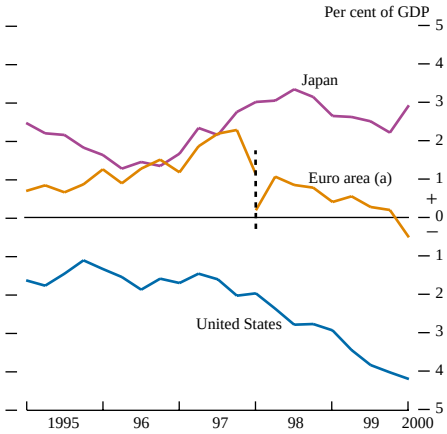
Chart 19
Sovereign bond yield spreads



Source: J P Morgan.

(a) Russian principal loans and interest rate arrears loans (both restructured commercial bank loans) were taken out of the index on 14 April and replaced by eurobonds to be issued in exchange.

Chart 20
Current account balances



Source: Primark Datastream.

(a) Vertical line indicates a break in the series.

account surplus widened from 2.2% of GDP in 1999 Q4 to 2.9% in 2000 Q1.

Sizeable current account deficits persist in Latin America. By contrast, aggregate current account surpluses in non-Japan Asia are expected to be around $32 billion during 2000, according to the most recent IMF *World Economic Outlook*, somewhat larger than expected at the end of 1999. This divergence in current account positions may offer one explanation for the different behaviour of spreads in the two regions.

Developments in capital and financial accounts are reviewed in more detail and over a longer period in the note on pages 244–46.

Global capital flows

This note reviews developments in global capital flows over the past two years.

- *There have been large inflows of foreign direct investment (FDI) and portfolio investment into the United States.*
- *There have been large net outflows of direct and portfolio investment from the euro area. This may reflect portfolio re-adjustment by fund managers following the start of EMU, and may be coming to an end.*
- *Foreigners have been net buyers of European equities, contributing to the strong performance of European equity indices.*
- *In Japan, net outflows of 'other investment' fell sharply in 1999, possibly reflecting the retrenchment by Japanese banks from international markets.*
- *Flows of FDI and equity portfolio investment into developing countries rose slightly between 1998 and 1999.*

The global picture

Table 1 summarises global current and financial account balances in 1998 and 1999. Much of the picture is familiar; large current account deficits in the United States balanced by large capital inflows; current account surpluses in Japan and the euro area, offset by net financial outflows. A feature of 1999 was the sharp reduction in current account deficits in the developing and transition economies, from a combined $115 billion in 1998 to only $38 billion in 1999. While the financial balance also declined, it is interesting to note that direct investment and portfolio investment equity flows into the developing countries as a whole *rose* slightly between 1998 and 1999.(1)

Comprehensive balance of payments data are not available for the other two main groups of countries not shown in the table, ie other advanced economies and the newly industrialised Asian economies. These two groups ran large current account surpluses in both 1998 and 1999.

Table 1
Current and financial account balances

US$ billions

		Current account	Financial account	Capital account	Errors
1998	United States	-221	210	1	10
	Japan	121	-110	-14	4
	Euro area	49	-79	16	15
	United Kingdom	-1	-10	1	10
	Developing	-90	117	7	-35
	Transition	-25	23	-1	3
1999	United States	-339	387	1	-39
	Japan	107	-85	-17	-6
	Euro area	25	-70	16	30
	United Kingdom	-21	13	-1	7
	Developing	-33	44	6	-17
	Transition	-5	4	1	0

Notes: Current account + financial account + capital account + net errors = 0. Figures may not sum exactly due to roundings.
Sources: IMF, ECB, Bank of England and national statistical agencies.

Change in methodology

In April 2000 the ECB adopted a new methodology(2) for compiling the income component of the euro-area current account. This has substantially increased the deficit on the income account, and correspondingly reduced the surplus on the current account for the years 1997 to 1999. The estimated surplus in 1999 is now around a half of the level previously estimated. Even after these revisions, the errors and omissions component of the euro-area balance of payments remains large.

Financial flows in the major economies

Table 2 shows a breakdown of the financial balances in the United Kingdom, United States, Japan and the euro area for 1998 and 1999. The data are all shown in US$ billion for ease of comparison.

(1) IMF *World Economic Outlook*, June 2000. The fall in financial flows is accounted for by lower net external borrowing and borrowing from the IMF by developing countries. This was almost $50 billion lower in 1999 than in 1998.
(2) The main revision is the treatment of interest on dividends on portfolio investment paid to non euro area residents. Where these are paid via central securities depositories in the euro area, some had been incorrectly allocated to the intermediaries and hence to the euro area.

Table 2
Financial account

Annual data, US$ billions

	Direct investment	Portfolio investment	Other investment	Reserve assets	Financial account
United Kingdom					
1998	-56	-28	74	0	-10
1999	-116	166	-38	1	13
United States					
1998	61	164	-8	-7	210
1999	130	237	2	9	378
Japan					
1998	-21	-40	-56	7	-110
1999	-11	1	1	-85	-84
Euro area					
1998	-118	-96	125	10	-79
1999	-147	-34	96	15	-70

Notes: The financial account is the sum of the first four columns.
Figures may not sum exactly due to roundings.
A negative sign on the financial account means net capital outflows.
An increase in reserves is shown as a negative.

- There have been substantial outflows from the euro area of both direct investment and portfolio investment of around $200 billion each year in total.

- These were partly offset by net inward 'other investment', as liabilities of the banking sector to the overseas sector increased substantially. This ties in with other data (eg BIS international bank assets data) showing that European banks have expanded their international activities and international funding.

- The United States has experienced large inflows of investment. In 1999 combined inflows of net direct and portfolio investment reached around $370 billion. The net position on 'other investment' has been broadly balanced.

- In Japan there has been a change in the composition of the financial account over the past two years. In 1998 there were large net outflows of portfolio and other investment. In 1999 the net outflow of other investment fell almost to zero, possibly reflecting Japanese banks' continued retrenchment from international markets. Japan's reserve assets rose by $80 billion, however, reflecting Bank of Japan purchases of foreign currency. In effect, the central bank rather than private residents acquired the foreign assets accumulated as the counterpart to the current account surplus. This has been interpreted in the markets as limiting the appreciation of the yen.

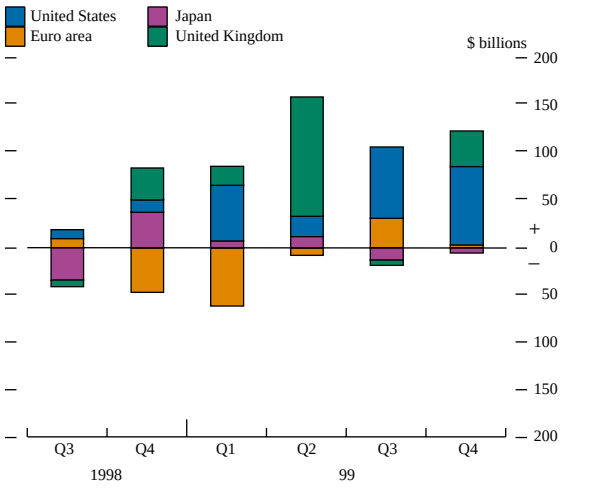
- Net outward portfolio investment in Japan fell by about $40 billion between 1998 and 1999. The net figure, however, masks a far bigger increase in foreigners' purchases of Japanese stocks, which rose from ¥19 billion in 1998 to a record ¥120 billion in 1999, contributing to the strength of the Japanese equity market. (The offsetting factors in net portfolio investment were a fall in foreigners' net purchases of Japanese bonds and an increase in Japanese residents' net purchases of overseas securities.)

- In the United Kingdom, there was a substantial net outflow of direct investment in 1999, but this was more than offset by a net inflow of portfolio investment. These data are dominated by two large takeover deals of foreign firms by UK firms in the second quarter.(1) These are recorded in the balance of payments as offsetting movements in outward direct investment and inward portfolio investment. (The deals were financed in effect by allocating shares in the UK firms to overseas holders of equity in the firms taken over.)

Quarterly pattern of portfolio and direct investment

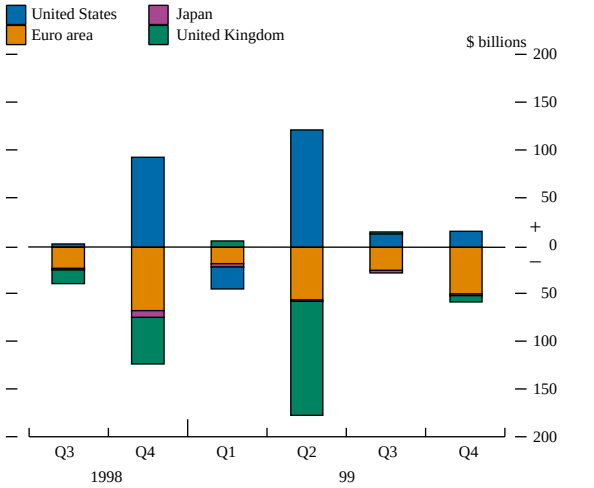
The annual data presented above obscure some interesting developments during the course of 1999. The charts below show the quarterly pattern of portfolio and direct investment

Chart A
Net portfolio investment



Sources: Bank of Japan, ECB, IMF and Office for National Statistics.

Chart B
Net direct investment



Sources: Bank of Japan, ECB, IMF and Office for National Statistics.

(1) Vodaphone Airtouch and Zeneca Astra.

in the United Kingdom, United States, Japan and the euro area over the six quarters to end-1999. In the euro area, direct investment has been uniformly outward on a net basis, but the pattern of portfolio investment has been more mixed.

Portfolio investment in the euro area

Anecdotal evidence suggests that one reason for large outward portfolio investment from the euro area is that, prior to EMU, European fund managers held a large proportion of domestic and other euro-area assets. Post EMU, they found themselves underweight in 'foreign' assets, since all euro-area assets were now 'domestic'. Fund managers' portfolio re-adjustment may therefore have accounted for the large portfolio investment out of Europe and into the United States and Japan.

In the bond markets, European residents were a large net buyer of overseas bonds in 1998 and the first half of 1999, but that reversed in the last six months of 1999, possibly suggesting that portfolio reallocation in bonds was reaching completion. The pattern in equity markets has been slightly different; indeed foreigners were large net *buyers* of euro equities in both 1998 and 1999, to the tune of about $100 billion per year—see Chart C.

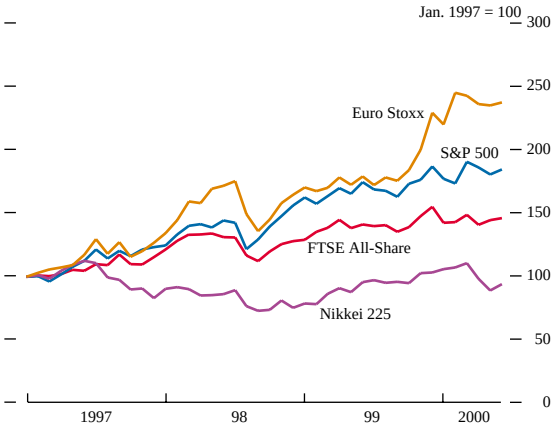
Developments in 2000

As Table 3 shows, there were substantial net inflows of portfolio investment to Japan in Q1, but this was more than offset by net outward flows of other investment. The recent trend of a build-up in official reserves continued.

The euro-area current account turned negative at the start of 2000. The financial account figures are dominated by the Vodaphone-Mannesmann takeover. As this was financed by an exchange of shares, it appeared in the accounts as a large direct investment inflow balanced by an equity outflow in portfolio investment.(1)

The final point—a useful cautionary note—is that the error terms for the most recent data tend to be large.

Chart C
International equity prices



Source: Bloomberg.

Table 3
Financial account

Quarterly data, US$ billions

	2000 Q1		
	Japan	Euro area	United Kingdom
Direct investment	0.1	147.2	-185.4
Portfolio investment	30.5	-178.5	183.1
Other investment	-48.1	90.8	3.8
Reserve assets	-19.5	-0.2	0.6
Financial account	-36.9	59.2	2.1
Net errors and omissions	9.8	-61.2	1.1
Current account	31.6	-1.2	-6.4

(1) The inward direct investment of €144.7 billion was more than double the value of direct investment in the euro area for the whole of 1999. Euro-area residents holding Mannesmann shares exchanged these for Vodaphone shares, showing up as an equity asset outflow, ie increased investment in foreign assets. There was also a fall in investment by non-residents, as Mannesmann shares that were owned by non-residents were exchanged for shares in Vodaphone. This reduced non-residents' investment in the euro area through an equity liability outflow. So there were outflows of equity assets and equity liabilities.

Public sector debt: end-March 2000

By Jonathan Bailey of the Bank's Monetary and Financial Statistics Division.

Public sector net debt fell by 2.8%, at nominal value,[1] *during the financial year to end-March 2000. This was the second successive annual reduction, following seven consecutive annual increases up to 1998. At end-March 2000 public sector net debt represented 36.6% of GDP, the lowest figure since 1994 and 3 percentage points lower than at end-March 1999. This article continues the annual series in the* Quarterly Bulletin[2] *analysing the outstanding financial liabilities of the public sector. It discusses developments during the year, and considers the implications of the current level and structure of UK government debt.*

Responsibility for government debt management was transferred to the Debt Management Office (DMO) in April 1998, and in April 2000 Exchequer cash management responsibilities were also passed over. The Bank of England's interest in the level and composition of public sector debt is now concentrated in other areas. Government debt is relevant to the sustainability of fiscal policy, and may impinge on monetary conditions. It is a key part of the collateral used in financial markets, and as such plays an important role in operations to implement monetary policy. In addition, the structure of government debt may influence financial stability, not least because liquid government debt markets at a range of maturities provide a benchmark for private capital markets.[3]

- The Bank of England is interested in the quantity of outstanding debt and in its composition and ownership, because conditions in the government debt market may influence private sector behaviour, and thereby the prospects for inflation.[4]

- Government debt instruments are widely used as collateral in the secured lending markets. In particular, the Bank implements the Monetary Policy Committee's interest rate decisions through its open market operations. Many of these transactions are undertaken through sale and repurchase (repo) agreements in which government bonds are used as collateral. So significant changes in the quantity of outstanding gilts could affect the liquidity of both the gilt market and the related repo markets.

- The authorities responsible for maintaining financial stability need to monitor the level of risk inherent in the balance sheet of the public sector, as well as the banking sector and the domestic economy more widely. They need to be alert to the risks of borrowing at short maturities, excessive reliance on borrowing from foreign residents, or large-scale open foreign exchange positions. Reliable statistics on the maturity, currency composition and holders of government debt instruments are necessary to assess these risks.

The level of public sector debt is an important indicator of the government's success in managing the public finances. In recognition of this, the UK government follows a sustainable investment rule, which states the objective of holding debt to a 'stable and prudent level', and has set a target of 40% for the ratio of net debt to GDP over the economic cycle. The government has a second fiscal rule to ensure that borrowing occurs only to finance public sector investments over the cycle. Achieving targets for the levels of the government debt and deficit are also two of the criteria for entry to the single currency monitored by the European Commission under the Maastricht Treaty. Along with inflation, the exchange rate and bond yields, the fiscal position of individual governments is seen as an important indication of a country's degree of convergence with the euro area.

The level of government debt is also monitored by other international organisations. For example, the IMF's Special Data Dissemination Standards, to which the UK government adheres, require that countries report both levels and maturity of central government gross debt on a monthly basis. These data (see Table C), along with information on the government's reserve position, are supplied showing positions in sterling and other currencies separately.

(1) For the purposes of measuring public sector debt, marketable debt instruments are conventionally valued at nominal (ie face) value. In this article all figures are given at nominal value, except where valuation at current market value is stated.
(2) Previously published in the November edition each year.
(3) Discussed further in the Bank of England *Financial Stability Review*, June 2000.
(4) In June 1998 the Bank of England organised a conference on 'Government debt structure and monetary conditions'. The discussion is summarised in an article in the November 1999 *Quarterly Bulletin*.

This article reviews developments in the UK public debt from each of these perspectives. It begins with the overall stock of public sector debt, including historical comparisons. The second section gives a more detailed analysis of the financial instruments which make up the debt. As British Government Stocks (gilts) are by far the most significant of these, the article focuses on the structure of the gilt portfolio and sets out changes in yields and market values during the year. The third section gives information on the ownership of debt and considers the UK government debt position relative to other countries. Finally, comparisons are drawn between the level of debt and the overall government balance sheet.

Total stock of outstanding public sector debt

The net debt(1) of the public sector (PSND) fell by nearly £10 billion (2.8%) in the 1999/2000 financial year, from £349 billion to £339 billion at nominal value (see Table A). The market valuation was about £35 billion higher than this. Nominal net debt fell by 3 percentage points, to 36.6% of GDP, the lowest ratio since 1994 (see Chart 1). The fall, which was largely in amounts borrowed through gilts and in holdings of foreign currency debt, reflected an £8.7 billion surplus in the public sector cash flow during the financial year (see Table B).

The current debt ratio is low by historical standards. Chart 2 shows that though the nominal debt level is high, it is at a relatively low level as a proportion of GDP. This reflects the fact that nominal GDP rose at a faster rate than the level of debt from 1945 to the late 1970s, and the two have grown broadly in line since then (though varying over the cycle). The ratio since the 1970s is closer to that in the years prior to 1914 than at any time between.

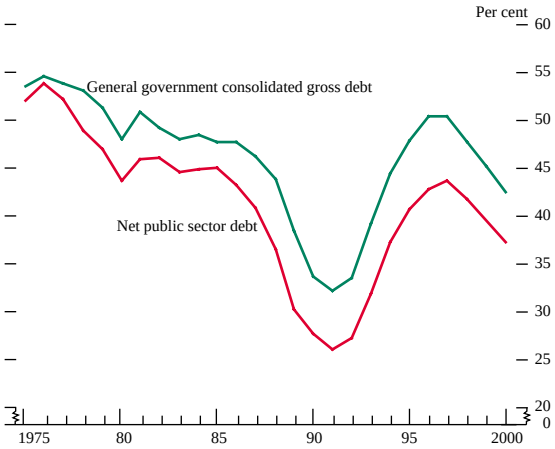
Table A
Public sector net debt

£ millions, nominal values (a); *percentages in italics*

31 March (b)	1998	1999	2000	Changes 1999–2000
Central government gross debt	**393,879**	**392,277**	**382,886**	**-9,391**
as a percentage of GDP	*46.8*	*44.6*	*41.4*	*-3.2*
Local government				
Total gross debt	51,933	52,742	53,437	695
less holdings of other public sector debt:				
Central government holdings of local government debt	43,397	45,273	46,656	1,383
Local government holdings of central government debt	170	273	254	-19
General government consolidated gross debt	**402,245**	**399,473**	**389,413**	**-10,060**
as a percentage of GDP	*47.8*	*45.4*	*42.1*	*-3.3*
Public corporations				
Total gross debt	26,044	26,775	26,812	37
less holdings of other public sector debt:				
Central government holdings of public corporation debt	25,668	26,440	26,453	13
Local government holdings of public corporation debt	0	4	1	-3
Public corporation holdings of central government debt	7,485	6,528	6,169	-359
Public corporation holdings of local government debt	810	780	812	32
Public sector consolidated gross debt	**394,326**	**392,496**	**382,790**	**-9,706**
as a percentage of GDP	*46.8*	*44.6*	*41.4*	*-3.2*
Total public sector liquid assets	**41,474**	**43,847**	**43,991**	**144**
as a percentage of GDP	*4.9*	*5.0*	*4.8*	*-0.2*
Net public sector debt	**352,852**	**348,649**	**338,799**	**-9,850**
as a percentage of GDP	*41.9*	*39.6*	*36.6*	*-3.0*

(a) Figures may not sum to totals because of roundings.
(b) Data from 1975 to 1999 are published in the *Bank of England Statistical Abstract 1999*, Part 1, Table 14.1.

Chart 1
Measures of public sector debt as a percentage of GDP, 1975–2000(a)



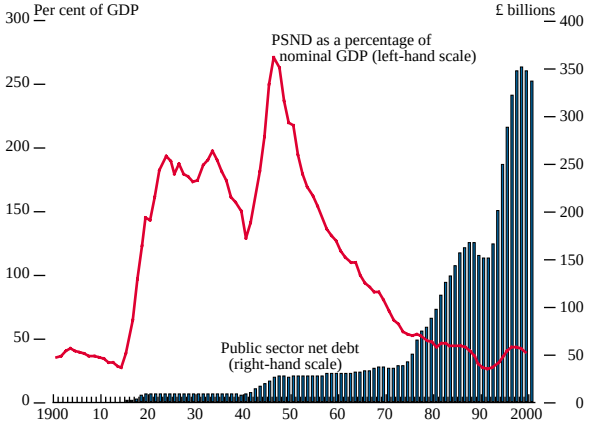
(a) At end-March each year.

Table B
Composition of the PSNCR

£ millions

	1997/98	1998/99	1999/2000
Central government net cash requirement (CGNCR)	**3,542**	**-4,535**	**-9,146**
Memo item: CGNCR on own account	2,650	-6,170	-10,559
Local government net cash requirement (LGNCR)	**-820**	**-404**	**860**
less borrowing from central government	*955*	*1,869*	*1,400*
General government net cash requirement (GGNCR)	**1,767**	**-6,808**	**-9,686**
Public corporations' net cash requirement (PCNCR)	**-719**	**-386**	**1,009**
less borrowing from central government	*-63*	*-234*	*13*
Public sector net cash requirement (PSNCR)	**1,111**	**-6,960**	**-8,690**
as a percentage of GDP	*0.1%*	*-0.8%*	*-0.9%*

Chart 2
Gross national debt, 1900–2000



Source: HM Treasury.

(1) Defined as gross financial liabilities at nominal value minus short-term assets.

The PSNCR and changes in the public sector net debt: reconciliation

Public sector net debt is a stock measure, and its change is calculated on a nominal, accrued basis. In contrast, the PSNCR, financed by transactions in assets and liabilities, is measured on a cash-flow basis. This leads to differences between the change in public sector net debt and the PSNCR for any given period, mainly because of the following:

- The value of foreign currency liabilities and assets is affected by fluctuations in exchange rates, and so the debt changes independently of any transactions that affect the PSNCR.
- When gilts are issued (or bought in ahead of their redemption date) at a discount or premium, the PSNCR is financed by the actual cash amount received (or paid out). The level of debt, however, is deemed to have changed by the nominal value of gilts issued (or redeemed).
- The capital uplift on index-linked gilts is recorded in the PSNCR only when it is paid out, ie when the stock is redeemed. In the measure of debt outstanding, it is accrued over the life of the stock.

£ billions	Year ending March 2000
PSNCR	**-8.7**
Plus	
Revaluation of foreign currency assets/liabilities	-0.5
Capital uplift on index-linked gilts	1.9
Discount/premium on gilt issues	-2.1
Other	1.1
Equals	
Change in public sector net debt	**-8.4**

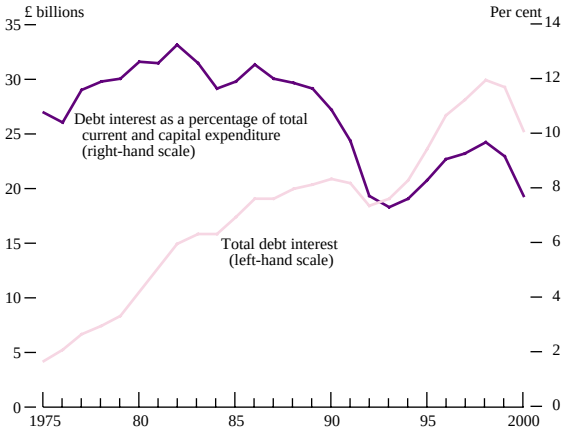
Note: Figures may not sum to total because of roundings.

Financing remits for 1999/2000 and 2000/01

The financing requirement(1) for central government for 1999/2000, which determines the amount of gilts and other debt instruments issued, was revised downwards during the financial year. This reduced the amount of gilt sales required, from the forecast of £17.3 billion to an actual amount of £13.6 billion. This was mainly the result of an improvement in the 1999/2000 central government net cash requirement (CGNCR), from a forecast deficit of £6.2 billion to an actual surplus of £9.2 billion. This improvement in the government's finances resulted in the cancellation of planned sales of Treasury bills and other short-term debt, and instead a net £8.8 billion of these instruments were redeemed. Net National Savings contributions also fell during the financial year (by -£1.1 billion), in contrast to the initial assumption of a slight increase (of £0.1 billion).

Interest and dividend payments on public sector debt during 1999/2000 were £3.9 billion lower than in the previous year. At £25.3 billion, this represented 7.7% of total public sector current and capital expenditure in the year, compared with 9.2% in 1998/99 (see Chart 3). This fall partly reflected the reduced net cash requirement, but was also influenced by a decline in short-term interest rates.

Chart 3
Public sector debt interest(a)



Source: Office for National Statistics.

(a) At end-March each year.

The latest assumption for the 2000/01 financing requirement was published by the DMO on 12 June 2000. This took into account the proceeds from the auction of mobile telephone licences in April, which, at £22.5 billion, were considerably higher than HM Treasury forecasts had previously assumed. The latest forecast for 2000/01 projects a cash surplus of £5.6 billion. Nevertheless, gilt sales totalling £10.0 billion are still planned for the year, made up of long-dated conventionals (£6.5 billion) and index-linked stock (£3.5 billion). The earlier plan to issue £2.2 billion of medium-dated conventional stock has now been abandoned. This emphasises the DMO's policy of concentrating issuance in long-dated conventionals and index-linked bonds, driven by market demands for these products, which are increased by the regulatory solvency requirements (the Minimum Funding Requirement).

Most forecasters expect that net public sector debt will continue to fall in the short term. The use of proceeds from the mobile phone auctions to redeem debt instruments and reduce new issuance makes this outcome more likely.

Analysis of public sector debt components

Total public sector gross debt (ie PSND before liquid assets are deducted) consists almost entirely of central government gross debt (CGGD) (see Table A). This is despite significant levels of local government and public corporations' gross debt (£53 billion and £27 billion respectively at end-March 2000); the vast majority of this is

(1) Published by the Debt Management Office, an Executive Agency of HM Treasury.

borrowed from central government and is thus netted out when calculating the consolidated figure. Also, although more than £6 billion of local government debt is not held by central government, this is offset in the public sector debt figures by a similar level of central government debt held by public corporations, such as the Post Office.

British Government Stocks (gilts)

Gilts continue to be the main component of the outstanding stock of government debt, accounting for 74% of CGGD at end-March 2000 (see Table C and Chart 4). This was 1 percentage point higher than a year earlier, despite total gilts falling during the financial year by £2.4 billion, to £283 billion.

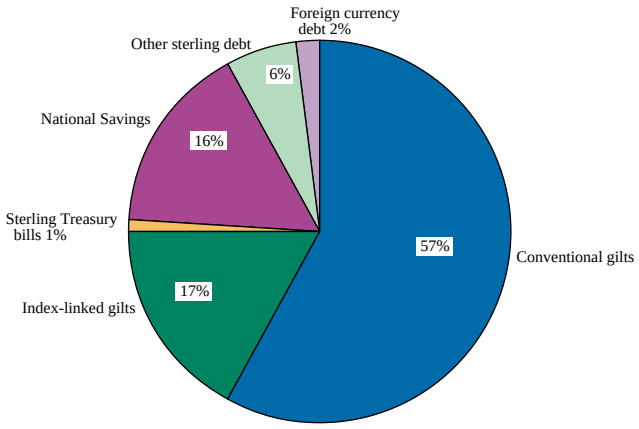
Table C
Central government gross debt

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

End-March (a)	1999		2000	
British Government Stocks	285,394	*72.8*	282,996	*73.9*
of which: index-linked	*62,289*	*15.9*	*65,703*	*17.2*
other	*223,105*	*56.9*	*217,293*	*56.8*
Sterling Treasury bills	4,721	*1.2*	4,453	*1.2*
National Savings	63,621	*16.2*	62,581	*16.3*
Certificates of tax deposits	574	*0.1*	535	*0.1*
Other sterling debt	26,147	*6.7*	23,368	*6.1*
Central government sterling gross debt	**380,457**	***97.0***	**373,933**	***97.7***
North American government loans	453	*0.1*	359	*0.1*
US$ floating-rate notes	1,239	*0.3*	1,254	*0.3*
US$ bonds	3,098	*0.8*	3,134	*0.8*
Euro Treasury bills (b)	2,341	*0.6*	0	*0.0*
Euro 9 1/8% 2001 bond	1,672	*0.4*	1,500	*0.4*
Euro Treasury notes	3,010	*0.8*	2,701	*0.7*
Debt assigned to the government	6	*0.0*	5	*0.0*
Central government foreign currency gross debt (c)	**11,819**	***3.0***	**8,953**	***2.3***
Total central government gross debt	**392,276**	***100.0***	**382,886**	***100.0***

(a) Data from 1975 to 1999 are published in the *Bank of England Statistical Abstract 1999*, Part 1, Table 14.2.
(b) The Bank of England assumed responsibility for the issuance of euro bills from 1 April 1999.
(c) Sterling valuation rates:
31 March 1999: £1 = US$ 1.6138, Can$ 2.4415, €1.4951
31 March 2000: £1 = US$ 1.5952, Can$ 2.3146, €1.6662

Chart 4
Composition of central government gross debt by instrument: end-March 2000(a)



(a) Figures may not sum to 100% because of roundings.

The stock of index-linked gilts continued to rise. Including capital uplift (the accrued inflation-linked valuation adjustment), the total held outside central government rose by £3.4 billion during 1999/2000. This was more than offset by a year-on-year fall of £5.8 billion in market holdings of conventional gilts. At end-March 2000 the nominal value of index-linked gilts in market hands totalled £65.7 billion, a 5% annual rise. Excluding the capital uplift, issuance of index-linked gilts totalled £1.6 billion. In cash terms, £3.0 billion was raised—meeting the DMO's commitment to issue at least £2.5 billion in index-linked stock during the year.

Index-linked issuance represented 22% of total gilts issued during 1999/2000, the remainder being conventionals. New issuance of conventional gilts totalled £9.8 billion at nominal value. This included two auctions of the long-dated benchmark 6% Treasury Stock 2028 (totalling £4.5 billion at nominal value) and one auction of the 10-year benchmark 5 3/4% Treasury Stock 2009 (£2.8 billion).(1)

The average remaining life of market holdings of gilts at end-March 2000 was 9.9 years (see Table D). This is the highest figure among the world's major economies and, since longer maturities minimise the need to continually raise new funds to redeem maturing debt, indicates a relatively stable financial position. The figure for the United Kingdom has been relatively unchanged in recent years, despite the preference within HM Treasury's issuance strategy towards long-dated stocks.(2) The falling gilts sales requirement has made it difficult to balance the market's desire for more long-dated stock with the government's reduced need to raise funds. Chart 5 shows the maturities of existing dated stocks, by nominal value in market hands, at end-March 2000. The modified duration figures, which indicate the percentage fall in the average market price of the gilt portfolio that would be associated with a single percentage point rise in yields, show an upward trend since 1990.

Table D
Average remaining life of dated stocks in market hands(a)

Years to maturity at 31 March

	1992	1993	1994	1995	1996	1997	1998	1999	2000
Latest possible redemption									
All dated stocks (b)	10.0	10.8	10.6	10.4	10.1	10.1	10.2	10.0	9.9
Excluding index-linked stocks	8.4	9.4	9.1	9.1	8.8	8.8	9.0	8.9	8.9
Earliest possible redemption date									
All dated stocks	9.8	10.5	10.4	10.2	9.9	9.9	10.0	9.9	9.9
Excluding index-linked stocks	8.1	9.0	8.9	9.1	8.8	8.7	8.9	8.8	8.8
Modified duration									
All dated stocks	6.0	6.7	6.7	6.3	6.1	6.3	6.9	7.4	7.4
Excluding index-linked stocks	5.3	5.9	5.9	5.5	5.3	5.5	6.1	6.4	6.3

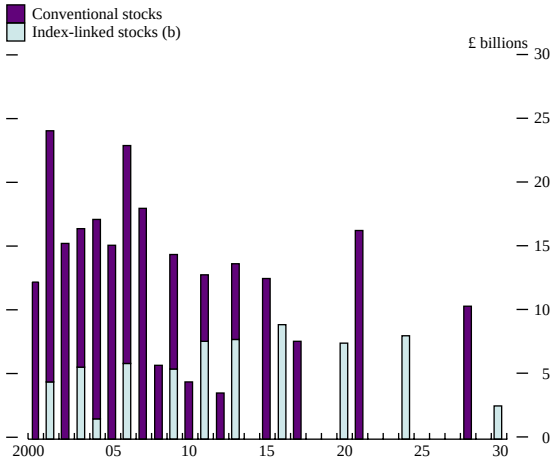
(a) These data are based on the nominal value of dated stocks held by the market at 31 March each year.
(b) Index-linked stocks are given a weight reflecting capital uplift accrued to 31 March.

The gilt yield curve, which measures the return on investments in gilts by maturity, began the financial year fairly flat, with yields very similar across all maturities.

(1) Details of gilt transactions are given each quarter in the 'Markets and operations' article in the *Bank of England Quarterly Bulletin*.
(2) *Debt Management Report*, HM Treasury, March 2000.

