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Volume 41 Number 3

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Markets and operations (pages 265–82)

Research and analysis

(pages 283-322)

This article reviews developments in international and domestic financial markets, drawing on information from the Bank of England's market contacts, and describes the Bank's market operations in the period 1 May to 3 August 2001.

Research work published by the Bank is intended to contribute to debate, and does not necessarily reflect the views of the Bank or of MPC members.

Capital flows and exchange rates (by Andrew Bailey of the Bank's International Economic Analysis Division, and Stephen Millard and Simon Wells of the Bank's Monetary Instruments and Markets Division). This article focuses on the possible role of capital flows in explaining exchange rate movements. Some commentators have suggested that a substantial increase in capital flows into the United States could have accounted for the recent appreciation of the US dollar. This could imply that capital inflows have increased in response to a rise in the rate of return on capital, which in turn has reflected the structural increase in US productivity seen in recent years. We find evidence to suggest that this may explain part of the recent dollar appreciation, but unsurprisingly it does not provide a full explanation.

Public attitudes about inflation: a comparative analysis (by Kenneth Scheve of the Bank's International Economic Analysis Division). This article analyses public opinion in advanced economies to assess what individual citizens think about inflation. Opinion surveys suggest that the general public is inflation averse, but that there is significant variation across countries and over time. Evidence is presented that average inflation aversion is sensitive to factors affecting the expected costs of inflation.

Measuring capital services in the United Kingdom (by Nicholas Oulton of the Bank's Structural Economic Analysis Division). For many macroeconomic purposes, such as the study of productivity or the assessment of capacity utilisation, we need measures of the level and growth rate of the productive services that the capital stock is capable of providing. The official estimates of the capital stock produced by the Office for National Statistics aim to be measures of wealth, not capital services. So while they are appropriate for their intended purposes, such as balance sheet analysis, they may not be appropriate for productivity analysis or in measures of capacity utilisation. This article discusses the theory behind a different concept of capital, called here the volume index of capital services (VICS), and presents estimates of the VICS for the United Kingdom—based on both a five-asset breakdown and an eight-asset breakdown includes three information and communications technology (ICT) assets: computers, software and telecommunications equipment. The VICS measure has grown faster than the wealth measures, and the divergence is more apparent when ICT assets are included explicitly.

Markets and operations

- This article reviews developments in international and domestic financial markets, drawing on information from the Bank of England's market contacts, and describes the Bank's market operations in the period 1 May to 3 August 2001.
- Private sector forecasts for short-term growth prospects in the G7 countries were revised down further during the review period and world equity prices fell.
- Official interest rates were lowered by 75 basis points in the United States, by 50 basis points in the United Kingdom and by 25 basis points in the euro area. There was no change in the stance of Japanese monetary policy.
- Short-term interest rate expectations fell sharply in the United States and the euro area. In contrast, they rose and then fell back again in the United Kingdom and were broadly unchanged in Japan. Uncertainty about the outlook for short-term interest rates generally remained at higher-than-average levels.
- Long-dated government bond yields were quite volatile in all the major markets. Over the period as a whole, yields fell in the United States and the euro area but were broadly unchanged in the United Kingdom and Japan.
- Exchange rate movements were relatively small over the period as a whole; the dollar appreciated despite greater falls in US interest rates than elsewhere.

Changes in the macroeconomic environment

Financial markets were particularly sensitive to economic data releases during the review period as market participants looked for evidence about the likely severity of the slowdowns in the United States and Europe and for indications about whether Japan had entered a recession. Overall, activity data for the G7 economies released during the period were mixed, with a slightly greater proportion of data announcements coming in weaker than expected. Broadly speaking, industrial production and manufacturing output data tended to be weaker than market participants had been anticipating, while retail sales and consumer confidence indicators were slightly stronger than had been expected. Reflecting these developments, most private sector forecasts for 2001 and 2002 GDP growth in the major industrialised countries were revised down between May and July. The largest such revisions were for Japan (see Chart 1). By contrast, most private sector

Chart 1

Forecasts for GDP growth in 2001(a)



(a) Means of survey samples.

forecasts for UK GDP growth in 2001 and 2002 were broadly unchanged during the period.

Between May and July, consumer price inflation forecasts for 2001 were revised up for the United States, the United Kingdom and the euro area. In each case, the revisions reflected higher-than-expected inflation outturns during the period. By contrast, there was a continued expectation of deflation in Japan (see Table A).

Table AForecasts for consumer price inflation

Per cent; percentage points in italics

	2001 f	orecasts		2002	forecasts	
	May	July	Change (a)	May	July	Change (a)
United States Euro area United Kingdom Japan	3.1 2.3 1.9 -0.3	3.2 2.7 2.1 -0.4	0.1 0.4 0.2 -0.1	2.5 1.8 2.3 -0.3	2.4 1.9 2.4 -0.4	-0.1 0.1 0.1 -0.1

Source: Consensus Economics.

(a) Changes between May and July 2001.

Short-term interest rates

In the United States, the Federal Open Market Committee (FOMC) reduced its Federal funds target rate by 75 basis points during the period; reductions of 50 and 25 basis points were announced on 15 May and 27 June respectively, lowering the official rate to 3.75%. In the United Kingdom, the Monetary Policy Committee (MPC) reduced the Bank of England's repo rate by 25 basis points on 10 May and by an additional 25 basis points on 2 August,⁽¹⁾ taking it to 5%. The European Central Bank (ECB) reduced its policy rate by 25 basis points on 10 May, lowering the official refinancing rate to 4.5%. There were no changes in the stance of Japanese monetary policy between May and the beginning of August.

Chart 2



Cumulative changes in short-term interest rate

(a) As indicated by changes in interest rates implied by futures contracts maturing in September 2001.

(1) For further details, see Monetary Policy Committee Minutes and Press Notices, August 2001.

Chart 3 US interest rates



Source: Bloomberg

(a) Three-month interest rates implied by eurodollar futures contracts at the dates specified. From August 2001 onwards, the x-axis relates to contract expiry dates.

Chart 4 Euro-area interest rates



Source: Bloomberg.

(a) Three-month interest rates implied by euribor futures contracts at the dates specified. From August 2001 onwards, the x-axis relates to contract expiry dates.

Chart 5 UK interest rates



(a) Three-month interest rates implied by short sterling futures contracts at the dates specified. From August 2001 onwards, the x-axis relates to contract expiry dates. Movements in short-term interest rate expectations in the dollar, euro, sterling and yen markets were not well synchronised during the review period (see Chart 2), and correlations between the daily changes in short sterling, eurodollar and euribor futures contracts were relatively low by recent historical norms. Domestic considerations were, therefore, the dominant influences on rate expectations in each case. Between 1 May and 3 August, rates implied by eurodollar, euribor and short sterling futures contracts expiring in 2001 fell by about 55 to 75, 35 to 60 and 5 to 15 basis points respectively (see Charts 3, 4 and 5). In contrast, Japanese short-term interest rate expectations ended the period little changed (see Chart 6).

Chart 6



⁽a) Three-month interest rates implied by euroyen futures contracts at the dates specified. From July 2001 onwards, the x-axis relates to contract expiry dates.

United Kingdom

Short-term interest rate expectations in the United Kingdom rose during the first half of the period and then fell back in the second half (see Chart 2). As noted above, these movements were largely influenced by domestic news. In particular, the largest daily changes in short sterling futures contracts occurred in response to the RPIX data release on 12 June and the MPC's decision to cut the Bank's repo rate by 25 basis points on 2 August. Interest rates implied by the September 2001 contract rose by 19 basis points on 12 June and fell by 20 basis points on 2 August; these were the biggest such daily changes since March 2000.

Chart 7 Effect of RPIX surprises on interest rate expectations^(a)



⁽a) From January 1997 to May 2001.(b) The surprise is measured as actual yearly percentage change in RPIX

minus the expected value of the RPIX release, divided by the expected value.

The market reaction to the RPIX data in June was large by historical norms. Evidence of this can be seen by comparing the June response (shown as the red triangle in Chart 7) with previous market reactions to RPIX data 'surprises' over the period January 1997 to May 2001 (shown as the blue diamonds). The estimated average reactions to data surprises are indicated by the line of best fit through the origin; this was estimated by regressing daily changes in the front short sterling contracts⁽¹⁾ on the days of RPIX releases against a measure of the surprises in the RPIX data releases, and a constant term.⁽²⁾ A 95% confidence interval around the expected reaction is also shown. As can be seen, the change in short-term interest rate expectations following the RPIX data release in June was greater than the upper limit of the 95% confidence interval and was thus unusually large.

This sharp change in short-term rate expectations occurred despite the fact that the RPIX inflation data released on 12 June were influenced by a number of temporary factors; the most important of these was a high rate of seasonal food price inflation. Part of the reason for the unusually large interest rate reaction to the data may have been the fact that the inflation figure followed a 3% fall in the sterling effective exchange rate index in early June (for further details see the foreign exchange section on page 274). Together, these two

(1) The most liquid short sterling futures contracts expire in mid-March, mid-June, mid-September and mid-December. The front contract is selected from these four and is the one with the nearest expiry date, except for the months where contracts expire; on the first day of these months, the contract with the next-but-one expiry date is used.

⁽²⁾ The data surprise term used in the analysis is defined as the RPIX inflation outturn minus the median Bloomberg News survey expectation; this difference is then expressed as a fraction of the median survey expectation. The method used here is similar to that described in 'News and the sterling markets', by Brooke, M, Danton, G and Moessner, R, Bank of England Quarterly Bulletin, November 1999.

developments may have added to any concerns that market participants had about a near-term increase in inflationary pressures. Factors relating to trading dynamics, such as hedging using the most liquid short-maturity interest rate futures contracts and the use of automated stop loss trading strategies, were said by market participants also to have contributed to the large daily rise in interest rates. The fact that rates implied by short sterling contracts fell back by around 5 basis points over the two days following the RPIX release was cited by some market participants as evidence that the movement on 12 June had been exaggerated.

In the first half of the period, stronger-than-expected US retail sales and US consumer confidence data, stronger-than-expected UK retail sales and average earnings data, and robust UK house price and CIPS services data also contributed to the rise in short-term sterling interest rate expectations. For short sterling contracts expiring in 2001, these movements were then more than reversed in the second half of the period. The fall in rate expectations reflected the MPC's decision to reduce the Bank's repo rate on 2 August, as well as weaker-than-expected UK industrial production and retail sales data, and falling equity prices. For contracts expiring in late 2002, the decline in rate expectations in the second half of the period only partly reversed the rise in the first half of the period. On 3 August, the rate implied by the short sterling contract expiring in December 2002 was 10 basis points higher than its position on 1 May.

The May, June, and July MPC decisions did not surprise market participants and had very little impact in the sterling money markets. On these announcement days, rates implied by the September 2001 short sterling futures contract changed by only 2 to 5 basis points. Ahead of each of these MPC decisions, economists polled by Reuters assigned a mean probability of 70% or more to the outcome that the MPC actually implemented. In contrast, the MPC's 2 August decision to reduce the official rate to 5% was not anticipated by most market participants. Private sector economists polled by Reuters on 24 and 25 July had attached a mean probability of 81% to no change in the Bank's repo rate. Traders in the sterling money markets appear to have adopted a similar view. Consequently, short sterling futures contracts expiring in September and December 2001 fell by 20 and 24 basis points respectively following the MPC's announcement.

In early August market participants attached more uncertainty to the central interest rate expectations implied by the short sterling futures curve. This was reflected in a rise in the standard deviations derived from options on short sterling futures contracts. The implied standard deviations at the six-month horizon increased markedly on 12 June when the May RPIX data were released, temporarily rising above the levels seen in the United States, but then fell back slightly in the second half of the period (see Chart 8). Over the period as a whole, the skewness of interest rate expectations became positive at the six-month horizon, suggesting that market participants attached a smaller downside risk to the interest rate path implied by short sterling futures contracts. By contrast, the skewness of interest rate expectations became more negative at the three-month horizon, suggesting that market participants attached greater downside risks to future interest rate expectations for early November.

Chart 8 Interest rate uncertainty^(a)



(a) Implied standard deviations of six-month constant-horizon interest rate futures contracts; five-day moving averages.

United States

Over the period, short-term interest rates implied by eurodollar futures contracts fell sharply; data releases, monetary policy decisions and policy statements were all important influences.

The decline in rate expectations partly reflected market participants' perceptions that the economic outlook had deteriorated. The mean US growth forecast for 2001 reported by Consensus Economics was revised down by 0.3 percentage points between 14 May and 9 July (see Chart 1). Short-term interest rate expectations fell following weaker-than-expected non-farm payrolls and industrial production data, and weaker-than-expected manufacturing survey evidence from the National Association of Purchasing Managers. In July, weak equities and concerns about the growth prospects of some of the emerging market economies also contributed to the decline in short-term interest rate expectations. These developments were partly offset, however, by stronger-than-expected retail sales data, University of Michigan confidence data, and some of the weekly initial jobless claims figures.

FOMC decisions during the period also had a significant impact on market expectations. Rates implied by the eurodollar futures contract expiring in September 2001 fell by 10 basis points following the FOMC's decision to reduce its target rate by 50 basis points in May, suggesting that the change had not been fully anticipated by market participants. Following the FOMC's June decision to reduce the Federal funds rate by a further 25 basis points, interest rates implied by eurodollar futures contracts expiring in 2001 and 2002 rose by 8 to 15 basis points. The reason for this was that, prior to the announcement, market participants had been approximately evenly divided between expectations of a 25 or 50 basis point reduction. Short-term rate expectations continued to rise guite sharply on the day after the FOMC decision. Later in the period, eurodollar rates fell following Chairman Greenspan's testimony to Congress on 18 July. Market participants were said to have reacted particularly to the comment that the FOMC would lower rates further if the economy continued to falter.

In contrast to the United Kingdom, interest rate uncertainty at the six-month horizon fell during the period in the United States, but it remained higher than during most of 2000 (see Chart 8). The skewness of rate expectations rose in July to become positive, suggesting that market participants thought that the net downside risks attached to the rate expectations implied by eurodollar futures contracts had diminished. On 3 August, a majority of market participants expected the FOMC to reduce the Federal funds target rate by 25 basis points by the end of the year, but then to begin raising the policy rate in Spring 2002.

Euro area

As in the United States, short-term interest rate expectations in the euro area fell sharply over the period. Both economic data and policy statements were influential, but policy decisions generally had a larger effect. The single biggest daily change in rate expectations occurred on 10 May, when the ECB reduced its refinancing rate by 25 basis points. This decision had not been anticipated by market participants and the rate implied by the September 2001 euribor futures contract fell by 22 basis points on the day. Because the decision on 10 May had been unexpected, market participants were particularly sensitive to official policy statements during the rest of the period. In particular, near-term rate expectations rose by 7 to 9 basis points following a statement by ECB President Duisenberg on 3 July indicating that there was little chance of a rate cut by the ECB at their meeting on 5 July.

The fall in short-term rate expectations over the period as a whole also reflected the weakening economic outlook, with most private sector forecasts for euro-area growth in 2001 being revised down (see Chart 1). Interest rate expectations fell following weaker-than-expected German industrial production data and weak purchasing managers' indices for Germany, France and Italy. This decrease was partly offset, however, by reactions to stronger-than-expected data for euro-area M3, German retail sales, and consumer prices in France and Germany.

On 3 August, most market participants expected the ECB to lower its official rate by 25 basis points by the end of the year. Over the review period as a whole, the uncertainty surrounding these interest rate expectations decreased at the six-month horizon and the skewness attached to them became less negative.

Japan

Forecasts for Japanese growth in 2001 and 2002 were revised down sharply during the period. This may have contributed to a fall in interest rate expectations for euroyen contracts expiring in 2003 and 2004, which fell by around 5 to 25 basis points. Continued forecasts for consumer price deflation in 2001 and 2002, together with a further large fall in equity prices, may also have contributed to the decline in rate expectations implied by longer-maturity euroyen contracts.

Long-term interest rates

As highlighted above, short-term yields fell or were broadly unchanged in the United Kingdom and Japan but fell sharply in the euro area and the United States. UK and Japanese long-dated government bond yields ended the period broadly unchanged but moved within a fairly wide range within the period. Euro-area and US long government bond yields fell by around 10 to 15 basis points (see Charts 9, 10 and 11). Although the net changes in yield curves were relatively small, the day-to-day volatility of government bond markets was generally higher than in Q1.

Chart 9 UK gilt yield curves^(a)



(a) Derived using the Bank's VRP curve-fitting technique. For further details, see Anderson, N and Sleath, J, Bank of England Quarterly Bulletin, November 1999.

Chart 10 US Treasury yield curves^(a)



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

Chart 11 German Bund yield curves(a)



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

Movements in long-dated UK gilt, US Treasury and German Bund yields lacked a clear direction during the period (see Charts 12 and 13). Nevertheless, correlations between the daily changes in ten-year government bond yields were relatively high by recent historical standards, suggesting that a number of common factors influenced all three bond markets.





(a) Zero-coupon spot yields derived using the Bank's VRP curve-fitting technique.

Chart 13 Cumulative changes in ten-year government bond yields since 1 May



The main common influence on the US and European government bond markets was changing perceptions about the severity of the global economic slowdown. Such short-term cyclical considerations appear to have had an unusually large effect on long bond yields during the period. Stronger-than-expected activity data led to increases in long bond yields in the second half of May and in late June, while weaker-than-expected activity indicators helped long bond yields to decline through most of June and July (see Chart 13). In the United Kingdom, the correlation between movements in ten-year gilt yields and the rates implied by the December 2001 short sterling futures contracts was unusually high. In the United States, however, the comparable association between the ten-year Treasury bond and the December 2001 eurodollar futures contract was less pronounced.

There were two other common influences on the movements in government bond yields. First, concerns about the financial stability of Argentina, Turkey and a few other emerging market economies may have caused some investors to shift their funds away from these markets and into the major government bond markets. Market commentators noted that while such portfolio shifts had generally been small, they had, on occasion, contributed to increased demand for gilts, Treasuries and Bunds. Second, falls in equity prices may have contributed to portfolio shifts out of equities and into bonds. Over the period as a whole, however, the correlations between changes in government bonds and equity prices were close to zero. This suggests that such portfolio shifts were less marked than in 2000 Q4 and the first quarter of this year. However, as can be seen from Chart 14, the correlation between the percentage daily changes in bond yields and stock prices did pick up in July.





⁽a) Thirty-day moving averages of the correlation coefficients between the daily percentage changes in the relevant equity index and the relevant government bond yield.

Supply considerations appear to have had only a small impact on long government bond yields over the period. Consensus Economics forecasts for the UK Public Sector Net Cash Requirement in fiscal years 2001–02 and 2002–03 remained broadly unchanged between May and July, suggesting that most market participants did not revise their expectations about future gilt issuance. Chart 15 shows that spreads between ten-year swap rates and gilt yields were broadly unchanged. This tends to support the conclusion that changes in expectations about the future supply of gilts had little effect on gilt yields in May, June and July. Similarly, the amount of sterling-denominated non-government bonds issued during the period was broadly unchanged from Q1 and is therefore unlikely to have affected long bond yields.

Chart 15 Ten-year swap spreads(a)



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

Speculation that the United Kingdom might apply for full membership of the European Monetary Union (EMU) earlier than market participants had previously thought also contributed to the movements in gilt yields during the period. Discussion of this issue by market participants picked up prior to the general election on 7 June. Around this time yield spreads between long-dated sterling and euro-area bonds narrowed as a number of market participants were said to have entered into speculative trades that anticipated a future convergence in UK bond yields on euro-area yield levels. Reflecting these developments, forward short-term interest rates (derived from the gilt yield curve) three, ten and fifteen years ahead rose towards comparable Bund forward rates at the end of May and in early June. Chart 16 shows that the spreads between UK and euro-area ten-year-ahead forward rates narrowed at around this time. However, these effects were short-lived and towards the end of the period the spreads were back to their pre-election levels.

US Treasury yields fell at all maturities over the period as a whole mainly due to the signs of weakening

economic activity. As with the gilt market, however, US government bond yields did not decline consistently through the period. In particular, bond yields rose in the second half of May (see Chart 17). Much of this increase reflected market participants' reactions to the 50 basis point cut by the FOMC on 15 May. This rate reduction was larger than had been anticipated by market participants and sparked some fears that it might increase inflationary pressures in the short to medium term, especially given the stronger-than-expected activity data released at around the same time. Both nominal yields and break-even inflation rates derived from inflation-linked US Treasury securities (TIPs) rose after the FOMC policy move. Towards the end of the period, however, a string of lower-than-expected price data reassured market participants that the FOMC's action was unlikely to increase inflationary pressures. As a result the ten-year break-even inflation rate derived from TIPs fell back by around 30 basis points over the month of June





(a) Spread between three-month forward rates ten years ahead derived from swap curves.

Chart 17





(see Charts 17 and 18). Conventional Treasury yields also fell.







Supply considerations appear to have had relatively little impact on Treasury yield movements during the period. The Consensus Economics forecast for the US Federal budget balance declined, suggesting an expected increase in issuance that might have put upward pressure on Treasury yields. However, these forecast revisions for the budget surplus were relatively small and probably did not contribute very much to the changes in yields observed in May, June and July. Further evidence of this can be seen from the fact that spreads between swap rates and comparable-maturity Treasury yields were broadly unchanged over the period as a whole (see Chart 15).

In the euro area, government bond yields fell following concerns about slowing domestic growth. Bond market participants appeared concerned about the deterioration in euro-area industrial production, which was reflected in a string of weaker-than-expected activity data. Most of the decline in yields occurred at short and medium maturities. At the long end of the yield curve interest rates were largely unchanged, possibly reflecting little change in the expected issuance of government bonds in Germany, France and Italy for the next two years.

Japanese government bond yields were largely unchanged over the period as a whole but were quite volatile within the period. Yield movements reflected the weaker outlook for the domestic economy, speculation about the possibility of an increase in the Bank of Japan's outright purchases of Japanese government bonds (Rinban operations), and volatile Japanese equity prices.

Equity markets

On 3 August, the FTSE 100 index stood at 5547, 6.4% below its level at the beginning of May. All of the other major share price indices also declined (see Table B). Consequently, the S&P 500 and the FTSE 100 indices both ended the period around 20% below last year's peak levels, while the Topix and DAX indices were around 30% down on their 2000 peaks (see Chart 19). On 25 July the FTSE 100 fell to a 33-month low of 5275. Daily volatilities increased until the end of July but remained below the peaks seen earlier in the year.

Table B

International equity market performance

Percentage changes from previous period, in local currencies

	2000	2001	
	Year	Q1 (a)	Q2 (b)
United States			
S&P 500	-10.1	-12.1	-4.1
Wilshire 5000	-11.9	-12.6	-3.6
Europe			
CAC 40	-0.5	-12.6	-10.8
DAX 30	-7.5	-9.4	-8.4
FTSE All-Share	-8.0	-9.1	-6.1
FTSE 100	-10.2	-9.5	-6.4
lapan			
Topix	-25.5	-0.5	-13.6
IT indices			
Nasdag Composite	-39.3	-25.5	-4.7
FTSE techMARK 100	-32.2	-24.8	-22.9
Neuer Markt	-40.1	-38.9	-34.8

Source: Bloomberg.

(a) 1 January to 30 March 2001.(b) 1 May to 3 August 2001.

Chart 19 International equity indices(a)



(a) In local currencies.

During the period much of the fall in the FTSE All-Share index was once again attributable to the IT and telecommunications sectors (see Chart 20). Share price declines were frequently linked to weak profit announcements by firms in these sectors, with the impact of the negative announcements by Marconi and Nokia being particularly marked. These developments

Chart 20 Components of the FTSE All-Share index



were mirrored in other European stock markets but the declines in the S&P 500 and Topix indices were related to falls in a broader range of sectors.

The overall number of profit warnings issued by UK firms fell back in the second quarter from the levels observed in Q1 but remained relatively high (see Chart 21). The decline from Q1 appears to have been due to reduced adverse effects both from foot-and-mouth disease and from poor weather conditions. More than a quarter of the 102 profit warnings issued by UK firms in Q2 were from IT companies. However, as can be seen from Chart 21, the number of profit warnings picked up again in July.

Chart 21 Profit warnings by UK companies(a)



(a) Monthly average number of firms listed on the FTSE All-Share index to issue a profit warning or negative trading statement.

During the reporting period, correlations among the daily movements of the major international share price indices were broadly in line with recent historical norms. However, the correlation between the FTSE 100 and the S&P 500 indices was higher than in Q1, suggesting that

US developments may have had more influence on UK share prices in recent months. There was also a rise in the proportion of UK companies citing US developments as a contributory factor for their profit warnings. This increased association contrasts with the low correlation between movements in US and UK short-term interest rate expectations noted above.

The ongoing divergence between the activity levels of the manufacturing and service sectors of the UK economy⁽¹⁾ was evident in profitability indicators and in equity prices. In the first quarter, the manufacturing sector had a net rate of return on capital employed of 5.3%, below its average level since 1995 of 8.7%; whereas the service sector had a rate of return of 15% in Q1, close to its average since 1995. Reflecting these developments, share prices of firms from the general industrials and basic industries sectors of the UK stock market have risen much less rapidly since 1995 than the share prices of firms in the cyclical services and financial sectors (see Chart 22).





The continued relatively high numbers of profit warnings in both the United States and the United Kingdom have led earnings projections to be revised down since April (see Chart 23). In the United States, forecasts for the annual growth of earnings per share in 2001 became more negative, but forecasts for growth in 2002 have been revised up. In contrast, estimates for the growth of UK earnings per share in 2001 and 2002 were both revised down during the period and now stand at 6.1% and 9.3% respectively.

Uncertainty about the future path of the FTSE 100 index, derived from the implied volatility statistics

Chart 23 Earnings per share forecasts



associated with options on equity futures contracts, rose until the end of July, while the associated skew statistic was little changed. Consequently, the probability attached to a further 10% fall in the FTSE 100 increased during the period. The uncertainty relating to the S&P 500 index fell slightly while the skew was little changed.

Foreign exchange markets

Among the major currencies, exchange rate movements were relatively small over the period as a whole (see Chart 24) and historic volatilities were generally lower than during much of the first quarter of the year. Between 1 May and 3 August, the dollar trade-weighted exchange rate index (ERI) appreciated by 0.6% while the euro and yen ERIs depreciated by 0.5% and 0.9% respectively. The sterling ERI was broadly unchanged, rising by just 0.2%.







(1) See the August 2001 Inflation Report for further details about the current sectoral divergences between the manufacturing and service sectors.

The appreciation of the US dollar was broadly based, although relatively small in magnitude when compared with its appreciation in the first three months of this year. Between 1 May and 3 August it rose by 0.6% against the euro, by 1.1% against the yen and by 0.2% against sterling. In effective trade-weighted terms the dollar reached a new fifteen-year high on 5 July (see Chart 25).

Chart 25

US dollar effective exchange rate index



Foreign exchange market participants have continued to find it difficult to rationalise movements in dollar exchange rates. Changes in interest rate differentials during May, June and July did not provide a particularly useful guide. US interest rates out to ten years ahead generally fell by more than in the United Kingdom and Japan over the period which might have been expected to accompany a depreciation of the dollar against sterling and the yen. US interest rates fell by more than comparable euro-area rates at short maturities, but by less than euro-area rates at two to ten-year maturities.

Market participants generally rationalised the dollar's appreciation against the euro in terms of relative growth prospects. In particular, they highlighted the fact that most forecasts continued to indicate that US GDP growth is expected to outperform euro-area GDP growth in 2002. Less attention was paid to the fact that US growth in 2001 is forecast to be lower than euro-area growth. As noted above, 2001 growth forecasts for the United States were revised down by slightly less than for the euro area; this may help to explain the dollar's appreciation against the euro during the review period. Similarly, forecasts for Japanese growth in 2001 and 2002 were revised down more sharply than comparable forecasts for US growth, consistent with the dollar's appreciation against the yen. In contrast, forecasts for UK growth were revised down by less than forecasts for

US growth; this might have been expected to support an appreciation of sterling against the dollar.

As noted previously, forecasts for the growth rate of earnings per share for US corporates in 2002 were generally revised upwards during the review period, although earnings per share forecasts for 2001 became more negative. For much of the period, measures of equity capital flows produced by investment banks indicated net flows into the United States, a continuation of the pattern observed in the first quarter; the main source of these flows was the euro area. Both of these factors may have contributed to the dollar's appreciation against the euro. Towards the end of the period, however, there was some evidence that this net flow into the United States may have reversed.

Looking ahead, option prices suggest that there was an increase in the perceived risk of a future depreciation of the dollar against the euro (see Chart 26). Skew statistics derived from eurodollar option contracts (one-month risk reversals) remained close to neutral for most of the period but became strongly positive in mid-July, suggesting that there was an increase in the price of insurance for an appreciation of the euro against the dollar. The short-term uncertainty about future movements in the euro-dollar exchange rate (one-month implied volatilities) remained much higher than for sterling against the euro and the dollar (see Chart 27), although it was broadly unchanged over the period.







The sterling effective exchange rate index rose by 0.2% between 1 May and 3 August. Appreciations of 0.4% and 0.9% against the euro and yen respectively were partly offset by a 0.2% depreciation against the generally strong dollar (see Chart 28).

Chart 27 Exchange rate uncertainty^(a)



(a) One-month implied volatilities derived from foreign exchange option contracts.

Chart 28 Sterling bilateral exchange rates



Sterling's appreciation against the euro was consistent with movements in interest rate markets as UK interest rates increased by more during the period than those in the euro area. However, the relationship between sterling's appreciation against the yen and movements in interest rates was less clear. Nevertheless, sterling's appreciation against both currencies was consistent with changes in relative growth prospects.

In the first four months of the year movements in sterling bilateral exchange rates generally reflected developments outside the United Kingdom, while for much of the May to July period domestic news was significant. Sterling's largest intra-day movements during the review period were caused by speculation that the United Kingdom might apply for full EMU membership earlier than the foreign exchange market had previously expected. Over the two days immediately prior to the UK general election on 7 June, sterling depreciated sharply amid market speculation that a re-elected Labour government with a large majority might call an early referendum on the question of adopting the euro as the national currency. Sterling depreciated in particular against the dollar and the euro, falling to a 15-year low against the dollar of \$1.3685 on 8 June. This movement reflected the commonly held assumption in the market that, were the United Kingdom to join the euro area, it would do so at a conversion rate for sterling against the euro that was higher than the £0.59 to £0.62 range within which it had traded for most of the period.

However, the movements in sterling spot and forward exchange rates were not accompanied by changes of a similar magnitude in foreign exchange option prices. Twelve-month implied volatilities for sterling (as derived from sterling-euro and sterling-dollar option contracts) were broadly unchanged over the period as a whole, although they had risen and then fallen back around the time of the euro speculation noted above. If sterling had been expected to depreciate further, volatilities may have been expected to rise over the review period. In addition, the implied correlations between movements in sterling and the euro against the dollar (in other words, the extent to which sterling was expected to move with the euro against the dollar) fell slightly during the period.⁽¹⁾ Thus it is not easy to conclude from these changes in market prices that there was a general shift in the probability attached to an earlier euro-entry date for the United Kingdom. Nonetheless, while sterling subsequently regained most of the depreciation it incurred against the G3 currencies around the time of the general election, the foreign exchange market has remained sensitive to further speculation about the likelihood of full EMU membership for the United Kingdom.