This picture changed during the year to the extent that the 5-year benchmark yield rose by around 125 basis points while the yield on the 20-year benchmark fell by 26 basis points. The increase in 5-year yields largely reflected a more general rise in short-term interest rates: the Bank of England repo rate in March 2000 was 50 basis points higher than a year earlier. At the long end, reductions in the net supply of gilts, combined with the continued strong demand for these assets by pension funds and life insurance companies, pushed market prices higher and yields lower.

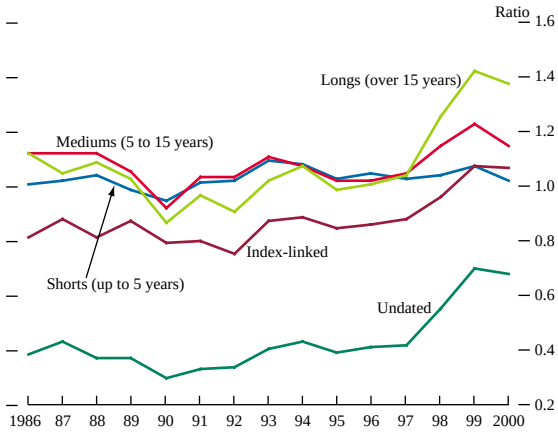
Chart 5
Redemption dates of dated stocks in market hands(a)



(a) As at end-March 2000, using latest possible redemption dates.
(b) Figures include accrued capital uplift to 31 March 2000.

The changes in gilt prices at different maturities are reflected in the market to nominal valuation ratios shown in Chart 6. Overall, £318 billion of gilts at market value were owned by the market at end-March 2000, 5% lower than a year earlier. However, this still represented an average 12% premium to the total at nominal value. The sharpest fall in market prices over the financial year was among medium-dated stocks, which at end-March 2000 were trading at an average 18% premium to their nominal value, a reduction of 8 percentage points from a 23% premium a year earlier.

Chart 6
Ratios of market to nominal values of stocks in market hands(a)



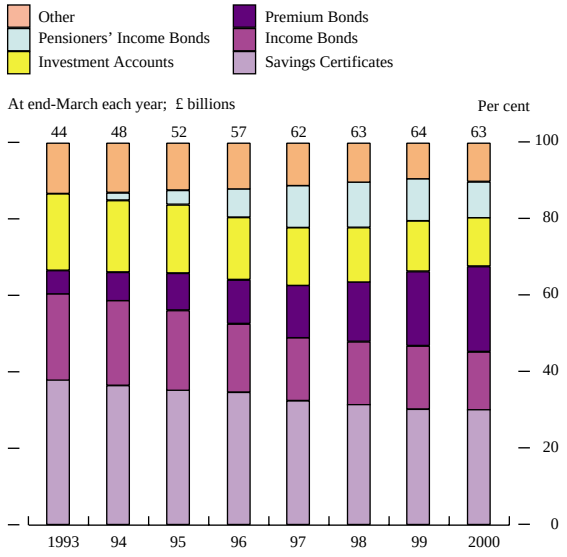
(a) At end-March each year.

National Savings instruments

The outstanding balance of National Savings instruments at end-March 2000 was £62.6 billion, £1.1 billion lower than a year earlier. During 2000/01 the balance is forecast to fall by a further £0.8 billion—reflecting instruments falling due for redemption in 2000/01—according to the 2000 *Debt Management Report*. Gross sales (ie sales and deposits including accrued interest) are expected to be around £12.5 billion, compared with £10 billion in 1999/2000.

National Savings instruments accounted for 16% of central government gross debt at end-March 2000 (see Chart 7), roughly the same as a year earlier. The proportion of National Savings held in Premium Bonds has now risen for eight consecutive years, to 22% in March 2000 from 6% in March 1993. As a consequence, the share of other instruments fell during 1999/2000, including Income Bonds which fell by 2 percentage points to 28%.

Chart 7
Composition of National Savings by product



Source: Department of National Savings.

Sterling Treasury bills

Sterling Treasury bills accounted for 1.2% of central government gross debt at end-March 2000. At £4.5 billion, this was 6% lower than a year earlier.(1)

Foreign currency

At end-March 2000 the sterling value of foreign currency debt outstanding was £9.0 billion, a 24% drop since

(1) More detailed analysis of the changes in Treasury bill issuance during the financial year is reported quarterly in the 'Markets and operations' article.

EC excessive deficit procedure: treatment of financial derivatives

There has been much discussion among statisticians and debt managers across Europe about the treatment of financial derivatives in government debt statistics. This box explains the background.

In 1997 the international guidelines for national statistical accounts, the System of National Accounts (SNA), were expanded by an international working group, led by the International Monetary Fund (IMF), following consultations aimed at amplifying and simplifying coverage of financial derivatives. These revisions included detailed guidance on the definition of financial derivatives for statistical purposes, the valuation of positions, the classification of margin payments and the treatment of settlement payments associated with interest rate swaps (including cross-currency swaps) and forward-rate agreements (FRAs).

The treatment of swap settlement flows under ESA95 was consistent with the initial SNA guidance, which explicitly stated that payments associated with interest rate swaps and FRAs should be included as property income. This means that the flows would be treated as revenues (or expenses), which in turn would contribute towards some sectoral balances (eg the general government deficit). This treatment was changed under the revised SNA.

It has been proposed that ESA95 be revised to maintain consistency with SNA. However, while this proposal has been accepted as necessary in a national accounts context, the implications for government deficit statistics have resulted in considerable resistance from those responsible for the management of government debt in certain countries. Because Maastricht debt and deficit are compiled on an ESA95 basis, any change to the accounting basis has knock-on implications for the debt and deficit figures.

For government deficits the proposed revision means that the revenues and payments arising from swap transactions conducted by government debt managers for hedging purposes, ie to reduce the risk inherent in borrowing in other currencies, would be treated as financial flows. It is argued that the use of these instruments within this context is for genuine debt management reasons, and is not speculative. Smaller countries, with weaker currencies, have used foreign currency interest rate swaps to hedge against fluctuations in the value of their own currency.

Such transactions are not widely used in the United Kingdom. All foreign currency borrowing by UK debt managers is directed towards helping to finance the foreign currency reserves, with the foreign exchange and interest rate risks hedged as part of the reinvestment of the proceeds within the reserves. It is very rare that foreign currency debt is swapped into sterling, and gilts have never been directly swapped either into sterling or into foreign currency. Any swaps that are undertaken are booked within the reserves rather than within the government debt accounts.

The solution proposed by Eurostat, which is supported by statisticians in most EU Member States, is to adopt the revised treatment of swaps within the main accounting framework of the ESA, thereby retaining consistency with wider international standards, but to recognise the need for a second measure of net borrowing which reflects the role of swaps as part of the wider cost of borrowing. No decision has yet been taken.

March 1999 (see Table C). This fall was almost entirely the result of the transfer of responsibility for euro bill issuance from HM Treasury to the Bank of England from 1 April 1999. At end-March 1999, market holdings of euro bills stood at £2.3 billion, ranging in maturity from one month to six months. By end-September 1999 all bills issued by HM Treasury had therefore matured.

Although the Bank of England is now the issuer of euro bills, there were no significant changes in the euro bill issuance programme. The proceeds are used by the Bank to finance the provision of intra-day liquidity, on a secured basis, to members of the euro payment system, and are held on the Bank of England's balance sheet as foreign currency assets.

The government's foreign currency reserves are an important component of the liquid assets of the public sector (see Table E). At end-March 2000 reserves totalled £21.5 billion, of which £6.8 billion was held in US dollars, £5.5 billion in euro and £3.0 billion in yen. Holdings of gold within this totalled £3.2 billion, at market value, at end-March 2000.

Table E
Public sector liquid assets

£ millions, nominal values

31 March (a)	1998	1999	2000	Change 1999–2000
Central government				
Official reserves	21,293	22,147	21,498	-649
Bank and building society deposits	2,292	1,762	3,398	1,636
Total central government liquid assets	**23,585**	**23,909**	**24,896**	**987**
Local government				
Bank deposits	7,994	8,519	7,434	-1,085
Building society deposits	3,796	3,756	4,324	568
Other short-term assets	3,693	4,334	4,754	420
Total local government liquid assets	**15,483**	**16,609**	**16,512**	**-97**
Public corporations				
Bank and building society deposits	1,469	2,029	1,455	-574
Other short-term assets	937	1,300	1,128	-172
Total public corporation liquid assets	**2,406**	**3,329**	**2,583**	**-746**
Total public sector liquid assets	**41,474**	**43,847**	**43,991**	**144**

(a) Data from 1975 to 1999 are published in the *Bank of England Statistical Abstract 1999*, Part 1, Table 14.1.

Ownership of government debt instruments

Some information is available about the sectoral identity of holders of government debt instruments. The estimated

distribution of the central government sterling gross debt is shown in Table F. Table G gives more detail for March 2000, showing estimated holdings of individual debt instruments by each sector. These are provisional estimates, based on a range of data sources, and are subject to revision.

Table F
Distribution of central government sterling gross debt: summary[a]

£ billions; *percentage of total in italics*

Amounts outstanding at 31 March

	1999		2000		Change 1999/2000
Public sector	5.8	*1.5*	3.6	*1.0*	-2.2
Banks	32.9	*8.6*	29.2	*7.8*	-3.7
Building societies	1.0	*0.4*	1.1	*0.3*	0.1
Institutional investors	183.0	*48.1*	186.3	*49.8*	3.3
Individuals and private trusts	89.9	*23.6*	93.0	*24.9*	3.1
Other UK residents	9.6	*2.5*	1.2	*0.3*	-8.4
Non-residents	58.3	*15.3*	61.9	*16.5*	3.6
Total	**380.5**	***100.0***	**373.9**	***100.0***	**-6.6**

Note: Figures shown may not sum to totals because of roundings.

(a) See Table G for more detail.

These figures show that banks' holdings of debt instruments continued to fall, for the fourth consecutive year, during 1999/2000. On the other hand, institutional investors, including insurance companies and pension funds, increased their stock during the year. Despite the overall fall in the sterling CGGD, individuals, private trusts and non-UK residents increased their holdings.

International comparisons

Along with other EU countries, the United Kingdom is required under the terms of the Maastricht Treaty to report government finance statistics to the European Commission for economic convergence reasons.

The Stability and Growth Pact (SGP) measures general government consolidated gross debt (GGCGD), calculated as a percentage of nominal GDP.(1) Most measures of debt monitor the ratio against GDP because GDP is closely linked to the tax base of the economy, and hence to the government's ability to service its debt. If the government can maintain its current spending and taxation plans indefinitely, while meeting its debt-servicing obligations, its fiscal stance is considered sustainable.

The latest figures submitted to the Commission show that UK gross government debt at end-December 1999 represented 46.0% of GDP. Apart from Luxembourg, this

Table G
Estimated distribution of central government sterling gross debt: 31 March 2000

£ billions, nominal values (a)

	Total	British Government Stocks (b)				Treasury bills	Other
		Total	Up to 5 years to residual maturity	Over 5 years and up to 15 years	Over 15 years and undated		
Public sector							
Local government	0.1	*0.1*	0.0	0.1	0.0	0.0	0.0
Public corporations	3.5	*3.5*	1.4	1.9	0.2	0.0	0.0
Total public sector	**3.6**	***3.6***	**1.4**	**2.0**	**0.2**	**0.0**	**0.0**
Banks (c)	29.2	*7.7*	3.6	2.7	1.5	1.8	19.7
Building societies	1.1	*0.8*	0.8	0.0	0.0	0.0	0.3
Institutional investors							
Insurance companies	104.7	*103.9*	24.7	43.8	35.3	0.6	0.2
Pension funds	77.3	*76.5*	20.6	36.0	19.9	0.6	0.2
Investment and unit trusts	4.4	*4.2*	1.8	1.7	0.7	0.0	0.2
Total institutional investors	**186.3**	***184.5***	**47.1**	**81.5**	**55.9**	**1.2**	**0.6**
Individuals and private trusts	93.0	*27.7*	11.8	10.7	5.2	0.0	65.3
Other UK residents	1.2	*0.1*	0.0	0.0	0.0	0.3	0.8
of which: Private non-financial companies	1.2	*0.1*	0.0	0.0	0.0	0.3	0.8
Non-residents							
International organisations	2.7	*0.7*	0.4	0.2	0.1	0.0	2.0
Central monetary institutions	16.7	*15.9*	9.0	4.1	2.8	0.8	0.0
Other	42.5	*41.9*	18.2	13.0	10.7	0.6	0.0
Total non-residents	**61.9**	***58.5***	**27.6**	**17.2**	**13.6**	**1.4**	**2.0**
Total	**373.9**	***283.0***	**92.4**	**114.1**	**76.5**	**4.5**	**86.5**

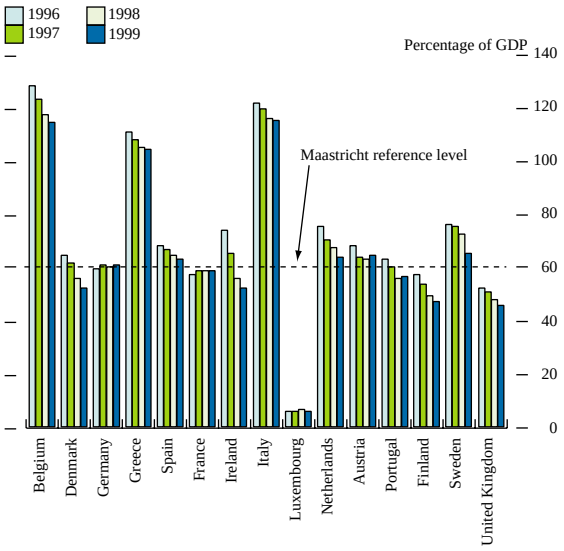
Note: Figures shown may not sum to totals because of roundings.

(a) Some of these estimates are based on reported market values; some others rely on broad nominal/market value ratios.
(b) A sectoral analysis of gilt holdings from 1975 to 1999 is published in the *Bank of England Statistical Abstract 1999*, Part 1, Table 14.4.
(c) Includes the Issue and Banking Departments of the Bank of England.

(1) At present the SGP's definition of GGCGD differs slightly from the definition used in the calculation of debt in the United Kingdom, where the emphasis is on debt representing the stock equivalent of the net cash requirement (PSNCR). The UK definition, although broadly based on the internationally agreed European System of Accounts (ESA95), does not currently include accruing liabilities arising from instruments where no actual transfer of funds takes place, such as finance leases. The Bank of England, HM Treasury and the Office for National Statistics are considering bringing the UK definition into line with that of the Pact.

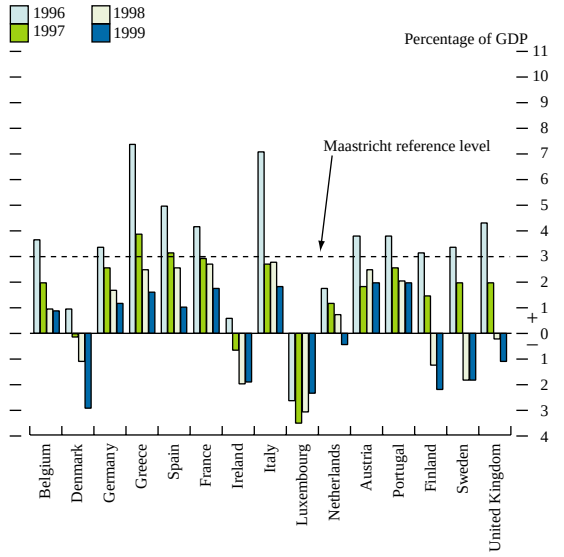
was the lowest among EU countries (see Chart 8), and is comfortably below the reference level of 60%. Debt ratios reported by Belgium, Greece and Italy remained above 100% of GDP in 1999.

Chart 8
General government consolidated gross debt (end-year)



Source: Eurostat.

Chart 9
General government net borrowing (calendar year)



Source: Eurostat.

The deficit reported under the Pact is the ratio of general government net borrowing to GDP, and the terms of the Pact allow deficits of up to 3%. Figures reported for 1999 by all countries met this condition, and the United Kingdom (-1.2%) was one of seven countries to report a net surplus (see Chart 9). In line with improving economic conditions, net borrowing in almost all EU countries has fallen consistently since 1996.

Some comparable information is available for other, non-EU, countries. For the United States, federal debt has been relatively stable in relation to GDP over the last four years, standing at 51% at end-December 1999. In contrast, Japanese government debt has increased rapidly in recent years, reaching a ratio of 84% at end-1999.(1)

Government balance sheet

Although measured at nominal value, the debt of government closely reflects its financial liabilities, which are measured at current market value. Table H shows how this relates to the total level of government assets and liabilities as published in the national accounts,(2) at market value. The government sector is a net borrower in financial balance sheet terms, with financial assets falling short of financial liabilities by some £330 billion at end-1999. However, with non-financial assets, including buildings and infrastructure, valued at £447 billion, the net 'worth' of the general government sector was valued at a positive £117 billion at end-1999. The short-term assets, which contribute to the calculation of nominal net debt, represent a relatively small proportion of the total general government assets figure of £626 billion.

Table H
General government balance sheet

£ billions

31 December	1997	1998	1999
Non-financial assets			
Tangible assets			
Residential buildings	71.2	79.0	78.7
Agricultural assets	2.8	2.8	2.7
Commercial, industrial and other buildings	110.7	115.5	118.4
Civil engineering works	183.5	203.3	223.7
Plant and machinery	16.4	16.8	17.5
Vehicles, including ships and aircraft	5.1	5.0	4.6
Stocks and work in progress	0.8	0.9	0.6
Total tangible assets	**390.5**	**423.3**	**446.2**
Total intangible assets	**0.7**	**0.9**	**1.1**
Total non-financial assets	**391.2**	**424.2**	**447.3**
Total financial assets	**166.9**	**169.2**	**178.3**
Total assets	**558.1**	**593.4**	**625.6**
Total liabilities	**491.2**	**528.8**	**508.6**
Net worth	**66.9**	**64.6**	**117.0**

Source: ONS, *Blue Book*.

Conclusion

The UK net public sector debt ratio is currently low by both historical and international standards. Over the economic cycle it appears to be within the range targeted by the government's sustainable investment rule, and is well below the Maastricht reference level of 60%. Most forecasters expect the level to continue to fall in the short term. With government receipts exceeding expenditure in 1999/2000, which is likely to be repeated this financial year, the present picture is one of stable and sustainable public finances.

(1) Source: OECD *Economic Outlook*.
(2) More details are given in *Blue Book 2000*, Office for National Statistics, July 2000.

UK government debt has a relatively long average maturity, which limits roll-over risk, and a small proportion is held in foreign currency instruments, reducing external risk.

The declining debt position has created a shortage of long-dated and index-linked government stock. The DMO is attempting to address this issue, for example through switch auctions, but if the stock continues to decline, shortages of stock at one maturity or another will remain. Should the debt ratio continue to fall, the reduced liquidity of the government bond market could potentially affect the ability to sell or repo out government bonds in the event of funding strain.(1)

The reduced availability of gilts creates opportunities for fund-raising for long-term investment by companies, and the gilt shortages may add pressure for changes in the Minimum Funding Requirement, applicable to certain long-term investors, to ease the pressure on pension funds and other long-term investors.

(1) This (and other questions posed by shrinking government bond markets) is discussed in the Bank of England *Financial Stability Review*, June 2000.

Annex
Notes and definitions

Central government gross debt

Comprises:

British Government Stocks (BGS): Sterling, marketable, interest-bearing securities issued by the UK Government. The nominal value of index-linked gilt-edged stocks is increased by the amount of accrued capital uplift. The whole nominal value of all issued stocks is recorded, even where outstanding instalments are due from market holders (where this is the case, the outstanding instalments are recorded as holdings of liquid assets). This article uses the same definition of short and medium-dated gilts as the National Loans Fund (NLF) accounts (under five years and five to ten years respectively). In the financing requirement, however, and in general market usage, short-dated gilts are defined as three to seven years and medium-dated as seven to fifteen years.

Treasury bills: Short-term instruments generally issued with either a one-month or a three-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 issuer at the tender.

National Savings securities: 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 *coin* in circulation, *Ways and Means advances* (the method by which government departments and the Bank of England Issue Department lend overnight to the NLF), *NILO stocks* (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 NLF), deposits with the National Debt Commissioners of *funds lodged in courts*, market holdings of *Northern Ireland government debt* (principally 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 and comprises *foreign currency bonds* (denominated in US dollars, Deutsche Marks and euro), *euro notes and bills*, *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 corporation debt*. All holdings of each other's debt by these three parts of the public sector are netted off to produce a consolidated total.

The local government sector comprises all bodies required to make returns under the various local authorities Acts. Public corporations are trading bodies (including nationalised industries), 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 Chapter 4 of the *Financial Statistics Explanatory Handbook*, published by the Office for National Statistics.

Public sector net debt

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

General government consolidated gross debt

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

Age structure and the UK unemployment rate[1]

By Richard Barwell, formerly of the Bank's Structural Economic Analysis Division.[2]

The proportion of youths in the labour force has fallen dramatically in the past 15 years, following the collapse in the birth rate in the 1970s (the 'baby bust'). Youths always have higher unemployment rates than adults, so this change in the composition of the labour force may have contributed to a fall in the aggregate unemployment rate. Based on data from the Labour Force Survey, it appears that about 0.55 percentage points of the 5.65 percentage point fall in the UK unemployment rate between 1984 and 1998 can be accounted for by changes in the age structure of the labour force.

Introduction

Most models of the labour market assume a short-run trade-off between unemployment and inflation; this assumption is at the heart of the Phillips curve relationship and the expectations-augmented models that followed it. So recent developments in the labour market have puzzled economists: in August 1999, for example, the number of people out of work and claiming benefit fell to a 19-year low and yet the RPIX inflation rate was at its lowest level for more than five years.

Part of the explanation of this puzzle may be that the natural or equilibrium rate of unemployment has fallen, enabling the actual unemployment rate to fall substantially without generating a pick-up in inflation. Explanations for the fall in the natural rate have tended to focus on supply-side factors, such as the decline in union bargaining power, reduced generosity of unemployment benefits and increased deregulation of the labour market. This paper examines another supply-side explanation, which has received less attention in the United Kingdom: that the natural rate has fallen partly because of changes in the composition of the labour force. Youths[3] tend to have higher unemployment rates than adults, and presumably have higher natural unemployment rates as well. The proportion of youths in the labour force almost halved over the past decade, so we would expect the aggregate unemployment rate and the natural rate to have fallen as a result.

Most of the existing literature investigating the impact of demographic change on the unemployment rate has looked at the US labour market. Katz and Krueger (1999) find that changing age structure accounts for about half of the fall in US unemployment between 1979 and 1998; Shimer (1998) finds that the effect is even larger, at about 70%. This paper provides a comparable estimate of the fall in UK unemployment that can be accounted for by the decline in the youth share of the labour force.

The first section presents two key stylised facts, which together suggest that demographic change could play a significant role in explaining recent developments in the UK labour market. First, that the youth share of the labour force has fallen dramatically over the last decade, and second, that youths always have higher unemployment rates than adults; the latter is analysed in the second section. The third section explains the 'shift-share' methodology developed in the literature, and uses it to provide a range of estimates of the impact of demographic change in the labour force on the unemployment rate. The fourth section discusses two alternative approaches that control for changes in the labour force participation rates of each age group. The final section uses current projections of the future size and composition of the labour force to assess the implications for the unemployment rate in the near future.

Stylised facts

Demographic change

The United Kingdom, like most of the developed world, has experienced a sustained period of significant demographic change in the postwar period. The crude birth rate[4] increased rapidly in the late 1950s and early 1960s, from 15 in 1955 to 18.5 in 1964, then collapsed to a low of 11.5 in 1977. It has since stabilised (see Chart 1). These changes were echoed 16 years later in the size of the youth cohort entering the labour market. Chart 2 illustrates the dramatic fall in the youth share of the labour force between the late 1970s and the mid-1990s: the proportion of 16–19 year olds in the labour force peaked at 9.9% in 1981, but had fallen to 5.8% by 1994.

(1) Based on a forthcoming *Bank of England Working Paper*, 'Age structure and the UK unemployment rate'.
(2) This work was completed while the author was working at the Bank.
(3) 'Youths' here refers to the 16–24 age group.
(4) The crude birth rate is measured as the total number of births each year multiplied by a thousand and divided by the total population.

Chart 1
Crude birth rate

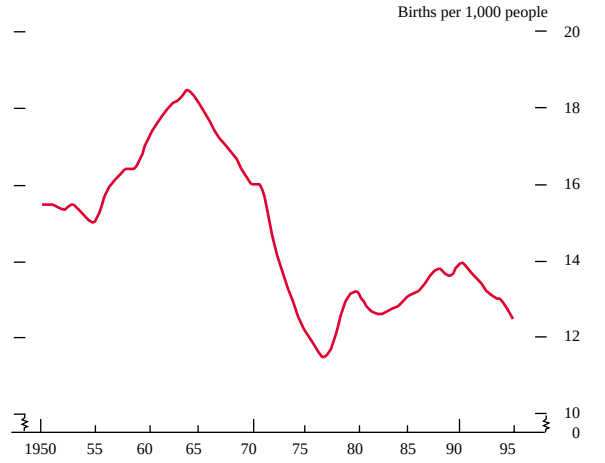
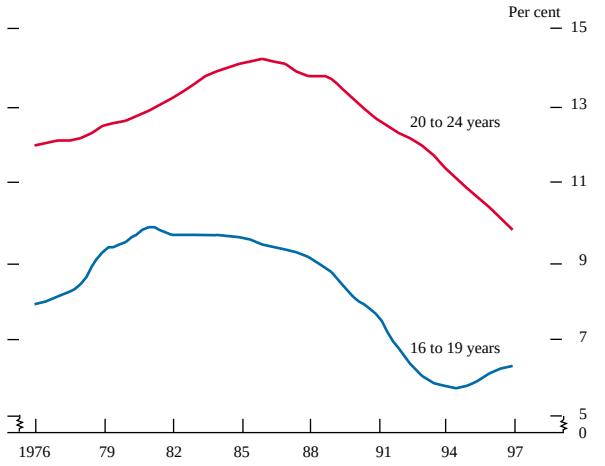


Chart 2
The youth share of the labour force



Although the large fall in the birth rate in the 1970s will have reduced the number of youths of working age, a number of other factors may have affected the youth share of the labour force, such as increased participation in the tertiary education system: the number of youths attending further and higher education colleges more than doubled between 1980 and 1995, which reduced the proportion of youths either employed or actively searching for work.

This reduction in the youth share of the labour force can be highlighted by changes in the youth activity rate. Between 1994 and 1998, the activity rate of the 16–17 age group fell by more than 4 percentage points, and that of the 18–24 age group fell by 7 percentage points. This had a significant impact on the number of youths in the labour force—if activity rates had remained at their 1984 levels, there would have been approximately 400,000 more youths in the labour force in 1998. Almost a quarter of the total fall in the number of youths in the labour force over the period was purely a result of changes in the youth activity rate, rather than of demographic pressures.

Changes in youth activity rates will not necessarily have affected the composition of the labour force to the same extent as they have the number of youths in the labour force. For men at least, activity rates have fallen for all age groups since the mid-1970s,(1) and so the size of the labour force may have fallen at a similar rate to the proportion of youths entering it. Changes in participation rates for specific age groups will matter only to the extent that they diverge from those of other age groups.

The youth unemployment gap

The unemployment rate is by identity equal to the product of the *inflow rate* into unemployment and the average *duration* of unemployment. So if U is the stock of unemployment, S is the inflow into unemployment and N is the size of the labour force then:

$$\frac{U}{N} \equiv \frac{S}{N} \times \frac{U}{S} \qquad \textbf{(1)}$$

In steady state, the number of people entering unemployment must equal the number leaving it. Letting H denote the total outflow from unemployment we get:

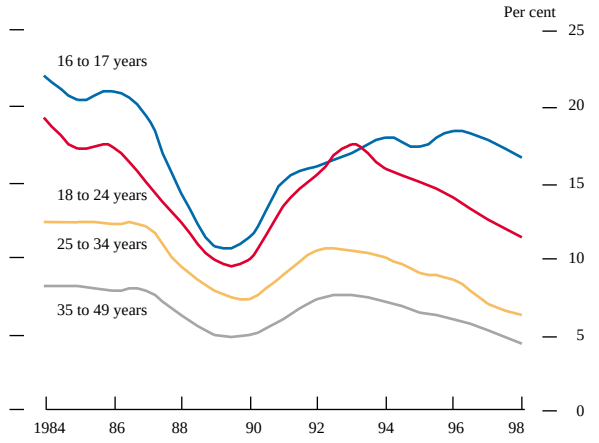
$$\frac{U}{N} = \frac{S}{N} \times \frac{U}{H} \qquad \textbf{(2)}$$

The final term of **(2)** is the reciprocal of the outflow rate, so the steady-state unemployment rate can be expressed as the inflow rate into unemployment divided by the outflow rate from it:

$$\frac{U}{N} = \frac{S/N}{H/U} \qquad \textbf{(3)}$$

Youths as a group always have higher unemployment rates than adults (see Chart 3). The UK data show that this is because younger workers have a higher propensity to become unemployed, ie their inflow rate into unemployment

Chart 3
Unemployment by age group



(1) Activity rates have risen for women. See Gregg and Wadsworth (1999).

is relatively higher. Once unemployed, however, their outflow rates from unemployment appear, if anything, to be marginally higher than those of adults; so, at any given time, a far smaller proportion of unemployed youths have been unemployed for an extended period. Although large numbers of young people flow into unemployment each period, relatively few end up becoming long-term unemployed.

Chart 3 shows that, relative to all other age groups, youths have had increasingly higher unemployment rates over the period. When the labour market began to recover in the mid-1990s, the unemployment rate of the youngest members of the labour force was the slowest to react—between 1993 and 1996 the unemployment rate of 16–17 year olds actually increased, while the rates of all other age groups fell. By 1998, while the unemployment rate of most other age groups had fallen by about a third, the unemployment rate of 16–17 year olds was still at its 1993 level. This may be because of increased participation in post-compulsory education—if, as seems likely, those members of each cohort with the best employment prospects enter further and higher education, then over time the average employability of the youths who join the labour force aged 16 will fall.

So our two stylised facts are:

- the proportion of youths in the labour force has changed dramatically over the past 20 years; and

- younger workers always have higher rates of unemployment than older workers because they have higher inflow rates into unemployment.

Given the orders of magnitude of the relevant variables, demographic change in the labour force clearly could have been large enough to have a material effect on aggregate unemployment.

The youth unemployment rate differential

Turnover in the labour market appears to be greatest for younger workers. Gregg and Wadsworth (1995) estimate that more than half of all the job changes during the course of a working lifetime occur before the age of 30, and a quarter before the age of 20. It appears that these high job separation rates can be explained either by discrimination against youths when firms are forced to lay off staff, or by the greater propensity of young workers to quit their jobs.

Firms' lay-off policies

Firms are periodically forced to lay off some of their employees, both in response to transitory and permanent shifts in demand, and as a result of periodic restructuring of the workplace to increase efficiency or profitability. If firms disproportionately concentrate lay-offs among their youngest employees, this might help to explain the higher youth inflows into unemployment. There are two main reasons why lay-offs may be concentrated among younger workers. First, that firms are constrained—by prior agreement to 'last in, first out' (LIFO) rules, which disproportionately target younger workers—in who will be laid off; and second, that firms choose to lay off their youngest employees.

Negotiated LIFO rules

In their survey of 'Pay and Employment Determination in Britain', Oswald and Turnbull (1985) find that LIFO is the most widely used method for choosing who will be made compulsorily redundant in a slump. The LIFO rule(1) discriminates against the most recent entrants to the workforce when the firm is forced to lay off staff. Youths are, almost by definition, recent entrants to any firm. Of the 350 establishments surveyed by Oswald and Turnbull, 64% used LIFO as their criterion to decide enforced redundancies. Although the recent decline in the coverage of trade union bargaining may have reduced the use of LIFO rules in deciding who is laid off, it is likely to remain important wherever unions have retained significant bargaining strength.

Firms choosing to lay off younger workers

Firms may choose to lay off their youngest employees in the face of a negative demand shock. Older workers will have acquired valuable workplace-relevant human capital during their time in the labour market. These skills will be costly for the firm to replace in terms of the financial cost of hiring and training replacements, and also because it will take time for a recent entrant to become familiar with the workplace. Also, if the firm chooses to lay off skilled incumbents it may be difficult to replace them when demand recovers. Conversely, young workers have little general or firm-specific workplace human capital and will still be in plentiful supply when demand recovers. So firms may choose to retain the skilled core members of its workforce and to concentrate lay-offs where possible among the least-skilled recent entrants.

The incentive to lay off younger less-skilled workers may be partly offset by the fact that they will almost certainly be paid substantially less than older members of the workforce, so the simplest way to cut labour costs significantly would be to lay off the more expensive older workers. However, there are sunk costs in hiring and/or training staff to replace skilled employees, and firms may not be able to continue to operate effectively without their skilled core workers. So lay-offs might still be concentrated among the least skilled, despite the fact that they are cheaper to employ. In the Oswald-Turnbull survey, 47% of firms reported deciding enforced redundancies according to which workers were 'least skilled or competent'. Also, if firms believe that youths are more likely to quit than adults then they may delay training new employees, which will prolong the period

(1) LIFO is typically introduced at the behest of unions, because LIFO rules give increased job security to the majority of employees.

for which young entrants to the firm will be viewed as low-skill workers (see Farber (1994)).