Between May and July, Consensus Economics' forecasts to the end of 2003 were revised down for the value of sterling against the dollar but were revised up for the value of sterling against the euro. Nonetheless, these forecasts continued to indicate an expectation that sterling would appreciate slightly against the dollar and depreciate against the euro over the period to the end of 2003. But any increase in uncertainty within the foreign exchange market about sterling's prospects was

(1) For a discussion of implied correlations, see the article 'Implied exchange rate correlations and market perceptions of European Monetary Union', by Butler, C and Cooper, N, in the November 1997 Bank of England Quarterly Bulletin.

Table C Sterling money markets

Amounts outstanding: £ billions

		Interbank (a)	CDs (a)	Gilt repo (b)	Stock lending (b)	Eligible bills (a)	Commercial paper (a)	Other (c)	Total
1998		150	122	95	35	19	10	4	435
1999		146	142	99	49	14	14	7	471
2000	01	156	132	100	51	14	15	6	474
	Õ2	159	135	124	54	12	16	7	507
	Õ3	162	125	127	53	12	16	7	502
	$\tilde{0}4$	151	130	128	62	11	18	9	509
2001	Õ1	171	141	126	67	13	19	7	544
	$\tilde{0}\tilde{2}$	177	131	128	67	12	22	6	543

Reporting dates are quarter-ends. Reporting dates are end-February for Q1, end-May for Q2, end-August for Q3, end-November for Q4 and end-year. Including Treasury bills, sell/buy-backs and local authority bills.

not reflected in option prices; implied volatilities derived from one-month and twelve-month sterling-dollar and euro-sterling option contracts were broadly unchanged at the end of the period compared with the beginning (see Chart 27), having previously fallen in the first four months of the year. The skews associated with exchange rate options, as indicated by one-month and twelve-month risk reversals for sterling against the euro and the dollar, were broadly neutral at the end of the period. This suggests that the perceived risks to sterling were broadly symmetrical.

The sterling money market

The amount outstanding in the sterling money market, which had grown sharply in Q1, was broadly unchanged in Q2 (see Table C). Changes in the amounts outstanding of three of the main components of the market—interbank deposits, certificates of deposit (CD) and gilt repo-were broadly offsetting.

While 'traditional' money market instruments grew little, there was continued anecdotal evidence of growth in the sterling overnight interest rate average (SONIA) swap market. This is related partly to the fact that SONIA swaps make more efficient use of capital and credit lines than interbank or CD activity because, rather than principal exposure, counterparties are exposed only to the difference between the fixed and floating legs of the deal. Also, SONIA swaps are more flexible instruments, which can be tailored more precisely to the user's maturity and funding requirements.

The average daily turnover in short sterling futures and gilt repo contracts increased between Q1 and Q2 (see Table D). This might have been linked to the sharp changes in expectations for official interest rates this year and the associated change in the shape of the sterling money market curve. Turnover in the overnight

Table D **Turnover of money market instruments**

Average daily amount, £ billions

	<u>1999</u>	2000	2001 Q1	<u>Q</u> 2
Short sterling futures (a)	53	45	62	69
Gilt repo	13.6	17.8	15.7	17.9
Interbank (overnight)	8.0	10.4	10.3	11.1
CDs, bank bills and Treasury bills	n.a.	n.a.	11.8	12.4

n.a. = not available

Sources: CrestCo, LIFFE, Wholesale Markets Brokers' Association and Bank of England. (a) Sum of all 20 contracts extant, converted to equivalent nominal amount.

Chart 29 Daily turnover in the overnight interbank market(a)



Source: Wholesale Markets Brokers' Association

(a) Ten-day moving average of the daily turnover.

interbank market (which is linked to activity in the SONIA swap market) continued at its recent higher levels (see Chart 29).⁽¹⁾

Sterling bond issues

The nominal value of the outstanding stock of gilts increased by £4.2 billion in the second quarter, to £286 billion, after decreasing by £3.7 billion in Q1. The contributions of gilt auctions towards this rise are shown in Table E; the inflation uplift effect on the outstanding

(1) There are no comprehensive data on turnover in the term interbank market.

Table ESterling bond issuance in 2001 Q2

DMO gilt auctions (£ millions)

Conventional	Date 24.05.01	Amount issued 2,500		Stock 5% Treasur	ry Stock 2012		
Index-linked	Date 25.04.01	Amount issued 400		$\frac{\text{Stock}}{2^{1/_2}\%\text{ Inde}}$	x-linked Stock 2011		
Switch auction results	Date	Nominal switched		Source stor	ck	Destination stock	Nominal
	21.06.01	1,400		8 ¹ / ₂ % 2007	7	5% 2012	1,694
Corporate issuance		Amount (£ billions)	D.,	- +			
	Number of issues	Total (a)	AAA	AA/A	BBB and lower		
Fixed-rate issues UK corporates UK financials Supranationals Overseas borrowers Total (a)	39 11 12 17 79	7.1 1.6 1.0 3.3 13.0	2.0 0.0 1.0 1.0 4.0	3.2 1.2 0.0 1.8 6.2	1.8 0.4 0.0 0.5 2.7		
FRNs UK corporates UK financials Supranationals Overseas borrowers Total (a)	9 14 0 15 38	0.9 2.1 0.0 1.7 4.7	0.3 1.1 0.0 0.4 1.8	0.3 1.0 0.0 1.2 2.5	0.2 0.0 0.0 0.1 0.3		

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

(a) Totals may not sum exactly due to rounding.

stock of index-linked gilts also added £1 billion. As noted in the long-term interest rate section above, these supply considerations, together with minimal changes to expectations about future gilt issuance, had little effect on gilt yields over the period as a whole.

Issuance of sterling-denominated non-government bonds remained strong in Q2, at £17.9 billion, almost unchanged from Q1 (see Chart 30). The proportions of new issuance between fixed and floating rate and between short, medium and long-dated maturities also remained broadly unchanged. However, the composition of issuers changed markedly in Q2, with issuance by UK

Chart 30

Total (fixed and floating) sterling-denominated non-government bond issuance



corporates rising strongly to 45% (or £8 billion) of total sterling-denominated non-government bond issuance (see Table E), up from 18% in Q1 (£3.3 billion) and 5.1% in 2000 Q4 (£0.9 billion). Although £1.7 billion of the corporate issuance in Q2 was by a single firm the utility company Welsh Water—the remainder was fairly evenly distributed among 27 other issuers. Furthermore, the proportion of bonds with a credit rating of BBB or lower rose from 9.5% in Q1 to around 17% in Q2, while the share of bonds issued with a AAA credit rating fell to a third.

The strong increase in issuance by UK corporates in the first half of 2001 is likely to have been influenced by three main factors. First, on the supply side, the relative attractiveness of raising equity-based finance is likely to have diminished due to the recent sharp falls in share prices. Second, medium and long-term sterling bond yields are currently at low levels relative to the experience of the past 30 years, thereby improving the relative attractiveness of raising debt through bond issuance. And third, there has been continued strong demand from pension funds (the largest class of institutional investor in the sterling bond market) for non-government bonds. This demand from pension funds has, in turn, been stimulated by three considerations in particular: first, the gradual increase in the maturity of pension fund schemes (as increasing numbers of members are in retirement); second, the need to hedge guaranteed annuity pension schemes sold in the late 1970s and early 1980s; and third, anticipation of the demise of the Minimum Funding Requirement and introduction of the FRS17 accounting standard, which have both stimulated a shift in pension funds' demand for fixed-income assets away from gilts and in favour of other bonds. Chart 31 illustrates that the proportion of pension fund and insurance company financial assets accounted for by non-gilt bonds (issued by UK corporates, UK financials and overseas institutions) has increased sharply since 1998, while the share of gilts they hold has declined.

Chart 31

Insurance corporation and pension fund financial asset allocations^(a)



While bond issuance by UK corporates increased in the first half of this year, sterling-denominated bond issuance by supranationals and other overseas institutions has declined. Market participants have attributed this to a gradual decline in the number of opportunities for such companies to raise finance in the sterling market at lower cost (after swapping the proceeds back into dollars or euros) than in the dollar and euro markets.⁽¹⁾

Despite the continued relatively high level of profit warnings issued by UK firms in Q2 and in July of this year, spreads between sterling-denominated non-government bond and gilt yields were generally little changed in May, June and July (see Chart 32). This, however, is likely to mask some increase in the costs of bond finance faced by UK firms in the telecommunications and IT sectors. This is because many of these firms have, in the past, preferred to issue

Chart 32 Seven to ten-year sterling bond spreads



Source: Merrill Lynch.

(a) Merrill Lynch's BBB sterling bond index includes seven issues; the step decline in the BBB spread in late May related to a single bond dropping out of the index when its maturity fell below seven years.

in the larger dollar and euro bond markets. Any widening in their bond spreads may not, therefore, appear in the sterling bond spreads shown in Chart 32. Marconi, for example, has outstanding bonds in both the dollar and euro markets but has not issued a sterling-denominated bond. In early July, the yields on its bonds increased by more than 200 basis points following its profit warning announcement.

Open market operations

Between May and July, the stock of money market refinancing held on the Bank's balance sheet (which comprises the short-term assets acquired via the Bank's open market operations) averaged £17 billion (see Chart 33). This was unchanged on the previous three-month period; the stock of bank notes in circulation (the principal sterling liability on the Bank's balance sheet) was also unchanged at around £28 billion. Compared with the same period in 2000, however, both the stock of refinancing and the outstanding stock of bank notes in circulation were some £2 billion higher.

During the review period, daily money market shortages averaged £2.3 billion, compared with £2.4 billion from February to April 2001 (see Table F). This slight fall reflected a slower rate of turnover in the stock of refinancing.⁽²⁾ Over the review period, the Bank's

(1) For further details about the costs of raising finance in different currencies, see the box 'International funding arbitrage', on pages 130–31 of the May 2000 *Bank of England Quarterly Bulletin.*

(2) Although most of the Bank's open market operations are conducted via two-week reverse repo transactions, the average rate of turnover of the stock is usually around seven to eight working days. This is because the Bank's counterparties can choose to obtain refinancing by selling eligible bills with less than a two-week residual maturity on an outright basis, or can obtain overnight repo refinancing at a penal interest rate if they choose.

counterparties refinanced 84% of the daily money market shortages at the 9.45 am and 2.30 pm rounds of operations (which largely have a two-week maturity) and 16% at the late rounds, on an overnight basis (see Chart 34). In the previous three-month period 20% of the refinancing had been undertaken on an overnight basis.

Chart 33 Stock of money market refinancing and daily shortages^(a)



Table F Average daily money market shortages

£ millions

1996	Year	900
1998	Year	1,400
2000	Year	2,000
2001	Q1	2,500
	April	2,300
	May	2,900
	June	1,800
	July	2,200

Chart 34 Refinancing provided in the Bank's open market operations



This reduction in counterparties' use of overnight refinancing (and consequent reduction in the average size of the shortage) can largely be explained by the fact that expectations that the MPC would cut interest rates were less strong: as noted on page 268, market expectations of any further reductions in the official rate at the June, July, and August meetings were minimal. When counterparties expect the MPC to reduce the repo rate they choose to take refinancing from the Bank largely on an overnight basis in the days immediately preceding the MPC meeting, even though this might entail a short-term rise in their borrowing costs. This leads to a number of larger daily shortages as refinancing is rolled over from day to day. When counterparties choose to obtain a smaller proportion of the refinancing on an overnight basis, the turnover of the stock of refinancing slows and, consequently, the average size of the shortages decreases.

There was a widespread expectation among market participants that the MPC would reduce the Bank's repo rate at its meeting on 10 May. On the two days prior to this decision the Bank's counterparties chose to take refinancing from the Bank largely on an overnight basis. This produced a record shortage of £8.0 billion on 11 May.

Chart 35 shows various short-dated money market interest rates and the Bank's repo rate. Since December 2000, interbank market rates at a two-week and one-month maturity have become more volatile. Partly in response to these developments, the Bank announced a technical adjustment to its open market operations, by introducing a deposit facility (see the box opposite).

Chart 35 Bank's repo rate and interbank rates



Open market operations deposit facility

With effect from 27 June 2001, the Bank supplemented its open market operations with a daily collateralised liquidity withdrawal facility (in effect, an overnight deposit facility).⁽¹⁾ This was introduced to moderate the extent to which overnight market interest rates trade below the Bank's two-week repo rate. The Bank already had in place an overnight lending facility, which helps to limit the extent to which overnight rates trade above the Bank's repo rate. The deposit facility thus puts the Bank's overnight operations at the end of each day on a more symmetrical basis and should reduce some of the volatility in overnight rates.

The new deposit facility is available to the Bank's counterparties at 3.30 pm every business day. To ensure that the new facility does not discourage active trading between market participants, the interest rate that the Bank pays on overnight deposits has initially been set at 100 basis points below the Bank's repo rate. For similar reasons the interest rate the Bank charges on its existing 3.30 pm lending facility is currently 100 basis points above the Bank's repo rate. In all other respects the Bank's daily open market operations remain unchanged. The new deposit facility therefore provides the market with an additional option, but

counterparties are free to determine for themselves whether they use it.

Counterparties used the deposit facility on five days between 27 June and 3 August (on two of these occasions, only small deposits were made with the intention of testing systems). In order to leave the market square by close of business, on each occasion that the facility was used the Bank increased the amount of refinancing available at the 4.20 pm settlement bank late repo facility by the size of the deposit and, on each occasion, the settlement banks borrowed the full amount of refinancing available. On days when sizable deposits were made, the overnight unsecured rate had traded in the market at, or less than, 100 basis points below the Bank's reportate. In effect, the deposit facility rate provided a 'floor' to the interbank overnight rate. By comparison, in the year before the introduction of the facility, the overnight rate had traded more than 100 basis points below the Bank's repo rate on 48 days.

The Bank will continue to monitor closely the use and effectiveness of the new facility, and will be ready to consider adapting its features in the light of experience and in response to feedback from market participants.

(1) The full technical details are contained in a supplement to the Bank's Operational Notice, which can be found on the Bank's web site at www.bankofengland.co.uk/markets/money/mmopnot.htm

After the introduction of the deposit facility, the Bank adjusted the amount by which it left the market short following the 9.45 am round of operations, even when the available refinancing had been fully bid for by counterparties. Since December 2000, this amount had been £1 billion. On 17 July, this was reduced to £800 million; and on 24 July, it was reduced further to £600 million.

There was one day of money market surplus during the review period (22 May). This was absorbed by a short-maturity gilt repo, executed by a competitive rate tender, at an average interest rate of 4.87%, a rate similar (as on the two previous surpluses in March and April 2001) to the prevailing market GC repo mid rate at the time the operations were conducted.

Gilts accounted for around 60% of the stock of collateral taken by the Bank in its open market operations during May, June and July (see Chart 36). Euro-denominated eligible securities⁽¹⁾ (issued by EU governments and

Chart 36 OMOs—instrument overview^(a)



(a) This chart shows the average shares of the various instruments held by the Bank as collateral for open market operations from May to July 2001. Figures in brackets relate to February to April 2001. Figures may not sum to 100% because of rounding.

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

supranational bodies) accounted for 27% of the collateral, up from 23% in the three months to end-April.

HM Treasury and Bank of England euro issues

The Bank of England continued to hold regular monthly auctions during the period. Each month, $\in 1$ billion of bills were auctioned, comprising $\in 200$ million of one-month, $\in 500$ million of three-month and $\in 300$ million of six-month Bank of England Bills. The stock of euro bills outstanding was therefore maintained at $\in 3.5$ billion throughout the period. Each monthly auction continued to be oversubscribed, with auctions being covered an average of 4.8 times the amount on offer. Bids were accepted at average yields of between Euribor minus 14.6 to 7.3 basis points for the relevant maturities.

On 17 July, the Bank reopened (for the second time) the Bank of England Euro Note maturing on 29 January 2004 with a further auction of €500 million, raising the total of this note outstanding with the public to €1.5 billion. The auction was covered 4.9 times the amount on offer and accepted bids were in a range of 4.470% to 4.495%. The final reopening auction of this Bank of England Euro Note is scheduled for 16 October 2001.

UK gold auctions

The programme of gold auctions held by the UK government continued in the period under review. Twenty tonnes of gold were sold at the auction on 15 May; a price of \$268.00 per ounce was achieved and the auction was covered 3.7 times. A further twenty tonnes were sold at the auction on 11 July; a price of \$267.25 per ounce was achieved and the auction was covered 4.1 times. The next auction in the programme will be held on 12 September 2001.

Public attitudes about inflation: a comparative analysis

By Kenneth Scheve of the Bank's International Economic Analysis Division.(1)

This article analyses public opinion in advanced economies to assess what individual citizens think about inflation. Opinion surveys suggest that the general public is inflation averse, but that there is significant variation across countries and over time. Evidence is presented that average inflation aversion is sensitive to factors affecting the expected costs of inflation.

Introduction

This article examines public opinion in advanced economies to assess what the general public thinks about inflation. Are individual citizens concerned about inflation? How important a public policy issue do they think it is? What influences their opinions about inflation? Does opinion about inflation vary across countries and, if so, what accounts for this variation? The opinion surveys examined in this article suggest that the public is generally inflation averse, but that there is significant variation across different countries. Evidence is presented that average inflation aversion is sensitive to factors affecting the expected costs of inflation for individual countries at particular times.

What does the public think about inflation?

A large body of public opinion research has shown that across a diverse array of countries, individual citizens generally have a strong aversion to inflation.⁽²⁾ Evidence supporting this characterisation has generally relied on fairly straightforward questions asking individuals to indicate how concerned they are about rising prices or how important they think inflation is as a public policy issue.

Although the wording of the question influences the exact pattern of individual responses, answers generally suggest high levels of concern about inflation. For example, survey respondents in the United Kingdom

have been asked the following question about the rising price of consumption goods:

How concerned are you about the rising price of food and other consumer goods?

Per cent

	1992	1994	1 <u>996</u>
Great deal Gair amount Not much Not at all	47 39 13 1	37 46 17 1	$ \begin{array}{r} 34 \\ 44 \\ 20 \\ 2 \end{array} $

Source: British Household Panel Study

Between 75% and 90% of respondents say that they are a 'great deal' or a 'fair amount' concerned about rising prices. The annual inflation rates (RPIX) in the United Kingdom for 1992, 1994 and 1996 were 3.7%, 2.5% and 3.1% respectively. Thus the surveys show that levels of concern about inflation are high, even when inflation is relatively low.(3)

Rephrasing the question so that individuals are faced with a simple choice between whether price stability is a very important issue or not does little to change the picture of a generally inflation-averse public. When asked this type of question, typically 75% to 95% of respondents give the 'very important' answer.⁽⁴⁾

Public concern about inflation is also evident in the impact that changes in inflation have on the popularity of incumbent governments. Time series analyses have shown that higher inflation rates are associated with lower government approval ratings and reduced vote

(1) Kenneth Scheve is assistant professor of political science at Yale University, and visited the Bank from September 2000 to July 2001.

⁽²⁾ See, for example, Alt (1979), Anderson (1995), Hibbs (1987), Lewis-Beck (1988), Sekhon (1999) and Shiller (1997).

⁽³⁾ The views of UK respondents to questions about the government's inflation target also show concern about low levels of inflation. The Bank's inflation attitudes survey reports that when asked whether the 2.5% inflation target is too high, too low, or about right, most respondents give the 'about right' response. But among those giving a dissenting view, more than three times as many choose 'too high' as 'too low'. See Bank of England (2001). (4) See, for example, UK responses to the 1988 Eurobarometer survey.

intentions for incumbent political parties.⁽¹⁾ Although this effect varies in magnitude across different countries and different time periods, the sensitivity of government popularity is evident across a wide variety of countries. This relationship indicates a demand for low inflation among the general public. Individuals value strong economic performance in general and low inflation in particular, and evaluate governments partly based on these outcomes.⁽²⁾

The intensity of the public's inflation aversion is evident in the proportions indicating concern about inflation. Another indicator can be constructed by asking respondents how important they think price stability is relative to other public policy issues. For example, in a 1995 survey a sample of US respondents was asked: 'Do you agree that preventing high inflation is an important national priority, as important as preventing drug abuse or preventing deterioration in the quality of our schools?' The results revealed that 84% of respondents agreed with this statement.⁽³⁾

Generally, survey evidence suggests a very clear characterisation of public opinion about inflation. Overwhelming majorities are concerned about inflation and rank price stability among the most important public policy issues.

Why do people dislike inflation?

The reasons why people generally dislike inflation are diverse. There is substantial variation in the theories of inflation that individuals construct and therefore in their perceptions of the consequences of inflation for their economic welfare. Importantly, individuals do not typically construct sophisticated explanations for why inflation occurs and for what its impact is likely to be. Nevertheless, many of the concerns of the general public are related to the costs of inflation that are highlighted in economists' models. Moreover, inflation is a salient public policy issue in most countries, and individuals are able to collect relevant information about prices through their consumption of economic news as well as via their daily activities as consumers and workers. This information allows them to develop general opinions about the costs and benefits of inflation that, while not necessarily the product of complex economic theories, may summarise and depend on many of the same factors identified in economic models.⁽⁴⁾ This section briefly summarises the main sources of public concern about inflation, and how these concerns relate to the costs of inflation emphasised by economists.

Studies of public opinion suggest that individuals' main concern about inflation is that they believe that it harms their standard of living.⁽⁵⁾ Robert Shiller (1997) provides the most extensive recent evidence based on surveys conducted in the United States, Germany and Brazil. He finds that respondents are chiefly concerned that their incomes will not keep pace with inflation. Economists often label this perception the 'inflation fallacy', because there is little reason to think that wages and prices do not move together resulting in no change in real incomes. Public opinion scholars have noted that this view may in part be the result of the tendency of individuals to attribute increases in their nominal wages to their own skills and effort rather than reflecting simple changes in price levels. Shiller probes respondents' reasons for thinking that inflation hurts their real incomes and finds further evidence to support this argument. Individuals do not have clear ideas about how their wages are determined that correspond with market-driven models. Consequently, they do not necessarily believe that their wages and other sources of income will adjust to inflation, and at the very least are uncertain about such adjustments.

Although confusion about how prices and wages interact certainly seems to play a role in the public's concern about the effects of inflation on standards of living, this concern probably depends also on the actual economic costs of inflation. A substantial literature has demonstrated that inflation can have a significant negative impact on economic growth and welfare.⁽⁶⁾ This literature focuses on two types of costs of inflation when inflation is perfectly anticipated and the economy is fully indexed for changes in the price level. First, shoe-leather costs are the costs of economising on real money balances. In an inflationary environment in which no interest is earned on cash balances, individuals

⁽¹⁾ See, for example, Anderson (1995), Hibbs (1987) and MacKuen, Erikson and Stimson (1992).

⁽²⁾ This interpretation of the empirical relationship between inflation and government popularity is reinforced by the public's responses to survey questions that ask them directly whether they think price stability is an important

responsibility of the government. Typically 80% to 95% of respondents agree that it is. See, for example, UK responses

to the International Social Survey Program's question (1985, 1990 and 1996) on this point. (3) See Shiller (1997).

⁽⁴⁾ For more information on low-information rationality in public opinion about the economy, see MacKuen, Erikson and Stimson (1992).

⁽⁵⁾ See Alt (1979), Hibbs (1987) and Shiller (1997).

⁽⁶⁾ See Bakhshi, Haldane and Hatch (1997), Barro (1995), Briault (1995), Feldstein (1997) and Joyce (1997).

will tend to hold less cash and make more trips to the bank. These trips cost time and effort and reduce economic welfare. The second set of costs is menu costs. Inflation makes it necessary to change price lists more often. From a more general perspective, the costs of indexing all contracts and the tax system might also be considered menu costs.

The magnitude of shoe-leather and menu costs, however, are generally thought to be small compared with the costs associated with inflation when it is imperfectly anticipated and/or the economy is not fully indexed. High inflation generates uncertainty about future inflation that creates costly distortions in the economy.⁽¹⁾ For example, uncertainty makes it more difficult for the price mechanism to work efficiently. Economic agents have greater difficulty in distinguishing between relative or real price changes and nominal or inflationary ones. Inflation uncertainty may have its most significant impact through its negative effect on productive investment. Inflation uncertainty raises the cost of capital and encourages unproductive investment in real assets, such as housing, as a hedge against inflation.

A number of studies have also shown that inflation generates costs because of its interaction with existing economic institutions that are less than perfectly indexed. For example, current tax systems are not fully indexed and effective tax rates are affected by rates of inflation. Feldstein (1997) and Bakhshi, Haldane and Hatch (1997) argue that this generates consumption distortions as inflation reduces the real post-tax return that savers receive, in effect raising the price of delayed consumption. This lowers future consumption from its optimal level, imposing what both studies estimate to be a substantial welfare loss. These analyses also show other costs associated with the interaction between existing tax systems and inflation, such as increasing over-investment in housing by accentuating the negative effects of interest relief on mortgage payments.⁽²⁾

These costs suggest that there may be more to the public's link between inflation and standards of living than confusion about the relationship between prices and wages. In fact, evidence shows that individuals make the connection between inflation and relatively poor real economic performance explicitly. For example, Shiller (1997) finds that individuals associate inflation with economic instability and low growth. A natural explanation for this association is the costs of inflation that economists have emphasised as being important.⁽³⁾ A further factor contributing to the public's association between inflation and lower standards of living is the distributional effects of inflation. Unanticipated inflation redistributes wealth from creditors to debtors and from individuals who receive fixed incomes to those who pay them. These unplanned redistributions from inflation certainly lead to lower standards of living for those individuals exposed to losses.⁽⁴⁾

The belief that inflation has a negative effect on an individual's standard of living is not the only source of the public's inflation aversion. In addition to real income considerations, individuals often cite inconveniences associated with inflation, such as making comparison shopping and planning for the future more difficult. These inconveniences have obvious connections with the costs that economists attribute to uncertainty about future inflation, discussed above. Another source of concern is the perception that inflation provides the opportunity for some economic agents to take advantage of others.⁽⁵⁾ Recall that higher inflation is associated with greater inflation uncertainty. Economic models predict unplanned redistributions of wealth and income from unanticipated inflation. While unplanned redistributions do not indicate that anyone will necessarily be taken advantage of, it seems likely that such redistributions would create such a perception.

Not all of individuals' concerns about inflation are as clearly related to economic considerations. For example, there is some evidence that individuals dislike inflation

See Joyce (1997) for discussion of the relationships between inflation, inflation variability and inflation uncertainty.
 The interaction between inflation and the tax system also generates some economic benefits that are discussed below and are accounted for in Feldstein's and Bakhshi, Haldane and Hatch's analyses.

⁽³⁾ This association also may be influenced by how individuals experience some supply shocks (see Mankiw (1997)). Negative supply shocks result in changes in relative prices, which individuals experience as rising prices that reduce their standards of living. Thus an inflationary environment due to the accommodation of a negative supply shock may also be a period of low growth. Individuals experiencing such periods, for example the 1970s in many oil-importing countries, will reasonably associate inflation with low growth. The association between inflation and economic instability may also be empirically correct as high rates of inflation may be a signal of bad policy generally that leads to poor real economic performance.

⁽⁴⁾ These redistributions mean that some individuals benefit from inflation, so that the overall effect of unplanned redistributions on attitudes toward inflation depends on the distribution of winners and losers and how expected gains and losses are weighed in individuals' assessments.

⁽⁵⁾ See Shiller (1997).

because they believe it will weaken the country's currency and thus damage its national prestige.⁽¹⁾ Further, some individuals associate inflation with political instability, and seem to believe that the causation runs from inflation to political instability, rather than the reverse.⁽²⁾

This section and the preceding one have summarised a number of important insights of public opinion and economics research about attitudes toward inflation. The key points from this review are that citizens are generally inflation averse and that the sources of their concerns are partly determined by perceptions of inflation's impact on national economic performance and on individual welfare. This discussion raises a number of important empirical questions. Most obviously, public dislike of inflation does not imply that there is not variation across different individuals and countries. In fact, to the extent that the costs of inflation appear to be an important determinant of public opinion about inflation, there are substantial reasons to believe that the assessment of these costs and thus public opinion will vary systematically across individuals and countries. The remainder of this article examines country-level variation in public opinion about inflation.

A cross-country measure of the demand for low inflation

The substantial literature on the political economy of macroeconomic policy-making provides a theoretical structure for analysis of cross-country variation in the demand for low inflation.⁽³⁾ In these models, voters and policy-makers are assumed to have utility or loss functions that depend on inflation and output or unemployment. The exact functional form of the utility or loss functions varies across different contributions to the literature, but the main intuition is that utility or welfare is decreasing in both the inflation rate and the unemployment rate.⁽⁴⁾ Importantly, the utility or loss functions also include parameters that indicate the relative weight of inflation and unemployment in

contributions to utility or losses. These parameters therefore indicate the voter's or policy-maker's inflation aversion, ie how the individual assesses the relative costs and benefits of inflation and unemployment.

To measure inflation aversion across countries, the article uses survey data from 20 advanced economies collected in various years between 1976 and 1997 by the International Social Survey Program and the Eurobarometer. The measure of inflation aversion from these surveys is based on responses to a question about macroeconomic priorities similar to the following Eurobarometer item:

What do you think the 'national' government should give greater priority to, curbing inflation or reducing unemployment?⁽⁵⁾

This question requires respondents to reveal explicitly how important they think low inflation is relative to the problem of unemployment. The key criterion in assessing whether this is a good measure of inflation aversion as defined above is whether responses to the question will be sensitive to individuals' assessments of the relative costs and benefits of inflation and unemployment.⁽⁶⁾ This expectation seems at least ex ante reasonable and the empirical work below bears out this assumption. It must be recognised, however, that individual responses to this question depend on the economic context in which the question is asked. Consequently, answers to this question, taken in isolation, can be thought of as eliciting the individual's context-specific demand for low inflation. Just as 'utility' in the theoretical literature depends on current inflation and unemployment rates, answers to this question will depend on the same factors as well. Inflation aversion itself-assessments of the relative costs and benefits of inflation and unemployment—is therefore measured by responses to the question controlling for the current economic context.

There are at least three alternative strategies for measuring the demand for low inflation. The first is to

⁽¹⁾ See Alt (1979), Hibbs (1987) and Shiller (1997).

⁽²⁾ See Shiller (1997).

⁽³⁾ Among the many important theoretical contributions in this literature, see Barro and Gordon (1983a, 1983b), Cukierman and Meltzer (1986), Hibbs (1987), Kydland and Prescott (1977), Lohmann (1992), Persson and Tabellini (1990), Rogoff (1985) and Walsh (1995).

⁽⁴⁾ The microfoundations for these utility functions as well as the exact functional form are a subject of some debate in the literature. Nevertheless, there is considerable empirical evidence consistent with the main idea that individuals think that unemployment, low growth and inflation are undesirable macroeconomic outcomes. Some of the evidence with respect to inflation is reviewed above.