Youths' higher propensity to quit

Young people quit their jobs more frequently. There are two main reasons why they may do so: they may be employed in types of jobs that encourage them to quit more often, or they may behave differently from adults in the labour market.

Low-wage/secondary sector jobs

The probability that an individual will quit a job is generally taken to be inversely proportional to the wage offered, so low-wage industries are generally also high-turnover industries. The labour market is often characterised as comprising two sectors: a primary sector of high-wage jobs, for which there are job queues and for which voluntary quits (into unemployment) are rare; and a secondary sector of low-skill jobs, characterised by low pay, poor working conditions and limited prospects for training or future wage growth.

Low pay is remarkably concentrated in a very small number of industries—half of all the low paid work in just six occupations (see Metcalf (1999a)). Younger workers are concentrated in the secondary sector (two fifths of those aged 18–20 and more than half of those aged 16–17 work in the retailing and hospitality industries, both of which are classic low-pay employers (see Metcalf (1999b)), so they will be more likely to quit their jobs than older workers. This might also explain their higher inflow rates into unemployment. So, on this explanation, it is not that youths necessarily have an intrinsically higher probability of quitting their jobs than adults, but simply that disproportionate numbers of them work in the high-turnover secondary sector.

Why are youths more likely to be employed in the secondary sector? If youths have lower reservation wages,(1) they will be willing to accept low-wage jobs that adults will reject; and their reservation wages may be lower either because they have only limited access to government benefit when unemployed,(2) or because their wages may be supplemented by contributions from their parents.

Adult workers may also be at a distinct advantage when applying for vacancies in the primary sector—they will be more productive (having acquired work-related human capital) and can provide references from previous employers to signal their ability and work ethic. Younger workers, with limited work experience and a shorter employment track record, will be at a distinct disadvantage to adults with otherwise identical observable productivity characteristics. So young workers are more likely to be forced initially to accept vacancies in the secondary sector.

'Job shopping'

An individual may be unable to assess how productive, and hence how well paid, he will be in a particular job until he accepts it. So individuals may sample a number of jobs, many of which they will quit when the match is revealed as unproductive—a process known as 'job shopping'. Job shopping is, in effect, the mechanism by which a new entrant to the labour force progresses towards a more permanent job. It may be that, because of their inexperience in the labour market, youths are more reliant on sampling jobs in order to discover their productivity; adults, on the other hand, may be better able to assess a job vacancy on inspection. So youths may accept—and then rapidly quit—jobs that adults would not have accepted in the first place.

Generational crowding and the youth unemployment rate

It is possible that the youth unemployment rate itself might be sensitive to the proportion of youths in the labour force. The empirical evidence (see Freeman and Bloom (1986)) suggests that the unemployment rate of a group, and in particular of youths, may be positively related to its share of the labour force. A number of factors will affect the size of these 'generational crowding' effects: the existence, level and coverage of any youth minimum wage legislation; the degree of substitutability and/or complementarity with other groups in the labour force; and the elasticity of demand for youth labour. So the shift in the composition of the labour force away from the young may have led to a fall in the youth unemployment rate, irrespective of any cyclical effects. However, as long as youth unemployment rates remain above those of adults, such shifts will still reduce the aggregate unemployment rate.

The quantitative importance of demographic change

The aim of this section is to quantify the importance for measured unemployment of the relatively higher youth unemployment rate and the significant change in the demographic composition of the labour force. To do so, changes in the aggregate unemployment rate over time are decomposed into two parts: that accounted for by changes in the unemployment rates of the separate age groups in labour force; and that accounted for by changes in the composition of the labour force itself. This 'shift-share' approach has its origins in the work of Perry (1970), but can also be found in Summers (1986), Shimer (1998), Katz and Krueger (1999) and Horn and Heap (1999), among others.

Accounting for changes in the aggregate unemployment rate

The aggregate unemployment rate at any time can be defined as the weighted average of the unemployment rates of all the separate age groups in the labour force, where the weights are simply the respective group's share of the labour

(1) A worker's reservation wage is the minimum he will accept to compensate him for moving into employment.
(2) Those aged 18–24 receive £40.70 Jobseeker's Allowance per week, while those aged 25 and above receive £51.40, under both the contribution-based and income-based schemes (Benefits Agency (1999)).

force. So a fall in aggregate unemployment will originate either from a change in the composition of the labour force towards groups with lower unemployment rates, or from a fall in the unemployment rates of some or all groups, or from some combination of the two.(1)

Following the terminology used by Katz and Krueger (1999), we define the age-constant unemployment rate as the weighted average of the age-specific unemployment rates, where the weights are the shares of each group in the labour force in a base year. It captures what would have happened to aggregate unemployment, given the observed changes in group unemployment rates, if there had been no age-related demographic change, ie holding the age structure in the base year fixed.

Katz and Krueger use the difference between the actual aggregate unemployment rate and this age-constant unemployment rate—the age adjustment to the unemployment rate (AAU)—to measure the impact of demographic change. This captures that part of the change in aggregate unemployment that cannot be explained by shifts in the group-specific unemployment rates alone, and must therefore be caused by shifts in the composition of the labour force.

The other main approach is to measure what would have happened to the unemployment rate if all the group-specific unemployment rates had remained constant and only the composition of the labour force had changed. This is the age-driven unemployment rate, ie the rate driven purely by demographic change. The rate depends (by construction) on the levels of unemployment in the base year, and so does not measure the unemployment 'caused' by demographic factors. But we can interpret the difference between the age-driven rate in a given year and unemployment in the base year as the implied change in the aggregate unemployment rate due to demographic pressures—the age-driven change in the unemployment rate (ADCU).

Shimer also uses a chain-weighted measure (CWM) to identify the change in unemployment attributable to demographic change between any two years. The CWM is not as sensitive to the choice of base year because of the implicit averaging involved in its calculation (see Shimer (1998)).

Empirical evidence

Dividing the labour force into youths (aged less than 25) and adults, using data for 1984–98 from the Labour Force Survey, Chart 4 shows that the age-constant unemployment rate tracks the actual unemployment rate quite closely for most of the period, and the two series are virtually indistinguishable up until 1989. Thereafter, however, the effect of the changing composition of the labour force is not captured by the age-constant rate and so the actual unemployment rate falls further than the age-constant rate. The path of the age-driven unemployment rate reflects this decline in the proportion of the young in the labour force and also falls over the period. However, because it is based on 1984 unemployment rates, it is unaffected by the large fall in all the group-specific unemployment rates as the economy recovered from the severe slump in the early 1980s.

Chart 4
Time path of actual, age-driven and age-constant unemployment

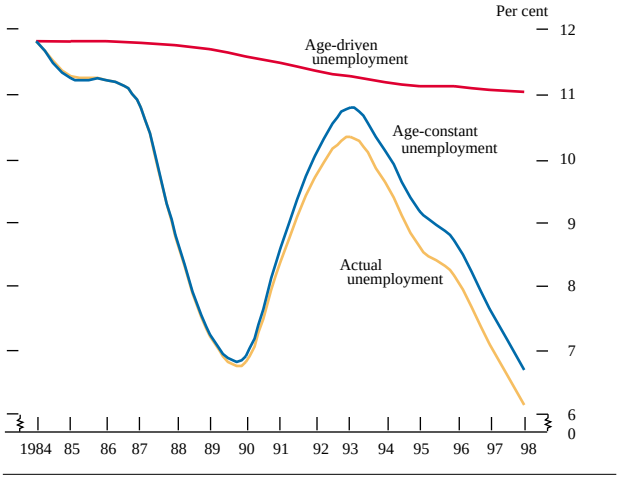


Table A summarises the changes in the different unemployment series. It appears that changes in the age structure of the labour force can account for 0.50 to 0.77 percentage points, or 9%–14%, of the fall in unemployment between 1984 and 1998.(2)

Table A
Estimates of impact on unemployment rate of demographic changes

Index of demographic pressure	Change (percentage points)	Percentage of change in unemployment rate explained
AAU	-0.55	10
ADU	-0.77	14
CWM	-0.50	9

Notes:
AAU = age adjustment to the unemployment rate.
ADU = age-driven unemployment rate.
CWM = chain-weighted measure.
See above for definitions.

Changing the base year

The results above use the unemployment rate and labour force composition in 1984 as the base for calculating the age-constant and age-driven unemployment rates. By repeating the analysis using each year in the sample in turn as the base, it is possible to test whether the results are qualitatively or quantitatively sensitive to the choice of base

(1) The forthcoming *Working Paper* contains a full mathematical exposition.
(2) These results may be sensitive to the way the labour force has been divided. But repeating this analysis by sub-dividing the labour force further into five separate age groups (16–17, 18–24, 25–34, 35–49 and 50+) gives very similar results: the impact of demographic change is very slightly less than the results shown above. See the forthcoming *Working Paper* for a fuller discussion.

year. The calculations of the age-constant and age-driven unemployment rates are now partly retrospective, so the definitions of the age adjustment to the unemployment rate and the age-driven change in the unemployment rate must be amended accordingly. The age adjustment to unemployment, given age-constant unemployment calculated using the base year, is now defined as the difference between the change in the unemployment rate and the change in the age-constant unemployment rate over the period.

The age-driven change in the unemployment rate is now defined as the difference between what the unemployment rate would have been in 1984 and in 1998, had group-specific unemployment rates remained at their values in the base year. The chain-weighted measure is of course unaffected, as it is based on the actual composition of the labour force and group unemployment rates in each year.

The results show that the choice of base year has a significant effect on the estimate of the impact of demographics on the unemployment rate. This is not surprising, as each base represents a different set of values for the composition of the labour force and for group unemployment rates.(1) But the mean estimates of the change in actual unemployment explained by each of the measures across all available base years (1984 to 1998) range from 0.49 to 0.65 percentage points, as shown in Table B, which is broadly in line with the estimates in Table A.

Table B
Mean estimates of impact on unemployment rate of demographic changes

Index of demographic pressure	Change (percentage points)	Percentage of change in unemployment rate explained
AAU	-0.65	11.5
ADU	-0.54	9.6
CWM	-0.49	8.6

See notes to Table A.

Generational crowding

The results above reflect only the direct compositional effect of demographic change, but do not capture interactions between group size and group unemployment rate. If, for example, the increase in the youth unemployment rate in the late 1970s and early 1980s was partly due to the rapid expansion of the 'baby boom' cohort, then the reverse would be seen as the proportion of young people in the labour force subsequently declined: both the youth share of the labour force and the youth unemployment rate would have fallen.

Shimer developed a useful measure of generational crowding effects, which in effect measures the correlation between age-specific labour shares and unemployment rates. If the measure is positive, then a group whose share of the labour force increases (decreases) will experience an increase (decrease) in its relative unemployment rate—supporting the notion of generational crowding. Conversely, if the measure is negative, then those groups whose share of the labour force increases would enjoy a relative fall in their unemployment rates.

Taking the sample as a whole and dividing the labour force into youths and adults, there appears to be clear evidence of generational crowding: when the youth share of the labour force declined, the youth unemployment rate also fell relative to that of other groups in the labour force. This result is not robust, however; taking any year between 1987 and 1991 as the starting-point, the evidence is of *perverse* generational crowding effects, with youths experiencing increasingly higher unemployment rates as their share of the labour force fell.

The youth share of the labour force fell steadily over the entire period, so the direction of change of the youth/adult unemployment differential is crucial to the sign of Shimer's crowding measure. The differential increased after 1989, despite the falling youth share of the labour force, which is why the perverse generational crowding effects are seen. A neutral assumption, on the available evidence, is probably that the group-specific unemployment rates have been independent of the composition of the labour force, and that the results discussed earlier remain appropriate measures of the effect of demographic change on unemployment.

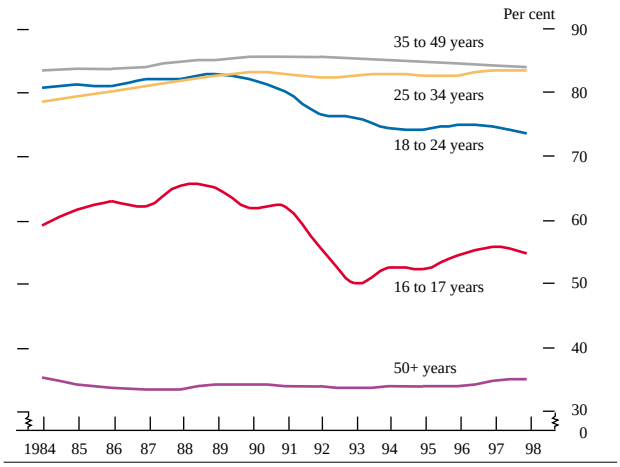
Controlling for changes in activity rates

The previous section provided estimates of how much of the change in the aggregate unemployment rate can be accounted for by changes in the composition of the labour force. However, as discussed in the first section, changes in the composition of the labour force are not driven only by demographic forces, but also by changes in activity rates of different age groups. As Chart 5 illustrates, the most striking change in activity rate occurred among the young—between 1984 and 1998, the activity rate of 16 to 24 year-olds fell by more than 6½ percentage points—which was almost certainly due to increased participation in post-compulsory education. However, changes in activity have not been confined to this age group—the participation rate of the 25–34 age group increased by about 5% between 1998 and 1984. Changes of this size may affect the size and composition of the labour force and hence the unemployment rate. We need to control for these changes in labour force participation by age group to measure accurately how much of the total change in the unemployment rate can be explained purely by demographic change.

The shift-share methodology outlined above can be modified in one of two ways to isolate the effects of demographic change. The first method essentially holds activity rates constant and calculates the hypothetical impact on the unemployment rate of changes in the composition of the

(1) For a fuller discussion of the effect of changing the base year, see the forthcoming *Working Paper*.

Chart 5
Activity rates by age group



labour force consistent with changes in the composition of the underlying population, given the observed behaviour of the group-specific unemployment rates. The second method focuses instead on how changes in the composition of the working-age population affect the fraction of the population who are unemployed.(1)

Table C shows that once we control for changes in the activity rates of each group over the period, demographic change explains a smaller percentage point fall in the aggregate unemployment rate than estimated earlier. This is because this analysis excludes the effect of greater participation in post-compulsory education, which would otherwise have reduced the unemployment rate. Furthermore, increased activity rates for the 25–34 age group, *ceteris paribus*, increased the size of the total labour force, which exacerbated the observed fall in the youth share of the labour force and so exaggerated the earlier estimates of the impact of demographic change on the unemployment rate. However, shifts in the composition of the labour force driven purely by demographic change still explain about a 0.45 percentage point fall in the unemployment rate over the period, averaging over the three measures.

Table C
Impact of demographic change on the unemployment rate, controlling for changes in activity rates by age group

Index of demographic pressure	Change (percentage points)	Percentage of change in unemployment rate explained
AAU	-0.52	9.4
ADU	-0.43	7.8
CWM	-0.40	7.2

See notes to Table A.

The impact of demographic change on the unemployed

An alternative estimate of the impact of demographic change on the unemployed can be obtained by repeating our shift-share analysis using working-age population shares and the ratio of each age group who are unemployed. The advantage of this approach is that it abstracts from all changes in labour force participation by focusing on changes in the composition of the working-age population, which is affected solely by demographic forces; the drawback is that it does not estimate the impact of demographic change on the unemployment rate itself.

Table D presents the results of this alternative shift-share decomposition, as before using each year in turn as a base for our calculations.

Table D
Impact of demographic change on the unemployed

Index of demographic pressure	Change (percentage points)	Percentage of change in unemployment rate explained
AAU	-0.38	8.5
ADU	-0.31	7.0
CWM	-0.28	6.3

See notes to Table A.

These results imply a smaller role for demographic change in explaining the absolute and proportional fall in the fraction of individuals who are unemployed compared with the other two approaches. This is largely due to the fact that the gap between the proportion of the youth and adult populations who are unemployed is significantly smaller than the differential between the youth and adult unemployment rates. So shifts in the composition of the working-age population would be expected to have a less important role in explaining changes in the fraction of the whole population who are unemployed.

Both of these alternative approaches show that, once we control for changes in labour force participation rates by age, shifts in the composition of the labour force explain less of the change in the aggregate unemployment rate over the period. However, demographic change remains the predominant cause of changes in the composition of the labour force, and hence of the estimated change in the unemployment rate from this source.

The effect of demography on future unemployment

Finally, what are the likely implications of demographic change on the future unemployment rate? Given reasonable assumptions about the pattern of fertility and mortality rates and the size and direction of cross-border migration, we can project the resident population into the future. To estimate the composition and size of the labour force, we also need to forecast the percentage of each of the separate groups in the labour force who will be either employed or actively searching for work.(2)

(1) For a fuller discussion of these methods, see the forthcoming *Working Paper*.
(2) These projections of the group-specific activity rates typically rely on four separate sets of explanatory variables: the level or change in the level, of the unemployment rate; the number of dependent children aged under 5 per woman; lagged activity rates; and time trends to capture other structural factors (see Armitage and Scott (1998), page 291).

We can identify three broad trends in the labour force projections for the next decade:[1]

- The youth share of the labour force will begin to recover from the baby bust and will increase slightly over the period.
- The number of people aged between 25 and 34 will decline sharply, as the baby bust generation reaches maturity.
- The relative share of the older section of the labour force (aged 35 or more) will increase, as the bulge in fertility rates in the early 1960s passes through the age distribution.

Given these projections, it is possible to make a tentative forecast of the implied change in the aggregate unemployment rate due to demographic pressures. By dividing the labour force into the three broad groups described above and taking 1998 as the base year, we can calculate the age-driven change in the unemployment rate based on the observed unemployment rates of each of these groups in our base year.

The impact of these demographic changes appears to be relatively weak throughout the period—demographic pressures will be responsible for a fall of about 0.035 percentage points, at most, in the aggregate unemployment rate. However, the potential for these benign demographic forces to reduce the unemployment rate has already been almost exhausted. The age-driven unemployment rate is projected to fall until 2001, and thereafter, following a short period of volatility, to remain at its 1998 level.[2] But, on the basis of these results, it is difficult to draw any conclusion other than that, however important demographic change may have been in the evolution of the unemployment rate in the past 20 years, there is little evidence that it will have much effect for the foreseeable future.

As emphasised above, shifts in the composition of the labour force can arise not only through demographic change but also through changes in the proportion of each age group that is economically active.[3] Controlling for any projected changes in the age-specific activity rates over the period, however, has a negligible effect on our estimates of the reduction in the unemployment rate implied by future shifts in the composition of the labour force. Finally, the impact of demographic change on the proportion of the working-age population that is unemployed is quantitatively similar.

Conclusions

The proportion of youths in the UK labour force has almost halved over the last 15 years. As youths have a higher unemployment rate than adults and the aggregate unemployment rate is simply the weighted average of the age-specific unemployment rates, a shift of this kind in the composition of the labour force should have been reflected in a fall in the aggregate unemployment rate.

Quantitatively, demographic pressures do indeed appear to explain part of the change in actual unemployment. Although this change is sensitive to the precise measure used, particularly the assumption made about the base year, it appears that about 0.55 percentage points,[4] or 10%, of the fall in the unemployment rate between 1984 and 1998 can be accounted for by changes in the composition of the labour force. There is no robust evidence, however, that youths became less likely to become unemployed, through generational crowding effects, as their share of the labour force declined.

However, demographic pressures were not the only forces that affected the composition of the labour force over the period; changes in the participation rates of different age groups will also affect the unemployment rate. Controlling for these, demographic change explains less of the change in the unemployment rate over the period. However, it appears that the shift in the composition of the population caused by the baby boom and bust still explains about 0.45 percentage points[5] of the fall in the unemployment rate over the period.

Finally, on the basis of current projections, it appears that future shifts in the composition of the labour force will have little effect on the unemployment rate over the next decade.

(1) Based on projections of the composition of the labour force in Armitage and Scott, *op cit*.
(2) In the interim, any generational crowding effects from changes in the composition of the labour force might amplify these results.
(3) For example, it is estimated that irrespective of any increase in the number of youths in the population, approximately 150,000 more youths will be economically active in 2011 than in 1998.
(4) This is approximately equal to the average (over all base years) of the age-driven change in the unemployment rate, the age adjustment to the unemployment rate and the chain-weighted index, when the labour force is divided into only youths and adults (actual change = 0.56 percentage points).
(5) As before, this is equal to the average (over all base years) of the age-driven change in the unemployment rate, the age adjustment to the unemployment rate and the chain-weighted index, when the labour force is divided into only youths and adults.

References

Armitage, B and Scott, M (1998), 'British labour force participation: 1998–2011', *Labour Market Trends*, June, pages 281–98.

Benefits Agency (1999), A Guide to Benefits, Leaflet MG1, Department of Social Security.

Farber, H (1994), 'The analysis of inter-firm worker mobility', *Journal of Labour Economics*, Vol 12 (4), pages 554–93.

Freeman, R B and Bloom, D (1986), 'The youth labour market problem: age or generational crowding', *OECD Employment Outlook*, pages 106–33.

Gregg, P and Wadsworth, J (1995), 'A short history of labour turnover, job tenure and job security, 1975–93', *Oxford Review of Economic Policy*, Vol 11 (1), pages 73–90.

Gregg, P and Wadsworth, J (1999), 'Economic Inactivity', Chapter 3 in Gregg, P and Wadsworth, J (eds), *The State of Working Britain*, Manchester University Press.

Horn, R and Heap, P (1999), 'The age-adjusted unemployment rate: an alternative measure', Challenge, January–February, pages 110–15.

Katz, L F and Krueger, A B (1999), 'The high-pressure labour market of the 1990s', *Brookings Papers on Economic Activity*, Vol 1, pages 1–63.

Metcalf, D (1999a), 'The way out? Low pay and the services sector', Centrepiece, Spring 1999, pages 17–21.

Metcalf, D (1999b), 'The Low Pay Commission and the National Minimum Wage', *Economic Journal*, Vol 109, pages 46–66.

Oswald, A J and Turnbull, P J (1985), 'Pay and employment determination in Britain: what are labour 'contracts' really like?', *Oxford Review of Economic Policy*, Vol 1(2), pages 80–97.

Perry, G (1970), 'Changing labour markets and inflation', *Brookings Papers on Economic Activity*, Vol 3, pages 411–41.

Shimer, R (1998), 'Why is the US unemployment rate so much lower?', *NBER Macroeconomics Annual*, Bernanke, B and Rotemberg, J (eds), pages 13–73.

Summers, L H (1986), 'Why is the unemployment rate so very high near full employment?', *Brookings Papers on Economic Activity*, Vol 2, pages 339–96.

Financial market reactions to interest rate announcements and macroeconomic data releases[1]

By Andrew Clare and Roger Courtenay of the Bank's Monetary Instruments and Markets Division.

Reactions of financial prices to news contain information about market beliefs and expectations. This article looks at reactions of a selection of UK interest rate, equity and exchange rate contracts to macroeconomic data releases and interest rate changes before and after the Bank of England was granted operational independence in May 1997. We find some differences in the nature of the reactions in the two periods, and attempt to draw out the implications for market perceptions of monetary policy.

Introduction

At 11.00 am on 6 May 1997 the new UK government announced that it had granted the Bank of England operational independence with respect to the implementation of monetary policy, subject to an RPIX inflation target of 2½% per year. This change was designed to improve the credibility and transparency of the monetary policy process. The Bank of England's aims were stated clearly, and the voting record and discussions of the members of the Monetary Policy Committee (MPC) were to be published shortly after interest rate decisions had been made.

Our aim in this study is to investigate whether there has been a systematic change since Bank independence in the way that market participants incorporate information from monetary policy announcements, and from other important macroeconomic data announcements, into financial prices. We use intra-day price data (rather than daily data, which are sometimes used in this context) because markets receive many different pieces of news throughout the trading day, and so the impact of a particular announcement may be obscured by using daily price series. We therefore concentrate on the minutes immediately preceding and following these announcements.

Our study uses high-frequency data on short and long-term LIFFE interest rate futures contracts,[2] on the LIFFE FTSE 100 stock index futures contract, and on the dollar/sterling and Deutsche Mark/sterling exchange rates. We monitor the behaviour of these financial prices around the times of interest rate announcements and key macroeconomic data releases over two periods: from January 1994 to 6 May 1997 (pre Bank independence), and from 7 May 1997 to June 1999 (post Bank independence).

The impact of news on financial prices

The reaction of financial prices to news should be determined by the extent to which the news changes market perceptions about the future payoff of the relevant security. For example, an announcement that changes expectations about long-term economic growth and inflation should, other things being equal, have some effect on the values of long-term assets. The announcement of Bank independence caused UK 20-year bond yields to fall by around 40 basis points on the day.

If the aims of monetary policy are clear and it is possible to predict interest rate decisions accurately using publicly available macroeconomic data, then the interest rate decisions themselves will usually be less newsworthy and so will, on the whole, provoke little reaction in financial prices. News will, however, be conveyed in macroeconomic data releases. Over a period when the monetary policy process becomes more transparent, the reaction to these macroeconomic announcements could therefore increase while the reaction to interest rate decisions declines.

But monetary policy will never be completely devoid of news. This is because the process of converting raw, publicly available data into an interest rate decision can never be a mechanical one. Many judgments must be made before a policy stance can be taken. To the extent that the people making those judgments, and the analysis on which they are based, 'add value' to the raw data, the decision may contain useful news for the market and hence cause market agents to revise asset prices on the release of the decision. In that case, increased transparency could allow more information to be extracted from the interest rate decision, and hence may provoke reactions that are large relative to reactions to other macroeconomic data releases.

In summary, any improvement in the transparency of monetary policy might bring about a change in the way that both interest rate decisions and other macroeconomic announcements are incorporated into securities prices. And it is possible that changes in the reactions to these two types of announcements may be in opposite directions.

(1) Based on a forthcoming *Bank of England Working Paper*, 'Assessing the impact of macroeconomic news announcements on securities prices over different monetary policy regimes'.
(2) Since futures prices are linked by a no-arbitrage condition to the value of the underlying asset, movements in futures contracts should mirror movements in the underlying asset.

Previous work

There is a considerable body of work that focuses on the impact of macroeconomic news announcements on securities prices. Many of the studies investigate the impact of macroeconomic news announcements on foreign exchange rates (see Almeida, Goodhart and Payne (1998), Andersen and Bollerslev (1998) or Kim (1998)), while others look at the impact of macroeconomic announcements on equity prices (see Mitchell and Mulherin (1994)), bond prices (see Fleming and Remolona (1997) or Jones *et al* (1994)), or on market interest rates (see Becker *et al* (1996) or Thornton (1998)).

Two studies of this kind are of particular relevance to our current work. The first, by Ederington and Lee (1995), looks at the impact of US macroeconomic news announcements on high-frequency data for T-bond, eurodollar and dollar/Deutsche Mark futures contracts. Their methodology compares the average behaviour of security prices around the times of the announcements with the average behaviour of the same securities in equivalent periods when no announcements were made. We use a similar approach in this paper. Ederington and Lee (1995) focus on price behaviour from 2 minutes before the announcement to 10 minutes after. They find that the measurable price reaction begins within the first 10 seconds after the announcement and is complete after another 40 to 50 seconds. Hence they implicitly establish that the optimal time frame in which to assess reactions is considerably shorter than a day.

The second study of relevance to our work is by ap Gwilym *et al* (1998), who also employ the Ederington and Lee (1995) methodology. In their work, ap Gwilym *et al* look at the impact of UK scheduled macroeconomic news announcements on LIFFE FTSE 100 and short sterling futures contracts. We also examine the reaction of these two contracts to macroeconomic announcements. ap Gwilym *et al* investigate the impact of nine different announcement types, finding that RPI, PPI and PSBR announcements have a significant impact on FTSE 100 contracts, and that RPI, PPI, labour market statistics and retail sales announcements have a significant impact on short sterling contracts. Looking at the behaviour of announcement relative to non-announcement days over a 12-minute window around the announcements, they find less price volatility than was found in equivalent US studies in the 2 minutes prior to announcements, and a sharp reaction which peaked in the first 90 seconds, and which remained significantly higher for another 5 to 6 minutes. In our empirical work we use all the macroeconomic announcement types that ap Gwilym *et al* find to be significant, and expand the set to include monetary policy related announcements.

While the studies cited above all use high-frequency data, there are two studies that use daily data to address issues of monetary policy transparency as seen by market participants. Haldane and Read (1999) look at the response of the UK yield curve to official interest rate changes, using daily data from January 1984 to May 1997 (the start of the Bank independence period). They conclude that the response of the UK yield curve to a 1% change in official interest rates fell following the adoption of inflation targeting in October 1992, particularly at maturities up to two years. In a related study, Joyce and Read (1999) look at the reaction of UK bond prices to RPI announcements from January 1982 to April 1997. They find that over the inflation-targeting period beginning in October 1992 bond prices became less responsive to RPI announcements, and they interpret this as a sign of improved monetary policy credibility.

Data

Price data

In our study we use tick-by-tick price data for five different assets for the period from the start of 1994 to the middle of 1999. We use data provided by LIFFE for short sterling, long gilt and FTSE 100 futures contracts, and data provided by Olsen Associates for the dollar/sterling and Deutsche Mark/sterling exchange rates.(1)

There are always a number of futures contracts with different maturities available at any one time. We have generally used data for the most heavily traded LIFFE contract in our analysis, switching when the most heavily traded contract changes. The switch tends to occur around four weeks before maturity for long gilt contracts, and at maturity for FTSE 100 contracts. For short sterling, the nearest to maturity contract is used at all times.

Macroeconomic announcement data

We calculate the reaction of the financial prices described above to a variety of macroeconomic news announcements relating to: interest rate changes (pre Bank independence); MPC interest rate changes (post Bank independence);(2) RPI/RPIX; PPI input/output; average earnings; unemployment; GDP (preliminary, revised and final); industrial production; retail sales; PSBR (and subsequently PSNCR); M0; M4; consumer credit; current account; global visible trade; ex-EU visible trade; CIPM index; CBI distributive trades survey; CIPS services survey; and CBI industrial trends survey.(3) The announcements reach the market at the official announcement time, which is generally 9.30 am for macroeconomic data releases and is currently 12.00 pm for interest rate decisions.

(1) We use Deutsche Mark/sterling up to 31 December 1998, and euro/sterling thereafter.
(2) We do not include the MPC's 'no change' decisions in our set of announcements, since no equivalent is available in the pre Bank independence era. We analyse these no change decisions in the fuller *Working Paper* version of this article.
(3) See Brooke, Danton and Moessner (1999) for a study of the most 'important' UK macroeconomic news announcements for UK financial markets.

Analysing the pattern of price reactions

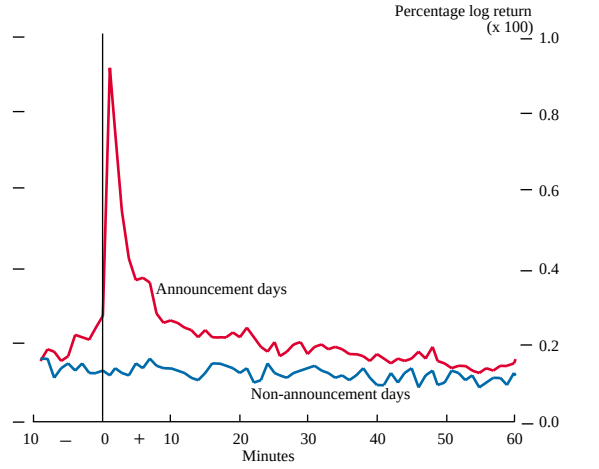
In our empirical analysis we monitor the pattern of price reactions by calculating returns for each one-minute window from 10 minutes before announcements to 60 minutes after. We make similar calculations for a control sample of days when no macroeconomic announcements occur, which we refer to as 'non-announcement' days. The returns are used to calculate mean absolute returns (a measure of volatility) and mean cumulative absolute returns over the same period. We compare the mean absolute returns series for announcement and non-announcement days and test for differences between the two. We also subtract the mean cumulative absolute returns on non-announcement days from the mean cumulative absolute returns on announcement days to produce mean cumulative absolute abnormal returns (CAARs). Any systematic difference in the behaviour of the asset prices on announcement and non-announcement days can be used as a measure of the 'abnormal' behaviour that occurs around these announcements. To determine whether a pre-defined set of announcements has a larger or smaller impact upon asset prices following Bank independence, we compare the abnormal behaviour in the pre-independence period with that in the post-independence period.

To illustrate the kind of impact that macroeconomic data releases typically have on securities prices, we plot in Chart 1 the mean absolute return for one-minute windows from 10 minutes before announcements to 60 minutes after, for the LIFFE short sterling contract. The chart shows the average reaction of this contract to all the macroeconomic announcements in our data set over the full sample period from 1994 to 1999. It is clear that these announcements have a pronounced impact upon contract volatility immediately following the announcement. This volatility remains higher than on non-announcement days for approximately 50 minutes, and is very much higher in the first 5 minutes or so. We apply a non-parametric test (the Kruskal-Wallis test(1)) to determine whether or not this higher volatility is significantly higher in a statistical sense. We use this non-parametric test rather than a parametric equivalent so that our results are not unduly influenced by outliers. The results show that volatility following macroeconomic announcements relative to volatility on non-announcement days is significantly higher at the 99% level of confidence for each of the 22 one-minute windows following these announcements. The question that we wish to consider, however, is whether volatility in the post Bank independence period is significantly different from volatility in the pre Bank independence period.

Empirical results

We begin our analysis by separating the announcement of interest rate changes from the other macroeconomic announcements, applying the generic term 'macroeconomic announcements' to this second set. Charts 2 to 11 show the mean CAARs in the pre and post-independence periods for

Chart 1
Mean absolute returns for the LIFFE short sterling contract following macroeconomic announcements



macroeconomic data releases and for announcements of interest rate changes. The line labelled 'Before BI' shows the mean CAARs in the pre-independence period, while the series labelled 'Since BI' shows the mean CAARs in the post-independence period. Table A gives the results of tests of the difference between the mean CAARs in the pre and post-independence periods after 5, 15 and 60 minutes. This is a test for significant differences at 5, 15 and 60 minutes in the data represented by the two lines plotted on the chart.

Interest rate announcements

Charts 2, 3 and 4 show that for each of the futures contracts, the *immediate* reaction to interest rate announcements in the post Bank independence period is higher than in the pre Bank independence period. This finding is consistent with the fact that the timing of interest rate announcements was known in advance post independence, whereas between 1994 and 1997 the timing was at the Bank of England's discretion. One would expect a much quicker reaction to an event whose timing was completely anticipated than to one where there was some uncertainty. However, when we look beyond the initial period we can see that after approximately 10 minutes the reaction is lower for the two interest rate contracts and approximately the same for the equity index contract.

For the exchange rates, Charts 5 and 6 show that the immediate reaction is also greater in the post Bank independence period than in the pre Bank independence period. But after approximately 30 minutes, the total impact of the interest rate announcements is very similar in both periods. These results suggest that for the period considered here, the overall impact of Bank independence on the different markets was either to reduce the reaction to interest rate changes, or to have little noticeable impact.

The test statistics in Panel A of Table A indicate that for the 5 minutes following the interest rate announcements, the increase in volatility in the interest rate contracts is

(1) The test is described in the Appendix on page 272.

Chart 2
Short sterling cumulative abnormal returns following interest rate announcements

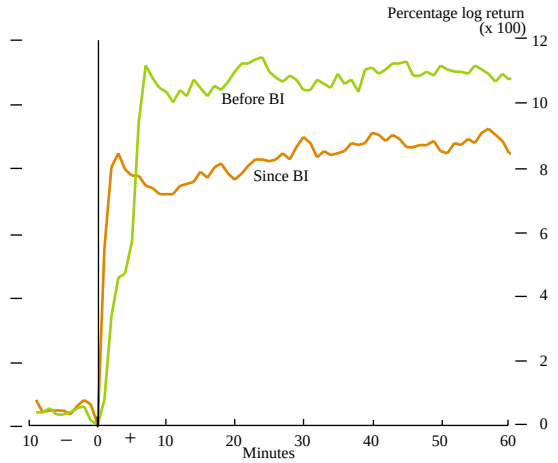


Chart 3
Long gilt cumulative abnormal returns following interest rate announcements

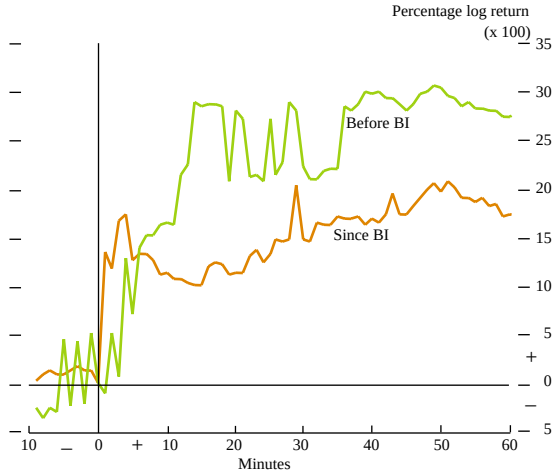


Chart 4
FTSE 100 cumulative abnormal returns following interest rate announcements

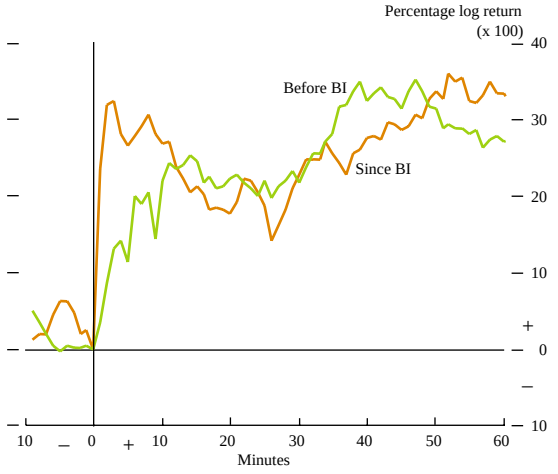


Chart 5
DM/£ cumulative abnormal returns following interest rate announcements

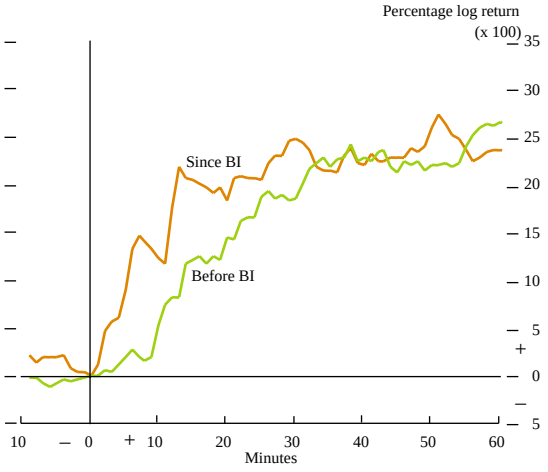


Chart 6
$/£ cumulative abnormal returns following interest rate announcements

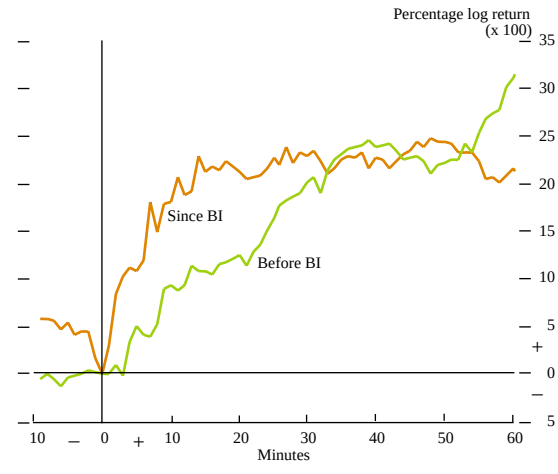


Chart 7
Short sterling cumulative abnormal returns following macroeconomic announcements

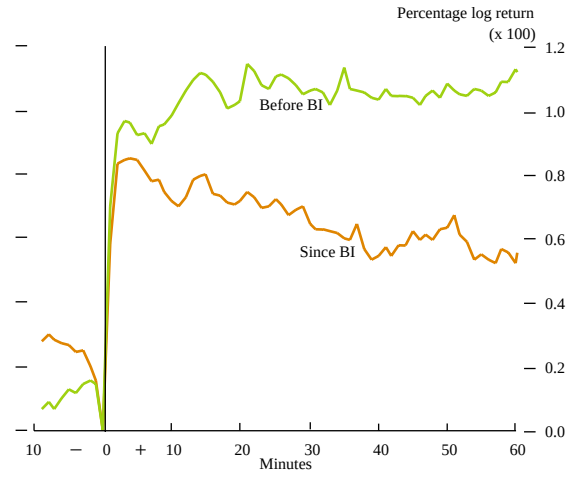


Chart 8
Long gilt cumulative abnormal returns following macroeconomic announcements

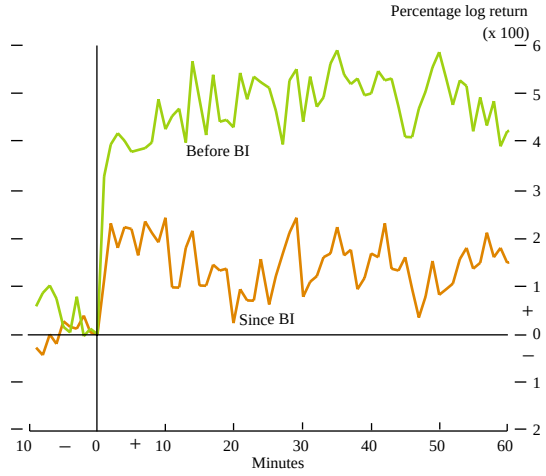


Chart 9
FTSE 100 cumulative abnormal returns following macroeconomic announcements

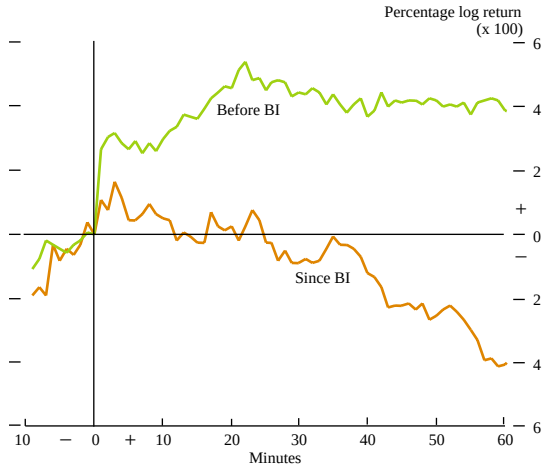


Chart 10
DM/£ cumulative abnormal returns following macroeconomic announcements

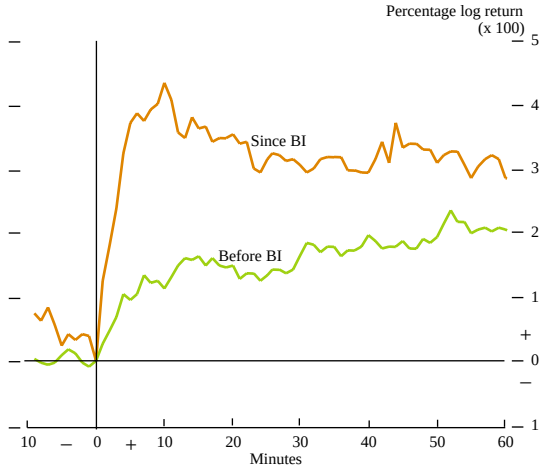
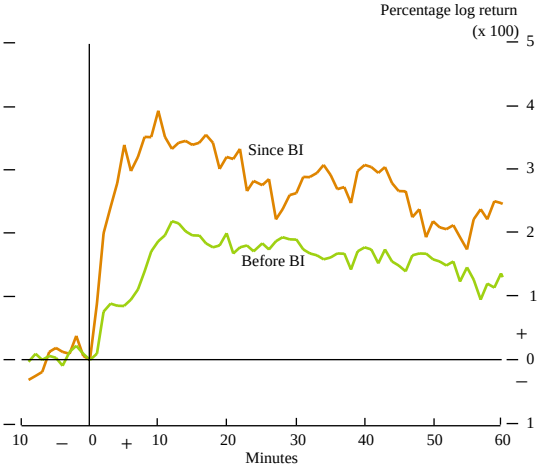


Chart 11
$/£ cumulative abnormal returns following macroeconomic announcements



statistically significant. However, this is not true for the FTSE 100 contract or for the exchange rates. Looking further ahead, we also provide test statistics for the difference in volatility between the two periods after both 15 and 60 minutes. The non-parametric test indicates that none of these observed differences is significant. But the analysis covers a small sample, which raises the chance of a test for a significant difference being rejected. Moreover, May 1997 to June 1999 was a period when the market had to learn about the MPC's reaction function. This learning process was complicated by the fact that membership of the Committee changed substantially during its first year, with one member standing down and four new members joining. So, given these changes, it is encouraging that Chart 2 is indicative of a reduction in the market reaction to an interest rate change in the hour after the announcement of a decision.

Table A
Abnormal reactions to announcements post versus pre Bank independence

		Short sterling	Long gilt	FTSE 100	DM/£	$/£
Announcement type	Mins.					
Panel A						
Interest rate changes	5	2.06 (a)	5.58 (a)	15.23	4.76	5.81
	15	-2.61	-18.45	-3.45	8.28	11.60
	60	-2.29	-10.24	6.30	-2.90	-9.10
Panel B						
Macroeconomic data announcements	5	-0.08 (b)	-1.58 (b)	-2.19 (b)	2.74 (b)	2.52 (b)
	15	-0.31 (a)	-3.90	-3.87 (b)	1.99	1.43
	60	-0.60	-2.74 (b)	-7.90 (b)	0.80	1.10

Notes: The figures represent the CAARs in the post-BI period minus the CAARs in the pre-BI period, for 5, 15 and 60 minutes following the announcements. The test uses rankings determined by the ratios of the cumulative absolute returns following individual announcements to the mean absolute returns on either pre-BI or post-BI non-announcement days.

(a) Significant at the 95% level of confidence.
(b) Significant at the 99% level of confidence.

Macroeconomic announcements

Charts 7, 8 and 9 show the reaction of the three LIFFE contracts to the set of macroeconomic announcements. The post Bank independence reactions are lower than the pre Bank independence reactions at all the horizons considered.

This is in sharp contrast to the results for the exchange rates, which are shown in Charts 10 and 11. There appears to have been a clear post Bank independence increase in reactions in the foreign exchange (FX) market following macroeconomic announcements at all horizons. The differences between the two sets of results are puzzling. They suggest at face value that there has been an upward shift in the perceived importance of macroeconomic data to FX markets relative to other markets.

These results are supported by the test statistics presented in Panel B of Table A for the 5-minute period following the announcements. It is also clear that for the long gilt and FTSE 100 contracts there is still significantly lower volatility 60 minutes after the announcements (and after 15 minutes for the short sterling contract).

Conclusions

The empirical results discussed above do not yield simple definitive conclusions about whether monetary policy is now better understood by financial market participants as a result of Bank independence. The total (cumulative) reaction of the LIFFE contracts and exchange rates to interest rate decisions appears either unchanged or lower in the post Bank independence period, depending on the market observed. This supports the idea that the news content of monetary policy announcements has fallen. However, while the total reaction supports this view, the immediate reaction in the first 5 minutes is larger in all of the markets studied here. With respect to interest rate decisions, it appears that the news contained in the decisions is incorporated into financial prices more quickly than in the pre Bank independence era. One possible explanation for this is that pre-positioning in the financial markets ahead of the decision has become more sophisticated since Bank independence, with the publication of a clear, unambiguous timetable for the announcement of interest rate decisions.

Looking at exchange rate responses, there is evidence to support the idea that FX market agents now pay more attention to macroeconomic data announcements. This evidence appears to suggest that the underlying economic data have become more important in these markets relative to the key monetary policy announcement.

A different picture emerges when we consider the impact on the LIFFE contracts of the same set of non monetary policy related announcements. For the short sterling and long gilt contracts these reactions are lower in the post Bank independence period. Since the total impact of interest rate announcements is also lower following May 1997, it is difficult to make any clear statements about the relative importance of monetary policy for LIFFE fixed-income market participants. We can say that all announcements now appear to have a lower impact upon the two interest rate contracts that we consider. Finally, there is a significant decline in FTSE 100 volatility around the set of macroeconomic announcements.

The empirical analysis presented here is based on a relatively short sample, including a period when the markets will have been learning about the new monetary policy framework. The results can only be suggestive rather than the basis for firm conclusions. Nevertheless, there is some evidence that interest rate announcements have become less important for some financial markets, and no more important for others, since May 1997.

Appendix

The differences in the mean absolute returns and mean number of trades between announcement and non-announcement days are tested using a non-parametric statistic.(1) The non-parametric test we use is the Kruskal-Wallis test which is given by:

$$H = \frac{12}{N(N+1)} \sum_{j=1}^{j} \frac{S_j^2}{m_j} - 3(N+1) \qquad \textbf{(1)}$$

where J is the number of series (here $J = 2$, representing announcement and non-announcement series); N is the total number of observations from both series combined; m_j is the number of observations from series j; and S_j is the rank sum for series j. This test statistic is distributed $\chi^2(J - 1)$ under the null hypothesis of equal medians.

(1) We also calculate a parametric test for the difference in these means, but given the highly non-normal nature of the data we prefer to use and report the non-parametric statistic in expression **(1)**. The parametric results are available on request from the authors.

References

Almeida, A, Goodhart, C A E and Payne, R (1998), 'The effects of macroeconomic news on high-frequency exchange rate behaviour', *Journal of Financial and Quantitative Analysis*, Vol 33(3), September, pages 383–408.

Andersen, T G and Bollerslev, T (1998), 'Deutsche Mark-dollar volatility: intra-day activity patterns, macroeconomic announcements, and longer-run dependencies', *Journal of Finance*, Vol 53(1), February, pages 219–65.

ap Gwilym, O, Buckle, M, Clare, A and Thomas, S (1998), 'The transaction-by-transaction adjustment of interest rate and equity index futures markets to macroeconomic announcements', *Journal of Derivatives*, Winter, pages 7–17.

Becker, K G, Finnerty, J E and Kopecky, K J (1996), 'Macroeconomic news and the efficiency of international bond futures markets', *Journal of Futures Markets*, Vol 16(2), April, pages 131–45.

Brooke, M, Danton, G and Moessner, R (1999), 'News and the sterling markets', *Bank of England Quarterly Bulletin*, November, pages 374–83.

Ederington, L H and Lee, J H (1995), 'The short-run dynamics of the price adjustment to new information', *Journal of Financial and Quantitative Analysis*, Vol 30(1), March, pages 117–34.

Fleming, M J and Remolona, E M (1997), 'What moves the bond market?', *FRBNY Economic Policy Review*, December, pages 31–50.

Haldane, A and Read, V (1999), 'Monetary policy and the yield curve', *Bank of England Quarterly Bulletin*, May, pages 171–76.

Jones, C M, Kaul, G and Lipson, M L (1994), 'Transactions, volume, and volatility', *Review of Financial Studies*, Winter, Vol 7(4), pages 631–51.

Joyce, M A S and Read, V (1999), 'Asset price reactions to RPI announcements', *Bank of England Working Paper*, No 94.

Kim, S J (1998), 'Do Australian and US macroeconomic news announcements affect the US$/AUS$ exchange rate? Some evidence from E-GARCH estimations', *Journal of Multinational Financial Management*, Vol 8(2–3), September, pages 233–48.

Mitchell, M L and Mulherin, J H (1994), 'The impact of public information on the stock market', *Journal of Finance*, Vol 49(3), July, pages 923–50.

Thornton, D L (1998), 'Tests of the market's reaction to Federal funds rate changes', *Federal Reserve Bank of St Louis Review*, November/December, pages 25–34.

Common message standards for electronic commerce in wholesale financial markets

By Bob Hills of the Bank's Market Infrastructure Division.[1]

An important aspect of electronic commerce is the potential for market participants to automate transaction processing fully, from the point of trade to final settlement. Such 'straight-through processing' could make wholesale financial markets more efficient, and lower the costs and risks that participants face. But it requires participants to use common message standards to exchange transaction data electronically. Several market-led initiatives to develop common standards have made substantial progress. But many trade messages are still sent by fax or using incompatible electronic networks, which means that different participants may have to re-input the same data manually at various points during the trade process. This article describes some of the initiatives to establish common standards. It then looks to economic theory to explain why market participants may find it difficult to co-ordinate to introduce a single standard, in spite of the wider benefits. It discusses how such technological changes may affect market structure. Finally, it considers whether some recent technologies, in particular eXtensible Markup Language (XML), may make it easier for market participants to adopt common standards.

Introduction

New technology is bringing significant changes to wholesale financial markets. But the benefits seen so far probably represent only a fraction of the potential gains. The automation of business-to-business (B2B) transactions in wholesale financial markets is likely to have a greater impact than in most other industry sectors, for two reasons. First, virtually all the products of financial firms (both wholesale and retail) can, at least in principle, be delivered entirely in digital form. And second, compared with other industries, wholesale financial markets have an unusually high proportion of transactions between competing participants.

Financial firms are increasingly using automated electronic networks to select, execute and process transactions. The benefits of such automation can be considerable—wherever data are input manually, human errors increase the number of failed trades, and transaction costs rise. Technological progress also makes possible changes in market structure that can pave the way for further efficiency gains. The Bank of England has an interest in these issues because of their implications for the efficiency and effectiveness of UK financial services.

Automation also has potential benefits for the stability of the financial system as a whole.[2] Greater automation is probably a pre-requisite for any further shortening of the settlement cycle for securities transactions. Shorter settlement cycles reduce the risk to firms that their counterparty will default between the initial transaction and final settlement. In the event of a default, a firm would have to enter into a replacement transaction, which may be on less favourable terms if market prices have moved in the meantime.

This 'replacement cost risk' increases when market prices are more volatile. This is often also when concerns about counterparty credit quality are greatest. Shorter settlement cycles could make markets more resilient in such stressed conditions by reducing concerns about counterparty credit risk, which can deter trading and prevent markets from clearing. Automation will enable shorter settlement cycles to be achieved without an increase in settlement failures.

In the past, all financial trades took place on the telephone or face-to-face on the floor of an exchange. Firms processed trades on paper, and manually re-input the details several times into different proprietary IT systems, both within and outside the firm. More recently, firms have begun to automate their internal processes, and to use electronic networks to trade, match and settle transactions with counterparties. But, by and large, these pockets of automation are isolated. Contact between firms is still often

(1) The author would like to thank David Rule, Roger Dean, Eric Dubois, Wolfgang Emmerich, Anthony Finkelstein, Anthony Kirby, Alan Line, Geoff Prior, Nigel Solkhon, Tim Wildenberg and Alastair Wilson for helpful comments.

(2) The Bank has responsibility for 'the overall stability of the financial system as a whole', as well as for promoting 'the efficiency and effectiveness of the financial sector, with particular regard to international competitiveness', as set out in paragraph 2 of the Memorandum of Understanding between HM Treasury, the Bank of England and the Financial Services Authority.

via fax, or by electronic communication using incompatible systems. The full benefits of automation will be seen only where there is 'straight-through processing' within and between firms, with little or no manual intervention between trade execution and settlement.

Straight-through processing requires the automated electronic transmission of trade details between devices or applications. Such automation can be achieved only if the two applications are connected via an electronic network and, in effect, speak the same language. In other words, it requires common message standards for the electronic exchange of transaction data.

A message standard is defined as any standardised means of communicating between participants the data relevant to the processing of a trade. A standard has two components: syntax (the technical basis of the standard); and business content (the data necessary to process the transaction). 'Syntax' is roughly analogous to the grammar of a spoken language. An example might be HyperText Markup Language (HTML), the current syntax that underpins the World Wide Web (WWW), or eXtensible Markup Language (XML—see below). 'Business content' (for example the standard template for the data relevant to a cash equity trade, for instance as defined by the Financial Information eXchange protocol (FIX)), roughly corresponds to the vocabulary of a spoken language.

Where a common standard is used by a number of participants in a market, the trade details can be passed between participants without having to be re-input to conform to a different standard. Even if the message standards are not identical, a similar effect can be achieved where the messages contain data that can be automatically reformatted or translated into another system. In this case, the standards are known as 'compatible', or 'inter-operable'.

A standard may be either open or proprietary. An open standard is not owned or controlled by any particular supplier or group of suppliers. Indeed, it is usually created and developed by co-operative industry groups. The creation and amendment of a proprietary standard, on the other hand, is controlled by a particular supplier. The supplier typically restricts use of the standard to its own network, and charges for the use of the network and other associated services. Nevertheless, use of a standard is not always limited to a particular network. Open standards may typically be transmitted over a wide range of closed and incompatible networks.

The next section of this article examines in greater detail the potential benefits of common message standards, including increased efficiency and lower risk. It then looks at several market-led initiatives to establish common standards for messages related to payments and securities and derivatives transactions. These include those promoted by industry bodies such as FIX, FpML, GSTPA, ISITC and SWIFT (see the box on page 276).

It is not always easy for market participants to agree and use a common standard. The second part of the article discusses how widely electronic messages based on common standards are currently used in financial markets, compared with messages sent using fax or separate proprietary networks. The article goes on to consider some of the reasons why market participants may have difficulties in co-ordinating the introduction of a single standard. It then looks at the potential for new technologies, such as XML, to facilitate the adoption of common standards, and discusses the effect that these technological changes may have on market structure. Finally, the article considers whether there is any role for central banks and regulators in the standard-setting process.

Benefits of common message standards

The academic literature on standardisation starts from a general premise that common standards will increase social welfare if there are direct 'network externalities'. A good or service is said to exhibit network externalities if the benefit to each existing user increases as more market participants adopt it (as long as it meets its users' basic needs). The most socially efficient outcome in this case is for all market participants to use the same standard. This can also be achieved by the use of messages that are fully inter-operable.

Common standards provide direct benefits. There are economies of scale where participants can band together to share the fixed costs of technical development. And participants can transfer data and exchange messages with lower transaction costs: firms need to purchase only a single IT system to exchange information with clients and counterparties using the same standard.(1) Eliminating the manual re-input of data by different firms at each stage of the transaction process is likely to bring increased efficiency, as well as a reduction in costs and risks. So common standards can play a significant role in the straight-through processing of trades.

Preliminary indications are that the cost savings from such straight-through processing would be substantial. Research from GSCS Benchmarks suggests that 11% of cross-border equity trades fail to settle on time. IBM estimates that around two thirds of all securities trades need to be amended, repaired or cancelled for some reason. SWIFT estimates that more than half of a custodian's settlement costs are caused by trade failure resolution (41%) and non-automation (18%).(2)

There are further implications for financial stability. Common standards, where they facilitate automation, may

(1) This may also enhance competition by reducing barriers to market entry—particularly for smaller intermediaries, who may be reluctant to purchase multiple proprietary systems. Nevertheless, there are operational risks associated with the use by all market participants of the same software. For instance, a deficiency in the software could affect all market participants simultaneously.
(2) Sources: GSCS Benchmarks survey; IBM Straight-through Processing for E-business Research; SWIFT.

Organisations and industry bodies involved in message standardisation and automation

- **DTC** (the Depository Trust Company), part of the Depository Trust and Clearing Corporation (DTCC), is the central securities depository for US equities. DTC's TradeSuite service is a leading provider of electronic trade confirmation (ETC) in the United States. *www.dtcc.com*

- **ebXML** (electronic business eXtensible Markup Language) is a joint initiative between UN/CEFACT and OASIS (the Organisation for the Advancement of Structured Information Standards), an international consortium of major software suppliers. ebXML plans to provide an open technical framework to allow XML to be used in a consistent manner for the exchange of all electronic business data. *www.ebxml.org*

- **EEMA** (the European Forum for Electronic Business) is a professional association for participants in electronic business. One of its projects is to develop EDIFACT messages that are compatible with XML. *www.eema.org*

- **FIX** (the Financial Information eXchange protocol) is an open message standard designed to support pre-trade and post-trade messages between broker-dealers and fund managers on trade date. It is currently used up to the point of allocation. *www.fixprotocol.org*

- **FpML** (Financial products Markup Language) is a planned initiative to create an XML-based market standard for electronic messaging relating to OTC derivative transactions. It plans to cover a range of services including electronic trading, confirmation and portfolio specification for risk analysis. *www.fpml.org*

- **GSTPA** (Global Straight-Through Processing Association) is an industry association. It is preparing to set up a 'transactions flow monitor' (TFM), to act as a central data store for the post-trade, pre-settlement flow of information between fund managers, broker-dealers and custodians. The TFM is designed around open industry standards based on XML. *www.gstpa.org*

- **ISITC** (International Securities Association for Institutional Trade Communication) is an industry body that agrees standards principally for trade communications between fund managers and custodians. *www.isitc.org*

- **ISO** (the International Organization for Standardization) has developed the ISO15022 standard for securities-related messages. It provides for a single definition of each data field (held in a 'data field dictionary') from which new messages can be created. The data field dictionary should thus facilitate the translation of one standard into another, where the two are otherwise incompatible. *www.iso15022.org*

- **SwapsWire** is an initiative announced in April by six major swaps dealers to automate the process of negotiation and trading of OTC derivatives. *www.swapswire.com*

- **SWIFT** is both a network-independent standard-setting body (based on the work of market participants on its committees) and a network provider (which can support non-standard as well as standard messages). SWIFT is also the designated registration authority for ISO15022. *www.swift.com*

- **Thomson Financial ESG** is a private sector supplier, which provides electronic trade confirmation (ETC) of trades, between fund managers and broker-dealers. Among Thomson's proprietary services are OASYS Global (its ETC system), an 'intelligent trade matching' (ITM) system, and Alert, a database of settlement details. *www.thomsonesg.com*

- **UN/CEFACT** (the United Nations Centre for Trade Facilitation and Electronic Business), jointly with ISO, developed in 1986 an international standard for structured electronic data interchange (EDI). This is known as UN/EDIFACT (United Nations Electronic Data Interchange for Administration, Commerce and Transport). In financial markets, it is used mostly for communication between banks and corporates. *www.unece.org/trade/untdid/welcome.htm*

- **W3C** (the World Wide Web Consortium) is a non-profit, vendor-neutral consortium developing common protocols for the Web. Among its responsibilities is the development of XML. *www.w3.org*

help markets to cope with higher volumes of transactions and settlements, without an increase in the number of fails. The experience of the 1960s, when the paper-based system in the United States was unable to cope with a significant increase in volumes, warns of the danger of insufficient capacity. The volume of trades has been increasing appreciably in recent years, and there is every reason to suppose that this trend will continue. For example, between 1997 and 1999, volumes traded on the New York Stock Exchange increased by 54% and on the London Stock Exchange by 20%; volumes settled in CREST increased by 59% and in the Depository Trust Company by 142%; and volumes of securities messages sent through SWIFT increased by 107%.(1)

Many major markets are moving toward shorter settlement cycles, causing further pressure on markets' processing capacities. The US Securities and Exchange Commission (SEC) has announced its intention for the US equity market to move from settlement three days after trade date (T+3) to T+1 in 2002. The United Kingdom plans to move from T+5 to T+3 in February 2001, with a possible view to moving subsequently to T+1.(2)

None of this is likely to be possible without a significant increase in the automation of the trading process. So the adoption of common standards for the processing of information is likely to play a key role. There is general agreement that, while the US move from T+5 to T+3 in 1995 was achieved simply by increased efficiency, a further reduction will require re-engineering of the trading process. If successfully implemented, however, shorter settlement cycles will provide firms with cost savings, and, as discussed above, may enhance the stability and resilience of the financial system in times of crisis.(3)

Further benefits of common standards derive from indirect network externalities. Suppliers are likely to develop and make available a wider range of complementary products (eg software if operating systems are made compatible). The cost of repairs is typically lower, since the pool of technical expertise is larger. And the 'learning-by-using' mechanism can take effect across as wide a group of users as possible. This is the process by which users' specific experience and knowledge of the standard contributes to the development by the supplier of the standard's technical capabilities.

Use of common message standards

The main recent initiatives to establish common message standards for the exchange of data in financial markets are described in the box opposite. Some of these standards have existed for a number of years and are used fairly widely in particular markets. But many trade details are still passed via fax or incompatible proprietary networks, particularly between fund managers and custodians, and by smaller brokers and fund managers. The box on pages 280–81 describes the different stages of a typical client-side cash equity trade.

Cash equities—pre-trade

The Financial Information eXchange protocol (FIX) is now used by most of the largest fund managers and brokers as an open message standard for pre-trade flows of information. FIX was originally developed by Salomon Brothers and Fidelity Management and Research Company to automate their bilateral messages, but has subsequently become used more widely. It is geared towards cash equities, though in principle it could be extended to any market.

FIX is independent of any specific network. But FIX functionality may be adopted by network suppliers as part of their proprietary systems. So proprietary systems that use FIX are not necessarily inter-operable. As a result, there are many 'flavours' of FIX; and in addition, there are many optional fields. Both of these factors militate against precision. To combat this, the FIX steering committee is establishing an ongoing certification and testing process, which is intended to ensure that FIX systems developed by different suppliers are compatible.

The FIX standard is defined at two levels: session and application. The session level concerns the delivery of data, and the application level defines business-related data content. FIX launched its latest version (4.2) in late March 2000, and plans to move soon to the XML-based FIXML. FIX and SWIFT are also in the process of mapping the FIX fields into ISO15022, an initiative to provide a common definition for each data field used in securities markets (see the box opposite).

Despite the popularity of FIX, market participants say that many smaller brokers in particular have not yet adopted the standard. Nevertheless, they have a strong incentive to do so: proprietary systems have acted as a barrier to entry to the smaller brokers, who are more reluctant to invest in multiple systems (or translation software where available). And their clients—the fund managers—are increasingly adopting FIX-compliant order management systems, which is likely to be an additional incentive. The large brokers currently have the capacity to accept most standards over most networks, but most of them strongly favour FIX.

(1) Sources of data: *New York Stock Exchange Annual Report 1999*; *London Stock Exchange Secondary Market Fact Sheet*, various issues; *CRESTCo Ltd Annual Report & Accounts 1999*; *Depository Trust and Clearing Corporation 1999 Annual Report*; *SWIFT 1999 Annual Report*.
(2) For further information on the US plans, see the speech by SEC chairman Arthur Levitt (1996) in which he first set out the goal of T+1 settlement. For further information on UK plans to shorten the settlement cycle for equities, see the joint Bank of England/CRESTCo/London Stock Exchange press release, 23 November 1999: 'UK equities: proposal for a shorter settlement cycle'.
(3) Hills and Rule (1999) discuss replacement cost risk in more detail, in the context of counterparty credit risks faced more generally by participants in payment and settlement systems.