⁽⁵⁾ See the appendix on page 292 for further description of the data sources and methods used to construct the dataset.
(6) Note that although there is no long-run trade-off between inflation and unemployment in standard economic models, individuals' assessments of the relative costs of inflation and unemployment are still a relevant and important feature of the utility functions specified in these models. For example, these preferences influence the determination of optimal disinflation paths and responses to exogenous shocks. See Barro and Gordon (1983b) and Di Tella, MacCulloch and Oswald (2001) for further discussion.

ask individuals survey questions specifically about inflation without reference to other macroeconomic policy objectives. For the analysis in this article, the major disadvantage of this approach is that there is no budget constraint or price explicit in the question. As noted earlier, the evidence suggests that most people can be expected to think that prices should be kept under control even if they disagree strongly about the relative importance of various economic policy objectives. The second approach is to measure the sensitivity of government popularity to inflation performance. While this method avoids problems with question wording in surveys, the relationship between government popularity and inflation depends on each country's political and economic institutions, and this variation makes it extremely difficult to construct comparable measures across countries. The third alternative implemented by Di Tella, MacCulloch and Oswald (2001) is to estimate the sensitivity of individuals' reported 'happiness' or 'life satisfaction' to inflation and unemployment. As previously implemented, this approach yields a single estimate of inflation aversion for a group of countries and it is not clear that single-country estimates using this method would be sufficiently precise to use as the dependent variable in the cross-country analysis in this article. Nonetheless, this method should be considered complementary to the more direct method employed in this article based on answers to the survey question about inflation and unemployment.

Each of the surveys used in this article asks a question having the same structure as the one cited above. The dependent variable in the analysis below, *Inflation Priority*, is the percentage of respondents in each survey indicating that inflation should be given priority. The mean percentage for the 44 surveys is 37.3 with a standard deviation of 11.7. The appendix on page 292 gives details of the data sources and methods used to construct the dataset.

Explaining variation in the demand for low inflation

This section evaluates some factors that may affect the public's macroeconomic priorities. The general framework used in this section for explaining variation in the demand for low inflation is that average public inflation aversion depends on the relative costs of inflation and unemployment. The starting-point for this analysis is examination of the impact of economic context on responses to the Inflation Priority question. The costs of inflation are increasing in the inflation rate, suggesting a positive relationship between actual inflation rates and the Inflation Priority dependent variable. Similarly, the costs of unemployment decrease with robust real economic activity and so economic expansions are likely to increase the percentage of respondents placing priority on reducing inflation. To test these hypotheses, the Inflation Priority measure in each of the 44 surveys is regressed on annual inflation rates and the estimated output gap for each country in the year in which the survey took place. The Inflation measure is the annual percentage change in the consumer price index.⁽¹⁾ The Output Gap variable is constructed by the OECD and is equal to the percentage difference between actual GDP in constant prices and estimated potential output. Consequently, as this measure increases, real economic activity is stronger so the expected costs of unemployment to the average individual are lower. This suggests a positive relationship between this measure of real economic activity and Inflation Priority. The parameter estimates from this regression are reported in the appendix. The key results of this analysis can be seen by examining Charts 1 and 2.

Chart 1 is a partial regression of *Inflation Priority* on *Inflation*. The variable plotted on the vertical axis is the part of *Inflation Priority* not explained by the variable *Output Gap*. The variable plotted on the horizontal axis is that part of the *Inflation* measure orthogonal to—ie

Chart 1 Inflation Priority higher with increased inflation rates



Notes: The variable plotted on the vertical axis is the part of *Inflation Priority* not explained by the variable *Output Gap*. The variable plotted on the horizontal axis is that part of the *Inflation* measure orthogonal to *Output Gap*. The partial regression line has an estimated slope of 0.992 with a standard error of 0.405. *Inflation Priority* is higher with increased inflation rates.

(1) Taken from the World Bank's Global Development Finance & World Development Indicators.

not correlated with-the Output Gap variable. This comparison assesses the marginal effect of annual inflation rates on Inflation Priority controlling for the estimated Output Gap. The chart indicates a positive relationship between the two variables. The estimated slope of the ordinary least squares regression line through these points is 0.992 with a standard error of 0.405. This indicates that, holding the Output Gap variable constant, the percentage of respondents placing priority on 'reducing inflation' increases by about 1 percentage point for a 1 percentage point increase in the inflation rate. This effect is statistically significant and is substantively important as well, given that the standard deviation of the Inflation Priority variable in this sample is 11.7 percentage points. As expected, the public's response to the survey question depends on the economic context in which it is asked. The costs of inflation increase with higher inflation rates, and concern among citizens about inflation increases accordingly.

Chart 2 is a partial regression of *Inflation Priority* on *Output Gap.* This chart again evaluates marginal relationships. Controlling for the inflation rate, how do current levels of real economic activity affect individuals' macroeconomic priorities? Chart 2 also indicates a positive relationship and the estimated slope of the regression line is 2.521 with a standard error of 1.027. An increase of 1 percentage point in the difference between actual and potential output is, all else equal, associated with an increase of about 2.5 percentage

Chart 2 Inflation Priority higher as real activity increases



Notes: The variable plotted on the vertical axis is the part of *Inflation Priority* not explained by the variable *Inflation*. The variable plotted on the horizontal axis is that part of the *Output Gap* variable orthogonal to *Inflation*. The partial regression line has an estimated slope of 2.521 with a standard error of 1.027. *Inflation Priority* is higher as real activity increases.

(1) See Barro and Gordon (1983b).

points in the *Inflation Priority* measure. This result is consistent with the idea that as actual output exceeds potential, times are good. The perceived costs of unemployment are likely to be lower, so individuals are more likely to place emphasis on price stability.

But variation in levels of unemployment across countries is not simply the result of being in different stages of the economic cycle. Unemployment also varies because of more fundamental structural factors. So individuals' macroeconomic priorities may depend not only on the extent to which actual output exceeds potential but also on the level of structural unemployment. This level of unemployment is called the non-accelerating inflation rate of unemployment (NAIRU) and has been recognised in the theoretical political economy literature as a relevant consideration in the assessment of the macroeconomic priorities of individual citizens and policy-makers.⁽¹⁾ Responses to the inflation priority question are sensitive to the relative costs of inflation and unemployment. The costs of unemployment are, of course, greater when the NAIRU is higher and so this is likely to be a consideration as individuals set their macroeconomic objectives.

Chart 3 plots *Inflation Priority* against *NAIRU* as estimated by the OECD. It is a partial regression plot for which the conditioning variables are *Inflation* and *Output Gap*. Controlling for these variables, the chart indicates a significant negative relationship between *Inflation Priority* and *NAIRU*. The estimated slope of the

Chart 3 Inflation Priority lower with higher NAIRU



Notes: The variable plotted on the vertical axis is the part of Inflation Priority not explained by the variables Output Gap or Inflation. The variable plotted on the horizontal axis is that part of the NAIRU variable orthogonal to Output Gap and Inflation. The partial regression line has an estimated slope of -1.176 with a standard error of 0.288. Inflation Priority is lower with a higher NAIRU.

regression line is –1.176 with a standard error of 0.288. This is a statistically and substantively significant correlation. In evaluations of the relative costs of inflation and unemployment, real activity consistent with stable prices is not the only consideration. Unemployment is costly even if it is structural, and these costs affect assessments of macroeconomic priorities.⁽¹⁾

As discussed above, the costs of inflation literature focuses substantial attention on the effects on welfare of the interaction between inflation and the tax system. The research shows that this interaction can have substantial negative effects. These negative effects are balanced against the recognition that inflationary finance of government expenditures can have some benefits. If non-distortionary lump sum taxes are not available, then raising revenue through the inflation tax may be better than other forms of taxation that distort economic behaviour. Inflation is still costly, and these costs will limit the extent to which it should be used as a source of revenue. How important a consideration this is in evaluating the relative costs of inflation and unemployment is likely to depend on the demand for government revenue.

Suppose this demand is assumed to be exogenous, depending on tastes for public services and current or past military needs. Two reasonable indicators of this demand are total government expenditure as a percentage of gross domestic product, *Government Spending*, and total debt as a percentage of gross domestic product, *Debt*. To test the hypothesis that inflationary finance considerations affect assessments of the relative costs of inflation and unemployment, the *Inflation Priority* measure is regressed on *Inflation, Output Gap, NAIRU, Government Spending*, and *Debt*.

Chart 4 reports the key result for this analysis. The variable plotted on the vertical axis is that part of *Inflation Priority* not explained by *Inflation, Output Gap, NAIRU,* or *Debt.* The variable plotted on the horizontal axis is that part of *Government Spending* uncorrelated with the same conditioning variables. The chart indicates that, holding these factors constant, there is a negative relationship between *Government Spending* and the *Inflation Priority* measure. The

Chart 4 Inflation Priority decreases with higher government spending



Notes: The variable plotted on the vertical axis is the part of *Inflation Priority* not explained by the variables *Output Gap, Inflation, NAIRU* or *Debt.* The variable plotted on the horizontal axis is that part of the *Government Spending* variable orthogonal to *Output Gap, Inflation, NAIRU* and *Debt.* The partial regression line has an estimated slope of -0.730 with a standard error of 0.115. *Inflation Priority* decreases with higher government spending.

estimated slope of the regression line is -0.730 with a standard error of 0.115. The correlation is then both substantively and statistically significant. The estimates for the marginal effect of *Debt* are also negative though of smaller magnitude and not statistically significant. Overall, the evidence is consistent with the argument that average inflation aversion is lower in countries that have a greater demand for government revenue, whether it is due to a taste for public services or some other factor.⁽²⁾

Another important difference among countries that may affect public assessments of the relative costs of inflation and unemployment is how open the national economy is to international trade. The general intuition in the literature is that inflation is more costly in more open economies.⁽³⁾ The reasoning on which this hypothesis is based differs across accounts. However, the intuition that higher inflation is correlated with greater uncertainty about future inflation and greater real exchange rate volatility, which is more costly in more open economies, is sufficient for the current analysis.

Chart 5 evaluates this hypothesis using the standard measure of trade openness of imports plus exports as a percentage of gross domestic product. It is a partial regression conditioning on *Inflation, Output Gap, NAIRU, Government Spending,* and *Debt.* There is no

⁽¹⁾ Note that this wedge between actual and potential output is assumed in many of the theoretical models in the political economy literature. See for example Barro and Gordon's discussion of the parameter k in their utility function (1983b).

⁽²⁾ An alternative interpretation of this correlation is that high levels of government spending may indicate preferences for

mitigating adverse outcomes in the labour market. Respondents with such preferences would be more likely to weigh the costs of unemployment heavily in the formation of their macroeconomic priorities.

⁽³⁾ See for example Frieden (2001), Lane (1995) and Romer (1993).

evidence in this sample that individuals in more open economies are more inflation averse. The estimated slope of the regression line is virtually zero and is not statistically significant. There is in fact no support for the hypothesis in this sample, regardless of the set of conditioning variables chosen.

Chart 5

Inflation Priority not correlated with trade openness



Notes: The variable plotted on the vertical axis is the part of Inflation Priority not explained by the variables Output Gap. Inflation, NAIRU, Debt or Government Spending. The variable plotted on the horizontal axis is that part of the Openness variable orthogonal to Output Gap. Inflation, NAIRU, Debt and Government Spending. The partial regression line has an estimated slope of -0.018 with a standard error of 0.027. Inflation Priority is not correlated with trade openness.

Another important argument in the literature on the determinants of inflation outcomes is that the size and structure of the financial sector is an important factor affecting the choice of monetary institutions, policy, and ultimately economic outcomes.⁽¹⁾ The basic idea is that the financial sector, particularly firms engaged in traditional commercial lending, has a strong preference for price stability. Strictly interpreted, this argument might apply only to the distribution of preferences about macroeconomic priorities—ie it implies that the financial sector is more inflation averse than the rest of society. However, a large financial sector might affect average levels of inflation aversion at the margin, both directly through individuals employed in the sector and indirectly through the sector's influence on the media.

Chart 6 evaluates this hypothesis based on a regression of Inflation Priority on Inflation, Output Gap, NAIRU, Government Spending, Debt, and Financial Employment. Financial Employment measures employment in the financial sector as a percentage of total employment. The partial regression in Chart 6 indicates a positive relationship between Financial Employment and Inflation Priority. The estimated slope

(1) See Posen (1995).

Chart 6





Notes: The variable plotted on the vertical axis is the part of Inflation Priority not explained by the variables Output Gap, Inflation, NAIRU, Debt or Government Spending. The variable plotted on the horizontal axis is that part of the Financial Employment variable orthogonal to Output Gap, Inflation, NAIRU, Debt and Government Spending. The partial regression line has an estimated slope of 0.886 with a standard error of 0.354. Inflation Priority increases with greater employment in the financial sector.

of the partial regression line is 0.886 with a standard error of 0.354. This evidence suggests greater inflation aversion in countries with larger financial sectors.

These analyses have suggested that public opinion about macroeconomic policy appears to be influenced by factors that affect the relative costs of inflation and unemployment. This section has evaluated a number of such factors, although the review is certainly not exhaustive. It may be possible to explain some of the remaining variation by including additional factors that affect the costs of inflation and unemployment across countries. Alternatively, this variation in inflation aversion may be due to various factors unique to specific countries over particular time periods. For example, a common argument is that historical experiences of extraordinary periods of inflation, and possibly subsequent political instability, may significantly influence public perceptions of the costs of inflation. This argument is often applied to explain the stylised characterisation of the German public as particularly inflation averse.

Another factor not accounted for in this analysis that may affect the public's assessment is the impact of the media and political elites. The media and elites influence the information sets on which individuals base their opinions about macroeconomic priorities. This may have a systematic impact on opinions if there are important differences across countries or over time. For example, there is some evidence in this dataset that individuals in advanced economies have become more inflation averse over time, which is consistent with the view that elites have placed greater emphasis on the costs of inflation and the benefits of price stability in recent years.

Conclusion

This article has examined public opinion about inflation in advanced economies. Evidence presented in this study as well as in previous research suggests that the public is generally inflation averse. Overwhelming majorities are concerned about rising prices, and this concern is evident even in low-inflation environments. The sources of individuals' distaste for inflation are diverse. Nonetheless, it seems clear that these concerns are influenced by the costs of inflation to individuals personally and to the national economy as a whole.

This characterisation of the public as generally inflation averse does not imply that there is not interesting variation across different countries. This article has presented evidence that inflation aversion varies across countries, and that a significant proportion of this variation is accounted for by factors influencing the costs of inflation to each country's economy.

Appendix

Data

The survey data used to construct the dependent variable, *Inflation Priority*, come from the following sources:

Country	Year	Source
Australia	1986	ISSP(1) 1985
Australia	1990	ISSP 1990
Australia	1996	ISSP 1996
Austria	1986	ISSP 1985
Austria	1997	Furobarometer 48 0
Relgium	1976	Eurobarometer 5.0
Belgium	1997	Eurobarometer 48.0
Canada	1996	ISSP 1996
Denmark	1976	Eurobarometer 5.0
Denmark	1997	Eurobarometer 48.0
Finland	1997	Eurobarometer 48.0
France	1976	Eurobarometer 5.0
France	1997	Eurobarometer 48.0
France	1997	ISSP 1996
Germany	1976	Eurobarometer 5.0
Germany	1985	ISSP 1985
Germany	1990	ISSP 1990
Germany	1996	ISSP 1996
Germany	1997	Eurobarometer 48.0
Greece	1997	Eurobarometer 48.0
Ireland	1976	Eurobarometer 5.0
Ireland	1991	ISSP 1990
Ireland	1996	ISSP 1996
Ireland	1997	Eurobarometer 48.0
Italy	1985	ISSP 1985
Italy	1990	ISSP 1990
Italy	1996	ISSP 1996
Italy	1997	Eurobarometer 48.0
Japan	1996	ISSP 1996
The Netherlands	1976	Eurobarometer 5.0
The Netherlands	1997	Eurobarometer 48.0
New Zealand	1997	ISSP 1996
Norway	1990	ISSP 1990
Portugal	1997	Eurobarometer 48.0
Spain	1996	ISSP 1996
Spain	1997	Eurobarometer 48.0
Sweden	1997	Eurobarometer 48.0
United Kingdom	1976	Eurobarometer 5.0
United Kingdom	1985	ISSP 1985
United Kingdom	1990	ISSP 1990
United Kingdom	1997	Eurobarometer 48.0
United States	1985	ISSP 1985
United States	1990	ISSP 1990
United States	1996	ISSP 1996

For the Eurobarometer 5.0 data, the English version of the question is: 'What do you think the 'national' government should give greater priority to, curbing inflation or reducing unemployment?'. Individuals were coded 1 if they gave the 'inflation' response and 0 if they gave the 'unemployment' response. Missing data were imputed using the EMis algorithm described in King, Honaker, Joseph and Scheve (2001). The dependent variable, *Inflation Priority*, is the percentage of respondents for each country survey giving the 'inflation' response corrected for missing data.

The question for the Eurobarometer 48.0 data differed in the responses coded. The English version of the question is: 'Do you think the 'national' government should give higher priority to reducing inflation or higher priority to reducing unemployment?'. Answers were coded on a 5-point scale ranging from 'a lot higher priority on reducing unemployment' to 'a lot higher priority on reducing inflation'. This scale was collapsed to a dichotomy, with 'inflation' answers coded a 1 and 'unemployment' answers coded a 0. The dependent variable, *Inflation Priority*, was coded using the same imputation and coding rules described above.

Finally, data from all three International Social Survey Program studies were based on responses to the question: 'If the government had to choose between keeping down inflation or keeping down unemployment to which do you think it should give highest priority?' Again, responses indicating 'inflation' were coded 1 and those indicating 'unemployment' were code 0, and the same procedures described above were used to construct the dependent variable *Inflation Priority*.

Regression results

Variable	Model 1	Model 2	Model 3
Inflation	0.992	0.740	0.726
Output Cap	(0.405)	(0.366)	(0.331)
Output Gap	(1.027)	(0.895)	(0.791)
NAIRU	(1.02/)	-1.176	-0.959
		(0.288)	(0.284)
Government Spending		· /	-0.730
			(0.115)
Debt			-0.056
			(0.043)
Constant	33.954	44.404	73.870
	(2.262)	(3.441)	(5.124)
R-squared	0.26	0.40	0.66
S.E.R.	10.26	9.41	7.24
Number of observations	s 44.00	44.00	44.00

Note: The table reports OLS regression estimates of *Inflation Priority* regressed on various independent variables. Each cell reports the coefficient estimate and, in parentheses, its standard error (White robust standard errors).

Variable	Model 4	Model 5
Inflation	0.720	1.030
	(0.327)	(0.353)
Output Gap	`1.539´	1.286
1 1	(0.814)	(0.808)
NAIRU	-0.955	-0.894
	(0.295)	(0.248)
Government Spending	-0.694	-0.678
1 8	(0.116)	(0.118)
Debt	-0.055	-0.049
	(0.045)	(0.044)
Openness	-0.018	(***)
1	(0.027)	
Financial Employment	()	0.886
1 9		(0.354)
Constant	73.613	62.061
	(5.161)	(7.074)
R-squared	0.66	0.69
S.E.R.	7.32	7.04
Number of observations	44.00	44.00

Note: The table reports OLS regression estimates of *Inflation Priority* regressed on various independent variables. Each cell reports the coefficient estimate and, in parentheses, its standard error (White robust standard errors).

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Measuring capital services in the United Kingdom

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For many macroeconomic purposes, such as the study of productivity or the assessment of capacity utilisation, we need measures of the level and growth rate of the productive services that the capital stock is capable of providing. The official estimates of the capital stock produced by the Office for National Statistics aim to be measures of wealth, not capital services. So while they are appropriate for their intended purposes, such as balance sheet analysis, they may not be appropriate for productivity analysis or in measures of capacity utilisation. This article discusses the theory behind a different concept of capital, called here the volume index of capital services (VICS), and presents estimates of the VICS for the United Kingdom—based on both a five-asset breakdown and an eight-asset breakdown—for the period 1979–99. The eight-asset breakdown includes three information and communications technology (ICT) assets: computers, software and telecommunications equipment. The VICS measure has grown faster than the wealth measures, and the divergence is more apparent when ICT assets are included explicitly.

Introduction

The aim of monetary policy is to keep inflation low and stable, in accordance with the target set by the Chancellor. Low and stable inflation is desirable because it is believed to be conducive to higher economic growth. In setting interest rates, the Monetary Policy Committee assesses the likely growth of aggregate supply over the medium term. Aggregate supply depends crucially on the volume of productive services provided by the capital stock. Measuring capital services presents a number of difficulties, both practical and conceptual. Progress in overcoming these difficulties will contribute both to a better understanding of the growth process and to a firmer basis for monetary policy.

Statistical agencies, including the Office for National Statistics (ONS), commonly estimate two different measures of aggregate capital, known generally as the gross stock and the net stock. Several different asset types are distinguished, eg buildings, plant and machinery, vehicles, etc. The gross stock of any asset is simply the sum of the past history of gross investment in that asset in constant prices, less the sum of losses due to accidents, scrapping and disposals. The aggregate gross stock is the sum of the gross stocks of the different assets. The net stock differs from the gross stock in that allowance is also made for depreciation, often at a straight-line rate over each asset's known or assumed service life (see the box on pages 298–99 for an explanation of concepts of depreciation).

Both the gross stock and the net stock are really measures of wealth; the net stock in particular is the right concept for a balance sheet. Economic theory, however, suggests that the wealth concept of capital is not appropriate for a production function or for a measure of capacity utilisation. For the latter purpose, we need a measure of aggregate capital *services*. A third concept of aggregate capital, which will be called here the volume index of capital services (VICS), answers this need.

What is the VICS?

In principle, the VICS measures the flow of capital services derived from all the capital assets, of all types and all ages, that exist in a sector or in the whole economy. The main difference between the VICS and wealth measures of capital is the way in which different types and ages of assets are aggregated together. In the VICS, each item of capital is (in principle) weighted by its rental price. The rental price is the (usually notional) price that the user would have to pay to hire the asset for a period. By contrast, in wealth measures of the capital stock each item is weighted by the asset price (ie the price at which it could be sold to another user).
Two major problems arise in constructing a measure of aggregate capital services. First, how to aggregate over different vintages of the same type of capital. Second, how to aggregate over different types of asset. A key concept in solving both problems is the marginal product of capital. This is hard to measure directly. But a profit-maximising firm (assumed to be unable to influence input prices) will accumulate capital up to the point at which its marginal revenue product equals what it would have to pay per period to hire the asset, the rental price. The rental price thus provides an empirical counterpart to the marginal revenue product of capital. The rental price is frequently not observable, but, as will be shown below, it can be related to the asset price, which generally *can* be observed.

An important practical implication of using a VICS rather than a wealth measure is that the VICS will give more weight to assets for which the rental price is high in relation to the asset price. If the stocks of such assets are growing more rapidly than those of other types, then the VICS will be growing more rapidly than the gross or net stock.

The VICS concept is not a new one. It came to prominence in the seminal growth accounting study of Jorgenson and Griliches (1967) and was employed in subsequent studies by Jorgenson and his various collaborators, eg Jorgenson *et al* (1987) and Jorgenson and Stiroh (2000). The theory was set out in Jorgenson (1989); a related paper is Hall and Jorgenson (1967) on the cost of capital. The OECD has recently published a manual on capital measurement, which contains a very full discussion of the various concepts, including the VICS, together with advice on how to measure it in practice (OECD (2001a)); the OECD productivity manual (OECD (2001b)) provides a more concise treatment.

Versions of the VICS are already produced officially for the United States by the US Bureau of Labor Statistics and for Australia (see Australian Bureau of Statistics (2001)). So far as the United Kingdom is concerned, versions of the VICS have previously been estimated by Oulton and O'Mahony (1994) for manufacturing industries (for three asset types: plant and machinery, buildings, and vehicles) and by O'Mahony (1999) for 25 sectors covering the whole economy (for two asset types: plant and machinery, and buildings). Work is also now under way within the ONS to produce a VICS. The ONS hopes to start publishing an experimental VICS in 2002. It is hoped eventually to publish it on a regular basis as a statistic linked to (though not part of) official national income statistics. The estimates presented here, on which the Bank has worked closely with the ONS, should be viewed as preliminary and subject to improvement as a result of the ONS research programme.

This article presents two sets of estimates of wealth and the VICS for the period 1979 to 1999. The first set is based entirely on official figures for gross investment in five different types of asset: buildings (excluding dwellings), plant and machinery, vehicles, intangibles, and inventories. The second set expands the number of asset types to eight by distinguishing, in addition, computers, software, and telecommunications equipment. This second set of estimates makes a number of significant adjustments to the official investment series (see below). But before presenting the estimates, some discussion of the theory behind the VICS is required.

The VICS in theory⁽¹⁾

In real terms, the growth rate of wealth is a weighted average of the growth rates of the stocks of each asset. The weights are the shares of each asset in the value of total wealth. The value of the stock of any asset is the asset price times the stock.

The growth of the VICS is also a weighted average of the growth rates of the stocks, but in this case the weights are the shares in the value of total capital services. The value of the services yielded by the stock of a particular asset is the rental price times the stock. To calculate the VICS we need then to calculate the services that each asset yields and the growth rate of its stock.

Asset stocks

The stock of any asset (asset *i*) in existence at a given moment (time *t*) is the result of all past investments, after allowing for losses due to accidental damage, scrapping or disposals, and the decline in efficiency of surviving assets due to age or use. Suppose that total losses due to all these causes are the proportion d_{is} of the investment made in the *i*th asset *s* years ago $I_{i,t-s}$. We may call d_{is} the rate of decay. Then the contribution to the stock at time *t* due to investment made *s* years ago

 The theory briefly set out here draws heavily on Jorgenson (1989). Papers that focus on depreciation include Hulten and Wykoff (1996) and Jorgenson (1996). is $(1-d_{is}) I_{i,t-s}$. Another way to think of the factor $(1-d_{is})$ is as the ratio of the services of a typical unit installed *s* periods ago to the services from a brand-new unit. This ratio equals the rental price of a unit that is *s* years old divided by the rental price of a new unit.

A special case is when the proportional rate at which the asset decays is constant over time. Call this constant rate of decay d_i . Then the services yielded today by an investment done *s* years ago, as a proportion of the original level of services, is $(1 - d_i)^s$. The asset stock (A_{ij}) now follows the simple relationship:

$$A_{it} = I_{it} + (1 - d_i) A_{i,t-1}$$

So to calculate the stock, we need to know investment in constant prices and the rate of decay.

Capital services

If firms maximise profits, the services produced by an asset are its marginal revenue product multiplied by the stock of the asset. Suppose that firms can hire each type of capital by paying a rental price per period. Then profit maximisation implies that the rental price will be equated to the marginal revenue product of the asset.

Financial leasing is a very common arrangement for machinery, and commercial buildings are frequently rented out by their occupiers. Nevertheless it is more common still for businesses to own their own capital. In this case, they can be thought of as renting the assets to themselves. But then there is no rental price to be observed. Even in the case of leased assets, it is generally easier to observe the asset price than the rental price. Fortunately, there is a relationship between the (usually unobserved) rental price and the corresponding (observed) asset price:

Here the rate of depreciation is the proportional difference between the price of a new asset and the price of an asset that is one period old.⁽¹⁾ The intuition behind this relationship is as follows. If a firm

purchases an asset, with a view to renting it out, then it will want the rental price to be sufficient to yield a rate of return. Second, since the asset is going to depreciate, the rental price must cover this loss in value too. Third, the price of a new asset might change. If it goes up, this will reduce the cost of holding one that has already been purchased. In the case of computers, the price of new computers is falling; so holding them incurs a capital loss, which increases the rental price. The rate of depreciation is also high: in the business sector PCs have a service life of only 2 to 3 years. Hence the rental price as a proportion of the asset price is very high, 60% or more. By contrast, buildings have a long service life and so depreciate slowly; and the price of new buildings tends to rise over time. So their rental price is comparatively low in relation to their asset price.

In principle, we can estimate the rate of depreciation from studies of new and second-hand asset prices. The most extensive studies have been done in the United States. These generally find that a geometric pattern of depreciation (see the box on pages 298–99) fits the data well; see Hulten and Wykoff (1981a) and (1981b); and Oliner (1993) and (1996). Geometric depreciation has therefore been adopted as the 'default assumption' in the US National Accounts; see (Fraumeni (1997) and Herman (2000)).

The rate of depreciation and the rate of decay are different concepts and in general need not be equal (see the box again). But if depreciation is geometric, it can be shown that the two rates are in fact equal. This is very helpful since to calculate asset stocks we need to know the rates of decay, about which we have no direct evidence. But we do have some evidence for rates of depreciation, which we can use for estimates of rates of decay too.

The final piece of the jigsaw required to calculate rental prices is the rate of return. Profit maximisation implies that the rate of return will be equalised across all types of asset, at least *ex ante*. Assuming that rates of return are equalised *ex post* as well, we can estimate this common rate of return from the observed level of total profits.⁽²⁾

The formula in the text also needs to be adjusted to allow for taxation and investment allowances; this has been done in the estimates reported below.

⁽²⁾ Certainly firms would like to equalise rates of return *ex ante*. But *ex post* things might turn out differently if they are unable to adjust the size of their holdings with equal speed for all types of asset. For example, an airline may be able to adjust its stock of computers more easily than its stock of planes. The assumption of equal rates of return might be particularly hard to maintain in a recession and perhaps too in a strong boom. As we will see below, the assumption of equal rates of return does appear to break down occasionally, when rental prices are estimated to be negative.

Depreciation and decay

Depreciation is geometric when an asset's value declines at a constant proportional rate as it ages. For example, suppose that the price of a new asset of a particular type is £10,000 in August 2001 and depreciation is geometric at 10% per year. Then in August 2001 a one-year-old asset of the same type will have a second-hand price of £9,000; a two-year-old asset will sell for $(1.0 - 0.1) \ge 9000 = \pounds 8,100$, and so on. A ten-year-old asset will sell for £3,487, and a twenty-year-old one for £1,216.

Straight-line depreciation is when an asset loses a fixed proportion of its initial value in each year of its service life. If the price when new is £10,000 and the service life is 20 years, then the asset loses one twentieth of £10,000, or £500, with each year of age. So a one-year-old asset is worth £9,500, a ten-year-old asset is worth £5,000, and a twenty-year-old asset is worth nothing. Straight-line depreciation is very common in business accounting but there it is usually applied to the historic cost of the asset. Straight-line depreciation is common too in national income accounting, but there the assets are revalued to current prices. The estimates of depreciation (capital consumption) in the UK National Accounts use straight-line depreciation.

Depreciation is a property of asset prices. Decay is a property of the services yielded by an asset as it ages. The two concepts are quite different but are connected, since theory suggests that the price of an asset should equal the present value of the services which it will yield over the remainder of its life. In other words, if one assumes a certain pattern of depreciation, this implies a corresponding pattern of decay, and *vice versa*. As mentioned in the text, if depreciation is geometric, then decay is also geometric; the converse is true as well. But no such simple relationship applies to other types of depreciation or decay.