And software suppliers are increasingly building FIX functionality into their new systems.

Cash equities—confirmation

FIX messages are used for the trade process up to the point of allocation. But FIX is not widely used for allocation and confirmation, for which Thomson Financial ESG's proprietary OASYS Global network and standards still dominate in the UK market.(1) Following the 1987 stock market crash, a group of market participants produced a specification for an automated version of the confirmation process, which had previously been conducted by fax or telex. Three suppliers—SEQUAL, ISMA and Thomson Financial ESG—built (interlinked) systems. But within a couple of years, Thomson's OASYS Global had acquired virtually 100% of the market, which it has retained since.

Thomson is currently implementing an 'intelligent trade matching' (ITM) system, which will provide central matching of trades. The ITM will calculate fees, tax and commission based on static data from participants, which it will store. ITM will use Alert, Thomson's proprietary database of settlement details. Although OASYS Global is a proprietary system, it can also take feeds from an open standard such as FIX. Thomson also operates MarketMatch, an electronic matching service for broker-to-broker trades.

Another approach is that of the Global Straight-Through Processing Association (GSTPA). GSTPA's activities focus on the post-trade, pre-settlement flow of information between fund managers, broker-dealers and custodians for cross-border trades. GSTPA was originally set up simply to agree a single operating model for cross-border trades. But it has since extended its scope by proposing a utility, known as a 'transactions flow monitor' (TFM). The TFM will act as a central data store, allowing data to be input only once. It will match cross-border trades multilaterally prior to sending information to the local market place. This is intended to reduce the extent to which trade details need to be repaired and hence the proportion of trades that fail to settle on due date, to involve custodians at an earlier stage in the process, and so to facilitate straight-through processing. Initial operation is scheduled for summer 2001. The TFM will be built by a consortium known as Axion4.gstp, which comprises SWIFT, the Swiss central securities depository (CSD) SegaInterSettle, and software suppliers TKS-Teknosoft (with IBM as a 'strategic technology partner').

On 1 May, Thomson and the Depository Trust and Clearing Corporation (DTCC) announced a joint venture to provide centralised trade processing, with a focus on the US market. Together, Thomson and DTCC process virtually 100% of automated electronic trade confirmation (ETC) messages in the United States. It remains unclear by how much the new venture will overlap with GSTPA, given that the TFM has been designed with cross-border trades in mind, and is intended to be neutral as regards the settlement practices in local CSDs.

Cash equities—settlement

Custodians receive settlement instructions either by the SWIFT network, their own proprietary system or fax. The SWIFT messages used for this purpose are typically those mandated by the industry body International Securities Association for Institutional Trade Communication (ISITC). ISITC was originally set up in the United States in 1989, but now has steering committees for Europe and Asia/Pacific. In 1991, ISITC agreed to adopt SWIFT message formats (though not necessarily the network) as the template for standardised trade communication between fund managers and custodian banks. ISITC agreed the business needs and the attributes of a message, and then approached SWIFT for implementation. These messages (SWIFT MT520/530) are now used widely in the market. ISITC is merged with the International Operations Association, and is formally known as ISITC-IOA.

Market participants say that the trend is towards the use of the SWIFT network. For instance, custodians receive an estimated 80%–90% of messages via SWIFT or the custodian's proprietary system. Despite the fact that custodians tend to demand indemnities for fax communications, which are less secure, some fund managers still use fax messages—even though some of them use SWIFT for their payment messages. In domestic markets, matched trade instructions are typically processed electronically through to the CSD. In the United Kingdom, for instance, custodians use SWIFT or BT Syntegra to communicate with CREST. Global custodians use SWIFT to communicate with sub-custodians in local markets.

But trade messaging is only one part of the custodian's role. Most of the information services that they provide relate to the timely presentation of information (eg corporate actions) to clients. There is less desire or scope to standardise this information; indeed, it is often a bespoke service as clients often want to manipulate the data themselves. So it tends to be sent by fax or e-mail.

Payments

SWIFT messages are used more widely for payments-related than for securities-related messages—they are the *de facto* standard for international cross-border messages between correspondent banks, and are increasingly used within payments systems (eg CHAPS € and TARGET). Securities broker-dealers and investment managers have been allowed full membership of SWIFT since June 2000. Along with a wide range of other

(1) Research from the Tower Group released in September 1998 showed that in 1998 only 0.2% of FIX messages were for allocations. 82% were for indications of interest. UBS Warburg—a fairly representative large broker-dealer—currently uses FIX 66% for indications of interest, 10% for orders, 24% for executions, and not at all for allocations (as reported by a representative of the firm speaking at the Buy-Side/Sell-Side Trading Conference in April 2000).

non-bank financial institutions, they were already permitted to use the network for securities-related business.

OTC derivatives

There is no standard messaging as yet for swaps and other over the counter (OTC) derivative transactions. But the development of Financial products Markup Language (FpML) and SwapsWire may change this. The project to develop FpML was initiated in summer 1999 by JP Morgan and PricewaterhouseCoopers. A steering committee has since been formed, comprising the heads of most of the largest interest rate swap trading houses.

The OTC derivatives market differs in key respects from the cash equity market. Although legal documentation is standardised, there is no standard definition of the data relating to instruments; a swap message typically contains ten times as much information as an equity trade message, and back-office processing is still largely paper-based. The FpML steering committee intends to provide standard definitions for the data fields relevant to OTC derivative transactions. A specification for FpML Version 1.0 was made available in July 2000.

SwapsWire is an initiative of ten leading OTC derivative dealers to automate the message flows for, in the first instance, US$ and € vanilla interest rate swaps. It is not a trading system, and will not replace the current form of private, bilateral negotiations between dealers in the OTC market. The system will be used for the exchange of prices, indications of interest and information relating to completed deals. A common, open standard will be chosen for exchanging messages. In the future there may be a formal link to a central counterparty clearing house. The dealers envisage that some form of system will be operational by the end of the year.

Corporate-to-bank communication

A significant proportion of communication between banks and their corporate customers is paper-based or takes place via proprietary networks. The principal common standard used for bank-to-corporate messaging is EDIFACT. EDIFACT standards can be transmitted over a wide range of networks, including SWIFT. In addition, EEMA (the European Forum for Electronic Business) is leading a project to develop EDIFACT messages compatible with the XML syntax. In practice, however, this standard appears to be used almost exclusively by larger corporates, given the relatively high cost of integration with in-house systems, and it is not used widely outside the European Union.

Potential barriers to the widespread adoption of common standards

Despite the theoretical benefits of common message standards, it is not always easy in practice for market participants to agree to use a particular standard. Given certain types of market structure, one or several suppliers in a market might have an incentive to establish or maintain different, incompatible proprietary standards. For instance, market participants often face different levels of costs from moving from one standard to another ('switching costs'). This would mean that some firms would benefit less than others from adopting a common standard. So market co-ordination may be difficult.

Path dependency and installed base

The adoption of a common standard need not be related to its technical quality, particularly where a number of incompatible proprietary standards are available. It could be related more closely to market participants' expectations of the ultimate size of the network of other users of a standard. In many circumstances, these expectations could be self-fulfilling. So the standard that participants expect to dominate may dominate. Nevertheless, the standard must fit its users' basic business needs, such that a message based on the standard contains all the information necessary to process the transaction.

Such a market may have a tendency towards 'path dependency'. This means that the path taken by a market depends on the nature and the number of users that a particular standard can claim at the beginning of the period of competition—its 'installed base'. So first movers may have an advantage, because their choice of standard may have a disproportionate effect on the choices of the other market participants.

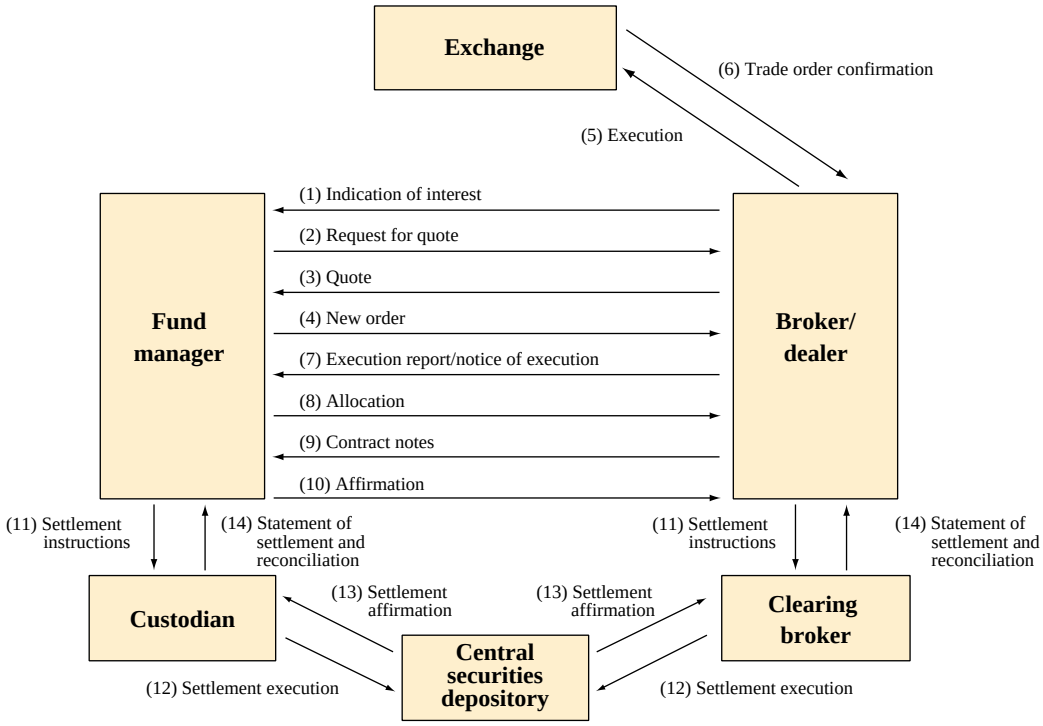
Incentives to adopt multiple or proprietary standards

The academic literature on standard-setting sets out some circumstances in which an industry might fail to adopt a common standard, even where it is socially optimal. A supplier's key strategic question when considering whether to support a common standard is whether competition for the market (ie between two proprietary standards to become the unique standard) will be more profitable than competition within the market (ie both using the same standard). This in turn depends largely on how likely it is that an equilibrium will be reached in which one firm dominates the market. In markets that exhibit strong network externalities, the co-existence of incompatible products may be unstable, since the benefits to each user increase with every additional user (economists call this a 'corner solution').

Besen and Farrell (1994) discuss three simple two-firm network market structures, in which agreement on a common standard may prove difficult. In each case, the two suppliers offer network services to customers on the basis of message standards that are either common or incompatible.

- **'Tweedledum and Tweedledee'.** Where the two suppliers have networks with similar costs and market shares, both may prefer incompatible standards. If each firm has a comparative advantage in the use of its preferred standard, each knows that it will lose market share by adopting the other standard. Equilibrium is therefore likely to be reached only where the two use incompatible standards. The suppliers might then use

Message flows for a cash equity trade



This box describes the typical flow of information between a fund manager (FM), broker-dealer (BD) and global custodian (GC) during the course of a typical client-side, on-exchange cash equity trade. This transaction is likely to be mirrored by a market-side trade between the BD and a market-maker, unless the BD is trading on its own behalf.

Independent of the trade

- Many data fields do not change from trade to trade, and so can be separated from the message flow. An interpretation of such 'static settlement data' might include trade date; settlement date; security description; time of trade; traded currency; settlement currency; commission details; indication of agency/principal/agency cross; local fee; local taxes; net consideration; fund allocation information; broker settlement details; and institutional settlement details.(1)

Pre-trade

- *Indication of interest* (IOI)—(BD to FM). IOIs market securities that the BD is buying or selling either in a proprietary or agency capacity. BDs send many more IOIs to FMs than they expect to be taken up, as an advertisement of the liquidity that they can offer. They are distributed to multiple FMs.

- *Request for quote*—(FM to BD). A FM may request a quote from the BD prior to placing an order.

- *Quote*—(BD to FM). This can be used either in response to a request for quote, or to publish unsolicited quotes.

- *New order*—(FM to BD). An FM submits an order to a BD for execution. It will typically contain special handling and execution instructions.

- *Execution report*—(BD to FM). The BD may send a number of execution reports, which describe the current state of the order and execution. This information can also be conveyed in fill messages via telephone. The message might confirm receipt of an order; confirm changes to an existing order; relay order status information; relay fill information on working orders; reject orders; or reject post-trade fee calculations associated with a trade.

(1) 'Variable trade data', the data essential to the life cycle of each trade, may include information such as the nominal amount of shares traded; the price; security code; buy or sell information; and account identification. 'Optional data' might include corporate actions; management reporting; currency conversion; lost and stolen securities; and compliance reporting.

Confirmation (post-trade, pre-settlement)

- *Execution*—(BD to exchange) and trade order confirmation (exchange to BD).
- *Notice of execution*—(BD to FM). The BD informs the FM that the transaction has been executed.
- *Allocation*—(FM to BD). Having matched the notice of execution with the original order, the FM informs the BD how it wishes the trade to be split across its sub-accounts (for different investment funds). It can also use this message to communicate fees and other details which can be computed only once the trade has been broken down across the sub-accounts.
- *Contract notes*—(BD to FM). The BD sends a contract note for each sub-account that has received a share of the executed trade. The BD may also deal with commissions, fees and taxes at this stage.
- *Affirmation*—(FM to BD). The FM agrees that the new data are correct.

Settlement

- *Settlement instructions*—(BD to clearing agent; FM to GC). The FM instructs the GC either to deliver or receive specified securities, either against or free of payment. In the case of transactions in overseas securities, the GC may pass these instructions on to a local sub-custodian. The BD sends similar information to its own clearing agent.
- *Settlement execution*—(GC, or local sub-custodian and BD's clearing agent to central securities depository (CSD)). The GC or local sub-custodian, and BD's clearing agent submit settlement instructions to the CSD for matching and settlement.
- *Settlement affirmation*—(CSD to GC, or local sub-custodian and BD's clearing agent). The CSD confirms that settlement has taken place.
- *Statement of settled transactions*—(GC to FM). The GC provides details of all transaction activity that has been received for a specified period and that has been settled. Similar messages can detail all pending transactions, or provide a statement of holdings.

Post-settlement

- Reconciliation. The GC ensures that the underlying securities accounts reflect the trade that has just been executed.
- GC may perform certain value-added post-settlement services to the FM, such as valuation, securities lending and management of corporate actions.

tactics to attract market share, such as giving customers introductory price offers (although this may lead to technical inertia once the initial intense competition has died down) and making a credible commitment to low future price levels.

- **'Battle of the Sexes'.** Both suppliers may agree that competition within a common standard is preferable to having incompatible standards. But if each has a comparative advantage in the use of their preferred standard, reaching agreement on which standard to choose may prove difficult. So the suppliers may adopt initial tactics such as making concessions in return for the use of favoured standards (eg low-cost licensing).
- **'Pesky Little Brother'.** Where the suppliers have different market shares, a consensus may be difficult. A supplier with a large installed base is likely to prefer incompatible standards, in the expectation that the market will tip (or remain) in its favour.(1) A smaller firm or new entrant, however, (as shown in Katz and Shapiro (1985)), is likely to prefer compatibility as this removes the larger firm's installed base advantage. So agreement is unlikely to be reached. Firms can actively prevent compatibility, either by asserting intellectual property rights or by frequently changing technologies.

Process of adoption

A further strand of research stresses cases in which a standard is not agreed because the process of adoption is not optimal. David and Greenstein (1990) set out the four main mechanisms by which standards are adopted in a network industry: (i) gradual adoption through a market mechanism, not sponsored by a firm with proprietary control over the standard; (ii) a market mechanism, where the standard is sponsored; (iii) through a voluntary committee of users; or (iv) through government intervention. In this section, we discuss the first three of these mechanisms. The role of governments in the standard-setting process is discussed in a later section.

- **Unsponsored.** Where no firm has a proprietary interest in the use of the standard, general adoption requires a certain threshold of early-adopter users. If the threshold is not reached, then others will not be persuaded.(2) So suppliers may have an incentive to

(1) The same might occur if the supplier is particularly confident of its technology.
(2) Other than the exceptional case in which every firm is better off under a new standard and there is full information.

give their technology to market participants free, or at a significant discount. In some cases, users that are early adopters may also find it beneficial to give their favoured technology to other market participants. Even if this does not mean that the number of users reaches the critical value, it could nevertheless increase the firm's own processing efficiency by ensuring that their counterparties use a single standard.

- **Sponsored.** Where a supplier has proprietary control over standards, it may seek to lock users into its technology, reducing their incentive to switch in the future. One method of achieving this is by aggressive pricing in early periods. Again, the supplier might consider giving the technology away at an early stage.

- **Voluntary user coalition.** No standard will actually be used in a market unless it fits the needs of users—which the users themselves are in the best position to determine. So in most cases it is better for the users of products (rather than software suppliers, official bodies or third parties) to drive the decision-making process. Most initiatives in financial markets are in practice developed by voluntary coalitions of users. Most of the costs of incompatibility are borne by the users of products. Where the optimal outcome for suppliers is incompatibility, users may have to purchase multiple sets of technology to communicate with a full range of counterparties or clients.

There are problems with standards being determined by such co-operative committees. For example their decisions tend to be less imaginative (in order to maintain consensus). They also tend to be more technically complicated (particularly where suppliers are involved). Committees are likely to recommend a market structure that preserves the interests of all of the coalition members, even where technological change means that other market structures may now be more efficient. Farrell and Saloner (1988) find that committees tend to move less quickly than the market, even if co-ordination may overall be of better quality. If the group's needs are not symmetric, then mechanisms need to be found to bind the minority to the consensus.

XML: the role of new technology

eXtensible Markup Language (XML) is a technological development with potentially profound implications for the standardisation of electronic messages. According to the definitions mentioned earlier, XML is a syntax. XML-based standards can then be created by defining data fields to relate to the particular business needs of a market. XML is being developed by the World Wide Web Consortium (W3C) in California, and is intended to overcome some of the limitations of HTML, the current WWW standard language.

XML is a significant advance on HTML because it describes the meaning of the data, in such a way that a computer can understand their significance. XML distinguishes the definition of content from the style of presentation (the latter is specified in a separate style-sheet written in XSL—eXtensible Style Language). Applications will be able, in effect, to talk to each other. XML is 'extensible'—it allows for the creation of new 'tags' to describe new and unforeseen message fields. This means that new customised XML tags can be created by anyone at any time. The meanings of the tags are described in a separate file known as a 'document type definition' (DTD). So data can be marked up in such a way that their style or format can be read on different platforms.(1)

XML has the potential to address two of the most common failings of standards—that they are either over-engineered and inflexible, or too flexible to constitute a standard. *Ex ante*, XML is highly flexible. Since it is extensible, participants in a particular market can define fields in any way that meets their needs. But *ex post*, XML is rigid. Once specifications have been agreed, messages can be sent only if formatted precisely. In this way, XML-based standards should significantly reduce the need for repairs to transaction details. But for this, users sacrifice the flexibility afforded by the optional fields available in other message standards.

XML's greatest asset may be its ubiquity. The fact that XML is embedded in the wider WWW technology should help it to establish critical mass. Even though most of XML's applications in financial markets will not take place over the public Internet, firms' investment in Internet software and expertise can be re-used for the XML-based closed networks used in financial markets. Virtually every current initiative to establish message standards for financial markets involves XML in some manner. FIX and GSTPA are both developing XML tags. Both new open market standards such as FpML and new proprietary standards are

(1) For instance, the trade details from a simple retail transaction may appear in HTML in the following form, where the tags <H3>, <I> or <B> indicate that the enclosed text should appear in headline type, italic or bold:
<H3>Sale price: £24.95</H3> <I>(Suggested retail: £39.95)</I> <B>Shipping cost: £4.00 UPS Ground</B>
So a computer may be able to interpret how the content should appear. But XML tags actually indicate what the content means. For instance, the same transaction details may appear in XML as:
<PRICE type="sale" unit="GB Pound">24.95</PRICE> <PRICE type="retail" unit="GB Pound">39.95</PRICE> <SHIPPING type="UPS Ground" unit="GB Pound">4.00</SHIPPING>
The meaning of the tags, such as <PRICE type="sale"unit="GB Pound"> are defined in a separate file—the document type definition. An XML-enabled search engine, for instance one looking for the lowest price on the Web for a particular item, can thus readily interpret this information, and recognise that £24.95 is indeed the price at which the good is being offered for sale. An excellent introduction to XML, from which this example derives, is Halfhill (1999).

based on XML. SWIFT's next generation network (swiftML) will also use XML.

However, these different XML standards will not necessarily be able to 'talk to one another' in their present form.(1) One initiative that might help to remedy this incompatibility is SWIFT's planned Standards Repository. The Repository will be an extension of the existing ISO15022 'data field dictionary', for which SWIFT currently acts as registration authority. Both are means of achieving inter-operability between different message standards, by ensuring that a single definition of each particular data field is used. Both will in principle facilitate the translation of messages between different standards. However, the Repository differs from ISO15022 because it maps standards at three levels: the business level (focusing on the understanding of the business processes); the logical level (focusing on the business information that needs to be exchanged); and the physical level (focusing on the messages and their syntax).

SWIFT intends that the Repository will include message types from all wholesale financial markets, and that it will be placed in the public domain. To ensure that it is a success, the Repository will have to be genuinely inclusive of a wide variety of standards and industry bodies. The governance arrangements for the new Repository will pose a particular challenge.

A further initiative to ensure *ex post* inter-operability between standards based on XML is ebXML (electronic business eXtensible Markup Language). This is a joint initiative between UN/CEFACT and OASIS (the Organisation for the Advancement of Structured Information Standards), an international consortium of major software suppliers. ebXML will provide an open technical framework to allow XML to be used in a consistent manner for the exchange of all electronic business data. The partners are seeking to involve a wide range of standard-setting bodies. ebXML faces issues similar to those faced by SWIFT's Standards Repository in its efforts to reach a critical mass of market participants.

Possible effects on market structure

Technology affects market structure by changing the relative costs of conducting a transaction in different ways—within a firm, using intermediaries or in an open market. Coase (1937) provided the classic analysis of the effects of changes in transaction costs on market structure. He argued that 'a firm will tend to expand until the costs of organising an extra transaction within a firm becomes equal to the costs of carrying out the same transaction by means of an exchange on the open market or the costs of organising in another firm'.

Although the current structure of intermediated financial markets will undoubtedly be affected by technological advances, it is not clear which institutions will be affected, and in what ways. For instance, if common message standards used over electronic networks reduce the cost of transactions in the market, there may be more transactions in the market and a lesser role for intermediaries. Indeed, exchanges are developing the technology to admit institutional investors directly. And common message standards such as FIX are increasingly allowing investors direct access to multiple pools of liquidity. Will this lead to broker-dealers becoming increasingly disintermediated from markets?

According to another argument, however, the efficiency savings from straight-through processing in financial markets may be more readily implemented within individual firms, given the difficulties and slowness of co-ordinating a large number of market participants. In other words, the marginal cost of organising a transaction within a firm would fall relative to the marginal cost of an open market transaction. If intermediaries are more efficient at adopting new technology than end-users, or if intermediaries are simply cutting costs faster than the cost of trading in the open market, then end-users will continue to use their services. It is difficult to predict the future structure of financial markets with any certainty, but the role of technology in determining it will be key.

The impact of XML on this process will be of some interest. The principal economic effect of XML may be to reduce switching costs, because it facilitates backward compatibility. In other words, more advanced versions of systems, standards or software will be readily compatible with older systems, standards and software. The costs of moving to a technically superior but still XML-based standard are thus reduced. This means that an industry will be less likely to experience technical inertia. It also means that market participants will be more likely to agree on a common standard because the differentials between firms' switching costs are likely to narrow.

The public sector perspective

The primary justification for public involvement in the standard-setting process is set out in Kindleberger (1983). Kindleberger argues that standards exhibit many of the characteristics of public goods. In other words, there may be a 'free rider' problem, such that no market player is willing to put resources into developing a common standard, even where there would be a social benefit to its adoption. Indeed, as discussed above, there are many situations in which market forces alone do not produce a solution that maximises social welfare.

In theory, central banks and regulators could remedy these market failures by mandating the standards to be used in a

(1) This problem is being addressed by the development of eXtensible Style Language Transformations (XSLT), which is a language for transforming XML documents into documents that use other XML-based standards. XSLT has been designed for use as part of XSL, the stylesheet language for XML, which has two components: transformation and formatting.

market. But public authorities need to exercise this power, if at all, with great discretion. Central banks and regulators may have less technical knowledge than suppliers and less knowledge of user needs than user groups. Moreover, where market participants face asymmetric switching costs, public sector mandate of a particular standard will have a redistributive effect, which should be taken into account.

A less prescriptive approach is for the public sector to set objectives, or criteria that a standard should meet. Market participants are then left to determine how to attain them. For instance, one possible approach to standards could be for central banks and regulators to stipulate that all new standards should be inter-operable. But a danger in adopting this approach alone is that it provides no new incentive for market participants to standardise.(1)

Another possible role for the public sector is co-ordination of market participants. In practice, financial market participants appear to be co-ordinating reasonably well in most cases, notwithstanding the fact that many of the standard-setting initiatives are still at a relatively early stage. Most of the new standards are open and user-driven. And most have the support of the major market players (although this means that progress is rarely fast). Where the different standards consortia overlap in scope, efforts have been made to co-operate. For example, FIX, GSTPA, FpML and SWIFT are working together. So the role for the public authorities seems, at this stage at least, to be limited. But if market participants do experience problems in agreeing common standards, central banks may be in a good position to act as catalysts for collective action.

Conclusions

The development of common message standards is central to the move towards automated processing of trade data and the wider adoption of electronic commerce in wholesale financial markets. This automation is expected to bring significant efficiency gains, as well as a reduction in costs and risk. Initiatives led by market participants to establish common standards have made considerable progress.

But it remains the case that too many trades in today's financial markets are still processed using fax or incompatible electronic networks. Standard-setting bodies continue to face difficulties in their efforts to gain widespread adoption of common and compatible message standards over the life of a trade.

Competitive pressures may force common standards to be adopted more widely if they are associated with new technologies that give market participants new ways to reduce costs or improve services.

The impact of XML, in particular, could be considerable. It has the potential to address some of the traditional failings of standards—that they are either too rigid, and do not reflect the needs of a particular market, or else that they are so flexible that they barely constitute a standard. It may also facilitate technological progress, by reducing firms' switching costs and so lowering barriers to entry and barriers to change. But this is likely to happen only if market participants work together to ensure that the XML-based standards that they create are inter-operable.

The precise ways in which electronic commerce and the development of common message standards will affect market structure in the medium term are difficult to predict. But it is clear that changing technology has the potential to bring about significant changes: to the ways in which markets operate and to the roles of market participants.

(1) Lelieveldt (2000) argues this point in greater detail.

References

Besen, S M and Farrell, J (1994), 'Choosing how to compete: strategies and tactics in standardisation', *Journal of Economic Perspectives*, Vol 8, pages 117–31.

Coase, R H (1937), 'The nature of the firm', *Economica*, Vol 4, November.

David, P A and Greenstein, S (1990), 'The economics of compatibility standards: an introduction to recent research', *Economics of Innovation and New Technology*, Vol 1, pages 3–41.

Farrell, J and Saloner, G (1988), 'Co-ordination through committees and markets', *Rand Journal of Economics*, Vol 19, pages 235–52.

Halfhill, T R (1999), 'XML: the next big thing', *IBM Research Magazine*, No 1.

Hills, B and Rule, D (1999), 'Counterparty credit risk in wholesale payment and settlement systems', *Financial Stability Review*, No 7, pages 98–114.

Katz, M L and Shapiro, C (1985), 'Technology adoption in the presence of network externalities', *American Economic Review*, Vol 75, pages 424–40.

Kindleberger, C P (1983), 'Standards as public, collective and private goods', *Kyklos*, Vol 36, pages 377–96.

Lelieveldt, S (2000), 'Standardising retail payments instruments', in Jakobs, K (ed), *Information technology standards and standardisation: a global perspective*, Hershey Press.

Levitt, A (1996), 'Speeding up settlement: the next frontier', remarks at the US SEC Symposium on risk reduction in payments, clearance and settlement systems, 26 January.

The environment for monetary policy

In his annual speech at the Mansion House,[1] *the* ***Governor*** *reports on an improving international environment. Risks to the outlook remain from the imbalances within and between the industrial countries, which persisted over the past year, but the global economy may now at least be moving in the right direction. Domestically the United Kingdom has experienced above-trend growth, falling unemployment and low inflation, despite the continuing difficulties caused for some sectors of the economy by the strength of sterling against the euro.*

I spoke last year—somewhat hopefully, even optimistically for a central banker—about the still nascent global economic recovery from the Asian crisis and its aftermath. But, more characteristically, I worried about the international imbalances affecting the major industrial countries, and the related imbalance within our own economy.

The good news, my Lord Mayor, is that the global recovery has turned out to be rather stronger than we dared to hope a year ago. The world economy is currently growing at around its long-term trend rate—of 4% or rather more—and is expected to continue to grow close to that rate over the next couple of years. Although meanwhile global inflation has so far remained generally subdued, monetary policy in the major industrial countries—which had been directed to stimulus during the period of sharp world economic slowdown—has, to varying degrees, reverted to being less accommodating with the equally sharp recovery.

The less good news is that the worrying international imbalances within and between the industrial countries persisted throughout most of the past year—though just between you and me, my Lord Mayor, and as long as you don't breathe a word to the Chancellor, there is a glimmer of a suggestion—no more than that—that those imbalances may now be becoming somewhat less worrying.

In the United States, evidence of a sustained improvement in the rate of productivity growth has persisted. We, in this country, must fervently hope that the seeds of this technological modification are blown in our direction and find a receptive environment here. There is no obvious reason why we should be immune from this highly desirable infection—though sadly the symptoms of contamination are still hard to detect. In the meantime, its supply-side effects in the United States imply that the US economy can sustain faster growth than seemed possible before, without necessarily overheating—at least for a time and up to a point. But the same developments have also helped to raise the temperature on the demand side of the US economy, and the Federal Reserve has been administering monetary sedatives at intervals throughout the past year. But finding exactly the right dosage, and the right timing, to keep the body temperature near normal in present circumstances really does demand the wisdom of Solomon—or at least the wisdom of Greenspan. Notwithstanding some more encouraging recent signs, there is still a possibility that continuing imbalance between domestic and external demand will need additional sedation or that it will eventually precipitate a sharp fall in the dollar and US asset prices. But the dollar has come off its recent peak and some of the exuberance may now have gone from equity prices—including some of the froth from the 'new economy' sector—so the risks of sharp correction may be less than they were.

Elsewhere, in Japan, after a long convalescence, there may now at last be some better prospect of a gradual but self-sustaining recovery in private sector demand. And there has been more substantial evidence in recent months of strengthening domestic demand and output growth across the eurozone. That fully justified the European Central Bank's gradual shift away from its earlier accommodating monetary policy stance; it may also have contributed to the beginnings of a recovery of the euro exchange rate towards a more comprehensible level.

We are certainly not yet out of the woods—there is a long way to go before anyone can feel confident that we are in fact in sight of a more sustainable balance between the major industrial economies. But I am more hopeful that we are now at least moving in the right direction.

And that is encouraging news for the United Kingdom.

On a macroeconomic overview, our own economy remains in pretty good shape. In the year to the first quarter, total output grew by just over 3%, while prices rose by 2.7% measured by the overall GDP deflator or by 2.1% on the Chancellor's RPIX target measure. That is the fifth time in

(1) Given at the Lord Mayor's Dinner for Bankers and Merchants of the City of London at the Mansion House on 15 June 2000. This speech may be found on the Bank of England's web site at www.bankofengland.co.uk/speeches/speech91.htm

the past seven fiscal years that output growth has exceeded the rate of inflation.

Since the recession of the early 1990s, both output growth and inflation have averaged around 2¾%. The number of people in employment—as we saw from yesterday's figures—is at an all-time high. The rate of unemployment, on a claimant count basis, is as low as it has been for 25 years. And interest rates over the past few years have been more stable and just about as low as anyone can remember.

Now it's true that there are uncertainties ahead—as there always are—which could make for a bumpier ride. The welcome weakening of sterling—which had risen to quite unrealistic levels against the exaggeratedly weak euro—will tend to reverse the downward pressure that it had been exerting on retail prices. Domestic demand growth will need to moderate to compensate for that, although there are some tentative signs in the recent data that it may be beginning to do so. The sustained tightness in the labour market could still put upward pressure on earnings growth and pay settlements—though the latest data are somewhat reassuring for the time being. We can't be confident about the effects in this country of the new economy—though we remain open-minded. Nor can we be confident of either the extent or the likely persistence of what appear to be exceptional downward pressures on retail margins. We don't know for sure what is likely to happen to the oil price. And so on.

We will—in the best central banking tradition—need to be eternally vigilant. But for all the uncertainties, the overall prospect for the economy as a whole over the next couple of years—in my view, but it is a view that I think is broadly shared by most of the other members of the Monetary Policy Committee—is for continuing steady growth, at or a bit above its longer-term trend, for continuing high employment, and for continuing low inflation at around the Chancellor's target.