For some assets, it has been suggested that the so-called 'one-hoss shay' or 'light bulb' pattern of decay is appropriate. In this case, the asset provides a constant level of service during its life, rather as a light bulb provides an approximately constant level of illumination up till the moment it burns out. It is sometimes suggested that this pattern is appropriate for computers and software. But here there is no counterpart to the physical failure of a light bulb. This makes it difficult to explain why these assets have such short lives if their efficiency is indeed unchanging while they are in service.

If decay is *hyperbolic*, the services from an asset decline at an increasing proportional rate with age. Both the US Bureau of Labor Statistics and the Australian Bureau of Statistics assume hyperbolic decay. Under this pattern the ratio of the services from an asset that is *s* years old to the services from a new asset is given by the formula $(L - s)/(L - \beta s)$, where *L* is the service life and β is a positive parameter.

Charts A, B and C compare the age-efficiency profile (how services change with age) with the age-price profile (how the asset price changes with age) for the cases of light bulb, geometric and hyperbolic decay. For light bulb and hyperbolic decay, asset life is assumed to be 20 years and the discount rate is set to 7% per year. The geometric decay rate is assumed to be 10% per year. Both asset prices and services are shown as proportions of their values when new (age 0), which are set equal to one. With light bulb decay, the age-price profile is concave, whereas with geometric decay it is convex. A convex age-price profile is more consistent with the empirical evidence. But other patterns of decay, such as hyperbolic, can also generate a convex age-price profile: see Chart C where we have set $\beta = 0.3$.







In summary, to estimate the VICS we need rental prices and asset stocks. To estimate rental prices, we need asset prices and rates of depreciation. To estimate asset stocks, we need a back series of investment in constant prices. Asset prices and investment are readily available from the National Accounts. Depreciation rates present more of a problem. Here we use rates based on the ones used in the US National Accounts. The reasons for using US rates are twofold. First, they have some empirical backing since they are derived from studies of the prices of second-hand assets. No such studies have as yet been done for the United Kingdom. Second, we cannot use the rates employed by the ONS since these are straight-line, not geometric.

Obsolescence versus physical decay

Some assets, like buildings, decay with age. Mechanical wear and tear causes many types of machinery to decay with use. Some assets, in particular computers and software, suffer little or no physical decay but are nevertheless discarded after relatively brief service lives. The cause is usually said to be 'obsolescence', due to the appearance of newer and better models. Does this make any difference to the analysis above?

The answer is no. Rental prices are measures of marginal products. Certainly these will decline if there is physical decay but this is not the only reason for them to fall. Anything that causes the *profitability* of capital equipment to decline will do just as well. Two possible causes of declining profitability are:

 If capital once installed is used in fixed proportions with labour, rising wages will cause older equipment to be discarded even if it is physically unchanged. As equipment ages, its profitability declines and it is



discarded when profitability reaches zero. (*Ex post* fixed proportions seem quite realistic for computers, where the rule is one worker, one PC.) But capital services from different vintages of the same asset are still correctly measured by rental prices: see Oulton (1995).

2. As capital ages, it may require higher and higher maintenance expenditure. This is particularly the case for computers and software, provided we understand maintenance in an extended sense to include maintenance of interoperability with newer machines and software. The profitability of a machine will then decline as it ages and it will be retired when profitability is zero: see Whelan (2000).

The basic principles behind the VICS are not affected in either of these two cases. To measure capital services, assets should still be weighted together by their rental prices. But depreciation will no longer be geometric, hence the decay rate will no longer equal the depreciation rate. This will affect the estimation of asset stocks. But we are normally interested in the growth rates of asset stocks and these will be relatively insensitive to the pattern of decay, as suggested by sensitivity tests reported below.

Comparing the wealth measure with the VICS

As we have seen, both measures are weighted averages of asset stock growth rates and only differ in the weights. In the wealth measure the weights are shares in total wealth and hence depend on asset prices, while in the VICS the weights depend on rental prices. We have also seen that the ratio of the rental price to the asset price differs between asset types: the ratio is higher for assets with short services lives (high rates of depreciation) and falling asset prices. It is intuitively clear (and can be proved formally) that the VICS will give more weight than the wealth measure to assets with higher-than-average rental price/asset price ratios.

The VICS in practice

The estimates of the VICS for the United Kingdom presented below use official series for investment in current and constant prices. These series include spending on assets like computers and software. But they are not distinguished separately. Later we also present estimates that do distinguish ICT assets separately and that make various adjustments to the official series, based on arguments in Oulton (2001).

The data⁽¹⁾

The UK National Accounts distinguish seven different asset types. Initially, the VICS will be calculated for five of these:

- 1. Buildings (excluding dwellings)
- 2. Plant and machinery
- 3. Vehicles
- 4. Intangible assets
- 5. Inventories

Computers and telecommunications equipment have always been included within plant and machinery, but not separately distinguished. Since 1998, software has been included under intangible assets.

Collectively, the returns on these assets are assumed to generate aggregate profits (gross operating surplus). Two other assets are also present in the national accounts, dwellings and valuables. The economic process generating housing returns is likely to be different from the one generating business profits, so dwellings are excluded here. This means that for consistency our measure of profit must also exclude returns to housing (see the appendix). Valuables, a small item, are excluded since we have no way of estimating an initial stock.

The National Accounts give us gross investment in constant and current prices for the first four of the asset types listed above, 1948–99. The price of each asset is calculated as an implicit deflator: investment in current prices divided by investment in constant prices. In the

(1) More detail on the data is given in the appendix on pages 305-07.

case of the fifth asset, inventories, we actually know the stock in 1998, in 1995 prices. The National Accounts give us the net change in inventories in constant prices. So we can calculate the stock in any other year. The price of inventories was assumed to be the implicit deflator for manufacturing output.

To calculate the stocks of buildings, plant, vehicles and intangibles for 1948–99, we need starting stocks for 1947 and assumptions about depreciation. The starting stocks were estimated using detailed industry-level investment data kindly supplied by the ONS; these series go back to the 19th century. The depreciation assumptions used here are as follows:

Asset	Depreciation rate		
	(per cent per year)		
Buildings	2.5		
Plant and machinery	13.0		
Vehicles	25.0		
Intangibles	33.0		
Inventories	0.0		

For the four fixed assets, these rates approximate those used by the Bureau of Economic Analysis (BEA) (see Fraumeni (1997)). The zero rate for inventories is taken from Jorgenson and Stiroh (2000). These rates will be referred to as the baseline depreciation rates.

Results for the five-asset model

Table A compares the rental price weights (calculated using the baseline depreciation rates) with the asset price weights. Clearly these are very different. For example, the rental price weight for plant is getting on for twice its asset price weight. So we would expect the VICS to give different results from a wealth measure of the capital stock. This is borne out by Table B, which compares the two types of measure. Over 1989–99, the baseline VICS grows more rapidly, by about

Table A

Comparison of rental price and asset price weights

	Buildings	Vehicles	Plant and machinery	Intangibles	Inventories	Total
Average re	ntal weights	s (shares in	aggregate pr	ofits), per cen	t	
1979–89 1989–99	36.0 39.4	$\begin{array}{c} 11.1\\ 10.2 \end{array}$	42.2 40.9	2.9 3.4	7.8 6.1	$\begin{array}{c} 100.0\\ 100.0\end{array}$
1979–99	37.7	10.7	41.5	3.1	7.0	100.0
Average as per cent	set weights	(shares in	nominal value	e of aggregate	capital stock),
1979–89 1989–99	59.0 58.7	$\begin{array}{c} 4.2 \\ 4.2 \end{array}$	23.5 24.7	$\begin{array}{c} 0.9\\ 1.1 \end{array}$	12.4 11.3	$\begin{array}{c} 100.0\\ 100.0\end{array}$
1979–99	58.9	4.2	24.1	1.0	11.8	100.0

0.4 percentage points per year. The divergence between the two measures becomes particularly marked in the past few years, as Chart 1 shows; in 1999 it is 1.6 percentage points.

Table B

Comparison of VICS and wealth measure: growth rates Per cent per year

	Wealth (five assets)	VICS (five assets)
1979–89	2.30	2.62
1989–99	3.01	3.38
1989–94	2.84	3.12
1994–99	3.18	3.63

Source: Appendix, Table 2.

Chart 1

Growth rates of VICS and wealth compared (five asset types)



The sensitivity of the VICS to the depreciation rate assumptions

Even if the baseline depreciation rates are appropriate for the United States, it is not clear that they should be applied in the United Kingdom. It is therefore useful to consider how sensitive the VICS is likely to be to the depreciation assumptions. The *level* of each asset stock is sensitive to depreciation but the *growth rate* is less so. In fact, if the growth rate of investment had always been constant, then the stock would grow at the same rate, which would be completely independent of the depreciation rate. Year-to-year volatility of the growth rate of investment does not make the stock growth rate sensitive to depreciation, but changes in the trend growth rate of investment do.

Charts 2 to 5 show the growth rates of the four types of fixed investment. They are fairly volatile on a year-to-year basis. Apart from software, the major component of investment in intangibles is oil and gas exploration, which accounts for the erratic behaviour in the late 1960s and early 1970s. Buildings show signs of change in the trend growth rate. The average growth rates are in Table C. Over the entire 51-year period, the growth rates of the two largest items, plant and buildings, come out fairly similar but this is far from the case over shorter periods, including in particular the most recent one. Hence we can see already that the growth of the VICS is likely to differ from that of a wealth measure.

Chart 2 Investment in buildings



Chart 3 Investment in plant



Chart 4 Investment in vehicles



Chart 5 Investment in intangibles



Table CAverage growth rates of real investment

Per cent per year

	Buildings	Plant and machinery	Vehicles	Intangibles
1948–64 1964–89 1989–99	7.78 2.46 1.87	5.16 4.12 4.31	3.14 2.29 1.69	2.15 15.16 0.90
1948-99	4.02	4.48	2.44	8.28

Table D shows average growth rates of the VICS using three different depreciation rates of the fixed assets:

- Baseline (see above)
- 'Low'—50% of baseline rates
- 'High'—150% of baseline rates

The zero rate for inventories is the same in all variants.⁽¹⁾

Table DAverage growth rates of VICS

Per cent per year

	Baseline	Low	High
1979–89 1990–99	2.62 3.47	2.91 3.49	2.52 3.49
1979–99	3.04	3.20	3.01

The average growth rates are remarkably similar over the past 20 years. Chart 6 shows the time path of the three versions of the VICS. These are again very similar. As the evidence for depreciation rates in the United Kingdom is fairly weak, it is comforting that the VICS seems relatively insensitive to uniform upward or downward movements in the rates (which might be interpreted as uniform shortening or lengthening of assumed services lives). One difference revealed by Chart 6 is that the higher the depreciation rate, the more variable the growth rate. The reason is that high depreciation rates mean that a higher weight is put on investment in the recent past in the VICS. Since investment is cyclical, the VICS tends to be more cyclical too.





These sensitivity tests use the rental weights without any adjustments. But the weights are not without problems. First, they are quite variable over time. However, using the mean of the weights over 1979-99 had very little effect on the results. Second, and perhaps more important, negative values sometimes occur. For example, since 1979 the rental weight for buildings has been negative once (1980) and that for inventories five times. Negative rentals indicate a breakdown of the assumption that firms are able to adjust all their assets optimally in every year. For the purpose of sensitivity testing, these negative values have been allowed to stand. But for satisfactory estimates of the VICS negative rental weights need to be removed. It turns out that this can be done by some simple smoothing, while constraining the weights to sum still to unity.⁽²⁾

Adjusting for ICT

We now consider the effect of distinguishing separately the services produced by information and communications technology (ICT) assets. Measuring the contribution of such assets involves numerous conceptual and empirical problems. These are considered in Oulton (2001), which argues for a number of adjustments to official figures. The two changes that have the most impact on the results are: (1) the use of US price indices (adjusted for exchange rate changes) to deflate UK investment in ICT assets; and (2) a tripling

(1) For the purpose of the sensitivity analysis, the 1947 starting stocks were held fixed while the depreciation rates for the

¹⁹⁴⁸⁻⁹⁹ period were varied. To minimise the influence of the starting stocks, I present results only for 1979 onwards.

⁽²⁾ Tables A and B and Chart 1 use smoothed rental price weights. This accounts for the slight difference between the baseline results in Tables B and D.

of the official nominal level of investment in software. Naturally, the resulting estimates need to be treated with caution and should be regarded as preliminary. Further research is clearly needed in this area. Ongoing work at the ONS may well lead to improved estimates in the future.

The three types of ICT asset and their depreciation rates (taken from Jorgenson and Stiroh (2000)) are:

	Depreciation rate
	(per cent per year)
Computers	31.5
Software	31.5
Telecommunications equipment	11.0

We now have eight types of asset in the VICS instead of five. Plant and machinery now excludes computers and telecommunications equipment, and intangibles now excludes software. The ICT-adjusted series are shown in two variants: 'low software' and 'high software'. The 'low software' deflator is based on the BEA's software price index as used in the US National Income and Product Accounts. The 'high software' variant uses one component of the BEA price index, that for pre-packaged software, which falls more rapidly.

Chart 7 shows the effect of incorporating these adjustments into the VICS. The ICT-adjusted estimates have a similar profile but lie uniformly above the baseline estimate. The adjustment clearly has a substantial effect on the aggregate growth rate. As Table E shows, compared with the baseline estimate of 3.38% per year, the high software variant of aggregate capital services grew at the substantially faster rate of 5.07% over 1989–99. Over the most recent period,

Chart 7

Growth of capital services, 1979–99: with and without ICT adjustment



1994–99, making the ICT adjustment raises the growth rate of the VICS by 2 percentage points.

Table E Growth of capital services: with and without ICT adjustment

Per cent per year

	VICS	VICS	VICS
	(eight assets,	(eight assets,	(five assets,
	low software)	high software)	baseline)
1979–89	3.63	3.84	2.62
1989–99	4.62	5.07	3.38
1989–94	4.05	4.51	3.12
1994–99	5.20	5.63	3.63

Source: Appendix, Table 2.

It is also interesting to compare the effect of weighting by rental prices, which is theoretically preferred, to weighting by asset prices. The two series in Chart 8 and Table F use identical data but different weights. As expected, the series using rental price weights grows more rapidly and the effect is very substantial: for example, it adds more than 4 percentage points per year in 1999. One reason is that the rental weight for ICT capital is about three times its asset weight.

Chart 8

Growth rate of capital services, 1979–99: asset price versus rental price weights



Table F Wealth and VICS measures compared

Growth rates, per cent per year

	VICS (eight assets, high software)	Wealth (eight assets, high software)
1979–89	3.84	2.43
1989–99	5.07	3.20
1989–94	4.51	3.04
1994–99	5.63	3.37

Source: Appendix, Table 2.

Conclusions

The VICS uses rental price rather than asset price weights, so it gives more weight to assets with a high

rental price/asset price ratio, ie to assets with short service lives and high rates of depreciation. It turns out that these are the assets whose stocks have been growing most rapidly in recent years. Consequently, the VICS has tended to grow more rapidly than a wealth measure. Over the period 1989–99, the VICS has grown at 5.07% per year when ICT assets are separately distinguished. This compares with a wealth measure based on exactly the same data and depreciation assumptions that grew at 3.20% per year. As ICT assets have grown in importance, the divergence between wealth and VICS measures has increased.

Since the VICS is the appropriate concept for productivity analysis, the present estimates have implications for the growth of total factor productivity (TFP). TFP growth is often estimated using a wealth measure of capital. If capital services have been growing faster than wealth measures, then TFP has been growing more slowly than a wealth-based estimate would suggest.⁽¹⁾

The implications for capacity utilisation are a little harder to draw. Since capital services have been growing more rapidly than a wealth-based measure would imply, it might seem that capacity utilisation has been growing less rapidly. But the slower growth of TFP works in the other direction. Capital and capacity utilisation play numerous roles in the Bank of England's medium-term macroeconomic model. So teasing out the implications of these new estimates for monetary policy will require careful analysis, going beyond the scope of this article.

This is true even though the adjustments made to investment in ICT lead to higher estimates of GDP growth (see Oulton (2001)).

Appendix

This appendix describes the sources and methods used to construct the baseline estimates of the VICS, ie those which make no special allowance for ICT. The ICT adjustments are fully described in Oulton (2001).

The equations of the model are as follows:

$$A_{it} = I_{it} + (1 - \delta_i) A_{i,t-1}, \qquad i = 1, ..., m$$
⁽¹⁾

$$K_{it} = A_{i,t-1}, \qquad i = 1,..., m$$
 (2)

$$p_{it}^{K} = T_{it} \bigg[r_t \bigg(p_{i,t-1}^{A} + \delta_i \bigg) p_{it}^{A} - (p_{it}^{A} - p_{i,t-1}^{A}) \bigg], \qquad i = 1, ..., m$$
(3)

$$\Pi_{t} = \sum_{i=1}^{m} p_{it}^{K} K_{it} = \sum_{i=1}^{m} T_{it} \bigg[r_{t} \bigg(p_{i,t-1}^{A} + \delta_{i} \bigg) p_{it}^{A} - (p_{it}^{A} - p_{i,t-1}^{A}) \bigg] K_{it}$$
(4)

$$\log n \left[K_t / K_{t-1} \right] = \sum_{i=1}^{m} \overline{w}_{it} \log n \left[K_{it} / K_{i,t-1} \right],$$

$$p_{it}^{K} K_{it}$$
(5)

$$\overline{w}_{it} = (w_{it} + w_{i,t-1}) / 2, \ w_{it} = \frac{p_{it}^{it} K_{it}}{\sum_{i=1}^{m} p_{it}^{K} K_{it}}, \ i = 1, ..., m$$

$$\log n \Big[A_t / A_{t-1} \Big] = \sum_{i=1}^{m} \overline{v}_{it} \log n \Big[A_{it} / A_{i,t-1} \Big],$$

$$\overline{v}_{it} = (v_{it} + v_{i,t-1}) / 2, \quad v_{it} = \frac{p_{it}^A A_{it}}{\sum_{i=1}^{m} p_{it}^A A_{it}}, \quad i = 1, ..., m$$
(6)

where

m is the number of assets

 A_{it} is the stock of the *i*th type of asset at the end of period t

 K_{it} is capital services from assets of type *i* during period *t*

 I_{it} is gross investment in assets of type *i* during period *t*

 δ_i is the geometric rate of depreciation on assets of type i

 r_t is the nominal post-tax rate of return on capital during period t

 T_{it} is the tax adjustment factor in the Hall-Jorgenson cost of capital formula

 p_{it}^{K} is the rental price of new assets of type *i*, payable at the end of period *t*

 p_{it}^{A} is the corresponding asset price at the end of period t

 Π_t is aggregate profit in period *t*

 K_t is aggregate capital services during period t

 A_t is aggregate real wealth at the end of period t

Equation (5) defines the growth rate of the VICS and equation (6) the growth rate of the wealth measure. These are chain indices of the Törnqvist type. Capital services in period *t* are assumed to derive from assets in place at the end of period t-1 (equation (2)). So when comparing the wealth and VICS measures in the charts and the text, we compare the growth of capital services between periods *t* and t-1 with the growth of wealth between the end of period t-1 and the end of period t-2.

Investment

The following table shows the investment series we have used, together with the ONS codes for the current-price and constant-price series.

Table 1

	ONS code, current prices	ONS code, 1995 prices
Other buildings and structures	DLWS	EQDP
Transport equipment	DLWZ	DĹŴJ
Other machinery and equipment		,
and cultivated assets	DLXI	DLWM
Intangible fixed assets	DLXP	EQDT
Changes in inventories	Not used	ABMQ
	Other buildings and structures Transport equipment Other machinery and equipment and cultivated assets Intangible fixed assets Changes in inventories	Other buildings and structures Transport equipment DLWS DLWZ Other machinery and equipment and cultivated assets DLXI DLXI Intangible fixed assets DLXP Changes in inventories

A complication is that while the nominal series for each type of investment goes back to 1948, the corresponding real series goes back only to 1965 for 'Transport equipment', 'Other machinery and equipment and cultivated assets' and 'Intangible fixed assets', and only to 1989 for 'Other buildings and structures'. For 'Other buildings and structures' over the period 1965–88, we have used the growth in the constant price series DLWT, which is the same as EQDP except that it includes transfer costs. For the years 1948–64, we have constructed our own implicit deflators for buildings and for plant and machinery from detailed, industry-level investment data provided by the ONS. These investment series are the ones employed in the ONS's capital stock model. These implicit deflators were spliced on to the later series in 1965. We have used our plant and machinery deflator to deflate investment in intangibles over 1948–64.

Capital stocks

We have used US depreciation rates taken from Fraumeni (1997): see the main text. For the fixed assets, the stock of each asset was accumulated using the official investment series from 1948 onwards (see above), employing equation (3). We therefore needed an initial stock for each asset in 1947. For 'Other buildings and structures', 'Other machinery and equipment and cultivated assets' and 'Transport equipment', a starting stock was generated using the same detailed, industry-level data supplied by the ONS; these data extend back to the 19th century. In generating these starting stocks, the same depreciation rates were employed as were used from 1948 onwards.

For inventories, the quarterly National Accounts gave the stock of inventories in 1995 prices at the end of 1998. The stock in each year in constant prices was then estimated by adding or subtracting the change in inventories in constant prices. The value of the stock of inventories in current prices was then generated by revaluing the constant-price stock using the price index for manufacturing [PLLU] from 1963 onwards and, prior to then, the implicit deflator for GDP.

Asset prices

The asset price of each asset type is derived as an implicit deflator: the current-price investment series divided by the constant-price investment series.

Tax/subsidy factor

The tax/subsidy factors were kindly supplied by HM Treasury.

Rental prices

To calculate the rental prices and hence the weights for each asset type in the capital aggregate, we include inventories and all fixed assets except for dwellings and use these to solve for first the nominal rate of return and then for the rental prices. Hence the appropriate profit total is aggregate profits minus what should be attributed to ownership of dwellings.

Total profit is therefore measured as gross operating surplus [ABNF] less housing consumption [CDDF+CDDG]. Housing consumption needs to be removed since we are excluding housing from the VICS. Under ESA79, the two components of housing consumption were known as 'Other rents' [CDDG] and 'Imputed rents of owner-occupied dwellings' [CDDF] respectively. We use the old codes since the ESA95 ones do not go back before 1986. The old codes have been continued and have identical values with the new ones where they overlap. However, they do not go back before 1963. For 1948–62, we estimate housing consumption by applying the ratio of housing consumption to the official estimate of the net stock of dwellings in current prices [CIWZ], averaged over the years 1963–65, to the net stock in the earlier period. The VICS and the wealth measures, with and without ICT adjustment, appear in Table 2 below.

Table 2Wealth measures of capital stock compared with VICS, 1979–99

Growth rates, per cent per year

	Wealth		VICS		
	five assets, no ICT adjustment	eight assets, ICT adjusted	five assets, no ICT adjustment	eight assets, low software, ICT adjusted	eight assets, high software, ICT adjusted
1980	2.92	3.04	3.52	4 63	4 75
1981	1.31	1.49	1.60	2.61	2.74
1982	0.71	0.80	0.75	0.95	1.05
1983	1.31	1.37	1.46	1.65	1.75
1984	1.87	1.97	1.78	2.22	2.35
1985	2.48	2.56	2.90	3.52	3.71
1986	2.71	2.80	3.33	4.45	4.72
1987	2.46	2.63	2.55	4.47	4.83
1988	2.95	3.17	3.07	4.93	5.21
1989	4.29	4.52	5.26	6.83	7.34
1990	4.33	4.48	5.50	6.80	7.44
1991	3.49	3.80	4.00	5.47	5.99
1992	2.16	2.28	2.32	3.14	3.49
1993	2.13	2.38	1.94	2.68	3.14
1994	2.11	2.26	1.84	2.16	2.49
1995	2.69	3.00	2.18	3.28	3.77
1996	2.92	3.27	2.90	4.61	5.08
1997	2.85	3.15	3.33	5.05	5.41
1998	3.40	3.72	4.14	5.67	6.04
1999	4.06	3.70	5.62	7.37	7.85
Average gro	owth rates, per c	ent per year			
1979-89	2.30	2.43	2.62	3.63	3.84
1989–99	3.01	3.20	3.38	4.62	5.07
1989-94	2.84	3.04	3.12	4.05	4.51
1994-99	3.18	3.37	3.63	5.20	5.63

Source: Oulton (2001) for ICT-adjusted series.

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Capital flows and exchange rates

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This article focuses on the possible role of capital flows in explaining exchange rate movements. Some commentators have suggested that a substantial increase in capital flows into the United States could have accounted for the recent appreciation of the US dollar. This could imply that capital inflows have increased in response to a rise in the rate of return on capital, which in turn has reflected the structural increase in US productivity seen in recent years. We find evidence to suggest that this may explain part of the recent dollar appreciation, but unsurprisingly it does not provide a full explanation.

Introduction

Much attention has been paid recently to the possible links between flows of capital into the United States, US equity prices and the US dollar.⁽¹⁾ It is argued that a structural improvement in US productivity⁽²⁾ increased the rate of return on capital, which led to a substantial increase in capital flows into the United States. These flows, in turn, caused the dollar to appreciate in both real and nominal terms. This possible explanation for the dollar's appreciation has been quite widely discussed in market commentaries,⁽³⁾ in the May 2001 issue of the IMF's *World Economic Outlook*, and in the December 2000 issue of the Bank of England's *Financial Stability Review*.

The aim of this article is to show how, focusing on the recent performance of the US dollar, it might be possible to tie together movements in the real and nominal exchange rates, the real interest rate, equity prices and the current/capital account balance. These relationships are complex, and their form at any time depends on the shock hitting the economy. Here we examine the effects of a permanent shock to the level of

future productivity.⁽⁴⁾ We also show how the effects of a productivity shock that is concentrated in a 'tradable sector' differ from the effects of a shock that affects the whole economy.⁽⁵⁾ Finally, we examine the US evidence to see how well it fits this theoretical analysis.

The effects of a productivity shock on capital flows ...

A productivity shock that raises expected future output in the home country will tend to lead to capital inflows for two reasons.

First, if consumers in the home country expect to be richer in the future, they would want to borrow from abroad—ie draw an inflow of capital—to increase their consumption today. (We assume that consumers are sufficiently forward-looking to wish to smooth their consumption over the present and future time periods.) In other words, they would increase their current consumption to reflect the expectation that their permanent income has increased. The annex on pages 316–18 sets out a simple one-good model that demonstrates how this may work.

By 'capital flows' we mean, specifically, flows of funds from savers to investors, either directly or through intermediaries. (Note that this definition is much broader than simply flows of financial assets.)

⁽²⁾ See Berry, S and England, D (2001), 'Has there been a structural improvement in US productivity?', Bank of England Quarterly Bulletin, Summer, pages 203–09 (henceforth Berry and England (2001)), which presents evidence of such a structural change.

⁽³⁾ Some examples of recent brokers' reports that discuss this are Lehman Brothers, Global foreign exchange strategies (1/3/2001), Morgan Stanley Dean Witter, Currency strategy and economics (22/11/2000), Goldman Sachs, European weekly analyst (17/11/2000), and Deutsche Bank, Global FX outlook and strategy (1/12/2000).

⁽⁴⁾ Such a shock would have a temporary effect on productivity growth while the economy was adjusting to its new higher level of productivity.

⁽⁵⁾ We can think of 'non-tradable' goods and services as those whose transportation costs are so large relative to their costs of production that it would never be profitable to produce them in an economy and then sell them abroad. Goods and services that can profitably be sold abroad are called 'tradable'.

Second, the expected increase in future productivity would raise expected future profits. This, in turn, would lead to an increase in equity prices and, other things equal, would encourage investment. Residents of the home country would want to take advantage of current investment opportunities that enhance future output (ie stimulate an increase in productivity) but without forgoing current consumption. So the increase in investment demand that is not financed by current domestic savings would be financed by inflows of capital. And inflows of foreign direct investment and foreign equity investment are particularly likely to increase as overseas investors also take advantage of the higher rates of return to capital in the home country.

... and the real exchange rate⁽¹⁾

The simple model in the annex shows that a productivity shock can generate large capital inflows even when the real exchange rate is constant. However, the real world is clearly more complicated than assumed in the model. In particular, we need to extend our analysis to a world in which the real exchange rate can vary.

A useful starting-point is the idea of uncovered interest parity (UIP), which suggests that the expected change in the real exchange rate over any period should equal the difference between the domestic real interest rate and that of the rest of the world. Within this framework, a shock to productivity that raised the future level of productivity, and hence temporarily raised productivity growth, would lead to an increase in the domestic real interest rate relative to the world real interest rate: that. in turn, would prompt a jump appreciation of the real exchange rate. As productivity growth returned to trend, bringing the domestic real interest rate back into line with the world real interest rate, the real exchange rate would depreciate back to its equilibrium value. One caveat to this is that within this model a more or less continual series of productivity shocks would lead to a longer-run appreciation of the real exchange rate.

But what happens to the equilibrium real exchange rate? This depends importantly on whether the productivity shock is concentrated in the tradable or the non-tradable sector. As is shown in the annex, a productivity shock that affects both sectors equally is likely to lead to a depreciation of the equilibrium real exchange rate. This happens because such a shock implies an increase in the relative supply of domestic goods and services; given this, their relative price must fall.⁽²⁾

On the other hand, a productivity shock concentrated in the tradable sector is likely to lead to an appreciation of the equilibrium real exchange rate. This is commonly known as the Balassa-Samuelson effect and occurs because product market arbitrage between countries equilibrates prices for the tradable goods and services at the same time as labour market arbitrage within economies means that wages are equalised at the margin between the tradable and non-tradable sectors. If one country has an increase in the productivity of its tradable sector, other things equal, real wages will increase in both the tradable and non-tradable sectors. Because there has been no productivity change in the non-tradable sector this leads to a rise in the price of non-tradable goods and services relative to tradables in the home economy, and an appreciation of the real exchange rate. By extension, if the economy undergoes a series of productivity shocks (ie residents keep being surprised by the level of productivity growth), the Balassa-Samuelson effect would indicate an ongoing appreciation of the real exchange rate in the face of such productivity shocks.

We use the simple two-good, two-period, two-country model in the annex to illustrate this effect. We find that a productivity shock that raises expected future output in both the tradable and non-tradable sectors by 5% leads to an initial appreciation of the real exchange rate of 2.16%. It then depreciates to an equilibrium level 1.84% below its starting value. On the other hand, a productivity shock that raises the expected future output of the tradable sector by 5% while having no effect on the non-tradable sector leads to an immediate appreciation of 2.16% with no further change in the real exchange rate. Chart 1 plots these stylised responses.

Although the numbers should be seen as purely illustrative, the key point is that the persistence of the real exchange rate appreciation depends crucially on the effect of the shock on the productivity of the tradable sector relative to the non-tradable sector.

⁽¹⁾ Throughout this article we define the real exchange rate to be the price of a representative consumption bundle in the

home country relative to that of a representative consumption bundle in the rest of the world.

⁽²⁾ We are assuming that the relative price of tradable goods and services in different countries cannot change; it is the fall in the relative price of non-tradable goods and services that drives the depreciation of the real exchange rate.

Chart 1 Effect of a productivity shock on the real exchange rate



One strong caveat to this analysis is that we have assumed that the relative price of tradables cannot change. In practice, the real exchange rate will depend not only on the relative price of tradable versus non-tradable goods and services in the domestic economy, but will also depend on the terms of trade between domestic and foreign tradables. To the extent that a productivity shock in the tradable sector only affects domestic producers of tradables, the appreciation of the exchange rate that arises from the Balassa-Samuelson effect will be muted. This will happen because such a shock implies an increase in the relative supply of domestic tradables; given this, their relative price (the terms of trade) must fall.

What about the nominal exchange rate?

So far we have only considered the real exchange rate. To examine what will happen to the nominal exchange rate, we need to make an assumption about monetary policy in the home country and the rest of the world. We assume that the rest of the world has the same inflation target as the home monetary authority and that monetary authorities in the rest of the world do not react to the domestic productivity shock.

Suppose that the home economy experiences a shock that raises output relative to trend. If the monetary authority accommodated the shock, it would lower interest rates, raising nominal demand by the same amount as the rise in output to leave inflation on target. In this case, the nominal exchange rate would move one-for-one with the real exchange rate. Alternatively, suppose that the monetary authority did not accommodate the shock. In this case, inflation would fall below target and the nominal exchange rate would rise relative to the real exchange rate.

How well does this tie in with the US story?

Notwithstanding recent revisions, the United States saw a quite sharp pick-up in labour productivity growth from around 1995. This was associated with rapid technological advances in the information and communications technology (ICT) sector and a pick-up in total factor productivity growth in the United States, as ICT became more widely used. Berry and England suggest that at least some of this pick-up represented a structural improvement in US productivity. In this section, we examine how capital flows and the real and nominal exchange rates have responded to this productivity shock in light of the theory presented above. Of course, we need to bear in mind that if the increase in productivity proves to be a purely cyclical phenomenon then all the effects described are likely to be reversed over the economic cycle.

Chart 2 shows the rapid widening of the US current account deficit over the past ten years. For any current account position there must be equal and offsetting capital flows, and so the widening US current account deficit was, by definition, financed by large inflows of capital from abroad. Put another way, and as described earlier, the productivity shock in the United States has appeared to lead to large capital inflows as US residents have borrowed against expected future income.

Chart 2 US current account balance



Chart 3 shows net capital inflows to the United States, illustrating the strong increase in both equity and foreign direct investment (FDI) flows since 1995. The IMF has suggested that these net equity capital inflows can help to explain recent movements in the euro-dollar

Chart 3 Net capital inflows to the United States



exchange rate, although long-term interest rate differentials also have an explanatory role.⁽¹⁾

Chart 4 shows movements in the real effective dollar exchange rate (deflated using consumer price indices) over the past ten years. Over the past five years, the real effective exchange rate has appreciated by 31%. This appreciation is large and our model suggests that, to explain the appreciation as a result of the productivity shock alone, the shock would have to be extremely large. However, it is possible that the increase in US productivity is at least partly responsible for the dollar's appreciation in real terms. In addition, for the appreciation to have persisted, economic agents would have had to take time to realise that some elements of the productivity improvements appeared more likely to represent a structural shock to productivity rather than being cyclical. This seems a reasonable characterisation of a consensus view of US developments, ie that part of the productivity gains has over time come to be regarded as more structural in nature.

Chart 4 US real effective exchange rate



(1) See, for example, chapter 2 of the IMF's May 2001 World Economic Outlook.

The evidence described in Berry and England (2001) suggests that the improvements in productivity have been most marked in the ICT sector. And imports of ICT goods (computers, accessories and telecommunications equipment) have accounted for more than 40% of total capital expenditure on ICT in the United States since 1995, suggesting that ICT goods appear to be fairly characterised as tradable. Further evidence to support the Balassa-Samuelson argument is provided by Chart 5, which illustrates that the relative price of ICT goods has fallen dramatically at a time when the real exchange rate for the dollar has risen.

Chart 5 Dollar real effective exc

Dollar real effective exchange rate (REER) and relative price of ICT goods



Chart 5 suggests that since 1995 the fall in the relative price of ICT goods is of the same order as the rise in the real exchange rate. This may be seen as evidence for the productivity shock in the ICT sector being able to explain the appreciation of the real exchange rate. However, the fall in the price of goods relative to the price of services—a broader proxy for the relative price of tradable versus non-tradable goods—is much more muted. We show this in Chart 6 by setting the services/goods CPI ratio in the United States alongside the rise in the real exchange rate.

Turning to other possible explanations, Chart 7 shows, furthermore, that movements in the terms of trade cannot account for the appreciation of the US real effective exchange rate. Indeed, since the end of 1998, the terms of trade have fallen, which by itself would imply a real depreciation.

One possible explanation for the strength of the dollar over this period, which does not rely on the productivity

Chart 6

Dollar real effective exchange rate (REER) and price of services relative to goods







shock, is that it is a purely cyclical phenomenon. A positive shock to domestic demand, such as a large increase in investment or fall in saving, would tend to raise the real interest rate relative to the rest of the world. As a result of the UIP reasoning discussed above, this would lead to a real exchange rate appreciation. This appreciation would be reversed as demand fell back to more sustainable levels.

Finally, Chart 8 shows the nominal exchange rate index for the dollar. Since the start of 1999, the dollar has appreciated by slightly more in nominal terms (37%) than in real terms (31%). This suggests that policy has, by and large, accommodated the real exchange rate increase. (If policy had been too tight—ie interest rates were kept higher than was necessary to keep inflation on track—the nominal exchange rate would have appreciated by considerably more than the real exchange rate, as happened in the mid-1980s.) Further evidence of this is provided by the fact that US inflation has tended to be higher than inflation in the United Kingdom and the euro area since about 1995. If policy had not been accommodating, US inflation would have fallen relative to inflation in the rest of the world.





Conclusions

In the context of assessing how economic models can cast light on the recent appreciation of the dollar, we have sought to tie together movements in real and nominal exchange rates, the real interest rate, equity prices and the current/capital account balance. These relationships are likely to be sensitive to the particular shocks assumed to be affecting an economy. We focus on the effects of a permanent shock to the level of future productivity (a temporary shock to the growth rate of productivity) in the United States, and how these effects might be sensitive to whether the shock is concentrated in tradable goods production, particularly the ICT sector.

It is relatively easy to show that such a shock would lead to larger capital inflows, higher expected future profits, an increase in equity prices and a higher level of investment. Moreover, this is widely accepted as representative of developments over the past five years or so in the United States. It is more complicated to make the link to a sustained appreciation of the exchange rate. A conventional UIP argument would suggest that a productivity shock will lead to an immediate appreciation of the real exchange rate, followed by a depreciation back to its equilibrium level as productivity growth returns to its trend rate. If we assume that it takes time for economic agents to realise that the increase in productivity is structural rather than purely cyclical, we can extend the period over which the real exchange rate appreciates before it eventually depreciates. If we assume that the productivity shock is spread evenly across the tradable and non-tradable sectors, then the equilibrium real exchange rate will—other things equal—depreciate, because such a shock implies an increase in the relative supply of domestic goods and a fall in their relative price.

But this story is sensitive to the assumption that the productivity shock is spread across tradable and non-tradable sectors. Other work suggests that the US productivity shock of recent years has reflected a strong ICT contribution, and that ICT is highly traded. Using a simple model we show that a productivity shock concentrated in tradable goods can lead to an appreciation of the equilibrium real exchange rate. But if we relax the assumption that the relative price of tradables in different countries cannot change, the appreciation will be more muted. A key question is how far such a model helps to cast light on the appreciation of the dollar. Unsurprisingly, the evidence suggests that the model will not provide a full explanation of the recent appreciation of the dollar, but along the way there is an interesting point to the exercise. Put simply if, to use an extreme assumption, we suppose that all tradable goods in the United States are ICT, then we can explain the large appreciation of the real dollar exchange rate because of the large relative fall in ICT prices. However, if we use relative goods/services prices to proxy the ratio of tradable goods prices to non-tradable goods prices, then it becomes harder to explain within this framework the scale of the appreciation of the dollar. Moreover, the fall in the US terms of trade since the end of 1998 is consistent with a rise in productivity in the US tradable sector relative to that in the rest of the world. That fall in the relative price of US tradables might imply a more muted appreciation of the real exchange rate as a result of a productivity shock.

Capital flows: technical annex

This annex develops a model to describe more formally the effect on capital flows and the real exchange rate of an anticipated future productivity shock. In the simplest version of the model, there is only one good.⁽¹⁾ This version of the model is used to show that a productivity shock will generate capital flows; this happens despite the fact that the real exchange rate never moves (purchasing power parity holds at all times). In the more developed version of the model, each economy is endowed with two goods: one that is tradable with the other country and one that is not tradable. In this case, we find that a shock that raises the productivity of both sectors in one country will always lead to a long-run real exchange rate depreciation. If, on the other hand, the shock affects only the tradable sector the real exchange rate will appreciate in both the short and the long run. Provided the productivity shock has some effect on the tradable sector, we will still observe capital flows towards the country experiencing the shock.

The one-good case

In this model, the representative domestic consumer maximises his utility function (we assume a simple log utility function) subject to a two-period budget constraint in which he is allowed to borrow from/lend to foreign consumers at the world real interest rate (determined endogenously). Mathematically, we can write this problem as:

Maximise
$$\ln(c_1^D) + \beta E_1 \ln(c_2^D)$$
 (1)

subject to
$$A = y_1^D - c_1^D$$
 (2)

and
$$E_1 c_2^D = (1+r)A + E_1 y_2^D$$
 (3)

where c^D is domestic consumption, y^D is domestic output (exogenously given),⁽²⁾ β is the consumer's discount factor, E is the expectations operator and A is net external assets (loans to foreigners) held at the end of period 1. This will equal capital inflows in period 1 and will result in capital outflows of A(1+r) in period 2 as the loans are repaid with interest.

The first-order conditions for this problem imply:

$$\frac{1}{c_1^D} = \beta(1+r) E_1 \left(\frac{1}{c_2^D}\right)$$
(4)

 $c_1^D + \mathbf{E}\frac{c_2^D}{1+r} = y_1^D + \mathbf{E}_1\frac{y_2^D}{1+r}$ (5)

Similarly, the first-order conditions for the (symmetric) foreigner's problem are:

$$\frac{1}{c_1^F} = \beta(1+r) \mathbf{E}_1 \left(\frac{1}{c_2^F}\right)$$
(6)

$$c_1^F + E_1 \frac{c_2^F}{1+r} = y_1^F + E_1 \frac{y_2^F}{1+r}$$
 (7)

And, for the world as a whole, we have the two budget constraints:

$$c_1^D + c_1^F = y_1^D + y_1^F$$
(8)

$$c_2^D + c_2^F = y_2^D + y_2^F$$
(9)

For ease of exposition, we assume perfect foresight. Assume that home consumers see a productivity shock that will raise output in period 2. In particular, we suppose that output is 5% higher in period 2 than originally expected in period 1. If we suppose that the two countries are of equal size, the effect of the shock will be to raise world output in period 2 by 2.5%. In this model, the growth rate of world output equals the growth rate of world consumption. Since both countries face the same real interest rate, domestic consumption growth and foreign consumption growth will be the same. Given 2.5% higher world consumption growth, this implies domestic and foreign consumption growth 2.5% higher than previously expected. From the Euler equations we can also see that the world real interest rate rises by $0.025/\beta$:

$$\frac{c_2^D}{c_1^D} = \frac{c_2^F}{c_1^F} = \beta (1 + r + 0.025 / \beta) = (1 + g + 0.025)$$
(10)

where g is the growth rate of output originally expected in each country.

With assumptions about the initial world growth rate and real interest rate, we can use this simplistic model to measure the capital inflows to the domestic economy, in the face of the productivity shock. Suppose the quarterly growth rate is 0.6% and the quarterly real interest rate is 1% (equivalent to annual rates of 2.4% and 4% respectively). Given these values, the first-order

⁽¹⁾ For ease of exposition the term 'goods' in this annex encompasses goods and services.

⁽²⁾ We abstract from production in this model; hence there is no capital and no investment.

conditions imply an annual value for β of 0.985. We can rearrange equation (5) to show that when domestic consumers anticipate a 5% increase in period 2 output, they raise period 1 consumption by 1.2%. Substituting this into equation (2) shows that this is funded by capital inflows equivalent to 1.2% of period 1 domestic output.

The desire of domestic consumers to smooth consumption by borrowing in period 1 drives up the real interest rate to 6.5% per annum. So in this simple (constant elasticity of intertemporal substitution) case, a large anticipated rise in domestic period 2 output induces a modest rise in consumption in period 1. This is because a large rise in the world real interest rate is required to tempt foreigners into forgoing consumption in period 1.

A two-good model

In this section, we look at what happens when we consider an economy that produces tradable and non-tradable goods. We can think of non-tradable goods as goods and services whose transportation costs are so large relative to their costs of production that it would never be profitable to produce them in an economy and then sell them abroad. The inclusion of such goods enables us to define a real exchange rate that is not constant (as was the case in the one-good world).

Consider a domestic consumer. His problem is again to maximise utility subject to the budget constraints he faces in each period. He is allowed to borrow/lend tradable goods from/to foreign consumers. He cannot borrow or lend non-tradable goods. Mathematically, we can write his problem as:

Maximise
$$\gamma \ln \left(c_{T,1}^D \right) + (1-\gamma) \ln \left(c_{N,1}^D \right)$$

+ $\beta \mathbb{E}_1 \left(\gamma \ln \left(c_{T,2}^D \right) + (1-\gamma) \ln \left(c_{N,2}^D \right) \right)$ (11)

subject to $A = y_{T,1}^D + p_1^D y_{N,1}^D - c_{T,1}^D - p_1^D c_{N,1}^D$ (12)

and
$$E_1(c_{T,2}^D + p_2^D c_{N,2}^D) = (1+r)A + E_1(y_{T,2}^D + p_2^D y_{N,2}^D)$$
 (13)

where c_T^D is domestic consumption of tradable goods, c_N^D is domestic consumption of non-tradable goods, y_T^D is domestic output of tradable goods, y_N^D is domestic output of non-tradable goods and p is the relative price of non-tradable goods expressed in terms of tradable goods. The particular utility function assumed implies that the share of consumer spending that goes on tradable goods is constant and equal to γ .

The first-order conditions for this problem imply:

$$\frac{1}{c_{T,1}^D} = \beta(1+r) \mathbf{E}_t \left(\frac{1}{c_{T,2}^D}\right)$$
(14)

$$\frac{\gamma}{1-\gamma} = \frac{c_{T,1}^D}{p_1^D c_{N,1}^D} = \frac{c_{T,2}^D}{p_2^D c_{N,2}^D}$$
(15)

In equilibrium, non-tradable output will equal non-tradable consumption. Using this fact and combining together the two budget constraints (equations (12) and (13)) gives:

$$c_{T,1}^{D} + \mathbf{E} \frac{c_{T,2}^{D}}{1+r} = y_{T,1}^{D} + \mathbf{E}_{1} \frac{y_{T,2}^{D}}{1+r}$$
(16)

We can use the consumer's utility function to define a consumption-based aggregate price index, *P*. The index is defined as the *P* that minimises total consumption expenditure, pc_N+c_T , subject to the utility function defined above. In this case, we can show that, if we use tradable goods as the numeraire, it will be given by:

$$P = \frac{p^{1-\gamma}}{\gamma^{\gamma} (1-\gamma)^{1-\gamma}}$$
(17)

Furthermore, we can define the real exchange rate between domestic and foreign consumption bundles as simply the ratio of the two aggregate price indices:

$$e = \frac{P^D}{P^F} = \left(\frac{p^D}{p^F}\right)^{1-\gamma}$$
(18)

where a rise in *e* signals a real exchange rate appreciation.

The first-order conditions for the (symmetric) foreigner's problem will include:

$$\frac{\gamma}{1-\gamma} = \frac{c_{T,1}^F}{p_1^F c_{N,1}^F} = \frac{c_{T,2}^F}{p_2^F c_{N,2}^F}$$
(19)

Log-linearising equations (15), (18) and (19) and noting that, in equilibrium, non-tradable consumption equals non-tradable output gives:

$$0 = \hat{c}_T^D - \hat{y}_N^D - \hat{p}^D = \hat{c}_T^F - \hat{y}_N^F - \hat{p}^F$$
(20)

$$\hat{e} = (1 - \gamma) \left(\hat{p}^D - \hat{p}^F \right) \tag{21}$$

where *^s* denote small percentage changes. We can combine these to give an expression for the real exchange rate:

$$\hat{e} = (1 - \gamma) \left(\left(\hat{c}_T^D - \hat{c}_T^F \right) - \left(\hat{y}_N^D - \hat{y}_N^F \right) \right)$$
(22)

We showed in the one-good case how to calculate the effect on domestic consumption of a productivity shock that raised future output in the tradable sector. In particular, given our parameterisations, a productivity shock that raised next period's domestic output of tradable goods by 5% led to an increase in the own rate of interest on tradable goods from 4% to 6.5% and a rise in first-period tradable-goods consumption of 1.2%. As this had to be financed by a capital inflow from abroad, we can immediately note that foreign first-period consumption of tradable goods would drop by 1.2%. If we assume a value for γ of 0.1 (reasonable for the United States), equation (**22**) suggests that the real exchange rate would appreciate by 2.16% in the period of the shock.

Moving into the following period, we can note that both the home and foreign countries experience tradable goods consumption growth 2.5% higher than previously. This implies that domestic consumption of tradable goods in period 2 will be 3.7% higher than its original trend and foreign consumption of tradable goods will be 1.3% higher than its original trend. The difference between the two remains the same and hence equation (22) implies that the real exchange rate stays 2.16% above its original level. This response of the real exchange rate to tradable-sector productivity shocks is known as the Balassa-Samuelson effect.

Notice that equation (22) also has strong predictions about the effect of a productivity shock in the non-tradable sector. In particular, a 1% current-period shock to output in the domestic non-tradable sector will lead to a 0.8% depreciation of the real exchange rate in the current period, with the future path of the exchange rate depending on whether or not this shock is temporary or permanent. The intuition for this result is exactly as stated in the main text: such a shock implies an increase in the relative supply of domestic goods and, given this, their relative price must fall. A perfectly anticipated shock to future output in the non-tradable sector will lead to no change in the current exchange rate and a depreciation of the future exchange rate. Because shocks to the non-tradable sector do not raise the domestic country's wealth in terms of tradable goods relative to the rest of the world, there will be no capital flows in response to such a shock. All that changes is the relative price of non-tradable goods and, by implication, the real exchange rate. This is a direct result of the form assumed for the utility function and may not hold in more general cases.

Putting these results together enables us to consider the effects of a productivity shock to both sectors that raised expected future output. Suppose that the home country is hit with a productivity shock that raises output in both sectors by 5% in period 2 and this is perfectly anticipated in period 1. The above analysis suggests that the real exchange rate would appreciate by 2.16% in period 1 before depreciating by 4% in period 2, finishing 1.84% below its original level. The intuition here is that, since the non-tradable sector represents 90% of the economy, the effects of the shock in the non-tradable sector are going to dominate those in the tradable sector. In the short run, the desire of domestic residents to smooth consumption will lead to a rise in their real interest rate relative to the rest of the world and hence a jump appreciation of the real exchange rate. In the long run, the productivity shock will lead to an increase in the relative supply of domestic goods and, given this, their relative price (the real exchange rate) must fall.

PPP and the real exchange rate-real interest rate differential puzzle revisited: evidence from non-stationary panel data

Working Paper No. 138

Georgios E Chortareas and Rebecca L Driver

The relationship between the real exchange rate and the real interest rate differential is often seen as one of the basic elements of policy-makers' 'conventional wisdom'. As such, it suggests that in the long run the real exchange rate will be given by a combination of a constant and the real interest rate differential. It is a relationship derived from two of the main building-blocks that underpin (explicitly or implicitly) much of international macroeconomics. The first is purchasing power parity (PPP), or the hypothesis that there exists a constant long-run equilibrium real exchange rate. The second is uncovered interest parity (UIP), or the hypothesis that the expected change in the exchange rate will be equal to the interest rate differential. Combining these using both the monetary and portfolio balance models, as well as more hybrid constructs, will produce the real exchange rate-real interest rate differential relationship investigated here. Despite the theoretical and intuitive appeal both of the real exchange rate-real interest rate differential relationship and of its underlying components, the empirical evidence for these propositions (either separately or collectively) has at best been mixed. This paper employs new non-stationary panel techniques to investigate the empirical basis both for PPP and for the real exchange rate-real interest rate differential relationship. The results suggest that the answers are very dependent on the sample considered.

The results are obtained using a panel of 17 OECD bilateral real exchange rates against the US dollar, with more than 20 years of quarterly information from the

post-Bretton Woods era. Our analysis uses recently developed stationarity and cointegration panel data tests. These help by increasing the span of the data, which raises the power of the tests (or in other words the ability to correctly reject the hypothesis being investigated).

The results show that there is little direct evidence to support PPP, ie the proposition that the real exchange rate is constant, or at least mean-reverting, in the long run. This evidence is obtained by examining the stationarity of the real exchange rate. The failure to find PPP contradicts the evidence from recent applications of non-stationary panel techniques to the real exchange rate. It suggests that, even with the new more powerful techniques, finding PPP may still be heavily sample-dependent.

Our results for the relationship between the real exchange rate and real interest differentials for the same sample also provide a contrast with earlier studies. In particular, the paper finds evidence that there exists a valid, stationary long-run relationship between the two variables. Using panel cointegration techniques it is possible to accept the existence of a long-run stationary relationship between the two. This is particularly obvious for the small open economies within the panel. When the panel consists solely of the G7 economies, however, the evidence for stationarity breaks down. This may explain the failure of most previous studies to uncover a long-run relationship, as these concentrated almost exclusively on G7 economies.

The United Kingdom's small banks' crisis of the early 1990s: what were the leading indicators of failure?

Working Paper No. 139

Andrew Logan

Bank failure has fortunately been a rare event in the United Kingdom. Even more infrequent has been the simultaneous failure of a number of banks that potentially threatens the stability of the financial system. This study uses as a backdrop the period, known as the small banks' crisis of the early 1990s, when failure was last widespread and the system faced a potentially systemic threat. It was also the most recent occasion on which the Bank of England provided emergency liquidity support to UK banks.

Using a logit model this study examines the balance sheet characteristics of the small and medium-sized UK banks at two points prior to the crisis period to see whether the banks that would go on to fail had any distinctive features compared with those that would survive. Its goal is to identify leading indicators of failure. This may assist the Bank of England and the Financial Services Authority (FSA) in crisis prevention policy prescriptions before a future crisis has had a chance to develop. In some senses it is analogous to the early warning systems employed by banking regulators in some jurisdictions, most notably the United States.

The study initially focuses on the small and medium-sized UK banks' balance sheet characteristics in 1991 Q2, the quarter prior to the announcement of BCCI's closure. This news accelerated the rate at which wholesale deposits were withdrawn from the small banks. At this point the most important leading indicators of failure were a high dependence on net interest income, low profitability, low leverage, low short-term assets relative to liabilities and low loan growth. Taken together, these indicators suggest that the banks that failed over the following three years were already weak by the early 1990s (reflecting the recession at the time).

While they may be helpful in identifying subsequent failures, these indicators cannot be used by regulators or central banks to take pre-emptive policy action. The interval between the signal and failure is too short, so by then, it may have been difficult for regulators to do anything more than manage down the scale of the problems. Indicators of future failure with a longer lead-time would be more useful.

Data from the pre-recession period were therefore analysed. The results suggest that rapid loan growth in the late 1980s boom was a good longer-term indicator of failure. A cyclical comparison indicates that the banks that subsequently failed tended to exhibit a pronounced boom and bust cycle in lending growth, unlike those banks that survived.

ICT and productivity growth in the United Kingdom

Working Paper No. 140

Nicholas Oulton

This paper seeks to measure the contribution of information and communications technology (ICT) to the growth of output and productivity. It follows recent work for the United States in taking a growth accounting approach. Four types of ICT are examined: computers, software, telecommunications equipment and semiconductors (chips).

Method

Using the growth accounting approach, the contribution of any particular type of output, such as computers, to GDP growth is:

Share of final output of computers in GDP *times* growth rate of final output of computers

Computers also contribute to aggregate *input* since they are a form of capital. The contribution of computers to aggregate input is:

Profit attributable to computers as a proportion of GDP *times* growth rate of the services of the stock of computers

Semiconductors are an intermediate product and in a closed economy their contribution would not be separately distinguishable using this methodology. But in an open economy like the United Kingdom they do make a contribution to output via net trade (exports net of imports).

In this paper, US price indices (adjusted for exchange rate changes) are used as deflators for ICT. US prices have been falling much more rapidly than their UK counterparts. The paper also argues that UK software investment in current prices is at least three times the official figure. The higher level of software investment argued for here raises both the level and the growth rate of GDP. These two adjustments taken together have a large effect on the results reported below.

The paper also uses capital services rather than the capital stock (a wealth measure) to quantify the contribution of capital. This too has a significant effect on the results. The reason is that the capital services measure gives a higher weight to assets with short lives and high depreciation rates, and this sort of asset, particularly computers and software, has been growing more rapidly. Wealth measures of capital have their place but theory suggests that capital services are the appropriate measure for the analysis of productivity.

Results

On the basis of these new estimates of ICT output and investment, there has been a substantial and growing understatement of GDP growth in the United Kingdom. From 1994 to 1998, accepting the new estimates would add between 0.25 and 0.33 percentage points per annum to the growth rate.

The share of ICT output in GDP has been rising fairly steadily but still only reached 3% by 1998. Despite this, the growth of ICT output has contributed about a fifth of GDP growth from 1989 to 1998.

On the input side, since 1989, 55% of capital deepening—the growth of aggregate capital services per hour worked—has been contributed by ICT capital. From 1994 to 1998, ICT capital accounted for a remarkable 90% of capital deepening.

ICT capital deepening accounted for 25% of the growth of output per hour in 1989–98 and 48% in 1994–98.

The UK performance in the second half of the 1990s resembles that of the United States in some respects. Both countries saw an acceleration in the rate of growth of output accompanied by an increase in the contribution of ICT capital deepening. But, despite the ICT adjustments, the UK growth rate of labour productivity weakens after 1994. Part of this is due to a fall in the contribution of non-ICT capital but part to a slowdown in total factor productivity (TFP) growth. By contrast, the US labour productivity acceleration has been accompanied by a rise in TFP growth (in both the ICT and non-ICT sectors of the economy). Overall, TFP growth has increased in the United States by about one half a percentage point, whereas it has fallen in the United Kingdom by about three quarters of a percentage point.

Finally, since the ICT share in GDP in the United Kingdom, though rising, is still only two thirds that in the United States, we may expect the contribution of ICT capital to economic growth in the United Kingdom to continue to increase.

The fallacy of the fiscal theory of the price level, again Working Paper No. 141

Willem H Buiter

In most macroeconomic models, the real equilibrium is determined in the long run by real factors such as the capital stock, the available labour force and technical progress. The nominal anchor, ie the determinant of the general price level, is usually provided by the money stock, a monetary policy rule, or the exchange rate regime. A recent literature has attempted to show that fiscal policy could provide the nominal anchor, and hence this approach is known as the fiscal theory of the price level (FTPL).

The purpose of this paper is to show that the FTPL is erroneous. It is based upon a fallacy that involves an economic misspecification. The proponents of the fiscal theory of the price level do not accept the fundamental proposition that the government's intertemporal budget constraint is a constraint on the government's instruments that must be satisfied for all admissible values of the economy-wide endogenous variables. Instead they require it to be satisfied only in equilibrium. This economic misspecification has implications for the mathematical or logical properties of the equilibria supported by models purporting to demonstrate the properties of the fiscal approach. These include: overdetermined (internally inconsistent) equilibria; anomalies like the apparent ability to price things that do not exist; the need for arbitrary restrictions on the exogenous and predetermined variables in the government's budget constraint; and anomalous behaviour of the 'equilibrium' price sequences, including behaviour that may ultimately violate physical resource constraints.

The FTPL is based on the distinction between two kinds of fiscal rule. A Ricardian fiscal rule requires that the government's solvency constraint holds for all admissible sequences of the endogenous variables. A non-Ricardian rule requires the government's solvency constraint to hold only for equilibrium sequences.

There are two ways of refuting the FTPL. The first is based on *a priori* economic considerations. It is taken

as axiomatic that only those models of a market economy are well-posed, in which, if default is ruled out, budget constraints (including the government budget constraint) must be satisfied for all admissible values of the economy-wide endogenous variables. It does not matter whether the government (or the private agents) are small (price-taking) or large (monopolistic or monopsonistic). It does not matter whether the government optimises (or what it optimises), satisfices or acts according to *ad hoc* decision rules.

According to this Ricardian postulate about the proper specification of budget constraints, a non-Ricardian fiscal rule that rules out default is ill-posed. Any model that incorporates a non-Ricardian fiscal rule, yet assumes that all contractual debt obligations are met, does not make *economic* sense.

The second way to refute the FTPL applies even if one does not accept the *a priori* assertion that, if default is ruled out, budget constraints must be satisfied always, not only in equilibrium, and that, consequently, a non-Ricardian fiscal rule only makes sense if we explicitly introduce an endogenous default discount factor on the public debt. This second approach involves the demonstration of a number of mathematical (or logical) and conceptual anomalies that characterise equilibria purported to be supported by non-Ricardian fiscal rules without default.

The issue is not just of academic interest. The FTPL implies that a government can exogenously fix its real spending, revenue and seigniorage plans, and that the general price level will take on the value required to adjust the real value of its contractual nominal debt obligations to ensure government solvency. If some misguided government were to take this seriously and acted upon it, the result, when reality dawns, could be painful fiscal tightening, government default or excessive recourse to the inflation tax.

Balancing domestic and external demand

In his annual speech at the Mansion House,⁽¹⁾ the **Governor** reports on a further year of steady progress in the overall economy, but notes that the global economic slowdown and the weakness of the euro exchange rate have contributed to a widening of the imbalance between the internationally-exposed sectors, which have been suffering, and the more domestically-oriented sectors, which have been doing rather better. The Monetary Policy Committee cannot do much directly to affect the external influences but can attempt to offset their effects by encouraging private sector domestic demand. The **Governor** goes on to note the obstacle posed by current exchange rates for early entry to the euro by the United Kingdom.

My Lord Mayor, Mr Chancellor, my Lords, Aldermen, Mr Recorder, Sheriffs, Ladies and Gentlemen.

It is always a privilege, my Lord Mayor, and a pleasure, to be invited to enjoy the splendour, and the generous hospitality, of the Mansion House on the occasion of this annual dinner for the Merchants and Bankers of the City of London. You provide us with an opportunity—in an atmosphere of calm—to reflect upon the events of the year that has gone by and upon the challenges to come.