And that, my Lord Mayor, is not a bad prospect either.

Our problem—and it has been a persistent headache over the past two or three years, as I have repeatedly tried to explain on earlier occasions—is the imbalance between the domestic sectors of the economy, which have by and large been doing pretty well, and those that are heavily internationally exposed. Those sectors have had a tough time over the past few years—what with the global economic slowdown and particularly more recently with the seemingly remorseless rise of sterling against the euro. That went well beyond constructive pressure to improve efficiency to destructive agony. We've been only too well aware of that—we could hardly not have been; and we've not been insensitive to it either. We have consistently taken account of the unexpectedly persistent strength of the exchange rate both in our forecasts and in our monetary policy judgments. But when you come down to it, as long as economic conditions between one country and another diverge, whether for cyclical or structural reasons, there is a choice. Countries can either aim to stabilise their respective domestic economies, accepting that that may mean exchange rate volatility, or they can aim to maintain exchange rate stability, accepting that that may destabilise their respective domestic economies. These are the horns of the uncomfortable dilemma we have been on.

I have no doubt, in terms of the macroeconomy as a whole, that we have been right to persist in aiming to stabilise our domestic economy—the facts speak for themselves. It is possible—even perhaps likely—that our dilemma may now become less acute, at least for a time, as the euro strengthens to a more sustainable level. Our best chance of maintaining that happier position—if indeed it occurs—is to persist in domestic stabilisation and structural reform alongside our European partners, but it is difficult to be confident at this stage that the dilemma will not re-emerge.

Monetary union and economic growth

In this speech,[1] John Vickers, Executive Director and Chief Economist at the Bank, discusses possible links between monetary arrangements—in particular monetary union—and economic growth. He stresses that growth depends ultimately on how the real economy works: there is no monetary magic that can conjure up growth. But monetary policy can contribute to conditions for sustainable growth by securing and maintaining price stability; and monetary union might extend this. It might also deepen the single market. The elimination of nominal exchange rate movement among members of the union removes some sources of shock but also some ways of adjusting to shocks. This underlines the importance of other adjustment mechanisms—especially supply-side flexibility, which is crucial for growth in any event.

Introduction

Monetary union and economic growth was the subject for discussion at a dinner in London one evening in March 1925. The host was the Chancellor of the Exchequer, Winston Churchill. His guests were the Treasury grandees Bradbury and Niemeyer; the chairman of the Midland bank and former Chancellor McKenna; and an economist called Keynes. In case you were wondering, the Governor of the Bank of England was away.

The question was whether Britain should rejoin the Gold Standard, and at the pre-1914 parity of $4.86. Oh to have been a fly on the wall! But we do have the next-best thing—an account by a fly at the table, written years later by Churchill's private secretary James Grigg:[2]

'The symposium lasted till midnight or after. I thought at the time that the [pro-gold] ayes had it. Keynes's thesis, which was supported in every particular by McKenna, was that the discrepancy between American and British prices was not 2½ per cent as the exchanges indicated, but 10 per cent. If we went back to gold at the old parity we should therefore have to deflate domestic prices by something of that order. This meant unemployment and downward adjustments of wages and prolonged strikes in some of the heavy industries, at the end of which it would be found that these industries had undergone a permanent contraction …

'Bradbury made a great point of the fact that the Gold Standard was knave-proof. It could not be rigged for political or even more unworthy reasons. It would prevent our living in a fool's paradise of false prosperity, and would ensure our keeping on a competitive basis in our export business … To the suggestion that we should return to gold but at a lower parity, Bradbury's answer was that we were so near the old parity that it was silly to create a shocked confidence and to endanger our international reputation for so small and so ephemeral an easement …

'One thing about this argument comes back to me with crystal clearness. Having listened to the gloomy prognostications of Keynes and McKenna, Winston turned to the latter and said: 'But this isn't entirely an economic matter; it is a political decision … You have been a politician; indeed you have been Chancellor of the Exchequer. Given the situation as it is, what decision would you take?' McKenna's reply—and I am prepared to swear to the sense of it—was: 'There is no escape; you have got to go back; but it will be hell'.'

Keynes later said that McKenna 'always lets one down in the end'. The decision to return to gold at the pre-war parity was made a few days later and announced in Churchill's Budget in April. The Bank of England strongly approved, though one director is reported to have resigned in protest—a Mr Vincent Vickers.[3]

I have quoted this account at some length because it contains a number of themes that still resonate today, ranging from the importance of knave-proof monetary arrangements to the difficulties of equilibrium exchange rate analysis. But above all the question of the return to gold, and the events that followed, is a powerful illustration of how monetary arrangements can matter—for the real economy as well as for prices.

But how do they matter? Is it possible that a change in monetary arrangements might have a permanent effect on

(1) Given at the conference to mark the 150th anniversary of the National Bank of Belgium on 12 May 2000. I am especially grateful to Andrew Bailey, Marion Kohler and Peter Westaway for their expert help in preparing this paper. I owe thanks also to Roger Clews, Phil Evans, Paul Fisher, Neal Hatch, Nigel Jenkinson, John Keyworth, Mervyn King, Don Kohn and John Townend for comments and suggestions on an earlier version. Responsibility for the contents of the paper rests, however, entirely with me. This speech may be found on the Bank of England's web site at www.bankofengland.co.uk/speeches/speech86.pdf

(2) Quoted in Kynaston (1999, page 119).

(3) See Moggridge (1972, page 95). The force of this protest is unclear, since records show that Mr Vickers had in fact ceased to be a director of the Bank in 1919.

the real economy? In particular, does monetary union have any implications for the rate of growth of the real economy? These are the broad questions that I want to address today. My aim is limited to exploring the economic logic of some links between monetary union and growth, and does not extend to providing a comprehensive quantitative assessment, festooned with fan charts, policy recommendations, and so on. If you were hoping for the latter, then I have at least let you down right at the start.

What really drives growth?

Although my task is to explore relationships between monetary union and growth, let us for a moment ignore monetary influences altogether. This is in fact what books on growth economics generally do. After all, just as inflation is a monetary phenomenon, so growth is a real phenomenon.

Among the most important real economic forces driving growth are:

- growth in hours worked;
- growth in human capital;
- growth in physical capital;
- improved allocation of labour and capital across production activities;
- better exploitation of economies of scale; and
- innovation and diffusion of improved technologies and methods.

Subtracting the first of these factors from output growth gives the rate of labour productivity growth—the growth of output per hour worked. The last three factors are elements of total factor productivity (TFP) growth—the growth in output not accounted for by growth in factor inputs.

Table A shows phases of per capita GDP growth for a number of European countries from 1820 to 1992. It is immediately apparent from the table why the post-war period from 1950 to 1973 is called the Golden Age. Growth was 2%–3% higher than in previous or subsequent generations. The high output growth came largely from strong labour productivity growth—see Table B.

Unlike in Japan over this period and other East Asian economies subsequently, where output growth was even greater, labour input growth in Western Europe was modest. The population of working age was not growing especially rapidly, and workers' annual average hours were declining, though human capital formation was probably substantial. Capital input growth made a large contribution to growth but most remarkable is the rate of TFP growth in the Golden Age—see Table C. This was related to, among other things, the reallocation of labour—eg from agriculture to manufacturing industry (a process that had largely happened earlier in the United Kingdom)—and post-war reconstruction, catch-up and convergence. Public policy fostered growth, for example by measures of international trade liberalisation—including the establishment of the European Community—and by sustaining macroeconomic stability.

Then came the notorious productivity growth slowdown, albeit a slowdown from an unusually speedy pace. As growth slowed, unemployment and macroeconomic volatility increased. The onset of the slowdown happened at the same time as the first OPEC oil price hike, and although post hike does not necessarily imply propter hike, the oil shock is an element of the explanation of the 1970s rise in European unemployment. What it and subsequent shocks cannot explain is the diversity of unemployment rates among countries in Europe. Institutional differences between labour markets are no doubt part of the explanation,

Table A
Phases of per capita real GDP growth

	1820–70	1870–1913	1913–50	1950–73	1973–92
Austria	0.7	1.5	0.2	4.9	2.2
Belgium	1.4	1.0	0.7	3.5	1.9
Denmark	0.9	1.6	1.6	3.1	1.6
Finland	0.8	1.4	1.9	4.3	1.6
France	0.8	1.5	1.1	4.0	1.7
Germany	1.1	1.6	0.3	5.0	2.1
Italy	0.6	1.3	0.8	5.0	2.4
Netherlands	1.1	0.9	1.1	3.4	1.4
Norway	0.5	1.3	2.1	3.2	2.9
Sweden	0.7	1.5	2.1	3.1	1.2
Switzerland	n.a.	1.5	2.1	3.1	0.8
United Kingdom	1.2	1.0	0.8	2.5	1.4
Arithmetic average	**0.9**	**1.3**	**1.2**	**3.8**	**1.8**

n.a. = not available.

Source: Maddison (1995, Table 3-2).

Table B
Rate of growth of labour productivity

GDP per hour worked

	1870–1913	1913–50	1950–73	1973–92
Austria	1.7	0.9	5.9	2.5
Belgium	1.2	1.4	4.5	2.9
Denmark	1.9	1.5	4.5	1.7
Finland	1.8	2.2	5.4	2.2
France	1.7	1.9	5.1	2.7
Germany	1.9	0.6	6.0	2.7
Italy	1.7	2.0	5.8	2.4
Netherlands	1.3	1.3	4.8	2.2
Norway	1.6	2.5	4.2	3.2
Sweden	1.8	2.8	4.1	1.3
Switzerland	1.5	2.7	3.3	1.7
United Kingdom	1.2	1.6	3.1	2.2
Arithmetic average	**1.6**	**1.8**	**4.7**	**2.3**

Source: Maddison (1995, Table 3-13).

Table C
Total factor productivity growth in different periods

Per cent per year

	1950–62	1960–73	1973–79	1979–90
Belgium	1.9	3.9	1.5	1.4
Denmark	1.8	2.8	1.2	1.3
France	3.5	4.0	1.7	1.7
West Germany	4.5	2.7	1.8	0.8
Italy	4.3	4.6	2.2	1.3
Netherlands	2.6	3.1	1.5	0.9
United Kingdom	1.3	2.3	0.6	1.6

Source: Crafts and Toniolo (1996, Table 1.7).

but they seem unable to explain the rise in aggregate unemployment over time. This puzzle—how to explain European unemployment patterns both over time and across countries—is explored in a recent paper by Blanchard and Wolfers (2000). Their analysis suggests that the *interaction* between shocks and institutions is crucial. This general theme will recur in what follows.

So how can monetary arrangements matter for growth?

Although growth is driven directly by real forces, monetary arrangements can have important indirect effects on growth through several channels. Of course monetary policy affects *demand* growth at short horizons by affecting short-term real interest rates, asset prices, and so on—as outlined in, for example, our Monetary Policy Committee's (1999) paper on the transmission mechanism of monetary policy.

But how can monetary arrangements influence the growth of *supply* capacity in the economy? This question has at least two aspects:

- long-run growth in 'steady state'; and
- medium-run growth in transitional phases.

By the latter I mean not just phases of technological catch-up, or transitions from one steady state to another, but also the kind of protracted adjustment that Keynes spoke of at Churchill's dinner.

Bearing in mind both of these aspects, the rest of my remarks will cover four links from monetary arrangements—and monetary union in particular—to supply-side growth:

- price stability effects;
- exchange rate effects;
- trade and competition effects; and
- policy-making effects.

I shall also comment on some monetary consequences of growth differentials within monetary union.

Price stability effects

The paper by Otmar Issing (2000) has already explored the relationships between price stability and growth at this conference, so I shall be brief. First, as a theoretical proposition, the steady-state inflation rate, which depends on monetary policy, will generally have some effects on steady-state output growth, and upon economic welfare more generally.(1) Inflation is a tax on real money balances, and taxes affect private behaviour and, via the fiscal arithmetic, have implications for government behaviour. Inflation can also have significant negative effects—especially on saving and capital accumulation—through interactions with the tax system.(2)

Second, in practice there appears to be no such thing as high steady-state inflation, for high inflation has generally been associated with volatile and uncertain inflation.(3) Inflation uncertainty has real costs—in terms of both risk and effort to avoid risk.

An example of these costs is housing finance, which in the United Kingdom, unlike elsewhere in Europe, has mostly taken the form of floating-rate mortgage debt, though mortgages with rates fixed over some term have become more popular in recent years. When inflation is very uncertain, as it was in the United Kingdom for a generation from the late 1960s to the early 1990s, both fixed and floating-rate debt have large risks. With fixed-rate debt the risk is to the borrower's (and the lender's) real wealth. Higher-than-expected inflation arbitrarily shifts wealth from lender to borrower, and lower-than-expected inflation does the opposite. With floating-rate debt the main risk is to household cash flows. If real wealth uncertainty dominates cash-flow uncertainty, then floating-rate debt will have relative attractions when inflation risk is high.

A credible commitment to price stability reduces both kinds of risk. More broadly it relieves financing decisions from the plague of large inflation uncertainty, and diminishes inflation risk premia in borrowing costs—to the benefit of households, businesses and government. Only when inflation is low and stable, and expected to remain so, are economic decisions free from such uncertainties and distortions.

Monetary union helps to contain the costs of high and uncertain inflation if it brings price stability to countries that would otherwise find that harder to secure and maintain. Exchange rate fixity to a sound currency or adopting such a currency provides a nominal anchor. It may have been a 'barbarous relic', but this is what the Gold Standard did in its time. The challenge in the modern era of managed money has been to create institutions—domestic or transnational—to achieve and maintain price stability. The architecture of European Monetary Union does this—it is certainly built to be knave-proof(4)—and the new monetary

(1) See, for example, Orphanides and Solow (1990), Woodford (1990) and Lucas (2000).
(2) See, for example, Feldstein (1999) and Bakhshi, Haldane and Hatch (1997).
(3) The Gold Standard era saw low average inflation but considerable volatility from year to year. So low inflation seems to be a necessary but not sufficient condition for stable inflation.
(4) Apparently no paper nowadays on European monetary arrangements is complete without a reference to *Alice in Wonderland*. So let it be noted that the Knave of Hearts was an important agent of transparency (albeit at the behest of the Queen). For it was he who turned over and exposed the three gardeners (the 2, 5 and 7 of Spades) who, having planted the wrong rose trees, had thrown themselves face down as the Royal procession approached.

framework in the United Kingdom, which has just had its third birthday, is constructed with similar intent.

Exchange rate effects

What is the relationship of monetary union to the issues of exchange rate volatility and the possibility of medium-term exchange rate misalignment?

The apparent break in the industrialised world's rate of productivity growth around the customary watershed of 1973 coincided not only with the first oil shock but also with the advent of an international monetary system in which the major currencies floated relative to one another. Previously, under the Bretton Woods system that prevailed from Keynes to Nixon, currencies were adjustably pegged to the dollar, which was in turn partly linked to gold. After the breakdown of the Bretton Woods system, exchange rates became more volatile. While the largest currencies floated, many European countries sought over time to limit exchange rate variability among their currencies in a series of steps that led to the creation of the euro last year.

Table D, which is from a recent IMF paper on exchange rate regimes,(1) shows measures of the short-run variability of, and longer-run trends in, the nominal and real exchange rates of five industrialised countries and of what is now the euro area. In the Bretton Woods era nominal exchange rate variability was zero, except from time to time when exchange rates were adjusted. The table shows that, by contrast, exchange rate variability has been substantial over the past 20 years. A quarterly standard deviation of 5%, which is typical against the dollar, is considerable volatility. Nominal effective (ie trade-weighted) exchange rates have been somewhat less variable, but of the countries in the table, they have been much less so only for France and Germany, reflecting the success of efforts to achieve intra-European nominal exchange rate stability.

Monetary union obviously banishes nominal exchange rate variation among member countries. It does not—and should not—remove real exchange rate variation among them (see below). And of course nominal and real exchange rate variability remains relative to non-members of the union.(2) Mussa *et al* (2000, Table 2.2) present evidence that over the 1973–98 period, euro-area countries had less exchange rate volatility than the euro area as a whole, but that short-run volatility for a 'synthetic' euro was broadly constant.(3)

On account of asymmetrical trade weights, moreover, the nominal effective exchange rates of member countries may behave differently. For example, from the start of 1999 to the beginning of May this year, the decline of 11% in Ireland's nominal effective exchange rate was twice as much as the 5½% decline experienced by Belgium—see Chart 1. This reflects the fact that the majority of Ireland's trade is outside the euro area while most of Belgium's is within it.

Table D
Selected industrial economies: volatility of bilateral and effective exchange rates, 1980 Q2–1998 Q4

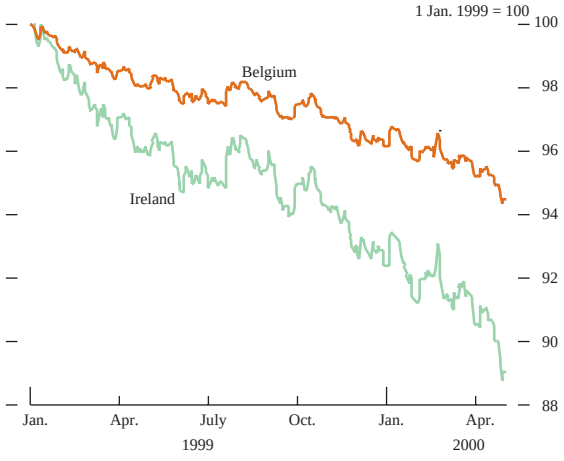
Per cent

	Bilateral versus US dollar (a)	Nominal effective exchange rate (b)	Real effective exchange rate (b)
Germany			
Standard deviation of quarterly changes	5.26	1.63	1.69
Trend quarterly appreciation (c)	0.72	0.47	0.13
Japan			
Standard deviation of quarterly changes	5.70	4.78	4.69
Trend quarterly appreciation (c)	1.28	1.98	0.70
France			
Standard deviation of quarterly changes	5.14	1.62	1.54
Trend quarterly appreciation (c)	0.30	0.19	-0.03
United Kingdom			
Standard deviation of quarterly changes	5.23	3.62	3.85
Trend quarterly appreciation (c)	-0.12	-0.42	-0.13
United States			
Standard deviation of quarterly changes	...	3.14	3.10
Trend quarterly appreciation (c)	...	1.39	-0.30
Euro area			
Standard deviation of quarterly changes	5.01	3.00	2.96
Trend quarterly appreciation (c)	0.35	0.67	0.21

Source: Mussa *et al* (2000, Table 2.1).

(a) All bilateral exchange rates are US dollars per national currency.
(b) Effective exchange rates are trade-weighted indices; the real effective exchange rate is based on the consumer price index.
(c) Based on a regression of the natural logarithm of the level of the exchange rate on a time trend.

Chart 1
Nominal effective exchange rates



(1) Mussa *et al* (2000, Table 2.1).
(2) In the absence of very high and variable inflation, real exchange rate variability broadly matches nominal exchange rate variability for each country, reflecting slow price adjustment in the short run. The long-run real exchange rate trends for the countries in Table D are not flat but they are large only for Japan. Therefore long-run trends in nominal exchange rates mostly reflect inflation differentials.
(3) This is because intra-area volatility has been limited by moves towards currency union, and this has dampened the exchange rate volatility of member countries. The exchange rate index for the euro area as a whole, however, has no weight on member country currencies. For example, it includes $ and £ but not FFr or DM.

This example illustrates how a nominal exchange rate shift relative to a non-member currency can have asymmetrical effects among member countries.(1)

Exchange rate variability is an issue not just in the short term: there have also been large medium-term swings in exchange rates. In this regard Mussa *et al* point to the 1980–85 rise of the dollar and the 1990–95 rise of the yen, and their subsequent reversals. One might add the 1996–2000 decline in the euro and its predecessor currencies, and the corresponding rise in sterling. Such episodes raise the question of exchange rate misalignment, on which Mussa *et al* conclude judiciously:

'Although exchange rate fluctuations are often equilibrating or reflect diverging cyclical positions or monetary policies, it seems likely that at least some large exchange rate movements for both advanced countries and emerging markets do not plausibly reflect economic fundamentals.'

Exchange rate misalignment was of course Keynes's principal argument against Britain returning to Gold at the old parity in 1925. His concern was that the required process of deflation of domestic prices would cause real damage, and to supply capacity as well as to demand. In reaching this conclusion, Keynes did not simply assume nominal wage rigidities. He also highlighted how real wage inertia could hinder the necessary aggregate adjustment of money costs and prices:(2)

'If *everyone* was accepting a similar reduction at the same time, the cost of living would fall, so that the lower money wage would represent nearly the same real wage as before. But, in fact, there is no machinery for effecting a simultaneous reduction. Deliberately to raise the value of sterling money in England means, therefore, engaging in a struggle with each separate group in turn …'

Two general points are illustrated by this argument. The first is that alternative processes of adjustment to misalignments and other economic disequilibria can have significantly different costs and therefore different economic consequences. Second, it is important if possible to avoid, or minimise the risk of, major misalignments, because adjustment processes can be difficult.

Subject to the key proviso of avoiding substantial misalignment at the outset, monetary union should on the whole help to prevent large misalignments among the real exchange rates of member countries. There is, however, the practical difficulty of knowing when, and if so how far, exchange rates are misaligned. Alas it is not a straightforward task to come up with definitive definitions or calculations of equilibrium exchange rates, and there is certainly no unanimity among those working in this field.

Of course, even if real exchange rates are well aligned at the outset, actual and equilibrium real exchange rates among member countries are likely to change over time and countries will in the normal course of events be subject to shocks. If equilibrium real exchange rates are required to move, adjustment must happen via differential inflation rates. In monetary union there is no alternative, since nominal exchange rate movement no longer exists. Moreover, domestic monetary policy is unavailable as an adjustment mechanism. Other equilibrating mechanisms therefore become all the more important in monetary union. If they function poorly, the nominal exchange rate stability gains of monetary union may be offset, at least to some degree, by other kinds of macroeconomic instability. The effect of monetary union on growth therefore depends in part on how well other institutions and policies support economic flexibility.

Trade and competition effects

The economic importance of EMU, and its potential implications for growth, goes far wider than the macroeconomic sphere. By extending the Single Market Project, EMU stimulates further the removal of inhibitions on the movement of goods, services, workers and (perhaps especially) capital. The common currency might promote competition also by enhancing the transparency and comparability of prices.

If monetary union does indeed add to the Single Market Project's promotion of trade and competition, how might that promote growth?

Most directly, foreign exchange transactions costs and hedging costs are saved. Arguably, the gains go much further. So claims Rose (2000), who presents estimates of the impact of monetary union on international trade over and above the elimination of exchange rate volatility. He concludes that 'two countries sharing the same currency trade three times as much as they would with different currencies'. It follows, says Rose, that currency unions such as EMU may lead to a large increase in international trade, and 'a big increase in trade will lead to substantial extra gains from trade for consumers inside the currency union'. Such gains could increase growth, at least for a transitional period, by improving resource allocation, specialisation, scale economies and other effects of competition on efficiency.(3)

Rose's striking claims can be questioned.(4) For example, fewer than 1% of the panel of bilateral trade relationships in his sample involved entities sharing a common currency, and many of those entities are quite small territories. And although Rose controlled for a number of underlying factors

(1) And of course the causes of the exchange rate shift in relation to the non-member currency could affect member countries differently.
(2) Keynes (1972, page 211). This essay was first published as a series of articles in the *Evening Standard* in July 1925.
(3) See, for example, Frankel and Romer (1999), and Proudman and Redding (1998).
(4) And were questioned by Quah and other members of the *Economic Policy* panel—see the discussion at the end of Rose (2000).

(eg common language) that might explain why trade and currency union tend to go together, it could still be that a common currency is a reflection of deeper institutional factors that favour trade, rather than a major causal factor. The question of how monetary union affects trade is nonetheless interesting and important, even if its answer is not yet fully resolved.

Turning to competition effects on growth more generally, three channels mentioned earlier were improved allocation of labour and capital across production activities; better exploitation of economies of scale; and innovation and diffusion of improved technologies and methods. Of course these channels also require factor mobility and free trade.

It is possible in endogenous growth theory to show how a shift in the level of competition could affect the steady-state rate of innovation and output growth.(1) Perhaps more directly, a step-up in competition could raise growth over a transitional period. For example, it might speed the catch-up of countries with lower levels of productivity. That would enhance aggregate growth in the currency area and at the same time diminish regional disparities of income as all countries move towards the (ever-advancing) productivity frontier.

Krugman and others have shown, however, that such 'cohesion through integration' is not the only possibility as regards growth differentials within monetary union.(2) The argument is, first, that regional industrial clusters benefiting from economies of agglomeration are more likely to form in a more integrated economy. Indeed efficiencies from specialisation are among the potential sources of productivity gain from integration. Second, this specialisation makes regional economies more subject to asymmetric shocks, since regions are less diversified sectorally. Third, high factor mobility tends to magnify economic fluctuations—capital, for example, tending to flow to relatively booming sectors (and hence regions). As a result, the argument goes, integration need not reduce disparity in regional growth rates.

This question is pursued in a recent study by Braunerhjelm *et al* (2000). They analyse three broad types of outcome that could result from regional specialisation spurred by economic integration:

- a broad *dispersion* of activity with regional specialisation but not polarisation between regions;
- strong geographical *concentration* accompanied by high labour mobility to faster growing regions away from others; and
- growing *polarisation* between prosperous regions with low unemployment and stagnant regions with high unemployment.

The authors argue that evidence on the mobility of capital relative to labour in Europe makes the concentration outcome unlikely, and that public policies have an important role to play in preventing polarisation. Their recommended policy recipe includes investment in skills, a pro-enterprise tax and regulatory framework, measures to promote wage flexibility in response to economic shocks, and avoidance of regional policies which 'try but fail to freeze existing patterns of economic activity'. These policies being supportive of growth in any event, the authors' central message is that 'growth and cohesion are not enemies; unless misguided policies determine otherwise, they are allies'.

Policy-making effects

The competition and trade effects just discussed are examples of how monetary union can complement other public policies towards the real economy. There are other possible interactions between monetary union and public policy, and these too can have implications for economic growth.

First, at the macroeconomic level, the frameworks for fiscal and monetary policy are inter-related, since fiscal stability is a necessary complement to monetary stability. This is recognised in the architecture of EMU by the budget deficit and debt-to-GDP ratio criteria for participation in the common currency and by the Stability and Growth Pact. Over the medium term, these fiscal requirements of the commitment to monetary stability have contributed to processes of fiscal consolidation, and that in turn is likely to foster conditions for economic growth.

Second, fiscal policy is also part of the adjustment mechanism in response to asymmetric shocks within the common currency area. Of course neither the euro area, nor the European Union more generally, has a central budget on the scale of that of national governments. So international transfers via the automatic stabilisers of fiscal policy are in that sense limited. But those stabilisers still operate inter-regionally within member countries, and also inter-temporally insofar as the Stability and Growth Pact envisages cyclical variation in current fiscal positions.(3)

(1) See, for example, Aghion and Howitt (1998, chapter 7). The first endogenous growth models in the Schumpterian tradition tended to find a *negative* relationship between competition and growth, because the motivation for innovation was the gain of market power. This does not accord with empirical work, such as that of Nickell (1996), which has found a positive relationship between measures of competition and productivity growth. More recent theoretical work using richer concepts of competition has explored positive relationships between competition and growth.

(2) See, for example, Krugman (1993) and Barrell and Pain (1998).

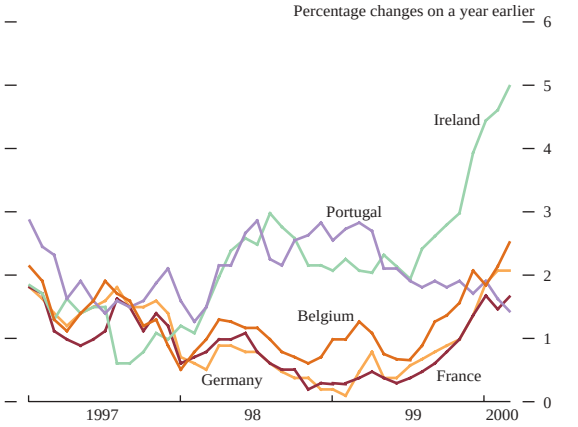
(3) If Ricardian equivalence obtained, there would be no inter-temporal fiscal stabilisation of this kind via the tax system (though public expenditure could still be countercyclical), because government debt finance would be equivalent in effect to tax finance. In such a world there would, however, be little need for such stabilisation, because the private sector would achieve inter-temporal smoothing anyway in the face of shocks. (And stretching the theory yet further, the private sector could mutually insure in advance against shocks via financial markets, whose integration monetary union could well enhance.)

Third, one of the themes running through the earlier discussion is the role of economic flexibility in response to economic shocks. Such flexibility is important for growth and prosperity in any event. That importance is underlined by monetary union, because domestic monetary policy and intra-union nominal exchange rate movement are no longer available as adjustment mechanisms (though at the same time they disappear as potential sources of shocks). If for this reason monetary union enhances the impetus to supply-side reform, it will again be an ally of growth.

Growth and inflation differentials in monetary union

In any currency area the price stability objective of the central bank must concern the price level at the aggregate level. So the ECB's task is to maintain price stability for the euro area as a whole. This is quite consistent with inflation differentials across countries, which clearly exist at present—see Chart 2. Indeed, the existence of different national inflation rates within a monetary union is to be expected as a normal state of affairs, partly for reasons relating to growth.(1)

Chart 2
Euro-area inflation rates



Inflation differentials would be absent only if there were no shifts in the price of one country's consumption basket relative to that of another country. This would be the case if prices for all goods and services were geographically uniform, and if, boringly, the typical consumer in each country had the same preferences among goods and services. Increasing competition, which monetary union might enhance, should promote geographical price convergence for tradable goods, but in the process that could itself give rise to inflation differentials.

Moreover, many goods and services are inherently non-tradable, and there would be little reason to expect non-tradables' inflation to be the same everywhere even if tradable goods prices were fully converged. Indeed, a country with relatively high productivity growth in tradables (relative to non-tradables)—which productivity catch-up might well imply—will tend to have higher-than-average inflation. This illustrates how growth differentials—which economic convergence requires—can give rise to inflation differentials.

This is not to say that all inflation differentials reflect equilibrium real exchange rate adjustments. Asymmetric cyclical positions, which might themselves come about partly in response to longer-term shifts in supply or demand conditions, may give rise to international differences in inflationary pressure. It is a familiar observation that, in a monetary union, policies other than monetary policy must address any adverse consequences of such asymmetries. The general point remains, however, that real exchange rates among members of monetary union naturally need to shift in the face of changing economic circumstances, and this can only happen through differential inflation rates.

Concluding remarks

There exists no monetary magic that can conjure up growth. Growth and prosperity depend ultimately on how well the real economy works. But monetary arrangements are part of the foundations for the real economy. The prime contribution that monetary policy can make to conditions for sustainable growth is to secure and maintain price stability. If monetary union has the effect of extending the domain of price stability, that should, other things being equal, be supportive of conditions for growth. If, moreover, monetary union has the effect of deepening the single market, that too should be positive for growth. The elimination of intra-union nominal exchange rate movement has effects of two kinds—some sources of shock are removed but so are some ways of adjusting to shocks. Monetary union therefore underlines the role of other adjustment mechanisms—in particular supply-side flexibility. That is of fundamental importance for growth in any event.

(1) For further discussion of the points below, see, for example, European Central Bank (1999) and Obstfeld and Rogoff (1996, chapter 4).

References

Aghion, P and Howitt, P (1998), *Endogenous Growth Theory*, MIT Press, Cambridge MA.

Bakhshi, H, Haldane, A and Hatch, N (1997), 'Quantifying some benefits of price stability', *Bank of England Quarterly Bulletin*, August, pages 274–84.

Barrell, R and Pain, N (1998), 'Real exchange rates, agglomerations and irreversibilities: macroeconomic policy and FDI in EMU', *Oxford Review of Economic Policy*, Vol 14(3), pages 152–67.

Blanchard, O and Wolfers, J (2000), 'The role of shocks and institutions in the rise of European unemployment: the aggregate evidence', *Economic Journal*, Vol 110, pages C1–C33.

Braunerhjelm, P, Faini, R, Norman, V, Ruane, F and Seabright, P (2000), *Integration and the regions of Europe: how the right policies can prevent polarization*, CEPR, London.

Crafts, N and Toniolo, G (1996), 'Postwar growth: an overview', in Crafts, N and Toniolo, G (eds), *Economic Growth in Europe Since 1945*, CEPR and Cambridge University Press.

European Central Bank (1999), 'Inflation differentials in a monetary union', *ECB Monthly Bulletin*, October, pages 35–44.

Feldstein, M (1999), 'Capital income taxes and the benefits of price stability', in Feldstein, M (ed), *The Costs and Benefits of Price Stability*, University of Chicago Press.

Frankel, J and Romer D (1999), 'Does trade cause growth?', *American Economic Review*, Vol 89, pages 379–99.

Issing, O (2000), 'The contribution of monetary policy', paper presented at the conference to mark the 150th anniversary of the National Bank of Belgium, Brussels.

Keynes, J M (1972), 'The economic consequences of Mr Churchill', in *Essays in Persuasion, Vol IX of The Collected Writings of John Maynard Keynes*, Macmillan, London.