And the past year certainly has been eventful—though it is notable that some of those events did not result in particularly dramatic change.

I think particularly of the Election and I congratulate the Government on the outcome, and you, Chancellor, on your own re-appointment. I very much look forward to continuing to work with you.

But I think, too, of our relatively stable overall economic performance—despite the devastating effect on many farmers, and on rural communities more generally, of foot-and-mouth disease; despite the weather and the floods; despite the disruption on the railways; and despite, above all, the pressures on the internationally-exposed sectors of our economy as a result of developments abroad.

In this last context, my Lord Mayor, I was struck by a recent newspaper comment to the effect that if we were

living on an island we'd be in reasonably good shape. Now I have to confess that I'd always been under the impression that we were living on an island, but I let that pass. What I think the writer was drawing attention to is the fact that despite the recent global economic slowdown—notably in the United States, despite the continuing weakness of the euro, and despite the sharp rise in crude oil prices over the past year, we have in fact, in terms of our own overall economy, enjoyed another year of steady progress.

GDP growth in the year to the first quarter—at 2.6% remained above our longer-term trend rate, and was above the rate of inflation, whether measured by the GDP deflator or our target measure of retail price inflation (RPIX), for the sixth time in the past eight years. Since the economic expansion began in 1992, annual output growth has averaged just less than 3% while the rate of inflation has averaged just under $2^{1/2}$ %. The number of people in employment last year (on the LFS measure) continued to rise fairly steadily to an all-time high; the number of unemployed people fell to below one million (on the claimant count measure) for the first time since December 1975, and the rate of unemployment fell to its lowest in more than 25 years in the United Kingdom as a whole, and to its lowest for more than 20 years in every individual region.

But, my Lord Mayor, even if—as I at least continue to believe—we are living on an island, that does not make us immune from developments abroad.

(1) Given at the Lord Mayor's Dinner for Bankers and Merchants of the City of London at the Mansion House on 20 June 2001. This speech can be found on the Bank's web site at www.bankofengland.co.uk/speeches/speech135.htm In particular, we are bound to be affected by current developments in the United States, both directly, and indirectly through the knock-on effects on third countries, with those effects on the eurozone particularly important for us.

By this time last year it had become clear that, even on the most optimistic view of improving underlying productivity—as the application of new information and communications technologies spread through the American economy—the rate of growth in the United States, of over 5%, was unsustainable in the light of increasing domestic and external imbalances. The pace of US domestic demand growth needed to slow—as of course it has.

The big questions now are about the extent of the slowdown and how long it will last.

On an optimistic view we may be largely through the sharp downward stock adjustment, and with consumption so far holding up better than generally expected, and with the possibility that investment will recover as the spread of ICT through the economy resumes, US activity may pick up as we move, say, into next year. But the pessimist can point to the weakness of private sector saving, which could induce more cautious consumer behaviour: he can point to a possible overhang of past investment excesses; and he can point to the US external deficit which will need to be corrected at some point. These adjustments might take place gradually over time, implying a more protracted period of relatively slow growth in the United States. Or, if you are really pessimistic, you might anticipate more abrupt adjustment, implying a period of negative US growth and global financial instability.

The recent somewhat erratic recovery of US financial markets from their earlier gloom suggests that they may have begun to side somewhat tentatively with the optimists; but some of the survey evidence of consumer and business confidence, on the other hand, supports a more pessimistic view.

The truth is that none of us knows with any great confidence just how the US situation will evolve. For what it is worth I remain modestly optimistic, but I am very conscious of the downside risks. The outcome is obviously the major uncertainty affecting us all.

The other major external influence on the economic situation in this country is the development of the

exchange rate. Depending on who you speak to sterling is variously described as dangerously weak, at a 15-year low, against the dollar, or as unsustainably strong, close to its peak, against the euro. The truth is that sterling's effective exchange rate has been relatively stable for most of the past $2^{1/2}$ years—at about 105 on the standard index, plus or minus 5%. The bilateral rates that are frequently quoted in fact tell us very little about sterling: they are essentially a reflection of the persistent general strength of the dollar on the one hand and the persistent general weakness of the euro on the other, resulting from sustained capital inflows to the United States in large part from the eurozone.

It was widely expected that, with the slowdown in the US economy, and associated weakening of US earnings expectations and stock prices, these capital flows would moderate, causing the dollar to weaken and a corresponding recovery in the euro. That clearly has not, yet, occurred, although—given the size of the US external imbalance—it is difficult to see how an exchange rate adjustment can ultimately be avoided.

In the meantime, the stronger dollar—and higher oil prices—have added to inflationary pressures elsewhere. But in our own case this effect has been offset by the weakness of the euro—or by sterling's bilateral strength against the euro, if you prefer—which has dampened both external demand and our domestic price level.

The result of these external developments—the global economic slowdown and the pattern of exchange rates taken together—for us has been that, notwithstanding only a rather modest slowdown of our overall economy, we have continued to see a growing imbalance between the internationally-exposed (particularly the euro-exposed) sectors, which have been having a rather torrid time, and the more heavily domestically-oriented sectors, which have been doing rather better. The weakness of manufacturing alongside continuing growth in the service sectors is a crude reflection of this imbalance.

With inflation running somewhat below the Chancellor's symmetrical $2^{1}/_{2}$ % target, and with developing uncertainties about the continuing strength of domestic demand, the MPC was in a position to respond to these developments by reducing interest rates earlier this year.

In fact we cut rates by ${}^{3}/{}_{4}$ %, while the Federal Reserve cut much more aggressively, by $2{}^{1}/{}_{2}$ % over much the same

period, and the European Central Bank by just ¹/₄% reflecting the different overall monetary conditions as they saw them in their respective currency areas. You might suppose that these relative interest rate movements would have encouraged the dollar to weaken against sterling and by more against the euro—and given the pattern of international imbalances it would have been helpful if they had. But, in the event exchange rates moved in the wrong direction, illustrating the unpredictable—even perverse—relationship between relative interest rate and exchange rate movements, at least in the short term. That ought to be a salutary lesson to those who imply that monetary policy can be directed to controlling both inflation and the exchange rate at the same time!

So there is not much that we can do directly, through monetary policy, to affect the various external influences weighing upon our economy. But we can attempt to offset their effects, by encouraging the growth of private sector domestic demand to try to keep overall demand in the economy growing in line with potential supply. And that in effect is what we have done through our recent interest rate cuts.

This approach is not, however, without risks. It involves accepting—at least while the dampening external influences persist—a growing imbalance between the internationally-exposed and the domestically-oriented sectors. If we did not accept that, then overall demand and output would be lower, and inflation would tend to fall further below target. But the imbalance cannot continue to grow indefinitely. At some point the elastic is likely to break—quite possibly through a sharp exchange rate adjustment. And at that point, having deliberately stimulated domestic demand growth, we would need to rein it back. But we could then find its momentum hard to stop.

I am not suggesting that we are necessarily approaching that point. Domestic inflationary pressures, including wage pressures, have so far remained reasonably subdued, and it is crucially important that that should continue. But it does explain our caution in moving interest rates down.

Somewhat similar concerns explain my reaction to recent speculation that the Government would now make a strong push for early entry to the euro. I take no position on the five economic tests, which are a matter for the Chancellor. But I do see the present external environment—and in particular, as I said elsewhere last week, the euro's present weakness—as a potentially serious obstacle to early entry. So I very much welcome the considered and cautious approach to making the assessment of the five tests, which the Chancellor set out this evening.

Most people agree that sterling's exchange rate on entry to the euro would need to be substantially lower than our present rate, which few would regard as sustainable in the medium and longer term.

Given the euro's present general weakness, that could come about in either of two ways.

If, achieving what was considered to be an appropriate entry rate against the euro—whatever that was precisely—involved a substantial depreciation of sterling's overall, effective, exchange rate (that's to say sterling's rate against other currencies generally), that would be bound to put strong upward pressure on our domestic rate of inflation. That would not only destabilise our domestic economy, it would also cause the intended euro-entry rate to appreciate in real terms, with adverse implications for our competitiveness within the eurozone. These effects would clearly be difficult to contain given the constraints on both our interest rate and the exchange rate as we moved towards entry, and very difficult to reverse once we were inside the single currency area.

This obstacle would diminish to the extent that the euro itself recovers against other currencies generally—as at some point it surely must. In that case sterling might weaken bilaterally against the euro, but it might be expected to strengthen against the dollar and other currencies, leaving our overall, effective, exchange rate closer to where it currently is. That would have less impact on our domestic rate of inflation.

There's no question, my Lord Mayor, that what we would like to see, both in the context of our current monetary management and if we are to join the euro, is a combination of a pick-up in the global economy and a recovery in the euro exchange rate. That would be in all our interests. But it is not at all clear what we can do to bring it about.

In the meantime, as we sail out from our island haven, through conflicting offshore currents and variable onshore winds, we may not find it easy to remain on the course set for us by Gordon the Navigator. We risk either being blown onto the Scylla of excessive domestic exuberance or sucked down by the Charybdis of external weakness. But we remain on watch, ready to tack as conditions change.

My Lord Mayor, yours is a great office with a great tradition. You—and the Lady Mayoress—have maintained that tradition this evening by entertaining us in such splendid style. And you have maintained that tradition, too, in your tireless promotion of the City of London—in its civic affairs, in its business activity, and in its engagement with our surrounding communities. In this last connection I look forward to joining with you and Howard Davies next Wednesday at the Heart of the City Carnival to celebrate, and encourage, the City's community and charitable involvement; and I hope that some of your guests this evening might care to join us at the Guildhall for that occasion.

But in the meantime I thank you for your gracious hospitality and I would ask all your guests to rise and to join me in a toast to your good health.

My Lords, Ladies and Gentlemen, the toast is:

'The Lord Mayor and the Lady Mayoress, David and Val Howard'.

The international financial system: a new partnership

In this speech,⁽¹⁾ Mervyn King, **Deputy Governor**, discusses the evolution of the international financial system over the past 50 years. The rapid increase in capital flows over this period has delivered benefits to both developed and emerging economies. But it has also brought challenges—none greater than the increased incidence of financial crisis over recent years. Guarding against future crises calls for a new partnership between developing and emerging market economies. Improved policies towards crisis prevention have a role to play, including through greater transparency, adherence to appropriate codes and standards of best policy practice, and management of countries' national balance sheets. Good progress has been made here in recent years. Rather less progress has been made on developing policies for crisis resolution. There is a lack of clarity about the official sector's current approach, which has added to uncertainty and borrowing costs for emerging markets. Greater clarity about the limits to IMF lending and alternative mechanisms for involving the private sector should be the two key ingredients of a new 'middle way' approach.

Introduction

It is both a great honour and a real delight to make my first visit to India in order to commemorate the 20th Anniversary of ICRIER. I feel especially honoured to be invited to deliver the first K B Lall Lecture. The theme of my lecture will be the international financial system, and the need for a new partnership between the developed economies and the developing or emerging market economies. The international financial institutions set up at Bretton Woods over 50 years ago were designed to deal primarily with problems of current account imbalances. In recent years, however, major financial crises have originated in the capital account. Why have these occurred, and how can we make them less likely in future and improve our ability to deal with them when they do occur?

I can think of no better place to discuss this subject than ICRIER. The links between international flows of private and public finance, and the need for a restatement of the role of the international financial institutions and a clearer understanding of their *modus operandi*, are subjects at the heart of the work of ICRIER. Your Founder Chairman, Dr K B Lall, whom I am delighted to say is with us this evening, worked tirelessly over the years in so many areas of international economic policy, including a period as Chairman of the General Agreement on Tariffs and Trade. Your current Chairman, Dr I G Patel, served India not only as Governor of the Reserve Bank but also at the International Monetary Fund. I owe I G a great debt for his help and support at the London School of Economics during his period as Director in the 1980s. And the new Independent Evaluation Office of the IMF, an important development in improving the accountability of the Fund, will be led by Mr Montek Singh Ahluwalia, one of India's most distinguished economists, and the husband of your Director, Dr Isher Judge Ahluwalia.

India was one of the 44 countries that participated in the meetings at Bretton Woods, which led to the creation of the International Monetary Fund and the World Bank. The Bank of England archives contains some fascinating material on the Bretton Woods Conference and, in particular, on the role of the Indian Delegation. A cable from the Foreign Office to the British Embassy in Washington on 1 June 1944 argued that there were strong grounds for giving India a seat on the Agenda Committee. The reply reported US opposition to this idea, in part because Canada and Australia were already represented on the Committee. The resulting compromise was the product of bureaucratic genius. An Indian representative was allowed to participate on the Committee provided that

(1) To commemorate the 20th Anniversary of the Indian Council for Research on International Economic Relations (ICRIER), New Delhi, 9 August 2001. This speech can be found on the Bank's web site at www.bankofengland.co.uk/speeches/speech138.htm there was no public announcement of the fact. In the end, common sense prevailed and India received an official invitation to attend the Agenda Committee.

Recent international financial crises

Perhaps the key difference between the world of Bretton Woods and the world today is the size and volatility of private capital flows. Then, as now, it was recognised that no system could ensure the compatibility of:

- (i) domestic monetary autonomy;
- (ii) stable exchange rates; and
- (iii) free capital mobility.

This 'impossible trinity' has been at the heart of the debate on the international monetary and financial system for many years. A sustainable system must sacrifice one of these three objectives. Some countries have decided to abandon the first leg of the tripod, namely domestic monetary autonomy. In Europe, twelve countries have formed a monetary union, and elsewhere, such as in Argentina and Hong Kong, currency boards, linked to the dollar, have replaced discretionary monetary policy. Other countries have abandoned the attempt to maintain rigidly fixed exchange rates, and adopted a combination of domestic monetary management based on an inflation target and a floating exchange rate. Examples include both developed economies, such as the United Kingdom and Canada, and emerging market economies, such as Brazil and South Africa. There are arguments for and against both of these approaches. But what is clear is that both in theory and practice there is now a recognition that pegged (fixed but adjustable) exchange rates do not provide a viable long-term middle course. More interesting, perhaps, is the absence of serious debate on the merits of the third position, namely the willingness to forgo freedom of capital movements in order to retain domestic monetary autonomy and stable exchange rates. That is perhaps surprising in the light of the experience of the two major countries in Asia that escaped the financial crisis of 1997-98, namely India and China, which had in common the presence of capital controls.

The willingness to impose controls on capital movements, at least temporarily, was certainly evident at the Bretton Woods Conference. Mindful of the weakness of Britain's national balance sheet, Lord Keynes, urged on by the Bank of England, argued that there should be no legally binding obligation to make the sterling balances convertible into dollars, not least those held by India. The vulnerability of countries to financial crises when private capital is freely mobile was uppermost in the mind of officials then, and has recently returned to prominence in the wake of recent crises.

Capital flows do, however, bring real economic benefits. They enable savings from around the world to move to those countries with the most profitable investment opportunities, benefiting lenders and borrowers alike. And such capital flows also transfer knowledge and expertise. The most important task of any financial system is to guide the allocation of scarce capital. As Larry Summers, the former US Treasury Secretary, said earlier this year, 'If you are looking for reasons why some countries succeed and why other countries do not succeed in the new global economy, a very large part of it goes to the greater success of the successful countries in channelling capital into the right places, and then making sure that it is used in a disciplined way'.

At Bretton Woods it was thought that post-war reconstruction could be financed by capital provided by the new World Bank, the twin of the International Monetary Fund. Hence it would be possible to finance reconstruction from long-term investment supplied by official institutions, without the necessity of allowing free movement of private capital that might raise the problem of the 'impossible trinity'. Soon, however, the demand for capital imports exceeded the ability of international institutions to supply loans. Private capital markets came into their own. The expansion of private capital flows was gradual, and, until about ten years ago, was primarily concentrated on flows among the developed economies. It is only in the past ten years that the explosion of private capital flows to emerging market economies has taken place. Data from the World Bank suggest that annual capital flows to emerging markets were less than \$10 billion in the early 1970s, rising to around \$300 billion in the late 1990s. At their peak, capital flows to emerging markets were around 5% of those countries' GDP.

Unfortunately, capital flows on this scale can reverse themselves as suddenly as they appear. The result of such sudden and large reversals of short-term capital flows has been a series of international financial crises, in Mexico in 1994–95, Asia in 1997–98, Brazil in 1998–99, and, more recently in Turkey and Argentina. The frequency and scale of these crises, if they were to continue, would be a serious impediment to the evolution of the international capital market. Unless we can both reduce the frequency and severity of such crises, and improve our techniques of crisis resolution, then the demonstrators against globalisation will be provided with unnecessary ammunition.

The costs of recent crises have been large. Between 1996 and 1998, the reversal of private capital flows to the five Asian countries primarily affected (Indonesia, Korea, Malaysia, the Philippines and Thailand) was almost \$150 billion, equivalent to about 15% of the pre-crisis level of GDP. Changes in the capital account imply equal and opposite swings in the current account. Inevitably, a change in the current account on that scale is likely to mean a deep recession. And during the Asian crisis, real GDP fell by 1% in the Philippines, 7% in Korea and Malaysia, 11% in Thailand and by 13% in Indonesia. Several years of economic growth were wiped out, leading in some cases to political instability. A recent study by Robert Barro shows that countries that experience financial crises can expect to return to their pre-crisis rate of economic growth only after about five years on average. Although the recovery of the afflicted Asian economies in 1999-2000 was more rapid, the fall in investment is likely to affect their level of output for several years.

It is clear, therefore, that it is dangerous for countries to sail unprepared into the deep waters of international capital markets. One of the important lessons of recent crises is that not all capital flows are equally dangerous. Most of the reversals in capital flows to the Asian countries were in the form of swings in short-term debt finance—about 80% resulted from changes in the net flows of finance from commercial banks. A build-up of short-term debt creates vulnerabilities in a country's national balance sheet. Where there are significant mismatches in either maturity or currency obligations, then a country is vulnerable to a liquidity run. In such a situation sudden reversals of capital flows can occur on a huge scale. That is the hidden cost of debt finance. In contrast, equity capital does not involve the risk of crises that are associated with the possibility of interruptions to payments on debt finance. This is because equity investment has a self-stabilising mechanism. Investors cannot withdraw from the equity market without finding a buyer to replace them. The market price adjusts in order for the seller to attract a buyer. Of course, the market price may move sharply and rapidly, and impact spending decisions. But crises resulting from payment interruptions are a feature of

debt finance. Lenders whose bonds mature or who choose to withdraw their deposits do not have to find a buyer. Instead they simply exit, and, if they do so on a sufficiently large scale, countries can find themselves facing a liquidity run.

Interest rates on lending to a country vulnerable to a run can rise to extremely high levels. If the market anticipates that a country may allow inflation to rise, or the exchange rate to fall, to alleviate the burden of domestic currency debt then interest rates on debt can rise rapidly. It is only ten years ago since overnight interest rates of several hundred per cent were seen during the ERM crisis in Europe. But even on foreign currency borrowing, a country may find that the spread of the interest rate at which it can borrow over the interest rate charged to 'safe' countries, such as the United States, can reach extremely high levels. And where that interest rate is markedly higher than the growth rate of the economy, the debt burden rapidly becomes unsustainable unless the interest rate can be brought down quickly. Before the Russian default and devaluation of 1998, the average spread on emerging market sovereign debt was around 500 basis points, in itself a sizable addition to the burden of borrowing in international capital markets. That spread then rose sharply to levels of between 1,000 and 1,500 basis points. At these levels debt burdens were clearly unsustainable. Since then, macroeconomic reform in many of the affected countries, with the help and support of the IMF, has reduced average spreads to a range of between 600 and 800 basis points, although there has been a further rise recently following the difficulties in Turkey and Argentina.

Emerging market spreads are currently around 900 basis points over interest rates on US Treasury bonds. It is not easy to reconcile spreads at this level with the fact that sovereign debt defaults on bonds are running at historically low levels. In part, the low level of defaults may reflect the increase in the number of exceptionally large loans made by the IMF in recent years. So what does account for the high level of emerging market spreads? There appears to be a good deal of uncertainty concerning the conditions surrounding the availability of official finance. It could be that investors are demanding higher interest rates to compensate for that uncertainty. There is also uncertainty among market participants about what would happen in the event of a debt restructuring and the expected repayments that would ensue. One role for

the official community is to try and mitigate these uncertainties through greater clarity about the criteria for official lending and its crisis resolution policies—a theme I return to below. If successful, one outcome of these reforms would be lower borrowing costs for emerging markets.

Investors are also starting to differentiate among borrowing countries more clearly than before. This has led to a greater dispersion of spreads on emerging market debt. Before the Russian crisis these spreads were tightly compressed with the central 50% of the distribution of emerging market spreads covered by a range of only around 100 basis points. At present, the range covered by the central 50% of the distribution is over 500 basis points. Correspondingly, there has been a sharp fall in the correlation between changes in emerging market spreads. The rolling 26-week correlation between changes in emerging market spreads reached a peak of around 0.8 at the time of the Russian crisis. Since then it has steadily declined, reaching a level of only 0.2 before the recent rise to around 0.35 following adverse developments in Turkey and Argentina. This differentiation in spreads is a welcome development. It shows that the possibility of contagion from a country affected by a crisis to others initially unaffected is less than might have been the case only a few years ago. Of course, if a country did default then correlations might rise significantly, but the focus of attention on recent crises and their causes has led investors to appreciate that many have been country-specific. Although there is no room for complacency, the lower correlation of spreads and the greater differentiation of risk assessments represents an increase in the efficiency in the way capital markets operate.

The experience of recent crises prompts two questions. First, what can countries do to protect themselves from the risk of further financial crises? Second, what should be the responsibility of the international community towards emerging market economies?

A new partnership

We need a new partnership between emerging market economies and developed economies. It is useful to distinguish between measures to improve economic performance and prevent financial crises, on the one hand, and ways to resolve crises once they have occurred, on the other. In this section I deal only with the former. Crisis prevention should be at the heart of the policies of both emerging markets and the international financial institutions.

In terms of prevention, recent experience suggests five lessons for the future.

First, it is important that borrowing countries, especially those without a track record of international borrowing, monitor and manage the maturity and currency composition of their national balance sheet. This is not a trivial matter. Most countries have inadequate information on the composition of their external liabilities, especially those of the private sector. Nevertheless, monitoring and managing the exposures of the public and financial sectors are important to avoid a build-up of potential vulnerabilities. In this respect, the IMF can play a helpful supportive role by providing assessments of vulnerability as part of the Article IV process, the new joint IMF/World Bank financial sector assessment programmes and debt management guidelines, and technical assistance on the data requirements implied by the need to monitor national balance sheets.

Second, limitations on official finance mean that countries should think carefully about the provision of self-insurance against a liquidity crisis. A simple, but often expensive, way to do this is to build up large foreign currency reserves, a strategy taken to heart by a number of emerging markets, including China and also Korea following its crisis. A potentially superior alternative is the creation of contingent credit facilities with both official and private sector creditors. So far, even at the high spreads on emerging market debt, these facilities have not proved attractive, and the CCL facility created by the IMF has lain dormant. The next few years will be a test of the value of such facilities.

Third, experience has shown the value of borrowing countries establishing good relationships with creditors well before any possibility of difficulty in repayment arises. The creation of investor relations programmes and the regular briefing of creditors about developments in economic policy can play a role in providing the information which the market requires to assess the riskiness of sovereign loans. It is never too early to build a relationship with actual or potential creditors. The IMF, in collaboration with the private sector, has recently drawn up a set of guidelines that countries might usefully follow when setting up an investor relations programme. The second aspect of relationships with creditors is the insertion of collective action clauses in sovereign debt contracts. This proposal, advanced originally in a G10 Deputies' report in 1996, has gradually become accepted as a sensible step forward. The United Kingdom has introduced collective action clauses into its foreign currency debt instruments. And just last month, the G7 Finance Ministers agreed on the importance of introducing collective action clauses into debt contracts to facilitate crisis management. Again, time may be on the side of reform.

Fourth, in the long run, the best way to avoid the problem of liquidity crises is for the composition of capital flows to emerging markets to move away from debt, both bank and bond, finance towards portfolio equity and direct investment. Shocks to the borrowing country would take the form of a fall in equity prices, not a liquidity run with its associated risk of a financial crisis and the need for external finance. Encouragingly, the pattern of capital flows to emerging markets is already evolving in that direction. Bank lending represented around 80% of capital flows to emerging markets during the 1970s. But by the end of the 1990s, FDI accounted for around 80% of emerging market capital flows, with portfolio equity accounting for much of the remainder. As Ken Rogoff, the new Economic Counsellor to the IMF, pointed out in 1999, there are still several biases towards debt rather than equity finance in capital flows to emerging markets. One of these is deposit insurance in both creditor and debtor countries, which makes it more difficult for the authorities to avoid being seen as providing some implicit support to international loans by domestic banks. There is no easy answer to this problem, but a shared concern in both borrowing and lending countries is the implicit insurance that both sides are giving to large parts of the financial system. The moral hazard so created is not restricted to international lending, but it does affect the incentives for the form of investment in emerging markets. We need also to guard against institutional or regulatory mechanisms-both international and domestic-which favour short-term over longer-maturity capital flows. In the long run, the solution is for emerging markets to create legal structures and a stable economic policy environment that provide the confidence to support inward equity investment in their economies.

Finally, greater transparency allows better-informed decisions by both borrowers and lenders, and reduces

the risk of contagion by allowing markets to differentiate among borrowers. Much has been said, and, more importantly, achieved in the area of transparency in recent years. There has been an explosion of codes and standards on different aspects of economic and financial policy in recent years. So much so, that some countries are claiming that the process needs to slow down. As part of the new partnership, transparency must be based on three principles.

First, that the appropriate codes and standards for a country at one stage of economic development may not be appropriate to countries at other stages. I say 'may' advisedly, because in each individual case the argument has to be made. But codes and standards should reflect different stages of development.

Second, countries must make clear to which codes and standards they are actually adhering. That is why countries should not be able to opt out of 'transparency about transparency'. Following the production of pilot transparency reports on a number of countries, including the United Kingdom and Argentina, the IMF has now made rapid progress in producing reports on the observance of standards and codes (ROSCs). As of April 2001, 110 ROSC modules had been completed for 43 countries, of which 76 have been published covering 31 countries. India has recently had a ROSC published on fiscal transparency. It is critical that monitoring of the observance of standards and codes be fully integrated into IMF surveillance under Article IV. Here implementation is urgent.

Third, in the area of transparency, ownership is all. Transparency cannot and should not be imposed on any country. Countries themselves benefit most from being transparent and releasing the reports of assessments by the IMF about their financial systems. And the enthusiastic embracing of transparency by a number of emerging markets has paid off in terms of better relations with creditors.

In the field of transparency, the key elements of the new partnership should be, first, a commitment by emerging market economies to implement transparency about transparency by publishing ROSCs, and, second, new opportunities for emerging markets to engage in the process of constructing and developing codes and standards. There is encouraging evidence of greater collaboration and consultation between developed and developing countries in the design and implementation
of the core standards—for example, on banking, securities and insurance regulation, data, payment systems, insolvency and transparency of monetary, fiscal and financial policies. That is all to the good and there is further to go.

Ultimately, the most successful route to enhance the influence of emerging markets on the development of standards and codes is to strengthen the role of the IMF and the World Bank, the twin institutions that can claim legitimacy through the membership of 183 countries. Under British chairmanship, efforts have been made to increase the effectiveness of the meetings of the IMFC,⁽¹⁾ which represents all countries around one table.

Private finance and public funds

In terms of the resolution of crises less progress has been made. The problem would be easier to solve were it possible to distinguish between two rather different sources of crises—a liquidity-based problem caused by a currency or maturity mismatch in a country's national balance sheet despite a sustainable macroeconomic and debt position; and a fundamentals-based problem, which means that the debt burden is unsustainable or the exchange rate or other key macroeconomic policies need to be altered. In the former case, the provision of liquidity support by the international community might help to bridge to a position in which the country could re-engage with its private creditors. In the latter case, the main requirement is not liquidity support but a change in macroeconomic or debt management policies. Recent crises have seen examples of both types of problem.

Liquidity runs typically occur because of a co-ordination failure among creditors. There are two solutions to this co-ordination problem. The first is a lender of last resort that is able to provide liquidity support quickly and on a large—indeed, potentially unlimited—scale for a short period to enable the affected country to meet its obligations. Such loans would normally be short-lived, and should be made available at an above-market interest rate such that this sort of finance is seen as last not first resort. The second solution to the co-ordination problem is for the borrower to impose a temporary suspension of payments to create a 'time out' during which the borrower can negotiate directly with the creditors, and so arrange a new profile of repayments of debt. Both approaches, if understood and implemented consistently over time, can provide an efficient solution to the co-ordination problem and eliminate the incentives for a liquidity run.

But, as Ken Rogoff pointed out in 1999, the lender of last resort approach carries with it the risk of introducing significant moral hazard into the loan market. If lenders believe that sovereign borrowers are likely to be bailed out, then their incentive to assess the riskiness of their loans will diminish. Equally, borrowing countries will find it more attractive to claim that the measures necessary to continue servicing their debt are 'politically impossible' if they believe that there is an international deep pocket willing to extend loans and defer the moment when the national balance constraint is binding.

There are two good reasons for the IMF not being able to play the role of an international lender of last resort, at least for the foreseeable future. First, the moral hazard created by both lenders and borrowers cannot simply be assumed away. It is not easy to quantify, but it is noteworthy that the number of sovereign defaults has declined quite sharply during the 1990s. If sovereign risk is mispriced by private capital markets, this sows the seeds of future crises. The increased provision of official finance would proceed hand-in-hand with an increased incidence of crises.

Second, to be effective, a lender of last resort must have the ability to extend sufficient resources that the market has no doubt whatsoever about the ability to provide whatever it takes to deal with the immediate crisis. The IMF is not in that position. There is no political commitment to provide the IMF with unlimited funds. As the finance ministers and central bank governors representing all IMF member countries said in their communiqué of the IMFC last September in Prague: 'The Committee notes that Fund resources are limited and that extraordinary access should be exceptional ...'.

In practice, however, exceptional access has often been more the norm in recent years. Normal access is typically defined as 300% of IMF quota. During the Asian crisis, Korea's programme was almost 2,000% of quota and Thailand's over 500%. More recently, Turkey's programme was over 1,500% of quota and Argentina's 500%. If creditors and debtors continue to believe that exceptional access is readily available, then international

(1) International Monetary and Financial Committee.

credit will be over-extended and the incidence of crisis will increase.

One reaction to these extremely large packages— 'bailouts'—and the accompanying moral hazard is simply to say that the official sector should have no part to play in what is essentially a private international capital market. Official lending is now small relative to private capital flows. Over the past three years, private flows have been around 7.5 times greater than official flows, according to IIE⁽¹⁾ data. Against that backdrop, some have argued that the IMF should be abolished. This would be to throw out the baby with the bath water.

What is needed is a 'middle way' between full IMF insurance and no insurance at all. This middle way would comprise IMF lending but within strong presumptive limits. A key principle underlying this approach is that the international community needs to set out as clearly as possible the criteria that will govern the size and scope of IMF lending. Since most agree that there are limits on IMF lending, there is merit in explaining those limits to both potential borrowing countries and their private creditors. This would enable debtor countries better to plan their policies. It would also allow creditors to assess risk more accurately. Indeed, put more controversially, how can sovereign risk be accurately assessed without clarity about the Fund's role? A lack of clarity about the likely response of the international community to potential crises is a recipe for inaccurate assessments of risk. Such uncertainty would add to the (already high) cost of borrowing by emerging markets.

So far, the 'middle way' seems a statement of the obvious-namely that there are limits to IMF lending and that there is merit, for debtors and creditors, in having clarity about those limits. The other side of this coin is that, on occasions, there will be countries that have run up unsustainable debt burdens, or face severe liquidity pressures, and who have little alternative but to restructure or reschedule their debt. Perhaps this is why the international community has moved significantly in the direction of giving 'private sector involvement' a greater role in the resolution of financial crises than was typically the case in the late 1990s. The IMF communiqué in Prague last year, the G7 Finance Ministers statement last month, recent joint work by the Bank of England and Bank of Canada, and, significantly, speeches by the new Managing Director of the IMF, Horst Kohler, have all emphasised the need to move

further in the direction of greater private sector involvement. As one example, the Report of the G7 Finance Ministers to the Heads of State and Government only last month stated that, 'While the IMF has an essential role to play, official resources are limited in relation to private financial flows. The engagement of private investors is thus essential for the resolution of payment imbalances in crises... the official sector needs to avoid creating expectations that private creditors and investors will be protected from losses or that official resources would be used to finance large, sustained capital outflows... We underscore the need for further progress'.

The opponents of this approach raise two important questions. First, is it possible to define limits on IMF lending? Second, is it acceptable for the official sector to countenance default by a sovereign borrower when the consequences for both the country and the international financial system could be devastating? I shall try to provide answers to both of these questions.

It is true that recent crises have been the result of developments in the capital account rather than the current account. As capital flows have grown, so too have the potential demands on the official community as they attempt to fill capital account financing gaps. That is why so many more programmes have involved 'exceptional' access in relation to quota. So perhaps, in a world of capital account crises, exceptional access should become the norm?

This argument is superficially quite attractive. But its implications need to be assessed carefully. It would mean that IMF resources would need to increase in line with private capital flows even for the IMF to maintain its current role. And since 1970, capital flows have grown around four times as fast as world incomes. The share of world GDP devoted to resourcing the IMF would grow rapidly over time. In fact, as private capital markets came to understand this, the scale of private capital flows could increase to an even greater extent. Private creditors and debtors would accumulate ever-larger bilateral debts, safe in the knowledge of a multilateral insurance mechanism. The logical end-point of this game is that the international community would be locked into providing ever increasing sums of money to countries in difficulty—in short, an international lender of last resort would be created by stealth. There is no evidence that anyone wishes to go down this route.

(1) Institute for International Economics.

To guard against this, it is crucial that there be some clearer presumption about the scale of 'normal' access. That scale may well be higher than was the case in a world of current account crises. And the approach of defining limits in terms of multiples of quota may be unsatisfactory because the size of quotas in some cases needs to be revisited. But that is not an argument against the principle of presumptive limits; it is a case either for reconsidering quotas or, in a more practical vein, relating access to finance to some other metric.

The key to limiting lending is not strict rules but stronger presumptions. These presumptions then provide the backstop for debtor-creditor negotiations and help condition expectations in financial markets. Exceptional lending above this presumptive limit would be possible in order to provide operational flexibility in extreme cases—for example, those threatening systemic stability. That is why the framework is one of presumptive limits rather than strict rules. But granting exceptional access should require much greater ex ante justification and ex post accountability. For example, exceptional access programmes should be automatically referred to the new Independent Evaluation Office of the IMF. This would raise the hurdle for granting exceptional access and provide greater clarity to debtors and creditors about the support that countries could expect from the official community.

The logical consequence of limited official finance is that inevitably there will be times when a re-profiling of sovereign debt may be necessary for some countries. Some have argued that sovereign debt restructuring or default is potentially too disastrous to contemplate, for the country or indeed for the world economy. The Russian default in 1998, and the disruption to world markets that followed from it, is often cited as evidence for the prosecution.

More careful analysis suggests two rather different conclusions from the Russian experience. First, the Russian default was disruptive in part because it came as a surprise to market participants. Private creditors had planned on one assumption—exceptional IMF financing, or the 'moral hazard' play as it was labelled by the market—and were surprised when their comfort blanket was removed. Greater clarity and stronger presumptions about the size and form of Fund financing would have reduced the surprise and the accompanying contagion. Expectations of debtors and creditors would have been conditioned *ex ante* and the severity of the crisis thereby reduced *ex post*. Second, the Russian experience illustrates the importance of having orderly rescheduling mechanisms in place. In Russia, it was not that they defaulted but the way that they did it that generated costs. The default was disorderly—neither efficient, nor equitable, nor expeditious. And that contributed importantly to the disruption to Russia and more widely. But rescheduling need not be like that. There are dead-weight costs to disorderly default. So there are lump-sum gains—to both debtors and creditors—to having orderly mechanisms in place.

This is where the official sector has a role to play. A key principle of any crisis resolution framework is that decisions on a sovereign's debt are the responsibility of the borrowing country, in consultation with its private sector creditors. Neither the IMF nor any group of countries should tell a country to restructure its debt. There are a range of options open to debtors in dealing with their creditors at times of crisis. Countries with a good track record of repayment and long-standing relationships with their creditors may be able to borrow more from the international market. Others, facing more severe liquidity pressures, may seek to undertake voluntary rescheduling or rollover of debt by bringing together all or some of their major creditors, as in the cases of Korea and Brazil. Those facing unsustainable debt positions may seek to negotiate market-based write-downs of their debt, as in the cases of Ukraine, Pakistan and Ecuador. And in yet another set of cases, a country may find it necessary to impose a temporary timeout on payments to all creditors, to give themselves some breathing space to address macroeconomic or co-ordination problems. The decision on exercising any of these options must rest with the debtor country.

The role of the official sector is to ensure that the full menu of financing options is made known and available to the debtor, from which it then chooses. This menu should include both the easier options—such as raising new private sector money—as well as the harder ones such as suspending payments. Each of these options is backstopped by limits on IMF lending, so that the 'pure bail-out' option is heavily circumscribed. Indeed, it is this backstop which helps provide the incentive for creditors and debtors to seek alternative, market-based solutions sooner.

The IMF should stand ready to assist countries, whichever of these options debtors choose to exercise, provided the appropriate prior conditions are satisfied. pressures decide to suspend payments temporarily, then the IMF should be willing to support that decision while remedial policy measures are put in place. This support could take the form of bridging finance—so-called IMF lending-into-arrears. The pre-conditions of lending-into-arrears could be designed to ensure that payments suspensions are handled in an orderly fashion—for example, that they are time-limited and equitable, and the debtor is negotiating in good faith. This would reduce uncertainty on the part of both debtors and creditors as to how the end game would be played out, thereby reducing borrowing costs.

These sets of procedures represent evolution in, rather than revolution of, the international financial architecture. They are about ensuring the official sector's own actions are clear, consistent and accountable, so that they contribute effectively to the resolution of financial crises. These procedures are fully consistent with the principles of private sector involvement outlined in the IMFC communiqué last September and more recently by the G7 Finance Ministers last month. The framework set out here is an attempt to begin to add some operational meaning to those overarching principles.

To sum up, both borrowing countries and private sector creditors must expect that, except in exceptional cases of systemic concern, the limits on official finance mean that they and they alone will be responsible for dealing with a resolution of problems concerning debt repayment. Standstills and debt restructuring will be only one of many options open to negotiation between debtors and creditors. The IMF should not attempt to impose a solution on borrowing countries. It should be willing to lend into arrears in circumstances where countries have chosen the route of a standstill and its associated conditions. But it should not create expectations that exceptional access is the norm.

Conclusions

Progress can be made only by closer co-operation between the developed and developing countries. The development of standards and codes, the design of IMF lending, and the wider agenda of trade liberalisation and international co-operation are all part of the new partnership of which I have spoken. The closeness of the relationship between Britain and India is a compelling reason for our working together in the various international fora to improve the international financial system. In his final report to the British Government on the creation of the Bretton Woods system. Maynard Keynes wrote that 'the excellence and closeness of our relations with the Indian delegation deserves special comment. Sir Chintaman Deshmukh (Governor of the Reserve Bank of India) handled his case with high dignity, ability and reasonableness; we always supported him on his interests and he always supported us on ours'. Perhaps our joint work on international financial architecture will recall the common architectural heritage of the Bank of England and official buildings in New Delhi. Herbert Baker, who, with Lutyens, was responsible for the design of early New Delhi also rebuilt the Bank of England in the inter-war period. In the upper storeys of the Bank he placed pavilions which are derivatives of the ends of the Secretariat blocks in New Delhi.

The international financial system: a new partnership

As Lord Keynes said in his speech at the closing plenary session of the Bretton Woods Conference on 22 July 1944, 'it has been our task to find a common measure, a common standard, a common rule applicable to each and not irksome to any. We have been operating, moreover, in a field of great intellectual and technical difficulty. We have had to perform at one and the same time the tasks appropriate to the economist, to the financier, to the politician, to the journalist, to the propagandist, to the lawyer, to the statesman-even, I think to the prophet and soothsayer.... We have shown that a concourse of 44 nations are actually able to work together at a constructive task in amity and unbroken concord. If we can continue in a larger task as we have begun in this limited task, there is hope for the world'. The IMF is still the only international body with the legitimacy, as well as the staff and expertise, to build and defend a successful international financial system. It is important, therefore, that we not accept uncritically the way it has developed, and we must examine closely how far changes in international financial markets require us to understand the consequences of limits to IMF lending and the implications of those limits for borrowing countries and private creditors alike. We need neither a grandiose new plan nor another Bretton Woods Conference. But we do need greater clarity and less fudge about how the present system is supposed to operate.

'Hanes Dwy Ddinas' or 'A Tale of Two Cities'

In this speech,⁽¹⁾ Mervyn King, **Deputy Governor** responsible for monetary policy, discusses the imbalances in the UK and US economies. He argues that they present major sources of uncertainty for the Bank's Monetary Policy Committee. Any unwinding of these imbalances could prove a difficult challenge to the Committee, as it tries to maintain a balance between total demand and supply. Controlling inflation in future may, as a result, prove more difficult than it has been over the past four years.

Vice-chancellor, ladies and gentlemen.

It was once said that economic forecasters are the unfathomable in pursuit of the unpredictable. As a student I found this odd. Whenever England played Wales at rugby the result was wholly predictable. The reason was simple. My fellow-student, Gerald Davies, ran faster than Englishmen, even when he carried the ball and they didn't. Economics is, unfortunately, less straightforward. Yet any decision that involves a lapse of time between its implementation and its effects requires a forecast. Time lags are the essence of the transmission mechanism of monetary policy. And that is why the Monetary Policy Committee spends much time thinking about the likely future path of the economy.

The severe limits on our ability to anticipate future events mean that forecasts can be no more than a description of the relative likelihood of a range of possible outcomes. Anyone who presents you with a point forecast for the future path of the economy is either concealing the most interesting part of their analysis, or suffering from self-deception. So the Monetary Policy Committee presents forecasts in terms of probabilities. And it is the balance of risks to the economy that determines monetary policy.

So what are the risks to the British economy at present? Overall, the past five years have been a period of remarkable stability for the United Kingdom. Annual GDP growth has averaged 2.8%, and there have been 35 consecutive quarters of positive economic growth. Since the MPC was set up in May 1997, inflation has averaged 2.4%, very close to our target of $2^{1}/_{2}$ %, and has been in the remarkably narrow range of 2%–3% in 43 out of the past 49 months. This degree of stability reflects well on the new framework for monetary policy in this country. But if I focus today on the risks ahead, it is not simply because as a central banker I know that to every silver lining is attached a cloud, but because the small deviations of inflation from the target over the past four years give a misleading impression of the greater volatility of inflation that we might reasonably expect to see in future.

There are two sources of uncertainty facing the United Kingdom at present, one domestic and the other international. Both are related to imbalances. The correction of these imbalances will pose challenges for policy over the next few years.

To see the domestic imbalances look beneath the relative tranquillity of the aggregate data to the significant turbulence among different sectors of the economy. It is obvious that there is an imbalance between those sectors of the economy most exposed to international competition and those sectors facing predominantly domestic competition. To describe this as a difference between manufacturing and services is too simple, but the point is clear. For that part of the economy producing internationally tradable, not just traded, goods and services, output is falling while consumer spending is buoyant. As a result, there is a 'tale of two cities' in which some industries are experiencing the worst of times, with declining manufacturing output, and others the best of times, with the latest retail sales figures showing an increase in the volume of sales over the past twelve months of 6.4%.

(1) Given to the Cardiff Business School, Cardiff University, on 18 June 2001. This speech may be found on the Bank's web site at www.bankofengland.co.uk/speeches/speech134.htm Such imbalances are not uncommon. Indeed, I first used the phrase 'tale of two cities' in early 1995 to describe the contrast between strong demand for manufacturing output and weak retail sales, the opposite of the position today. Since then the economic see-saw has lurched from external to domestic demand, partly as a result of the continuing weakness of the euro, which has led to a large and persistent rise in the sterling effective exchange rate.

The scale of the imbalances at home can be seen in figures for domestic and external demand. Whereas aggregate demand and output have risen at a fairly steady rate of around $2^{3}/4\%$ over the past five years, domestic demand, supported by rapid money and credit growth, has risen much more rapidly than net external demand. Indeed, private final domestic demand grew at an average rate of nearly 5% over this period, and its growth was in excess of 4% a year in four of the past five years. This imbalance between domestic demand and output has resulted in a rising trade deficit. Net external demand, exports less imports, actually made a negative contribution to total economic growth in each of the past five years. This is the first time that the external contribution to growth has been negative for a period of five consecutive years since the 1870s. And that negative contribution is likely to continue for the foreseeable future.

Imbalances on this scale are unsustainable, although it is far from obvious for how long they can continue. At some point, the weakening balance sheet positions of the private sector will lead to a slowing of consumption and investment as households and firms, respectively, reduce spending to lower the ratio of debt to prospective income. Household debt to income and corporate debt to profit ratios are at historically high levels. Moreover, within the corporate sector the debt levels of the most highly indebted companies—those in the top decile of the distribution of debt to profits ratios-are even higher than in the early 1980s and early 1990s. That holds true even when the telecoms sector is excluded. Spending might, therefore, be expected to decelerate in response to these balance sheet positions. But, for the time being, final domestic demand continues to grow at above trend rates, exacerbating the imbalances within the economy and adding to the risk of a large adjustment at some point in the future. The continuing shift of resources to meet the demand for better public services means that private demand must grow much more slowly over the next few years. In turn, that would

enable the trade deficit to stabilise and eventually fall back.

The second uncertainty facing the United Kingdom is the slowdown in the world economy, and, in particular, the downturn in the United States. In 2000, the world economy grew by 4.7%, the highest rate for twelve years. And, stimulated by an increase in productivity growth, the US growth rate had reached almost 6% a year in the first half of 2000. Such a rate was unlikely to have proved sustainable.

Over the past five years productivity growth in the United States has risen markedly. Labour productivity growth rose by more than 1 percentage point a year to an average of $2^{1/2}$ %–3% between 1995 and 2000. Some of this rise was the impact of new technology on efficiency, and some was the result of greater investment in IT—capital deepening—which added significantly to the amount of capital with which each employee was working. But demand rose even more rapidly than the supply of output, leading to a large current account deficit. The external imbalance was the mirror image of the internal imbalance.

So a slowdown in the United States was not only unsurprising, it was desirable. But the speed of the turn-round in the United States has taken most commentators by surprise. Investment in IT, which had been growing at around 20% a year, actually fell in the first quarter. As a result, and as in the United Kingdom, the United States has experienced a fall in manufacturing output while consumption and the housing market appear more resilient. Prompt action by the Federal Reserve has so far limited the slowdown to a downturn in inventories and fixed investment. Whether the slowdown in the United States will be more prolonged than is embodied in the current consensus view will depend critically upon personal consumption. And, in turn, that will depend upon expectations of future productivity and hence income growth in the United States.

If there were to be a reappraisal of the extent of the increase in productivity growth in the United States, then there might be a further downward revision of asset prices and a lower path for consumption spending. So far, the evidence, both from consumption directly, and financial markets indirectly, suggests that no major reappraisal has occurred. Share prices have fallen from their peaks of last year. But price to earnings ratios remain well above historical levels. The average P/E ratio in the United States since 1900 was around 14. The ratio peaked at over 30, falling back to current levels of well over 20. Interestingly, the divergence of valuation between hi-tech and other companies has virtually disappeared in recent months. There has also been a reduction in the perception of downside risks to equity returns. Returns on shares are usually negatively skewed; that is, there is a greater chance of a return below rather than above its expected value. During the course of this year, the degree of negative skew has fallen in the United States, suggesting that market expectations of further sharp falls in share prices have diminished.

Of course a reappraisal of the future growth of productivity could yet occur. The recent fall in IT spending will, at least in the short run, reduce the contribution to higher productivity growth from capital deepening. It is never easy to detect changes in underlying productivity growth because a large quantity of data is needed to distinguish clearly between changes in trend and cyclical movements. Nevertheless, there is no evidence to suggest that the rate at which computing processing power is increasing—doubling every 18 months according to Moore's Law—has diminished. Indeed, there have been suggestions that the pace of doubling of processing power is now closer to twelve months.

But there is one reason for caution about estimates of higher future productivity growth, and that is the conventions used to measure output and hence productivity. It might seem obvious that a higher level of gross domestic product, produced by the same number of person-hours, is an improvement in productivity. But gross domestic product, GDP, is not value added. It is the latter which is the correct measure of output and it differs from the former by an appropriate allowance for depreciation of capital goods. The proper measure of output is net domestic product, NDP. In normal circumstances, the growth rates of GDP and NDP are identical. But the two can differ when the average depreciation rate of the capital stock is changing, and that is exactly what has been happening recently. There has been a shift toward greater investment in short-lived assets, such as IT and computer software, and as a result the average depreciation rate has risen. Part of the additional gross output is simply replacing the higher proportion of capital that wears out each year. It makes no sense to

include the higher depreciation as part of increased output and hence higher productivity. A change in technology that raises output today at the expense of output tomorrow is not an improvement in productivity. Using estimates of growth rates of GDP will lead to an overestimate of the rise in productivity growth during the transition to higher depreciation rates. The rise in average depreciation rates in recent years suggests that the magnitude of this overestimation could be non-negligible, although more research is needed. Moreover, as John Kay has pointed out, the measurement problem, and the overestimation of output growth, is even more acute when the price of capital goods is falling relative to that of final consumption goods.

What this argument suggests is that economists should be cautious about drawing strong conclusions about the future path of productivity growth. The changes in technology are real and are evident in many aspects of our home and business lives. But their implications for aggregate productivity growth are much more uncertain.

The two uncertainties facing the UK economy at present, namely the imbalances both at home and overseas, suggest that the Monetary Policy Committee may be in for a slightly bumpier ride over the next four years than during its first four. So far, the Monetary Policy Committee has managed to achieve an overall balance in the economy despite the contrasting fortunes of the internationally exposed and more sheltered sectors of the economy. But if these large imbalances are to unwind, then the Committee is likely to face a difficult challenge in trying to maintain a balance between total demand and supply. Controlling inflation in future may prove more difficult than over the past four years, and the longer the imbalances persist the greater the risk that the subsequent adjustments to demand, output and inflation are larger than those experienced recently.

Any rebalancing of the economy is likely to be associated with a fall in the real exchange rate. But the magnitude and timing of that are not only uncertain, but also difficult for the MPC to influence. As Sir Samuel Brittan wrote recently about expected changes in exchange rates: 'These developments are most likely to happen when they are least expected and least welcome'. Although a sharp fall in sterling has been the fervent wish of many manufacturers over the past four years, I recall the words of the person who told me: 'think very carefully before you make a wish—it might come true'. The only problems worse than those of an excessively strong currency are those of an excessively weak currency.

The existing imbalances pose risks also to the inflation outlook. Prices of services have tended to rise faster than those of goods—about 2% a year faster since 1990. But over the past twelve months the gap between the two inflation rates has exceeded 3 percentage points. Services inflation has been in the 3%-4% range for some time, but goods inflation declined steadily from over 3% in late 1995 to close to zero in the spring. The strength of sterling was the main factor that lay behind this fall in goods inflation. But there are now tentative signs of a pick-up in goods prices and the retail sales deflator. RPIY inflation has also risen during the course of this year from 1.5% to 2.8%. The MPC will monitor the price data extremely carefully. But there is likely to be significant short-run volatility in the inflation figures over the coming months, and it would be unwise to read too much into the latest inflation figure because the rise from 2.0% to 2.4%, although the largest one-month increase since October 1996, was largely accounted for by jumps in the prices of seasonal food and petrol.

There is, I believe, broad-based support for the objective of setting interest rates to meet the inflation target. Quarterly opinion polls since November 1999, commissioned by the Bank of England and published in our *Quarterly Bulletin*, provide support for this proposition. But it is clear that the MPC still has much work to do to explain how interest rates affect the economy. Building a constituency for low inflation is a primary objective of the Bank, and one to which we attach great importance. Support for low inflation, and stability more generally, cannot be taken for granted, nor based solely on fading recollections of boom and bust. There is a new generation with little memory of the high and unstable inflation rates of the past. The Bank has, therefore, started an annual competition for schools in which students play the role of the Monetary Policy Committee. The first year's competition attracted over 200 entries, and culminated in the national final at the Bank of England in March. Next year's competition has just been announced, and I would encourage as many schools as possible to enter the competition and pit their wits against the MPC. I am delighted to report that Bassaleg Comprehensive School in Newport, who won last year's South Wales regional heat, were the first team in the United Kingdom to enter this year's competition.

Success in explaining the objectives of monetary policy, building the constituency for low inflation, and setting policy in order to meet the inflation target, are all key parts of the role of the Monetary Policy Committee. But the MPC cannot fine-tune the economy guarter by quarter. Its contribution to stability is to meet the symmetric inflation target of $2^{1/2}$ %, looking beyond the immediate short-term fluctuations in monthly inflation rates. The Committee will have to watch carefully developments in the economy as they unfold, and be ready to act promptly in either direction. There will always be unpredictable events to which the MPC will need to respond. What is essential for monetary policy is the transparent framework for meeting the inflation target in the medium term, and, in so doing, helping to anchor inflation expectations as close as possible to the $2^{1/2}$ % target. At the beginning of next month the MPC will meet for the 50th time. Reaching our half-century has not been without incident. No doubt there will be more surprises on the way to our century. But the symmetric and transparent inflation target provides the best defence against unexpected events.

Has UK labour market performance changed?

In this speech,⁽¹⁾ Professor Stephen Nickell⁽²⁾ asks at why wage inflation has remained stable despite the fact that unemployment is at its lowest level for a generation. The answer is that the level of unemployment consistent with stable inflation (the NAIRU) has fallen substantially since the 1980s. Professor Nickell argues that the main factors underlying the fall in the NAIRU over the past 20 years have been the decline in the role of trade unions and the tightening of the benefits system. The small fall in unemployment taxes, changes in product market competition and the introduction of the National Minimum Wage have not played an important role. Professor Nickell also looks at changes in activity rates over the same period. The proportion of inactive men has risen by around 10 percentage points, concentrated on the unskilled and those living in high-unemployment regions, and this has been offset by an almost equivalent increase in activity among women. Professor Nickell concludes that the benefits to the economy as more women are working have been more or less cancelled out, at least in numerical terms, by the steady withdrawal of men from the labour force.

1 Introduction

In the late 1980s, unemployment (on the ILO measure) fell from 11.2% in 1986 to 7.2% in 1989. Over the same years, inflation (measured by the GDP deflator) rose from 3.5% to 7.1%. In the late 1990s, unemployment fell from 10.3% in 1993 to 5.5% in 2000. However, inflation also fell, from 2.7% to 1.7%, over the same period.

In 1998, around 2.3 million men of working age (excluding students) were classified as economically inactive, ie neither employed nor looking for work. Twenty years previously, this number was only 400,000.

In 1979, the proportion of employees who were trade union members was more than 50%. Today this number is below 30% and, in the private sector, below 20%.

In 1975, earnings at the 90th percentile of the pay distribution were less than three times earnings at the 10th percentile. By 1996 this multiple had risen to nearly four times.

These facts are all indicative of big changes in the UK labour market in the final quarter of the 20th

century. In what follows, we look at some of the forces underlying these changes and briefly touch on their implications for policy. In the next section we look more closely at the interaction between monetary policy and the labour market. In Sections 3 and 4, we analyse the recent history of UK unemployment and the forces underlying its substantial decline over the past decade. In Section 5 we focus on inactivity rates, and in Section 6 we consider the growth of some significant imbalances in the UK labour market. We conclude with a summary and some final remarks.

2 The labour market and monetary policy

One way of looking at the setting of monetary policy is by noting that to stabilise inflation, it helps if real demand is kept in line with potential output. Given the lags in the system, this must be done in a forward-looking manner. In order to do this, it is vital to keep track of potential output. For example, a *ceteris paribus* increase in the growth rate of potential output will typically require a temporary loosening of monetary policy. The growth rate of potential output may be split up into four parts as follows:⁽³⁾

⁽¹⁾ Given at the Society of Business Economists on 16 May 2001. This speech can be found on the Bank's web site at www.bankofengland.co.uk/speeches/speech128.pdf

⁽²⁾ Member of the Bank of England's Monetary Policy Committee and School Professor of Economics, London School of Economics. I am very grateful to Nicoletta Batini and Brian Jackson of the Bank's External MPC Unit for their help.
(3) More formally, if Y* is potential output, *POP* is the population of working age, Π is the level of trend labour

productivity (trend output per employee), *ia* is the inactivity rate, u^* is the equilibrium unemployment rate (NAIRU), then $Y^* = \Pi x POP x$ (1 - ia) x ($1 - u^*$). Taking log derivatives yields $y^* = II + pop - ia - u^*$ where $y^* = \ln Y^*$, $pop = \ln POP$, and $II = \ln \Pi$.

^{. . .}

Potential output growth = trend labour productivity growth

- + growth of the working-age population
- the trend rate of change of the inactivity rate
- the rate of change of the equilibrium unemployment rate.

Trend labour productivity growth is the trend rate of growth of output per employee, the inactivity rate is the proportion of the population of working age neither working nor looking for a job, and the equilibrium unemployment rate is the unemployment rate consistent with stable inflation, sometimes termed the NAIRU.

The operation of the labour market impacts on all four of the elements of potential output growth. The first, namely trend productivity growth, depends crucially on the rate at which skills are accumulated. The growth of the population of working age is mainly determined by demographic changes but it is also influenced by net migration. Both equilibrium unemployment and the extent of inactivity directly reflect the performance of the labour market. In what follows, we focus on these last two factors, although we may occasionally comment on some implications for productivity growth. We begin by looking at the recent history of equilibrium unemployment.

3 The recent history of unemployment in the United Kingdom

Before going into detail about recent shifts in equilibrium unemployment, it helps to set the scene if we have some idea of the history of unemployment in post-war Britain. In Chart 1, we show the path of unemployment since 1960, using the standard ILO definition (ie an unemployed person is someone without work who is actively searching for work and is available to take up a job).⁽¹⁾ We can see that unemployment started to move gradually upwards in the late 1960s and early 1970s, surging upwards rapidly after the first oil shock in 1974, again after the second oil shock in 1979, came down rapidly in the Lawson boom of the late 1980s, and rose equally rapidly after 1990. Since 1993 it has gradually subsided so that by 2000 it reached its lowest level since the 1970s.

Chart 1 Unemployment in Britain, 1960–2000



Note: These data refer to the ILO rate back to 1984. Prior to that, the data are based on OECD standardised rates spliced onto the published registered unemployment rate (see Layard *et al* (1994), Annex 6, Table A3 for details).

To get some understanding of these fluctuations, let us consider the period since the mid-1980s. In 1986, unemployment had been in excess of 11% since 1982. By the spring of 1990, it had fallen below 7%. This dramatic fall was produced in part by expansionary fiscal and monetary policy, in part by an international boom and in part by a large fall in commodity prices in the mid-1980s. So why did the fall in unemployment come to an end? Basically because inflation, as measured by the rise in the price of UK output (GDP deflator), rose from 2.5% per annum in 1986 to 7.6% in 1990. Indeed during one month in 1990, the headline RPI rate reached double figures. Furthermore, by 1990, the trade balance was in deficit to the tune of 4% of GDP.

Anxiety about these trends had set in by 1988 and the short-term interest rate rose from around 8% in the spring of 1988 to 15% by the winter of 1989. This tightening of monetary policy had its effect on inflation and unemployment after 1990. By 1993, unemployment had risen to more than 10% with GDP price inflation falling to 2.7%. By 1992, the government was getting anxious about rapidly rising unemployment and once the United Kingdom had left the European Exchange Rate Mechanism, monetary policy loosened, with short rates falling from more than 10% to around 6.5% during 1992. Unemployment then started to fall and from 1994, GDP inflation started to rise, peaking in 1996. Since 1996, we have been in the benign state of falling unemployment and stable or gradually falling inflation. However, the balance of payments deficit has been gradually worsening since 1997.

⁽¹⁾ To be more precise, they must have searched actively for work within the past four weeks and must be able to start work within the next two, or they must be waiting to take up a job already obtained.

What does this story reveal? Basically it is consistent with a standard open economy natural rate view of the world. Thus if economic activity gets too high and unemployment gets too low, inflation starts to rise. If unemployment gets too high, inflation starts to fall. So we define equilibrium unemployment as that level which is neither too high nor too low and which is thus consistent with stable inflation. This equilibrium level is sometimes called the 'natural rate' or the NAIRU.⁽¹⁾ In practice, things are a bit more complicated because a high exchange rate can act to suppress inflationary pressure essentially by enhancing the effective level of foreign competition facing UK firms as well as by making imports cheaper. So, if the exchange rate is high, which usually shows up in the form of a larger trade deficit, this may prevent inflation rising even if unemployment is below the equilibrium rate. Formally, what this means is that there is a three-way trade off between unemployment, changes in inflation and the balance of payments. If unemployment is below the equilibrium rate, either inflation rises and there is no balance of payments deficit or inflation is stable and there is a payments deficit or there is some combination of the two (see Lavard et al (1991), Chapter 8, or Nickell (1990)). So here we define the equilibrium unemployment rate as that rate consistent with stable inflation and a zero balance of payments deficit.

Despite its name, the equilibrium unemployment rate may change quite significantly from one decade to the next. How and why it might have changed we shall discuss below. What is important to understand here is that, broadly speaking, it cannot be changed by monetary policy. This simply influences the way in which actual unemployment fluctuates around the equilibrium rate.