Krugman, P (1993), 'Lessons of Massachusetts for EMU', in Torres, F and Giavazzi, F (eds), *Adjustment and Growth in the European Monetary Union*, Cambridge University Press.

Kynaston, D (1999), *The City of London*, Vol III, Chatto & Windus, London.

Lucas, R (2000), 'Inflation and welfare', *Econometrica*, Vol 68, pages 247–74.

Maddison, A (1995), *Monitoring the World Economy 1820–1992*, OECD, Paris.

Moggridge, D (1972), *British Monetary Policy 1924–1931*, Cambridge University Press.

Monetary Policy Committee (1999), *The Transmission Mechanism of Monetary Policy*, Bank of England, London.

Mussa, M, Masson, P, Swoboda A, Jadresic E, Mauro, P and Berg, A (2000), 'Exchange rate regimes in an increasingly integrated world economy', *IMF Occasional Paper*, No 193, Washington DC.

Nickell, S (1996), 'Competition and corporate performance', *Journal of Political Economy*, Vol 104, pages 724–46.

Obstfeld, M and Rogoff, K (1996), *Foundations of International Macroeconomics*, MIT Press, Cambridge MA.

Orphanides, A and Solow, R (1990), 'Money, inflation and growth', in Friedman, B and Hahn, F (eds), *Handbook of Monetary Economics*, North-Holland, Amsterdam.

Proudman, J and Redding, S (eds) (1998), *Openness and Growth*, Bank of England, London.

Rose, A (2000), 'One money, one market: the effects of common currencies on trade', *Economic Policy*, Vol 30, pages 9–45.

Woodford, M (1990), 'The optimum quantity of money', in Friedman, B and Hahn, F (eds), *Handbook of Monetary Economics*, North-Holland, Amsterdam.

The exchange rate and the MPC: what can we do?

In this speech,[1] *Sushil Wadhwani, member of the Bank's Monetary Policy Committee, argues that looking* only *at a two year ahead inflation forecast when setting interest rates is likely to be sub-optimal, and that allowing asset price misalignments to have an additional impact on interest rates could enable a reduction in the volatility of inflation. Currently, sterling is probably 'overvalued' against the euro, and so this might affect the appropriate level of interest rates. Dr Wadhwani also suggests that, under certain circumstances, sterilised intervention can be effective.*[2]

1 Introduction

Even after its recent fall,[3] the current level of sterling is clearly an issue of great concern to many businessmen. This is reflected in the considerable media attention that has recently been devoted to the pain caused by the overvaluation of sterling. Indeed, I've found that in recent meetings with people from businesses around the country, there is little else that they want to talk about.

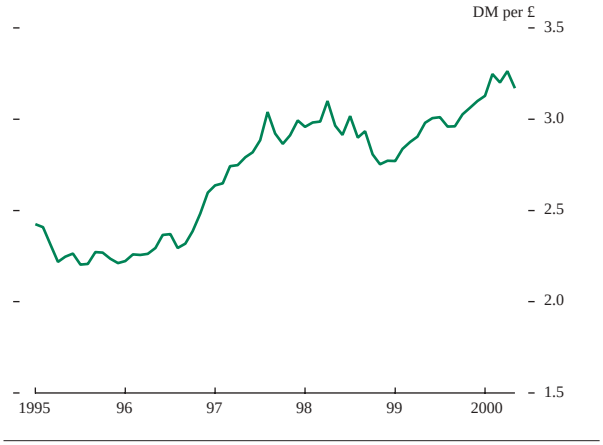
My talk today can therefore be thought of as some answers to the most frequently asked questions. The issues that I hope to deal with are:

- Why has the pound risen considerably against the Deutsche Mark over the last few years?
- What is likely to happen to the £-DM exchange rate over the next few years?
- What, if anything, can the MPC do about it? In particular, can we do anything to help in terms of how we incorporate asset price misalignments into our decision-making process and/or use foreign exchange intervention? Should we look again at our forecasting convention for the exchange rate? Or, given our remit, is there nothing that we can do? I shall conclude that, although there is no 'quick fix', there are things that are entirely consistent with its remit that the MPC can do, which *might* reduce the degree of overvaluation of sterling.

2 Can we understand the post-1995 rise of the pound?

The pound has risen from around DM2.20 in mid-1995 to around DM3.17 now, an increase of more than 40%[4] (see Chart 1). In terms of possible factors that might explain the rise, one could point to:

Chart 1
£-DM exchange rate



2.1 Purchasing power parity (PPP) considerations

Most measures of the PPP exchange rate are around DM2.60, so when sterling was at DM2.20 in 1995–96, it was undervalued on this measure.

2.2 A change in the macroeconomic framework

Historically, Labour governments in the United Kingdom have been associated with sterling crises (eg 1967, 1976). Having the 'party of the Left' commit to low inflation by granting the Bank of England independence while simultaneously committing to rules *vis-à-vis* fiscal policy was always likely to boost sterling by reducing the risk premium associated with holding UK assets.[5]

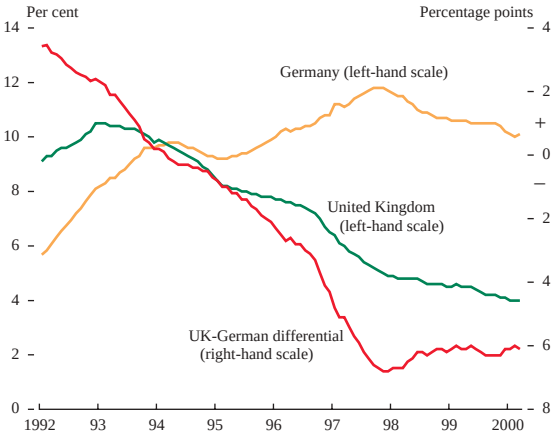
(1) Given to the Senior Business Forum at the Centre for Economic Performance on 31 May 2000. This speech can be found on the Bank of England's web site at www.bankofengland.co.uk/speeches/speech88.pdf
(2) I am extremely grateful to Nick Davey and John Henderson for their help with this speech. Bill Allen, Nicoletta Batini, Joanne Cutler, Charles Goodhart, Clifford Smout, Gus O'Donnell and Andrew Wardlow provided me with helpful comments on an earlier draft. Of course, all views expressed here are entirely personal and do not represent the position of either the Monetary Policy Committee or the Bank of England.
(3) Sterling fell from DM3.44 in early May to around DM3.17 on 24 May.
(4) The pound has been even higher in the interim, reaching DM3.44 on 3 May.
(5) I do not mention these two factors as an *ex post* rationalisation for the strength of sterling. In 1996 I argued that PPP considerations and the macroeconomic probity implied by joining EMU (or, failing that, Bank of England independence), were likely to lead to a stronger pound (see Wadhwani (1996)).

2.3 Supply-side reform

Many market participants argue that sterling deserved to be re-rated relative to the Deutsche Mark because the United Kingdom undertook much more far-reaching supply-side reforms in the last 15 years than Germany did. Indeed, Mr Jim Leng, Chief Executive of Laporte Industries, was recently quoted(1) as saying that the employment law changes of the 1980s had given UK companies a competitiveness boost equivalent to a sterling depreciation of DM0.75.

We could attempt to proxy for the superior supply-side performance of the United Kingdom by looking at the unemployment performance of the two countries (see Chart 2). In Wadhwani (1999), I reported some econometric evidence supporting a link between movements in the relative unemployment differential and exchange rate movements; this relationship held across a variety of exchange rate pairs. Those estimates suggested that the lower level of UK unemployment relative to German unemployment could, of itself, account for a sterling appreciation of around DM0.15 during 1996–98.

Chart 2
UK and German unemployment rates



2.4 External balance considerations

Though the above factors suggest that the £-DM exchange rate should be stronger than is implied by PPP considerations, the United Kingdom's inferior net foreign assets position and current account deficit would suggest a weaker exchange rate. This is perhaps why some estimates of the so-called 'fundamental equilibrium exchange rate' (FEER) suggest an equilibrium value for sterling against the Deutsche Mark that is rather lower (eg DM2.04–DM2.49 in Wren-Lewis and Driver (1998)). I return to an evaluation of the relative quantitative importance of this factor below.

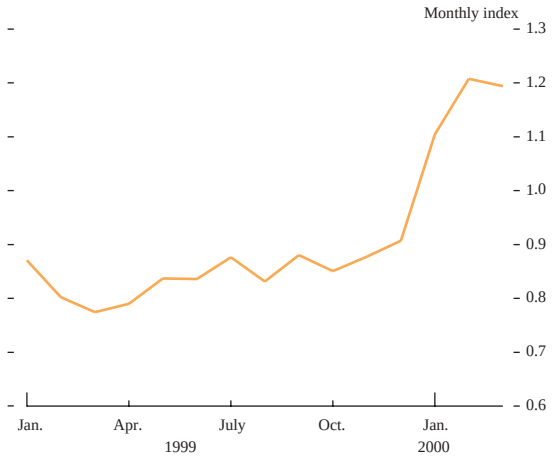
2.5 Cyclical considerations

There are many studies of exchange rate behaviour that suggest that the returns associated with holding the currency of a country with a higher-than-normal interest rate advantage over another country are positive (see, for example, Froot and Thaler (1990) for a survey). European real short-term interest rates are currently low, and this is associated with an abnormally high real short rate differential between the United Kingdom and Germany. Other things being equal, the evidence suggests that this is consistent with a somewhat higher level for sterling against the Deutsche Mark.

Last September,(2) I estimated an econometric model which suggested that the intermediate-term model-based equilibrium exchange rate (ITMEER) was around DM3. Essentially, the superior unemployment performance of the United Kingdom and the high interest differential were, empirically, more important than external balance considerations and therefore suggested an equilibrium exchange rate that was higher than PPP levels. However, this estimate was likely to *overestimate* the longer-term equilibrium level because it included the effect of temporary cyclical considerations in terms of a higher-than-normal interest rate differential. On the other hand, the model did not include the potential effect on the exchange rate of the improved macroeconomic framework. Anyhow, that work suggested that while one could explain a £-DM exchange rate of around DM3 (and, perhaps, a further modest cyclical overshoot), the level of DM3.44 (attained on 3 May) is less easy to explain.

Indeed, the rise of sterling against the Deutsche Mark in recent months has been quite difficult to rationalise, especially as it appears to have been accompanied by greater relative optimism about both the supply-side and demand-side prospects of the euro area against the United Kingdom. Specifically, the German stock market has significantly outperformed the UK stock market in recent months (see Chart 3),(3) and the normal historical correlations (reported, for example, in Wadhwani (1999))

Chart 3
Performance of the DAX against the FTSE 100



(1) In the *Financial Times*, 9 May 2000.
(2) See Wadhwani (1999). The work was carried out by Hasan Bakhshi of the Bank's Structural Economic Analysis Division, to whom I am grateful.
(3) The German market has outperformed on both a local currency and a common currency basis.

would, other things being equal, have been associated with an appreciation of the euro against sterling. However, in recent months, even news about structural reform in the euro area has failed to lift the currency. For example, news on 23 December of a proposed reform of corporate taxation is said to have boosted the DAX by around 4½% on the day (see, for example, the *Financial Times*, 24 December 1999). However, the euro-dollar exchange rate barely moved in reaction to that news.(1)

Hence, to summarise, I think that one can 'explain' a significant proportion of the rise in sterling against the Deutsche Mark from its mid-1995 levels of around DM2.20. Purchasing power parity considerations, the superior supply-side performance of the United Kingdom and the reforms in the macroeconomic framework have all probably played a role. However, I have argued that the rise of sterling above DM3 is much more difficult to explain in terms of the underlying economic fundamentals. Moreover, the fact that the euro has sometimes failed to respond to news about structural reform in the euro area does suggest that it has, to some extent, acquired a 'life of its own'.

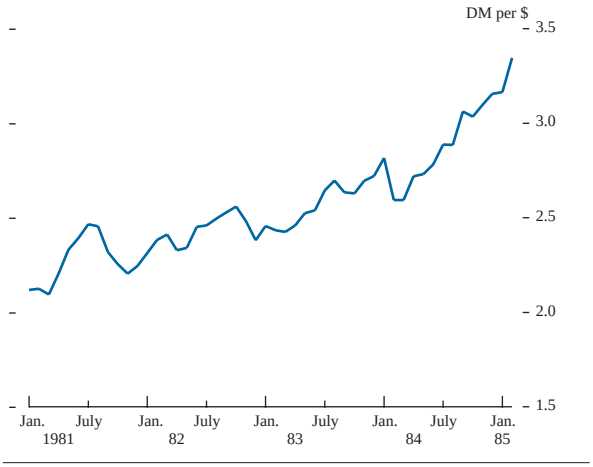
3 Prospects for the £-DM exchange rate

If I update the econometric equation used in my September 1999 paper to incorporate recent developments, it would suggest that, on the assumption of unchanged macroeconomic conditions (eg constant relative interest rates and equity prices, etc) the pound might depreciate to around DM2.95 in the next year or so. This is because sterling is significantly overvalued against the Deutsche Mark on a PPP basis, and also because the German stock market has outperformed the UK stock market by a considerable amount in recent months.

Of course, our model does not incorporate the possibility that sterling deserves to be re-rated because of the improvement in the UK macroeconomic framework. Also, the assumption of constant relative interest rates might not be valid as the pound falls. Specifically, if the pound were to fall for reasons which had no offsetting impact on domestically generated inflationary pressures, it is plausible that UK interest rates would have to rise. Hence sterling might fall by less than our model implies. On the other hand, other events (eg a significant fall in global equity markets) could (as discussed in Wadhwani (1999)), drive the pound significantly lower. Although sterling does look 'overvalued' against the Deutsche Mark, it does not against the US dollar (currently around $1.4750). Hence it would be reasonable to expect further significant weakness of sterling against the euro, but not against the dollar.

Although I have argued that the pound is likely to depreciate against the euro over the next year, one should recognise the fact that exchange rate overshoots can last longer than one thinks. For example, many economists predicted a fall in the US dollar from early 1984 onwards, as it had already risen significantly since 1981, and yet it rose by almost 30% between March 1984 and February 1985 (see Chart 4). However, periods of persistent overvaluation are costly and may be associated with a permanent loss of capacity. Export markets that are lost when the exchange rate is overvalued are difficult to re-enter, even when the exchange rate comes down again. Hence, it is not surprising that many commentators and people from industry that we meet ask the MPC to 'do something' about the exchange rate. What can we do?

Chart 4
$-DM exchange rate



4 What can the Monetary Policy Committee do?

4.1 Some things that we should not do

First, let me reject some proposed solutions that would, in my opinion, be damaging and are, in any case, inconsistent with the MPC's remit. Some have suggested that a little more inflation would not be overly worrying, and so we could increase the level of the inflation target from 2½% to something a little higher.(2) That would be a mistake. In recent years, inflation expectations have come down significantly in this country, and these are gains that are worth preserving. Allowing a 'little more inflation' now would be perceived as the thin end of the wedge and could be hugely damaging to the credibility of the new monetary framework in the United Kingdom; and long-term interest rates would almost certainly rise.

Alternatively, others have suggested that we have an exchange rate target as well as an inflation target. Again, I think that would be a mistake. We have but one main policy instrument—the short-term interest rate.(3) Obviously we could not achieve both targets simultaneously. In the current conjuncture, this would increase inflation expectations and thereby be damaging.

(1) The euro rose by around 0.25% against the dollar, well within the average normal daily levels of volatility.
(2) Of course, the choice of the inflation target is, in any case, a matter for the Chancellor, not for the MPC.
(3) We may, occasionally use foreign exchange intervention, which potentially gives us an additional policy instrument. However, as I argue below, this is an instrument to be used judiciously and sparingly.

So I explore some alternative policies in the context of the MPC's remit below.

4.2 Incorporating asset price misalignments within an inflation-targeting framework

4.2.1 Theoretical considerations

Recently I had the privilege to be a part of a group of economists who were asked to write on how asset prices should affect central bank policy (see Cecchetti, Genberg, Lipsky and Wadhwani (2000)). We were a fairly diverse bunch, with my co-authors including the former Research Director of the New York Fed, a Swiss-based monetary economist and the chief economist of a leading Wall Street firm. We concluded that, when operating in an inflation-targeting regime, central banks could reduce the volatility of inflation around the target if they allowed the interest rate setting decision to be influenced by both the prospective inflation forecast (say two years out), *and* any obvious asset price misalignments. We presented some simulation results in two different macroeconomic models suggesting that such a policy rule would reduce inflation (and usually output) variability, compared with a policy rule which merely reacted to a fixed-horizon inflation forecast. One of the models that we used for our simulations has, in the past, been used at the Bank of England to shed some light on the issue of the optimal forecast horizon (see Batini and Nelson (2000)).(1)

Our proposal is wholly consistent with the remit for the MPC, where the Chancellor has defined price stability as a target for RPIX of 2½%, and where 'the inflation target is 2½% *at all times*'.(2) Hence the MPC should be concerned about deviations of inflation from target at all time horizons, not just two years ahead, which is the perception of some market participants. I would argue that looking at asset price misalignments as well as our two year ahead inflation forecast might help the MPC to fulfil the Chancellor's remit more effectively than looking just at inflation forecasts 18–24 months out. Note that, although there is no mechanical link between two year ahead inflation forecasts and the voting behaviour of the MPC, most market participants perceive the two year ahead inflation forecast as playing a very important role in the final decision. As my colleague Charles Goodhart points out, many outside observers have noted that all the fan charts for inflation published since the MPC was established have shown inflation very close to target at the terminal date, but deviating by more in the preceding quarters. Goodhart concludes that 'the implication of this would seem to be that a horizon of 18 to 24 months is also the policy horizon of the MPC'.(3)

A purist might argue that the central bank should really look at inflation forecasts at several (all) future time periods, and set the interest rate to achieve the smoothest path consistent with hitting the pre-specified target on average. While in principle correct, such a procedure is, however, much too ambitious given the uncertainty related to the time lags in the effects of policies and shocks in general. Moreover, such a policy might not be easy to implement. As Kazuo Ueda, member of the Bank of Japan Policy Board, said in his contribution to the conference at which our report was presented, a central bank that was looking at inflation forecasts five to ten years out would have been raising interest rates in 1987–88 in Japan. However, given that the central bank was focused on inflation only one to two years out, it was much more difficult to justify increasing interest rates. Our proposal for incorporating asset price misalignments can be interpreted as an alternative way of allowing for considerations relating to longer time horizons.(4)

A second way to rationalise our recommended policy rule is that in an uncertain world where central banks necessarily operate on the basis of rather limited knowledge about some of the crucial variables (eg the size of the output gap), asset price misalignments can sometimes convey information that is not necessarily available in the inflation forecast. For example, as Ueda emphasises, inflation was low in Japan during the 1986–89 period, and estimates of total factor productivity growth had risen (see also Yamaguchi (1999)). Indeed, as Ueda points out, the IMF said as late as February 1989 that there was no inflationary threat in Japan. Yet if the framework had explicitly allowed for asset price misalignments, monetary policy would have been tighter than was implied by looking just at a near-term inflation forecast, based on what turned out to be an over-optimistic view of the likely growth rate of potential output. This is a fairly general point. Financial market prices are typically based on an implicit forecast of the economy. If the central bank's view is that the market's forecast might change (because it is wrong now), then the effects of this revision should impact policy-making today.

4.2.2 The current UK conjuncture

In the current UK conjuncture where we have an 'overvalued' exchange rate, the above analysis would suggest that interest rates should be held a little lower than would be necessary to hit the inflation target two years out.

(1) I am grateful to Nicoletta Batini of the Bank of England for running some simulations on the Batini-Nelson model.
(2) Emphasis added—see the Chancellor's letter to the Governor, 3 June 1998.
(3) See Goodhart (2000), page 7.
(4) An alternative justification is to recognise that, of course, in conventional macro-models, once one allows for either non-linearities in the model or for non-additive uncertainty, then the conventional theoretical argument for inflation forecast targeting is no longer valid (see, for example, Svensson (1999)). In that particular case, policy should be set by looking at the forecast of the entire distribution of possible outcomes rather than just a point forecast. Once again, looking at asset price misalignments might be thought of as providing information about the distribution of possible outcomes over and above looking at the forecast of the mean outcome for inflation. At the Bank we already do look at our fan chart, but given the other difficulties associated with that, looking at asset price misalignments might be a reasonable simple alternative.

The advantages of this stance would include the possibility that by keeping interest rates lower than they would otherwise be, the level of the pound is also likely to be lower than it would otherwise be. This would have the effect of reducing the size of the inflation undershoot now. Moreover, if the pound overshoots its equilibrium level by less now, this reduces the size of the inflationary shock and the corresponding possible inflation overshoot associated with the likely fall of the pound at some uncertain date in the future. Also, if a lower level of the pound now reduces the number of firms that go out of business because of an 'overvalued' exchange rate (ie firms that would be perfectly viable at the equilibrium exchange rate), the greater capacity of the economy is also likely to reduce the size of any inflationary overshoot that might follow a fall in the pound.

So I would argue that in the current conjuncture, if one wants to reduce the average deviation of inflation from target,(1) which, after all, is more consistent with the MPC's remit of trying to hit the inflation target 'at all times' than a policy that is tied to the two-year horizon, then an interest rate which is a little lower than is necessary to hit 2½% on our modal projection in two years' time is likely to do it. This is because the reduced inflation undershoot in the near term and the reduced inflation overshoot when the pound falls from a less elevated level will, easily, more than offset the modest deviation from target two years out in terms of an objective function that weights deviations from target at all time horizons equally.

Note that this policy recommendation contrasts sharply with the view that, in the current conjuncture, interest rates should be *higher* than is necessary to hit the inflation target in two years' time in order to prepare for sterling's fall. Currently, I disagree with this prescription because the higher interest rates would not only exacerbate the inflation undershoot now, but could end up increasing the degree of inflation overshoot later by increasing both the likely size and the probability of an *eventual* collapse in the pound, by taking it up to even more overvalued levels first.

There is another important reason why it would be a mistake to raise interest rates pre-emptively in order to slow domestic demand growth now to better prepare the economy for a likely fall in sterling. The conventional argument is that whether or not the MPC actually responds to a fall in the pound by raising interest rates surely depends on *why* the pound falls. If, for example, global equity markets were to tumble from their current, overvalued levels, then it is likely that the US dollar would also fall against the euro and take the pound with it (see Wadhwani (1999) for some empirical evidence on this linkage). Of course, a significant fall in global equity markets would make the MPC less likely to raise interest rates, notwithstanding the effect on sterling.

To take another example, suppose that the level of the £-DM exchange rate is, other things being equal, associated with the relative growth rates of the two economies. If, hypothetically, sterling falls because the UK economy slows autonomously, there might once again be no need to raise interest rates. In both cases, there would have been no need to 'prepare' the economy for sterling's fall. Hence, in this case, what might appear to be a prudent, pre-emptive policy might actually lead to overkill.

Of course, it is important to incorporate misalignments in *all* asset markets into our decision. Some have argued (see, for example, Yamaguchi (1999)) that perhaps excessive attention was paid to the strong yen by Japanese monetary policy makers in 1986–88. Arguably, had they looked at misalignments in the land and equity markets at the same time, monetary policy would probably have been tighter.

Consequently, in focusing on the exchange rate misalignment in the discussion above, I am implicitly making a judgment that, currently, the misalignments in the housing and equity markets are quantitatively less important for interest rate setting. Of course, this could change. The fall in sterling from DM3.44 to DM3.17 in recent weeks has already significantly reduced the size of the foreign exchange (FX) misalignment. I can certainly envisage circumstances where, hypothetically, I might be more worried about a house price misalignment than a FX bubble. In that case, interest rates would have to be a little higher than would be needed to achieve the two year ahead inflation forecast. Note that in forming my judgment that the misalignment in the FX market is more important at the moment, I am not only looking at the degree of misalignments in the various asset markets, but I am also influenced by the fact that a 1% move in the exchange rate has a much larger effect on inflation than a 1% move in the price of either equities or houses.

I should emphasise that the 'third way' solution that I have proposed above does *not* involve having an exchange rate target. Price stability is still, as per the remit, the paramount consideration. The recommended policy does not set out to prick the exchange rate bubble. It merely contends that in the presence of a bubble, interest rate policy should recognise the presence of such a misalignment, and that interest rates should be set such that the volatility of inflation is reduced. Hence the proposal is entirely consistent with the notion of using one instrument for one target—only that the target is the likely volatility of inflation around the 2½% level, instead of being seen as largely focused on the two year ahead inflation forecast. Although the policy guide is not designed to prick bubbles, if market participants knew that the central bank modified interest rates in response to asset price misalignments, then bubbles would, plausibly, be less likely to occur. This is likely to be a considerable benefit of this proposal.

As is clear from this discussion, I think that there are powerful theoretical reasons for considering this alternative

(1) As measured in absolute value terms or, alternatively, as squared deviations.

interest rate policy, though the fact that most market participants see the Bank as using an interest rate that feeds back off an inflation forecast two years or so out is a potential hurdle.

An important argument against the Bank changing its procedures is that the system is still new (it dates back only to May 1997), and a change could be damaging to credibility. As Sir Samuel Brittan (2000) argues about a change in the remit to incorporate exchange rate considerations:

> 'I have to admit that, if made now, such a change would only increase the impression that the British adopt a bewildering succession of monetary objectives, only to drop them when the going gets rough.'

Although Sir Samuel is talking about a change in remit while I am discussing a change that might help the MPC to fulfil its remit more effectively, the risk is clear. If, hypothetically, the MPC were to say that it took asset price misalignments into account *separately*, there is a clear risk that the markets would, in the current conjuncture, think that the Bank had gone soft on inflation (although this would be to wholly misunderstand the true situation).

On the other hand, as *The Economist* (2000a) reminds us when discussing the incorporation of asset prices into central bank policy:

'that simple—but bad—policy rules can be easily explained does not make them better than good policy rules'.

It seems to me that the MPC's interest rate reaction function can legitimately be made more complex (by, for example, including asset price misalignments), but it is of critical importance that any change be justified and explained *only* with reference to doing a better job in terms of achieving price stability, ie the ultimate objective should remain simple and easy to explain.

Of course, another important reason for being cautious is that we do need more research in this area.

Also, there may be other ways of refining our operating procedures that might help us to reduce the volatility of inflation. A theoretical example of this would be to produce a forecast that was conditioned on a prospective time-path of interest rates rather than the current conditioning assumption of constant interest rates. A discussion of that issue would detain us for too long tonight, but my colleague, Charles Goodhart (2000), has recently written an excellent paper on the practical difficulties surrounding this proposal.

Anyhow, over the next few months, the MPC will have to continue to make difficult decisions about how it incorporates asset price misalignments into its policy decision and, indeed, on how it communicates its policy formation process. I shall now turn to another possible 'solution' to our current predicament—direct intervention in the FX markets.

4.3 Can foreign exchange intervention help sometimes?

In the United Kingdom, although the Government is responsible for the exchange rate regime, the Bank may use its own separate pool of exchange rate reserves 'at its discretion to intervene in support of its monetary policy objective'.[1] In addition, of course, the Bank would act as an agent for intervention using the Government's FX reserves (action which would be automatically sterilised).

Although the issue of FX intervention has been debated at some MPC meetings, the Committee has not, as yet, decided to intervene.

If one felt that sterilised intervention were effective,[2] then it could be a useful additional tool in the current conjuncture. Anything that pricked the 'bubble' in sterling *now* would both reduce the current inflation undershoot and prevent the UK economy from receiving a significant inflationary impulse at some future, uncertain, date when the inflation rate may well already be above target. So I see no problem in justifying a successful FX intervention policy in terms of our monetary policy objective, as it is likely to make the prospective path of inflation smoother. In addition, given that our remit includes concerns about output and employment (of course, without prejudice to the price stability objective), FX intervention that prevented the 'hysteresis' effects associated with a period of exchange rate overvaluation could also be interpreted as supportive of our monetary policy objective.

However, there are those who argue that sterilised intervention is unlikely to be effective because the likely size of any operation is small in relation to the daily volume of the FX market. In this context, I like the analogy for FX intervention used by Dominguez and Frankel (1993)—(DF). They liken the role of intervention to the role played by herd dogs among cattle. It is clear that a few dogs, who, after all, are smaller in size and fewer in number than the steers, cannot always sustain control of the cattle. However, on those occasions when a stampede gets under way because each panicked steer is following its neighbours, the herd can potentially wander off quite far from their initially desired direction. The dogs can sometimes be helpful in a stampede, as, by turning a few steers around, they might induce the herd to follow. It is interesting that DF claim, after careful analysis of the data, that:

'Intervention does appear to have been instrumental in pricking the 1984–85 speculative bubble in the dollar.' (page 139).

(1) See the Chancellor's letter to the Governor, 6 May 1997.
(2) And it is sterilised intervention that we are discussing, because unsterilised intervention is just equivalent to changing interest rates.

If one recognises the reality that the FX markets contain many participants who trade on the basis of past price momentum rather then the underlying economic fundamentals, it is easy to see how overshoots might occur. Those who trade currencies on the basis of economic fundamentals obviously have to take the activities of the momentum-based traders into account. Under some circumstances, FX intervention can give the fundamentals-based traders greater confidence to initiate positions during overshoots. Alternatively, in an over-extended market, intervention can sometimes directly affect the behaviour of the momentum-based traders.(1)

In terms of the empirical evidence on the efficacy of FX intervention, DF concluded that 'foreign exchange intervention can 'work' if properly conceived and executed' (page 140). In a more recent study by the European Central Bank, Fatum (2000) argued that:

'… the results clearly suggested that intervention is indeed effective in terms of influencing the evolution of exchange rates over the short-run, … clear evidence was presented that coordinated intervention was more likely to be associated with a success' (page 18).

Of course, it is important to put these results in perspective. In the United Kingdom, we all remember the failed intervention operations associated with trying to stay within the ERM. Intervention is unlikely to succeed if it works in the opposite direction to the underlying economic fundamentals. For me, sterilised intervention is no magic weapon to wheel out generally. In my opinion, while intervention is a valuable weapon in the MPC's arsenal, it should only be used when the chances of success are relatively high, eg during periods of significant misalignment, provided some other conditions that are conducive to success are also met.

There are those who argue that successful FX intervention in the current conjuncture would be self-defeating because a lower pound would lead to higher interest rates, which would take the pound back up (see, for example, *The Economist* (2000b)).

Even putting aside the issue that there is no mechanical link between exchange rate movements and our interest rate decision, I do not believe that the pound would necessarily go up all the way back to its original position even if interest rates were raised. This is because I think that 'hysteresis' effects in exchange rates can be important. When a market includes a significant number of momentum-based traders, demand curves can become perversely sloped, and multiple equilibria are possible.(2) Under certain circumstances, FX intervention can cause a *large* move, while any subsequent interest rate rise might only have a modest effect.

Further, allowing an overshoot to continue can, of itself, begin to affect the 'fundamentals' or, at least, the market's perceptions of them. For example, allowing the euro to fall indefinitely might, rightly or wrongly, increase perceptions of the political risk associated with holding that currency. It is therefore a mistake to assume that the fundamentals are independent of the precise time-path of the moves of a currency. Intervention can, therefore, even affect the 'fundamentals' by altering the time-path of a currency's movements.

For those who believe that FX intervention cannot work if monetary policy is not working in the same direction, just think back to the intervention to support the yen in 1998 (on 17 June). Within a few hours, the yen moved against the dollar from around ¥144 to ¥136 (a dollar depreciation of more than 5%), despite the fact that there was, then, no immediate prospect of the Japanese tightening monetary policy or the United States easing monetary policy. It is possible that this particular intervention operation was successful because it was *coordinated*, involving the US Fed as well as the Bank of Japan.

Hence, to summarise, FX intervention is no panacea, and can easily fail. However, used judiciously, it can sometimes be helpful in terms of achieving our monetary policy objective.

4.4 Exchange rate forecasting procedures and the interest rate decision

In a small open economy like the United Kingdom, the exchange rate can have an important effect on the inflation forecast. For example, in the context of the core macroeconometric model used in the MPC's forecasting process, if one takes an exogenous fall in the exchange rate of 10% (ie a change that, hypothetically, occurs for reasons unrelated to fundamentals), then this would imply an increase by up to as much as 1.4 percentage points in RPIX inflation two years out. Hence, if one were to use the inflation forecast and the model mechanically (which the MPC does not), the implied impact on interest rates of a difference in the exchange rate forecast can be substantial.

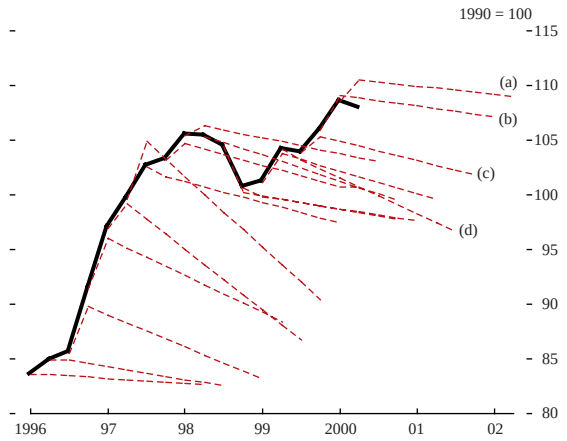
Note also, therefore, that the more pessimistic the MPC is about sterling, then, other things being equal, the higher UK interest rates will be and, consequently, the higher sterling will be. Hence, those who desire sterling to be lower must actually want the MPC to expect sterling to remain high!

At the Bank of England, the exchange rate has (until November 1999) been forecast using the assumption of the textbook uncovered interest parity (UIP) hypothesis, whereby the exchange rate is assumed to move in line with existing interest rate differentials. Note that during a period where the effective exchange rate has moved from around 83 in 1996 Q1 to about 113 in May 2000, at each stage

(1) See, for example, Rosenberg (1996), pages 310–15; Rosenberg is a currency economist at a leading Wall Street firm. Academics call this the 'noise trading' channel.
(2) See Genotte and Leland (1990) for an application of such a model to the 1987 stock market crash.

during this near-35% *appreciation* of the currency, the Bank of England has tended to predict a *depreciation* (see Chart 5). A corollary of this is that, other things being equal, the Bank of England's inflation forecast has been persistently higher than it might have been under perfect foresight of the exchange rate and, therefore, there is a risk that interest rates have been set too high. Of course, as we discussed above, forecasting exchange rates is not easy.

Chart 5
***Inflation Report* ERI forecasts relative to outturn**



Note: We have linearly interpolated between the starting-point and the two year ahead projection published in each *Inflation Report*.

(a) May 2000 *Inflation Report*.
(b) February 2000 *Inflation Report*.
(c) November 1999 *Inflation Report*.
(d) August 1999 *Inflation Report*.

A lesson that I draw from our difficulties with forecasting exchange rates is that one needs to be open-minded and willing to use a variety of different inputs and techniques to arrive at one's view about the likely evolution of the exchange rate. I think that it would be a mistake to stay within the straitjacket of academic, Rational Expectations-based models.

In terms of policy-setting, I wonder if a lesson is that, perhaps, one should not set interest rates on the assumption that exchange rates would fall, but, instead, react to the situation if and when the exchange rate falls. This is analogous to how the MPC treats equity prices, and it may well turn out to be appropriate here, though I regard it as very much the second-best alternative.

5 Conclusions

I have argued today that:

(i) Re-rating of sterling

Although there are some good reasons (eg supply-side reform, improved macroeconomic framework) for a re-rating of sterling against the Deutsche Mark and that the 'equilibrium' exchange is likely to be *higher* than the PPP level of around DM2.60, it is very difficult to justify the level of around DM3.40 that was achieved in early May.

(ii) Prospects for sterling

Given that sterling is now 'overvalued' against the Deutsche Mark, it should plausibly decline over the next two years or so. However, while we wait for the FX market to 'get it right', otherwise viable businesses might face considerable difficulties, and the prospective volatility of inflation is likely to be high (and could go even higher). So it is legitimate to ask whether the MPC should 'do something' about the exchange rate misalignment.

(iii) Incorporating asset price misalignments within an inflation-targeting framework

The MPC has an inflation target and, given that we only have one instrument, I do not believe that we can try to target the exchange rate as well. Also, I certainly do not think that we should try to get the exchange rate down by aiming for a higher inflation rate, as high and variable inflation ultimately destroys jobs.

So I explored an alternative, whereby the MPC would focus on minimising the average volatility of inflation around the 2½% target at all times in the future, but, in order to achieve this goal, interest rates would respond to both the two year ahead inflation forecast *and* asset price misalignments. Of course, this would be entirely in line with the Chancellor's remit. In the current conjuncture, it would imply that interest rates be held modestly lower than is necessary to hit the inflation target two years out, because such a policy would, by keeping the pound lower than it would otherwise be, both reduce the size of the inflation undershoot now and plausibly reduce the likely size of the inflation overshoot that might occur if and when the pound eventually falls (because it would fall from a less elevated level). Hence, the average deviation (in absolute terms) of inflation from target would plausibly be reduced by the pursuit of such a policy. Although this alternative policy rule does *not* set out to prick asset price bubbles directly, it is plausible that the knowledge that the central bank would adjust interest rates in response to an asset price misalignment would, of itself, make the emergence of an asset price bubble less likely. This would represent an additional contribution to macroeconomic stability.

Although I believe there to be sound theoretical and practical reasons for adopting the above proposal, one potential hurdle is that market participants perceive us to be setting interest rates by feeding off an inflation forecast two years or so out. If, hypothetically, the MPC were to say that it took asset price misalignments into account *separately*, there is a clear risk that the markets would think that the Bank had gone soft on inflation. This would, of course, be to entirely misunderstand the true situation, as we would only be taking asset price misalignments into account in order to do a better job of achieving consumer price stability. Nevertheless, there is an

important communication issue here, and this will clearly be a significant consideration in how this debate evolves.

(iv) The role of foreign exchange intervention

Sterilised intervention that helped to prick the current sterling 'bubble' would, in the current conjuncture, make it easier to achieve (consumer) price stability in this country. Although there have been some spectacular instances where intervention has failed (eg trying to keep the United Kingdom within the ERM), there is empirical evidence that, under certain circumstances, sterilised intervention can be effective (especially when there is a 'bubble'). So I feel that, used judiciously, FX intervention could potentially be useful in terms of achieving our overall monetary policy objective, although it is no panacea. It would be important to use it only when the pre-conditions for likely success were in place.

Finally, I do not believe that one can offer any 'quick fix' to the problem of an overvalued exchange rate. Given that the MPC's remit is consumer price stability, there are clear limitations (for good reason) on what we can do. I have, however, discussed some suggestions with respect to our interest rate setting procedures and FX intervention that *might* alleviate the extent of the pound's overvaluation and, thereby, help us to do a better job in terms of delivering consumer price stability.

References

Batini, N and Nelson, E (2000), 'Optimal horizons for inflation targeting', *Bank of England Working Paper*, No 119.

Brittan, S (2000), 'Beware the politics of sterling', *Financial Times*, 13 April.

Cecchetti, S, Genberg, H, Lipsky, J and Wadhwani, S (2000), 'Asset prices and central bank policy', ICMB/CEPR Geneva Papers on the World Economy, No 2.

Dominguez, K and Frankel, J (1993), 'Does foreign exchange intervention work?', Institute for International Economics, Washington DC.

***The Economist* (2000a)**, 'Central banks and asset prices', 13–19 May.

***The Economist* (2000b)**, 'Rescuing the euro', 13–19 May.

Fatum, R (2000), 'On the effectiveness of sterilised foreign exchange intervention', *ECB Working Paper*, No 10.

Froot, K A and Thaler, R H (1990), 'Anomalies: foreign exchange', *Journal of Economic Perspectives*, Vol 4, No 3, Summer, pages 179–92.

Genotte, G and Leland, H (1990), 'Market liquidity, hedging and crashes', *American Economic Review*, December.

Goodhart, C A E (2000), 'Monetary transmission lags and the formulation of the policy decision on interest rates', Bank of England, *mimeo*.

Rosenberg, M R (1996), 'Currency forecasting', Irwin, Chicago.

Svensson, L (1999), 'Price stability as a target for monetary policy: defining and maintaining price stability', IIES, Stockholm, *mimeo*.

Wadhwani, S B (1996), 'Sterling work for Labour', *New Economy*, pages 138–42.

Wadhwani, S B (1999), 'Sterling's puzzling behaviour', *Bank of England Quarterly Bulletin*, November, pages 416–27.

Wren-Lewis, S and Driver, R L (1998), 'Real exchange rates for the year 2000', Institute for International Economics, Washington DC.

Yamaguchi, Y (1999), 'Asset prices and monetary policy: Japan's experience', remarks at Symposium sponsored by the Federal Reserve Bank of Kansas, August.

The work of the Monetary Policy Committee

In this speech,[1] *Ian Plenderleith, Executive Director for financial market operations and member of the Bank's Monetary Policy Committee, reviews prospects for the UK economy. He notes that the overall picture is an encouraging one, with the prospect of continuing growth overall on a basis that can be sustained into the medium term. He discusses the strains the economy has faced, within this overall encouraging picture, from the substantial rise in the exchange rate in recent years, and suggests that some of the more extreme strains may now be abating, with the euro now moving back to more realistic levels. He also discusses the benefits that may come from the 'new economy', but suggests that the evidence for enhanced economic performance in the United Kingdom from this source is, so far, piecemeal rather than conclusive.*

I want to thank you very warmly for your kind invitation to lunch today. I particularly appreciate it because, for me, as a Midlander by upbringing who went to school in Birmingham, it is a chance, more or less, to come back home. I learnt at school the healthy habit of never taking any expert, however erudite, at face value; and that means that I can quite understand why economics is regarded as a form of brain damage, and why someone once defined an economist as someone who sees something that works in practice, but warns you that it will never work in theory.

I want to try to suggest today that, while you must make up your own minds about the brain damage, the second proposition is not the case: basic prudent economic good management can work in practice, and indeed is working in practice in the United Kingdom today, even if the process is not always as straightforward as we would ideally like.

But because I still retain my scepticism about experts, I want to make this a two-way session. I will begin with a few words about how we see the prospects for the UK economy, but I would then very much welcome views from all of you on how you see things from the perspective of your own businesses. All of us on the MPC spend a good deal of our time meeting business and other groups around the country precisely in order to try to get a first-hand impression of how the economy is progressing in different regions and sectors. We greatly value the feedback we get from these visits, alongside the continuous input we get from our Agents permanently based around the country.

Let me begin with an overall view. If you look at the performance of the UK economy as a whole over recent years—and I will come in a moment to variations within different regions or sectors—the picture is, by any standards, a fundamentally impressive one. The economy, viewed overall, has since the early 1990s achieved a continuing steady and sustained growth—in output and employment and personal wealth—without jeopardising low inflation and so without incurring the destabilising swings between boom and bust that so weakened the United Kingdom's economic performance in earlier years.

Since the present monetary framework, based on an explicit low inflation target, was adopted nearly eight years ago, we have enjoyed the longest period of uninterrupted growth achieved in modern times. Growth in output over this period has averaged around 2¾% a year, which is above most estimates of our long-run underlying trend; and unemployment on the claimant count has fallen from a peak of 10.5% at the beginning of 1993 to 3.9% at present. Importantly, the gains in employment have been shared around the country: the fall in unemployment in the West Midlands over the same period has been from 11.1% to 4.2%, and the picture is similar in other regions.

This sustained expansion in activity has been achieved with the best performance in terms of price stability that we have experienced for a generation: retail price inflation has averaged 2.7% over the period. With this has come markedly lower nominal interest rates, with short-term rates averaging some 6¼%, compared with 11¼% over the previous decade; and the very welcome fall in inflationary expectations has enabled longer-term interest rates (10-year government bond yields) to fall to 5¼%, which (apart from a brief period last year) is the lowest we have seen them for nearly 40 years.

This sustained improvement in the United Kingdom's overall economic performance is the more remarkable when we remember that in 1998 we experienced a severe international disturbance in the wake of the Asian crisis. The downturn in Asia, accentuated by economic crisis in Russia, spread rapidly through the emerging market economies around the world and manifested itself in a sharp weakening in external demand felt by all the industrialised

(1) Given to the Stafford Chamber of Commerce on 14 June 2000. This speech may be found on the Bank of England's web site at www.bankofengland.co.uk/speeches/speech90.htm

countries. In response, we cut interest rates, from 7½% in October 1998 to 5% in June 1999, and in the year since then we have seen a strong recovery in activity in the UK economy. Through 1999, in fact, growth accelerated back towards and beyond its trend rate, and employment continued to rise. It is precisely to ensure that this upswing in activity last year can continue at a sustainable rate, without generating overheating, that we acted pre-emptively through last winter to edge interest rates up to 6%, where they have stayed for the past four months.

There are now some signs that the pace of activity may be moderating to a more sustainable level. Growth overall in the year to the first quarter was running at around 3% a year, still somewhat above long-run trend. Inflation is currently running somewhat below our target of 2½%. But cost pressures are still evident, particularly in the labour market, and may be reinforced if the exchange rate continues to ease, as it has in the past month. We need to remain vigilant, but, provided we take no risks with the progress we have made in recent years in maintaining low inflation, the prospect is for continuing growth overall on a basis that can be sustained into the medium term.

This overall prospect is an immensely encouraging one, and it is enormously important that we should not for one moment jeopardise it when we bring into the reckoning, as we should, particular features of the picture that may be creating strains for particular parts of the economy. It would be in no one's interests for the stability that has enabled the economy to grow so steadily in recent years to be undermined. Our first, and continuing, priority has to be to continue to deliver the stable monetary framework—of interest rates directed at maintaining low inflation—as a platform on which commerce and industry throughout the country can build their businesses and generate the growth in output and employment the country needs, if we are to prosper on a continuing and sustained basis.

Within this encouraging overall picture, however, we have faced severe and unwelcome strains from the substantial rise in the exchange rate in recent years. No area of the economy has escaped the effect of these strains: agriculture and some service industries have felt them just as much as manufacturing. But the imbalance has undoubtedly been most severely felt by exporters, and by businesses most exposed to import competition; and that means that the effects have fallen most acutely on the manufacturing sector. The frustration felt by those who have built up efficient and competitive businesses, only to find their market position threatened by a rise in the exchange rate over which they have no control, is entirely understandable. Their experience has been, and continues to be, a significant feature in our judgment about the appropriate stance of policy for the economy as a whole. We believe it enormously important that we should look not just at the development of the economy as a whole, but also at how different regions and different sectors are faring—and indeed at differences within different regions and sectors. For that reason, the input from our twelve Agents, whose job it is, located in all the main regions, to maintain continuous contact with local businesses and provide feedback to us on local conditions, has been extremely important in our assessment of developments in the economy. The feedback we get—that the rise in sterling has been, and is, causing severe strains—comes through loud and clear.

The imbalance created by the strength of sterling is as unwelcome to us as it is to the businesses affected by it, because it poses us an acute policy dilemma. With the economy as a whole, as I have indicated, recovering strongly over the past year from the Asian crisis, led by buoyant domestic demand, particularly in the service sector, we have needed to moderate somewhat the pace of the upswing to ensure that price pressures, looking a year or more ahead, do not run ahead of our inflation target. In judging how far, and how fast, to moderate domestic demand, we have taken into account the weakness of the United Kingdom's external sector, and the impact particularly on manufacturing, as an immediate factor partly offsetting the buoyancy of domestic demand. But we have also had to take into account the possibility further ahead that, if the exchange rate moves back to more realistic levels, as we expect, the boost that could bring to external demand could only be accommodated, without strains on the supply capacity of the economy as a whole, if domestic demand has moderated. The rise in the exchange rate, and certainly the appreciation in the past winter, has been as unwelcome to us as to the businesses affected because of the acute difficulty of setting the appropriate policy stance for the economy as a whole when there are divergent pressures on different sectors of the whole.

The difficulty is compounded because, although sterling has eased back somewhat in the past month, it is very difficult to find a rational explanation for the rise sterling exhibited in the months before that, since the latter part of last year. The rise we saw in sterling from, roughly, mid-1996 to mid-1998, an appreciation of around 25% in overall terms, may have partly reflected a growing perception around the world that the UK economy as a whole was benefiting from the structural reforms put in place in earlier years, and that the framework within which economic policy was being conducted was sound and was commanding confidence. It also probably reflected cyclical factors, with the United Kingdom, along with the United States, experiencing strengthening growth without inflation, while activity in continental Europe remained subdued. The rise was also partly accentuated by the Asian crisis, as the currencies of the emerging market countries depreciated. If these were the main influences at work, they related, welcome or unwelcome, to fundamentals in the economic environment, to which businesses could adapt over time. And indeed, it is impressive that so many businesses were able to generate cost savings and efficiencies to enable them to remain competitive internationally.

But it is hard to see that these factors can explain the rise in sterling in recent months. In fact of course, what we have principally seen in this more recent period has been not so

much further gains in sterling as persistent weakness in the euro. Hence we have remained in a fairly steady range against the dollar, and have now indeed fallen somewhat against it. The exchange rate strains we have faced over the past year have thus been essentially a function of euro weakness rather than sterling strength.

It is not at all clear why the euro has been weakening. Some have suggested that it may reflect unfamiliarity with the new structure of European monetary union, and perhaps also uncertainty about progress in structural reform in individual economies in the euro area. Whatever the reason, the fact of the euro weakening has added to the strains on UK businesses affected by the exchange rate movement, and it is of course of little comfort to them that it seems to reflect perceptions of the euro rather than any factors specific to sterling. But it does mean that, while there is little the United Kingdom can in itself do to offset the effect, it is reasonable to expect that the euro may in due course move back to more realistic levels; and that does indeed appear to have been happening in some part over the past month. Whether that will continue is hard to judge, but there are reasonable grounds for believing that some of the more extreme strains we have been experiencing from exchange rate movements may be abating. If that is so, it will be enormously helpful both to the balance of the UK economy as a whole and to the individual businesses most directly affected.

What would not help in this process would be for the MPC to take risks with our overriding responsibility for maintaining low inflation as a basis for the economy as a whole to continue to grow. To take risks with our inflation target in the hope of achieving some short-run impact on the exchange rate would be likely to do far more damage to the growth prospects of the economy as a whole than any immediate relief it might give to businesses suffering from the exchange rate, because the relief, if any were achieved, would be temporary, while the likely result would be the need for sharper interest rate rises down the road to rein back inflationary pressures built up in the meantime. Nor indeed is it at all clear that we would achieve any useful effect: when the MPC cut interest rates by $2^1/_2$ percentage points between October 1998 and June 1999, the exchange rate against the euro actually rose.

I have tried to deal frankly and openly with the dilemma that the MPC has faced in recent months from this persistent weakening in the euro. I have tried to explain how we view the problem, and how we take account of the impact of the exchange rate, but also the limits on what we can do to resolve the dilemma. Let me end by touching on one other dilemma we face in setting interest rates—but in this case what I believe is an altogether more encouraging and exciting, if somewhat tantalising, prospect—the 'new economy'.

By the 'new economy', I mean a series of different, but related, structural developments in the business environment that have been visible in recent years in the United States and have undoubtedly made a major contribution to enhanced economic performance there, and that may come to have a similar impact here. The dilemma is that, while the benefits these developments can bring are undoubted, if and when they manifest themselves in enhanced economic performance, the evidence of their doing so in this country is, so far, piecemeal rather than conclusive.

The developments I am referring to are partly the product of greater flexibility in the structure of the economy and greater competitiveness. They partly reflect the increasing trend towards globalisation, of markets and of business processes. They reflect also the rapid advances being made in information and communications technology (ICT), and the application of these advances right down to the grass roots of business and commerce—better communication through e-mail, better price visibility through the Internet, the development of e-commerce as an alternative retailing channel and for inter-company purchasing, and the application of ICT advances throughout the productive processes of individual businesses (in design and marketing, production control and distribution) to improve efficiency and responsiveness to customer needs.

The reason why these advances, if they are translated into actual improvements in our economic performance, are so exciting is that they represent scope for improvements in the supply side of the economy: they hold out the possibility that the economy might be able to grow faster than recent historical experience without jeopardising price stability. But precisely because they represent changes in the structure of the business environment, their economic impact is not easy to track, and assessing that impact will need cool heads and careful judgment. The benefits may take time to come through. They may affect demand, as well as supply, in the economy, with implications for overall price stability that could go either way. The effects may appear in some areas of the economy before others. The process is inherently uncertain. For all these reasons, it will be extremely important that we do not anticipate the process and begin to award ourselves the benefits before we have seen concrete evidence that they have been captured in improved economic performance. There are promising portents, but relatively little concrete evidence yet, of the United Kingdom achieving the improvements in productivity that have so benefited the US economy in recent years. That does not mean that it will not happen here. But it does mean that we need to be both vigilant to avoid the pitfall of anticipating the gains before they arrive, and alert to capitalising on them if and when they begin to come through.

Let me end where I started. The impressive performance of the UK economy in recent years demonstrates, I believe, what can be achieved within a framework of continuing commitment to low inflation. There are dilemmas that we face, as I have described, and there are limits to what monetary policy can do to relieve them. But that is simply a recognition of the plain fact that the continuing growth in

output and employment we have achieved in recent years in this country is not something delivered by economic policy makers: it is the product of the vigour and resourcefulness and dedication of hundreds of thousands of individual businesses across the country. The job of the MPC is to deliver a platform of continuing price stability so that business and industry across the country can continue to deliver the goods and services the market place wants. We shall continue to concentrate on our contribution so that you can contribute yours, to the benefit of the whole country.

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/qb/qbcontents.htm

Articles and speeches (indicated S)

August 1998 (continued)
Recent economic developments and the MPC approach to monetary policy (S)
Financial services into the year 2000 (S)

November 1998
Public sector debt: end March 1998
Inflation and growth in a service economy
The foreign exchange and over-the-counter derivatives markets in the United Kingdom
Recent changes to the national accounts, balance of payments and monetary statistics
Inflation targeting in practice: the UK experience (S)
The objectives and current state of monetary policy (S)
Economic policy, with and without forecasts (S)

February 1999
Sterling wholesale markets: developments in 1998
The external balance sheet of the United Kingdom: recent developments
The impact of inflation news on financial markets
Monetary policy rules and inflation forecasts
The yen/dollar exchange rate in 1998: views from options markets
Risk, cost and liquidity in alternative payment systems
Monetary policy and the international economic environment (S)
Monetary policy and the labour market (S)
EMU: a view from next door (S)
Central bankers and uncertainty (S)

May 1999
The transmission mechanism of monetary policy
Monetary policy and the yield curve
The Bank's use of survey data
Monetary policy and uncertainty
An effective exchange rate index for the euro area
The financing of small firms in the United Kingdom
Structural changes in exchange-traded markets
Developments in small business finance (S)
Economic models and monetary policy (S)
Inflation and growth in the services industries (S)

August 1999
What makes prices sticky? Some survey evidence for the United Kingdom
The use of explicit targets for monetary policy: practical experiences of 91 economies in the 1990s
Financial sector preparations for the Year 2000
The Asian crisis: lessons for crisis management and prevention (S)
The MPC two years on (S)

August 1999 (continued)
Price stability in the United Kingdom (S)
The impact of the international environment on recent monetary policy (S)

November 1999
Sterling market liquidity over the Y2K period
Public sector debt: end March 1999
The external balance sheet of the United Kingdom: recent developments
News and the sterling markets
New estimates of the UK real and nominal yield curves
Government debt structure and monetary conditions
Challenges for monetary policy: new and old (S)
Sterling's puzzling behaviour (S)
Monetary policy and asset prices (S)
Interest rates and the UK economy—a policy for all seasons (S)

February 2000
Sterling wholesale markets: developments in 1999
Recent developments in extracting information from options markets
Stock prices, stock indexes and index funds
Private equity: implications for financial efficiency and stability
Back to the future of low global inflation (S)
British unemployment and monetary policy (S)
Before the Millennium: from the City of London (S)

May 2000
A comparison of long bond yields in the United Kingdom, the United States, and Germany
Money, lending and spending: a study of the UK non-financial corporate sector and households
Monetary policy and the euro (S)
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)

August 2000
Public sector debt: end-March 2000
Age structure and the UK unemployment rate
Financial market reactions to interest rate announcements and macroeconomic data releases
Common message standards for electronic commerce in wholesale financial markets
The environment for monetary policy (S)
Monetary union and economic growth (S)
The exchange rate and the MPC: what can we do? (S)
The work of the Monetary Policy Committee (S)

Bank of England 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/workingpapers/index.htm, where abstracts of all *Papers* may be found. *Papers* published since January 1997 are available in full, in PDF format.

No	Title	Author
90	Bank capital and risk-taking *(January 1999)*	Alistair Milne A Elizabeth Whalley
91	Forward-looking rules for monetary policy *(January 1999)*	Nicoletta Batini Andrew G Haldane
92	Coalition formation in international monetary policy games *(February 1999)*	Marion Kohler
93	Business cycles and the labour market can theory fit the facts? *(March 1999)*	Stephen Millard Andrew Scott Marianne Sensier
94	Asset price reactions to RPI announcements *(March 1999)*	M A S Joyce V Read
95	Price formation and transparency on the London Stock Exchange *(April 1999)*	Victoria Saporta Giorgio Trebeschi Anne Vila
96	Uncertainty and simple monetary policy rules—An illustration for the United Kingdom (*June 1999*)	Simon Hall Chris Salmon Tony Yates Nicoletta Batini
97	To trim or not to trim? An application of a trimmed mean inflation estimator to the United Kingdom (*July 1999*)	Hasan Bakhshi Tony Yates
98	The non-linear Phillips curve and inflation forecast targeting (*July 1999*)	Eric Schaling
99	Should uncertain monetary policy-makers do less? *(August 1999)*	Ben Martin Chris Salmon
100	Money, credit and investment in the UK corporate sector *(September 1999)*	Andrew Brigden Paul Mizen
101	Monetary policy loss functions: two cheers for the quadratic *(September 1999)*	Jagjit S Chadha Philip Schellekens
102	Monetary stabilisation policy in a monetary union: some simple analytics *(October 1999)*	Andrew Brigden Charles Nolan
103	Inflation and real disequilibria (*December 1999*)	Mark S Astley Tony Yates
104	Openness and its association with productivity growth in UK manufacturing industry (*December 1999*)	Gavin Cameron James Proudman Stephen Redding
105	Caution and gradualism in monetary policy under uncertainty (*December 1999*)	Ben Martin
106	Monetary policy surprises and the yield curve (*January 2000*)	Andrew G Haldane Vicky Read
107	Must the growth rate decline? Baumol's unbalanced growth revisited (*January 2000*)	Nicholas Oulton
108	The sensitivity of aggregate consumption to human wealth (*January 2000*)	Hasan Bakhshi
109	The effects of increased labour market flexibility in the United Kingdom: theory and practice (*February 2000*)	Stephen P Millard

110	Imperfect competition and the dynamics of mark-ups (*February 2000*)	Erik Britton Jens D J Larsen Ian Small
111	Liquidity traps: how to avoid them and how to escape them (*April 2000*)	Willem H Buiter Nikolaos Panigirtzoglou
112	Inventory investment and cash flow *(May 2000)*	Ian Small
113	A small structural empirical model of the UK monetary transmission mechanism *(May 2000)*	Shamik Dhar Darren Pain Ryland Thomas
114	Testing the stability of implied probability density functions *(May 2000)*	Robert R Bliss Nikolaos Panigirtzoglou
115	Trade credit and the monetary transmission mechanism *(June 2000)*	Marion Kohler Erik Britton Tony Yates
116	Persistence and volatility in short-term interest rates *(June 2000)*	Nikolaos Panigirtzoglou James Proudman John Spicer
117	A limited participation model of the monetary transmission mechanism in the United Kingdom *(June 2000)*	Shamik Dhar Stephen P Millard
118	How well does a limited participation model of the monetary transmission mechanism match UK data? *(June 2000)*	Shamik Dhar Stephen P Millard
119	Optimal horizons for inflation targeting *(July 2000)*	Nicoletta Batini Edward Nelson
120	UK monetary policy 1972–97: a guide using Taylor rules *(July 2000)*	Edward Nelson

Statistical Abstract

The annual *Statistical Abstract* comes in two parts: Part 1 contains a range of banking and other financial data; Part 2 provides longer runs of monetary statistics and related items. For 2000, each part is priced at £25.00 (including postage) in the United Kingdom. A concessionary price of £20.00 per part is available to academics in the United Kingdom and £15.00 per part to students and secondary schools in the United Kingdom.

Monetary and Financial Statistics

A monthly publication, *Bank of England: Monetary and Financial Statistics (Bankstats)*, was launched in January 1997. This comprehensive publication (priced at £90.00 per annum in the United Kingdom for 2000) contains detailed data on money and lending, bank and building society balance sheets, international positions of banks operating in the United Kingdom, government financing and the money markets (including gilt repo and stock lending), issues of securities and short-term paper, interest rates and exchange rates; it also contains occasional background articles. If you would like more information, please contact Daxa Khilosia, Monetary and Financial Statistics Division, telephone 020–7601 5353.

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
E-commerce and financial statistics: a report of a half-day meeting of the Financial Statistics Users' Group	Graham Clark	June	4–7
Calculating the accrual of interest on debt securities	C B Wright	June	1–3
Monetary financial institutions' in Jersey, Guernsey and Isle of Man balance sheet	Jim Thame and Richard Lamming	April	1–2
Statistics for European Monetary Union: a report of a half-day meeting of the Financial Statistics Users' Group	Jenny Dawuda and Neil Walker	January	1–5

Targeting Inflation book

In March 1995, the Bank hosted a conference of central banks currently adhering to inflation targets. This book, edited by Andrew Haldane, draws together contributions from each of the eight countries represented at the conference. It details cross-country experiences of this monetary framework and the key operational and theoretical issues it raises. The book is suitable for both academics and practitioners. The price of the book is £20.00 plus postage and packaging.

Index-linked debt book

In September 1995, the Bank held a conference to discuss a broad range of theoretical and practical questions raised by index-linked debt in general, and the UK experience in particular. This book contains revised versions of the papers presented at the conference, as well as the papers that were circulated by the Bank ahead of the conference, setting out background information and key policy issues. The price of the book is £10.00 plus postage and packaging.

Openness and Growth book

The *Openness and Growth* book, published in October 1998, contains the proceedings of an academic conference held at the Bank of England in September 1997. The research described in the book investigates the link between productivity growth and the international openness of the UK economy. The price of the book is £10.00 plus postage and packaging.

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 plus postage and packaging.

Government debt structure and monetary conditions

In June 1998 the Bank of England organised a conference to discuss the interactions between the size and structure of government debt and monetary conditions. This book published in December 1999, contains all but one of the papers presented at the conference, plus a background paper prepared within the Bank. The price of the book is £10.00 plus postage and packaging.

These publications are available from Publications Group, Bank of England, Threadneedle Street, London, EC2R 8AH; telephone 020–7601 4030; fax 020–7601 3298; e-mail mapublications@bankofengland.co.uk

General enquiries about the Bank of England should be made to 020–7601 4444.
The Bank of England's web site is at: http://www.bankofengland.co.uk
The web site gives details of job opportunities at the Bank, at http://www.bankofengland.co.uk/employment

Quarterly Bulletin and Inflation Report subscription details

Copies of the *Quarterly Bulletin* and *Inflation Report* are available from the Bank as a **combined** package; the *Inflation Report* is also available separately. The prices are set out below:

Destination	2000				1999			
	Quarterly Bulletin and *Inflation Report* package		*Inflation Report* only (1)		*Quarterly Bulletin* and *Inflation Report* package		*Inflation Report* only (1)	
	Annual	Single	Annual	Single	Annual	Single	Annual	Single
United Kingdom by first-class mail (2)	£40.00	£10.00	£12.00	£3.00	£40.00	£10.00	£12.00	£3.00
*Academics, **UK only***	*£27.00*	*£6.75*	*£8.00*	*£2.00*	*£27.00*	*£6.75*	*£8.00*	*£2.00*
*Students, **UK only***	*£14.00*	*£3.50*	*£4.50*	*£1.50*	*£14.00*	*£3.50*	*£4.50*	*£1.50*
European countries including the Republic of Ireland, by letter service	£48.00	£12.00	£14.00	£3.50	£48.00	£12.00	£14.00	£3.50
Countries outside Europe: Surface mail	£48.00	£12.00	£14.00	£3.50	£48.00	£12.00	£14.00	£3.50
Air mail: Zone 1 (3)	£64.00	£16.00	£21.00	£5.25	£64.00	£16.00	£21.00	£5.25
Zone 2 (4)	£66.00	£16.50	£22.00	£5.50	£66.00	£16.50	£22.00	£5.50

(1) There is a 25% discount if five copies or more of the same issue are purchased.
(2) 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.
(3) All countries other than those in Zone 2.
(4) Australasia, Japan, Peoples' Republic of China, the Philippines and Korea.

Readers who wish to become **regular subscribers**, or who wish to purchase single copies, should send to the Bank, at the address given below, the appropriate remittance, payable to the Bank of England, together with full address details, including the name or position of recipients in companies or institutions. If you wish to pay by **Visa, Mastercard, Switch or Delta**, please telephone 020–7601 4030. Existing subscribers will be invited to renew their subscriptions automatically. Copies can also be obtained over the counter at the Bank's front entrance.

The **concessionary rates** for the combined *Quarterly Bulletin/Inflation Report* package and the separate *Inflation Report* are noted above in *italics*. **Academics at UK institutions** of further and higher education are entitled to a concessionary rate. They should apply on their institution's notepaper, giving details of their current post.

Students and secondary schools in the United Kingdom are also entitled to a concessionary rate. Requests for concessionary copies should be accompanied by an explanatory letter; students should provide details of their course and the institution at which they are studying.

The *Quarterly Bulletin* is also available from Bell & Howell Information and Learning: enquiries from customers in Japan and North and South America should be addressed to Bell & Howell Information and Learning, 300 North Zeeb Road, Ann Arbor, Michigan 48106, United States of America; customers from all other countries should apply to White Swan House, Godstone, Surrey, RH9 8LW, telephone 01444 445000.

An index of the *Quarterly Bulletin* is also available to customers free of charge from Publications Group at the address given below. It is produced annually, and lists alphabetically terms used in the *Quarterly 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 DM200 per volume or DM4,825 per set.

The *Quarterly Bulletin* is available on the Bank's web site at www.bankofengland.co.uk/qb/index.htm

Issued by Publications Group, Bank of England, Threadneedle Street, London, EC2R 8AH; telephone 020–7601 4030; fax 020–7601 3298; e-mail mapublications@bankofengland.co.uk