Finally, although it is easy enough to talk about equilibrium unemployment, pinning down the number is less straightforward. Basically, it is influenced by any factor that systematically influences inflationary pressure in the labour market at a given level of unemployment. For example, changes in the power of trade unions, the operation of the benefit system, the match between the skill requirements of job vacancies and the available skills of unemployed job searchers, labour taxes, product market competition and minimum wages can all change the equilibrium rate. Furthermore, changes such as these do not act on the equilibrium rate instantaneously. Individual behaviour takes time to adjust to changes in the economic environment, so that the impact of changes of the type listed above on the equilibrium rate will tend to emerge gradually over a number of years.

4 Recent changes in the equilibrium unemployment rate

The easiest way of estimating the equilibrium unemployment rate is to take the actual rate and make a downward (upward) adjustment if inflation is falling (rising) or if the balance of payments is in surplus (deficit). The calibration of the size of the adjustment must be generated by some estimated model. In Table A we present some estimates of the equilibrium rate based on this method for various periods since 1969. We use periods of at least four years in order to smooth out year-to-year fluctuations. As we can see, for the most recent four-year period, equilibrium unemployment is estimated to be 5.7%, although it should be recognised that there are considerable uncertainties surrounding this number. Over the period 1997-2000, the average level of actual unemployment is above this and the balance of payments is in deficit, which is consistent with the falling rate of inflation. In fact, in the most recent year (2000), unemployment has fallen below 5.7% but this has not been associated with rising inflation because the high level of the exchange rate has helped to suppress inflationary pressure. In 2000, this was associated with a balance of payments deficit of around 2% of GDP.

Table A

Estimates of equilibrium unemployment

	1969 <u>-73</u>	1974 <u>-81</u>	1981 <u>-86</u>	1986 -90	1991 <u>-97</u>	1994 -98	1997 <u>-2000</u>
Unemployment (per cent)	3.4	5.8	11.3	8.9	8.8	7.9	6.1
Change in inflation (per cent per annum) Balance of payments deficit (per cent of potential GDP) Equilibrium unemployment (per cent)	1.5	1.1	-1.2	0.5	-0.7	-0.04	-0.4
	-0.7	0.9	-1.3	0.8	0.7	-0.1	0.5
	3.8	7.5	9.5	9.6	8.9	6.9	5.7

Source: Economic Trends for unemployment, inflation, balance of payments and GDP.

Unemployment refers to the ILO rate, inflation to the GDP deflator. Potential GDP refers to actual GDP corrected for unemployment fluctuations. The equilibrium rate is calculated exactly as described in Layard *et al* (1991), pages 442–45, or Nickell (1990). As well as adjusting for inflation changes and the payments deficit, there is also an adjustment for unemployment dynamics.

Notes: Prior to 1990, the values of inflation changes and the trade balance are lagged one year and two years respectively to account for the time taken for these factors to feed into unemployment. After 1990, we use current values because the reaction of unemployment to economic conditions increased in rapidity.

For our purposes, the key feature of Table A is the steady decline in the equilibrium unemployment rate from its

⁽¹⁾ I prefer the equilibrium rate. The natural rate is a misnomer, since there is nothing natural about it and it can be systematically changed by some types of policy. NAIRU is a misnomer because it should be the constant inflation rate of unemployment, ie non-changing not non-accelerating.

peak level of the 1980s, a decline that accelerated in the second half of the 1990s. The obvious question is what has brought this about. And the obvious place to look for an answer is at the workings of the labour market. Before going into detail, it is worth recalling that we should not expect shifts in the operation of the labour market to impact instantaneously on the equilibrium rate. As is well known, it takes a considerable time for individual and organisational behaviour to respond fully to changes in the economic environment. That said, we shall now investigate successively changes in industrial relations, the benefit system, labour taxes, the introduction of a National Minimum Wage, and the extent of competition in the product market.

4.1 Changes in the system of wage determination

In most European countries, the majority of employees have their wages determined by trade union collective bargaining. In those countries where this bargaining operates in an uncoordinated and adversarial fashion, this tends to generate upward pressure on inflation at given levels of labour market slack leading to higher levels of equilibrium unemployment.⁽¹⁾ In the 1970s and early 1980s, Britain was one such country. For a variety of reasons, which include the trade union legislation introduced in the 1980s, the structure of wage determination in Britain has changed dramatically over

Table B

The spread of trade unionism in Britain, 1970–99 Per cent

	<u>1970</u>	1975	<u>1980</u>	1985	<u>1990</u>	1994	1996	1998	1999
Coverage	68	n.a.	70	64	54	40	36.5	34.5	35.8°
Density	44	48	50	45	38	34	31.2	29.6	29.5

n.a. = not available.

Notes: Coverage refers to the proportion of civilian employees whose pay was covered by a trade union collective agreement. Density refers to the proportion of civilian employees who are members of a trade union.

Sources: Coverage, 1970–94, estimates by Brown, W based on Milner (1995), Millward et al (1992) and OECD (1997). 1996–99 based on Hicks (2000). Density, 1970–85 based on Visser (1996). 1990–99, Labour Force Survey, see Hicks (2000), Table 2. Note that the coverage data in 1999 (marked with an asterisk) are based on a different question in the Labour Force Survey than that asked previously.

Table CUnions in Britain, 1999

	All	Private sector		Public sector		
		<25 emp	<u>≥25 emp</u>	<25 emp	≥25 emp	
Coverage	36	10	31	62	75	
Density	30	9 (Avera	26 ge = 19)	51	62	

Source: Hicks (2000), Tables 5 and 7, based on the Labour Force Survey.

the past 20 years. This is reflected in the numbers presented in Tables B and C.

These data reveal that the proportion of workers covered by trade union collective agreements has halved from its peak of 70% in 1980 and this decline has almost been matched by the fall in union membership. Looking at the private sector alone, which is the driving force behind wage inflation,⁽²⁾ we see that by 1999 membership is down below 20% with only a small minority of private sector workers being covered by collective agreements. During this process, wage bargaining, even in the unionised part of the private sector, has become far less adversarial. Indeed the number of strikes is currently minimal relative to the level of disputes two decades ago.

How has this change, which is almost unique in its scale among OECD countries, come about? Two factors are important. First, the trade union legislation of the 1980s moved the balance of power in disputes away from employees and made it harder for unions to organise. This made it less easy and attractive to join a union. Second, the heavily unionised sectors of the economy have been in relative decline over the whole period (except for the public sector). This process is exemplified by the numbers presented in Table D. These show clearly how, in the private sector, newer establishments set up after 1980 are far less likely to be unionised than those set up before 1980.

Table DUnion recognition in establishments

Per cent unionised

	All	Private sector	Private sector	
		Manufacturing	Services	
1980 1998	64	66	40	94
Set up before 1980 Set up after 1980	54 29	50 14	28 18	88 85

Source: Machin (2000), Table 3. Based on Workplace Employee Relations Surveys.

So as old establishments are replaced by new establishments, unionisation inescapably diminishes. This is almost the whole story. Derecognition in continuing plants is very rare (see Machin (2000), Table 2). So whatever these changes have meant for the working conditions of the average employee, there seems no question that they have contributed to the decline in

(1) For detailed evidence on this issue see, for example, Nickell (1997). Many heavily unionised countries in Europe, such as the Netherlands, Denmark and Norway, have systems of collective bargaining that enable the parties to the bargain to take account of the macroeconomic consequences of the agreements that they strike. This has helped them to achieve low levels of unemployment. Such coordination was attempted in Britain in the late 1970s with only limited success because the institutional framework was simply not up to the task.

(2) Evidence suggests that most public sector wages follow the lead of the private sector, often with a considerable lag.

inflationary pressure at given levels of labour market slack and hence to the fall in equilibrium unemployment.⁽¹⁾

4.2 Changes in the benefit system

There are four aspects of the benefit system that influence equilibrium unemployment. These are, in turn, the level of benefit, the duration of entitlement, the coverage of the system, and the strictness with which the system is operated. In Tables E, F, G we present a partial picture of how the system has changed over the years. In Table E, we see that the actual level of benefit relative to earnings has declined quite rapidly since the late 1970s, basically because of the abolition of earnings-related supplement and the switch of indexation from an earnings basis to a price basis introduced by the first Thatcher administration.

Underlying these broad changes have been numerous detailed shifts, set out in Table F, which have reduced

Table EBenefit replacement ratio

Per cent

	1961 -65	1966 -70	1971 -75	1976 -80	1981 <u>-85</u>	1986 <u>-90</u>	1991 _95	1997
OECD measure	25	27	24	24	22	18	18	18
Bank of England measure	53	60	57	56	52	44	43	42

Note: The OECD measure is an average of unemployment benefit entitlement relative to average gross wages for three different family types (single, with dependent spouse, with non-working spouse) over the first five years of an unemployment spell. The Bank of England measure refers to the ratio of the total income while unemployed relative to the total, post-tax income while employed. It includes taxes and subsidies although it excludes housing benefit. the coverage of the system and increased its operational strictness. The former effect is made clear in Table G. All these changes have made unemployment a less attractive state than work, which will have had a gradual impact on equilibrium unemployment.

Table G

Proportion of males unemployed receiving benefit, by characteristics

	1983	1990	1993	1997
All Duration <12 months Duration >= 12 months Married, working spouse Married, non-working spouse	0.907 0.882 0.931 0.857 0.942	0.694 0.651 0.787 0.563 0.774	0.797 0.809 0.785 0.706 0.828	0.691 0.654 0.730 0.604 0.740
, 01				

Source: Schmitt and Wadsworth (1999), Table 2.

A small digression is in order here to point out that simply because a change in the benefit system reduces equilibrium unemployment, it does not necessarily imply that it is a good thing. It is arguable, for example, that the current system is simply too mean. In fact, to have a system that operates well, it is not necessary to plunge households into poverty should the sole breadwinner lose his or her job.

The system as operated in Denmark, for example, was substantially reformed in the early to mid-1990s, not by reducing the generous level of benefit (replacement rates close to 70% of gross earnings), but by providing a system of job search assistance allied to a set of sanctions to be applied if individuals do not fulfil their responsibilities to look for and accept work. These

Table F

Some important changes in unemployment insurance and unemployment assistance, 1983-98

Unemployment insurance	
Indexation	Uprating reverted to historical rather than forecast inflation (1983). Suspension of statutory indexation (1986).
Child dependent allowances	Abolished 1984.
Occupational pensions	Unemployment insurance (UI) reduction if in receipt of pension extended to over-55s.
Disqualification period	Extended from 6 to 13 weeks (1986) and 26 weeks (1988). Voluntary redundancies excluded from this category (1985).
Contribution conditions	Entitlement to depend on paid (not credited) NI contributions in past two (not one) years before claim (1988).
Unemployment assistance	
Equal treatment	Couple free to choose who should be claimant, 1983.
Income support	Replaced supplementary benefit with series of allowances based on age and marital status. Capital limit raised from £3,000 to £6,000. Rates assistance limited to 80%. Additional housing cost assistance abolished. Help denied to people whose partner working more than 24 hours a week (1988).
Disqualification	40% reduction if disqualified from UI (1986).
16-17 year olds	General entitlement removed (1988).
Mortgage interest	Under-60s to receive only 50% of interest during first 16 weeks on benefit (1987).
Restart	Compulsory counselling and referral for unemployed workers with duration in excess of six months (1986). Interviewed every six months (1988).
	Actively Seeking Work Rule introduced 1989. Show good cause for refusing jobs. New claimants required to complete Back to Work Plan and attend a review after 13 weeks.
Jobseekers allowance	UI reduced from 12 to 6 months (1996).
New Deal	New Deal for young people (1998).
Sources: Schmitt and Wadsworth (1999)	Atkinson and Micklewright (1988)

(1) The rough-and-ready numbers reported in Nickell and Van Ours (2000) suggest that this factor has made the most important contribution to the decline in equilibrium unemployment.

reforms have underpinned the excellent performance of the Danish labour market in recent years (Danish unemployment is currently around 5%).

In any event, desirable or otherwise, the overall thrust of changes in the benefit system in the United Kingdom have undoubtedly contributed to the fall in equilibrium unemployment reported in Table A. Indeed, all the evidence suggests that this and the changes in trade unionism are the most significant factors.

4.3 The role of employment taxes

The taxes that are important in the labour market are those that form part of the wedge between the real cost of labour per employee facing firms and the real post-tax consumption wage facing workers. This is important because if any tax that is part of this wedge rises, then either workers get poorer or labour costs go up and employment falls. So, to the extent that workers resist falls in their living standards, employment will fall. The taxes that contribute to this wedge are payroll taxes, income taxes and consumption taxes. There is considerable debate on the extent to which changes in these taxes are absorbed by wage changes or end up impacting on employment (see Nickell and Layard (1999) for a summary and evidence). The overall conclusion is that a small part of the tax change may impact on employment and this might have helped to reduce equilibrium unemployment since the early 1980s because the tax wedge has fallen slightly since that time. The contribution reported in Nickell and Van Ours (2000) is just over 1/2 percentage point.

4.4 The National Minimum Wage (NMW)

While the introduction of the NMW in April 1999 was obviously irrelevant for the reduction in equilibrium unemployment since the 1980s, looking forward it could play a role. The evidence from other countries is that for minimum wages set at relatively low levels (such as the UK level), the employment effects are minimal except perhaps for young people in those countries that do not have a special low rate for the under-21s. (See Dolado *et al* (1996) for a good summary.) The evidence we have so far in the United Kingdom confirms this (see Machin *et al* (2001) for a particularly reliable analysis). So while the existing NMW strategy continues, we should not expect significant effects on equilibrium unemployment from this direction.

4.5 Product market competition

In a world where wages are determined by bargaining, increases in product market competition will tend to reduce equilibrium unemployment and raise the share of labour in total output. Many have argued that there has been a significant rise in competition in the United Kingdom over the past 20 years and most businessmen would agree. Forces pushing in this direction include privatisation, deregulation and declining trade barriers both within Europe and in the world at large. On the other hand, these same forces have also generated a great deal of 'restructuring' in many of the affected sectors which has, in many cases, had the effect of sustaining and even concentrating market power. Until the strengthening of the UK anti-trust system on 1 March 2000, when the 1998 Competition Act came into force, competition law was quite feeble, particularly relative to that ruling in the United States. This perhaps explains why the share of profit in the business sector of the economy has not exhibited any significant trends in the United Kingdom over the past 30 years⁽¹⁾ (see Chart 2), and why many internationally traded branded goods are so expensive in the United Kingdom despite the 'high' exchange rate, which makes imports cheaper.



Chart 2 Adjusted profit share

Source: Measure derived from a definition of the labour share in Batini, Jackson and Nickell (2000).

It is worth noting that following the sharp rise in the exchange rate in 1996–98, UK firms operating in international markets have been under particular competitive pressure, which has impacted on margins in recent years and helped to suppress UK inflation. My previous remarks concern the longer-term trends in

(1) This is also the case in the United States. Interestingly enough, the share of profits has risen substantially in continental Europe over the past 15 years, perhaps indicating a weakening of competition.

Note: This is the profit share in the private sector.

market power and competition, not short or medium-term fluctuations due to exchange rate shifts.

4.6 Inflationary expectations

Before moving on to discuss inactivity, it is worth remarking on a particularly important feature of the operation of the labour market which has been most helpful in recent years, namely the low level and stability of inflation expectations. In Chart 3 we present the RPI inflation expectations of trade unions, since these will be particularly relevant to wage bargaining. As can be seen, since the introduction of inflation targeting after Britain's exit from the ERM in 1992, trade union inflation expectations have gradually subsided and are currently relatively stable. This stability is, in a sense, a public good because it enables the economy to operate in a more stable fashion. Thus if the economy is hit by a shock, its impact will be much greater if the shock influences inflation expectations. For example, in the period from the beginning of 1999 to the middle of 2000, the oil price rose from around \$10 to around \$30 a barrel. Had this been incorporated into inflationary expectations, the nominal and then the real macroeconomic consequences of the shock would have been far more significant. As it is, the macroeconomic consequences appear to have been minimal. This expectational stability is arguably a consequence of the structure of monetary policy determination and it has played a significant role in helping to suppress wage inflation, despite the historically low levels of unemployment that we are currently enjoying.





(1) See Schweitzer (2001), Table 1. Figures refer to 1993-99.

5 Recent changes in inactivity rates

The other key part of the impact of labour supply on potential output growth is the rate of change of the inactivity rate. Inactivity is, in some respects, more important than unemployment because there are vastly more people in this category. So the number of potential workers among the inactive is substantial and this could, therefore, have a potentially significant impact on potential output growth. In practice, however, the inactivity rate among non-students has remained remarkably stable over the past 25 years (see Table H). It is important to recognise that the inactive are not as cut off from the labour market as the name suggests. Overall, some 4% of non-student inactive individuals actually get jobs every quarter.⁽¹⁾ This compares with around 23% of the unemployed (and 14.8% of inactive students). So the inactive are a source of potential labour supply but they are very different from the explicitly job-seeking unemployed.

Table H UK inactivity rate

Per cent			
	All	Men	Women
1975	18.8	2.6	36.5
1979	19.0	4.7	34.6
1983	20.8	8.2	34.4
1987	19.2	9.6	29.8
1990	17.5	8.9	26.9
1993	19.2	11.3	27.9
1998	19.7	13.2	26.9

The inactivity rate refers here to the total number of individuals of working age who are not students and who are neither working nor unemployed, as a proportion of the non-student population of working age.

Source: Labour Force Survey, spring quarter, Gregg and Wadsworth (1999).

Underlying the stability of the inactivity rate among non-students is a dramatic contrast between men and women. Since 1975, the percentage of non-student men of working age who are inactive has risen by more than 5 times, around a 10 percentage point increase. By contrast, this is almost offset by a nearly 10 percentage point decline in the inactivity rate of women. These are dramatic changes indeed and reflect quite a number of such effects that underlie the calm macroeconomics of the UK labour market. These we pursue in the next section.

6 Imbalances in the UK labour market

The most important changes in this context are the improving position of women relative to men and the

skilled relative to the unskilled. So let us start with the situation of women relative to men.

6.1 Imbalances between the sexes

The main point here is that women are catching up. In Table I, we present information on employment rates and relative pay rates. The basic picture is of the employment rates of men and women coming together and the relative (hourly) pay of full-time women rising substantially. This has not happened for part-time women. The pay gap is closing in part because qualification rates have been rising faster from women than men and partly because women are improving their rewards relative to men for the same qualifications. For example, by the mid-1990s, the proportion of younger (25-34) full-time women with degrees was higher than for men, whereas the number of part-time women with degrees was only one third as great. These changes have been driven partly by the impact of the anti-discrimination legislation of the early 1970s and partly as more and more employers recognised that it was silly to throw away profits by making it hard for women to enter and progress in their firms.

Table I

Employment and relative pay rates by gender

Per cent

	Employn	nent rates	Relative pay			
	Men	Women	Full-time Women/men	Part-time Women/men		
1975	92.3	59.4	63	66		
1981	84.7	59.6	68	59		
1984	80.6	60.1	68	59		
1987	80.4	63.3	70	65		
1990	84.4	68.1	71	58		
1993	77.5	66.6	78	61		
1998	81.0	69.3				

Source: Desai, Gregg, Steer and Wadsworth (1999), taken from the Labour Force Survey and the General Household Survey.

Given that women are improving their position relative to men, let us return to the changes in inactivity noted in Table H and see if we can shed some more light on the startling differences between men and women portrayed there. We can start by looking at the reasons for inactivity set out in Table J. For men, the majority of inactivity is caused by sickness and disability, particularly among the prime age group. In this group, the majority of inactive women report themselves as looking after home and family. For older workers, sickness, disability and early retirement are very important for both men and women. This suggests that we should investigate further the role of sickness and disability but, before doing so, we should look at another major imbalance, that between low-skill and high-skill workers.

Table JReasons for inactivity in 1998

Per cent

	Sickne disabil	ss/ ity	Home family	and	Early retire	db	Disco	uraged	Othe	r
Age	М	W	M	W	М	W	M	W	М	W
25–49 50–64	71.6 59.7	20.6 41.7	15.3 4.5	70.6 31.2	0.5 25.2	0.2 12.7	1.2 2.6	0.5 0.9	11.6 8.1	8.2 13.5

Source: Gregg and Wadsworth (1999), Table 3.4 from Labour Force Survey, spring quarter. M = men. W = women.

6.2 Imbalances by skill

It is well known that over the past two decades, individuals with higher qualifications have improved their situation dramatically relative to those with low or no qualifications. This is partly because of the bias of technical change in favour of the skilled and partly because changes in the pattern of international trade have favoured skilled workers in the developed countries (see, for example, Berman et al (1998) and Wood (1994)). Thus in Britain, the wage differentials between those with high qualifications and those with no qualifications rose substantially between the 1970s and the 1990s despite the significant increase in the numbers of the former relative to the latter (see, for example, Machin (1999) Tables 11.4 and 11.5). This suggests that, for the skilled versus the unskilled, there has been a significant increase in the relative demand relative to the relative supply. This may be expected to have an impact on both unemployment and inactivity rates that favours the skilled. This is indeed precisely what has happened, as Tables K and L indicate.

Table K Unemployment rates by gualifications

Per cent

	Degree	Higher intermediate	Lower intermediate	None
Men				
1979	1.5	2.4	3.3	7.0
1985	3.4	8.2	12.4	19.1
1990	2.2	5.5	7.3	13.6
1998	3.0	4.5	8.3	15.6
Women				
1979	3.4	4.2	5.3	7.2
1985	5.7	8.2	10.6	13.0
1990	4.2	5.7	6.6	9.2
1998	2.9	3.8	5.9	8.4

Source: Nickell (1999), Table 1.3, from Labour Force Survey, spring quarter.

Table L Mala inactivity r

Male inactivity rates by qualifications

Per cent

	Degree	'A' level and equivalent	'O' level and equivalent	CSE and equivalent	None
1979	0.8	1.6	1.5	1.6	4.9
1981	1.2	1.1	1.9	2.2	6.0
1984	3.8	3.8	5.8	5.1	14.5
1987	5.2	5.5	6.2	7.4	17.0
1990	4.7	6.0	6.0	7.6	17.3
1993	7.1	9.2	9.5	10.5	22.1
1998	7.4	9.4	10.7	13.2	30.4

Source: Gregg and Wadsworth (1999), Table 3.3 from Labour Force Survey, spring quarter. These refer to the non-student population of working age. In Table K, we see how the unemployment rates for men have worsened dramatically for men with no qualifications (around one quarter of the population of working age). Interestingly, this has not happened for women, yet another example of the relative improvement of their labour market situation.

In Table L, we see that inactivity rates for men without qualifications have risen enormously so that by 1998, almost one third are inactive. To obtain some idea of what is going on here, we look at the sub-group of the inactive men who are sick or disabled. In Table M, we show the percentage of the population of working age who are inactive because of sickness or disability. We divide both by age and educational qualification and we see some remarkable numbers. For those without qualifications, aged 25-54, the proportion of the male population who are inactive because of sickness or disability has increased from 3.1% in 1979 to 18% in 1998. Even more startling is the fact that this number has doubled since 1993 during a period when unemployment was falling and the overall economy was buoyant. This is one of the key factors underlying the rise in male inactivity over the past 20 years.

Table M

Male sickness inactivity rates by sex, age and level of qualification

	1979	1985	1990	1993	1996	1998	2000
Age 25-54							
Degree Higher intermediate Lower intermediate None	0.2 0.4 0.8 3.1	$0.4 \\ 1.3 \\ 1.1 \\ 4.9$	0.5 1.8 1.6 6.9	1.1 3.4 2.7 8.7	$1.0 \\ 3.1 \\ 4.9 \\ 14.8$	1.1 4.3 5.2 18.0	1.0 3.4 5.2 17.2
Age 55-64							
Degree Higher intermediate Lower intermediate None	1.8 4.5 4.2 8.6	3.3 10.6 7.3 17.3	3.8 12.5 11.0 22.1	8.5 16.5 15.1 24.9	6.1 13.5 20.1 31.9	6.7 19.3 17.6 34.6	4.8 15.0 20.8 33.8

Source: UK Labour Force Survey, spring quarter.

A further aspect of these dramatic changes is the difference across regions. As we can see from Table N, inactivity rates are much higher in high-unemployment regions than they are in low-unemployment ones, indicating that this is a demand as well as a supply-side phenomenon.

Table N

Male unemployment and inactivity across regions

Area male	Inactivity rate		Inactivity rate	rate (low skill, 25+)		
unemployment rate	1990	1998	1990	1998		
<5%	8.3	11.9	13.2	27.3		
5%-7%	11.1	13.9	18.3	32.6		
7%-9%	12.9	15.1	23.1	33.6		
>9%	14.9	18.7	26.3	43.4		

Source: Gregg and Wadsworth (1999), Table 3.5 from Labour Force Survey, spring quarter.

The implications of these imbalances

We started out this part of the paper by noting that overall inactivity rates had barely changed over 25 years. So, as far as aggregate potential output has been concerned, changes in inactivity have not been an issue. But underlying this picture of calm, there have been the most dramatic shifts.

Women have been catching up with men and the demand for unskilled men has all but collapsed. In areas of high unemployment, more than half the men with no qualifications are not working and a large proportion of these would be classified as sick or disabled. One of the lessons of all this is that the inadequate education and training received in the past by a significant part of the population has not only been disastrous for them personally but has meant that the UK economy has been made significantly poorer by not making use of their potential. The benefits to the economy overall as more women have chosen to work have been more or less cancelled out, at least in numerical terms, by the steady withdrawal of men from the labour force.

7 Summary and conclusions

A key part of the process of making monetary policy is to understand the forces underlying the growth of potential output. This divides naturally into productivity growth and the potential growth of employment. Given that population growth is mainly a function of demographics, the potential growth of employment depends crucially on trends in unemployment and inactivity. The former are those non-workers looking for a job whereas the latter are the non-workers not looking for a job. Interestingly enough quite a number of this last group nevertheless end up in employment, although a lot fewer than from the unemployed.

In this paper we have analysed the forces underlying trends in unemployment and inactivity. Our main results are as follows:

• The main factors underlying the fall in equilibrium unemployment over the past 20 years have been the decline in trade unions, particularly in the private sector, and the fall in generosity and increase in strictness of the benefit system. The small fall in employment taxes, changes in product market competition and the introduction of the National Minimum Wage have had a minor impact.

- The inactivity rate among the non-student population has barely changed since 1975. This stability masks enormous changes, however, since the inactivity rate among men of working age has risen by around 10 percentage points over this period (a multiple of 5 times!) and this entirely offsets the large falls in inactivity among women.
- Underlying the rise in inactivity among men have been dramatic increases among the unskilled so that by 1998, around 30% of non-student men of working age without qualifications were inactive. Even more dramatic is the fact that most of these are inactive because of sickness or disability, even

those who are not elderly. For example, in 1979, around 3% of men aged 25–54 without qualifications were inactive because of sickness or disability. By 1998, this number had risen to 18%. The corresponding number for those with degrees is 1%.

• The incidence of inactivity is much higher in high-unemployment regions than in low-unemployment regions. Thus, in the high-unemployment regions of the North-East and North-West, more than half the men aged 25–64 without qualifications are not in employment. This indicates that this is not just a supply-side phenomenon.

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Some reflections on the MPC

In this speech,⁽¹⁾ Sushil B Wadhwani⁽²⁾ notes that it is encouraging that inflation expectations have fallen under the new monetary framework. However, because of the recent tendency to undershoot the target, he argues that it is important to keep the forecasting process under review. He presents evidence suggesting that, on average, the Bank of England's interest rate decisions have surprised the markets more than the decisions of other central banks, though, more recently, the gap has narrowed.

Good afternoon. It is a great privilege for me to have the opportunity to discuss the process of policy formulation in the United Kingdom with you today.

The new UK monetary framework

I shall start today by briefly outlining the monetary policy framework in the United Kingdom. We have just passed the fourth anniversary of the announcement that the Bank of England would be independently responsible for the operation of monetary policy. Decisions concerning interest rates are now taken each month by a nine-member Monetary Policy Committee (MPC). Our responsibility, as defined in The Bank of England Act (which came into effect in 1998), is 'to maintain price stability and, subject to that, to support the economic policy of Her Majesty's Government, including its objectives for growth and employment'.⁽³⁾ The Chancellor gives an annual remit to the Bank, currently specified as a symmetric target for the annual growth rate of retail prices excluding mortgage interest payments (the RPIX index) of $2^{1/2}$ %, and so there is a clear objective for monetary policy.

The new monetary policy framework is intended to be transparent, so we publish a quarterly *Inflation Report*, which contains the MPC's inflation forecast. The minutes of our monthly policy meetings are also published, now just two weeks after the decision (though the legal requirement is six weeks), and these show the individual votes. We are individually accountable to Parliament through appearances before the relevant Select Committees.

How has the new framework performed?

The new system appears to have made an encouraging start.⁽⁴⁾ Inflation averaged around 7% during the 1980s, and around $4^{1}/_{4}$ % over the 1990–97 period. But, between May 1997 and March 2001, annual RPIX inflation has averaged 2.4%, slightly below target. Since the introduction of the new framework, inflation has also been remarkably stable, lying within a rather narrow range (actually just 1.8%–3.2%) during this period (see Chart 1).



⁽¹⁾ Given to the National Association for Business Economics in Washington DC on 21 May 2001. This speech can be found on the Bank's web site at www.bankofengland.co.uk/speeches/speech129.pdf

⁽²⁾ Member of the Bank of England's Monetary Policy Committee, and Visiting Professor at the City University Business School and the London School of Economics. I am extremely grateful to Nick Davey and Jennifer Greenslade for their help and advice. Helpful comments on an earlier draft were received from Joanne Cutler, Sir Edward George, DeAnne Julius, Kathy McCarthy, Edward Nelson, Gus O'Donnell, Ian Plenderleith and Peter Rodgers. The speech is entirely personal and does not in any way express the views of either the Monetary Policy Committee or the Bank of England.

⁽³⁾ Chapter 11, Part II, Section 11.

⁽⁴⁾ For a detailed discussion of the framework and its performance, see HM Treasury (1999).

Note that the arrangements that existed prior to May 1997 appear to have lacked credibility in the markets. For example, in June 1995, an inflation target of 2¹/₂% or less was announced and yet inflation expectations ten years ahead (derived from financial markets) generally remained above 4%. But market measures of inflation expectations fell sharply on 6 May 1997 following the announcement of the new monetary framework, and there have since been further falls to a level slightly lower than the target (see Chart 2). This suggests that the markets believe that the current framework will deliver the target in the long run.





Credibility may also be considered with reference to the inflation expectations of independent economic forecasters. There have been substantial falls in the consensus one-year-ahead RPIX inflation forecast since the new monetary arrangements were put into place. Since then, these expectations have remained very close to target (see Chart 3).

Chart 3

Consensus forecast of UK four-quarter-ahead RPIX inflation



(1) On the Labour Force Survey definition.

It is interesting to note that UK expectations have fallen by more than US expectations, whether measured in terms of ten-year-ahead market expectations or survey-based measures (see Charts 4 and 5). This suggests that the fall in inflation expectations may be a reflection, at least in part, of the change in the policy framework in the United Kingdom. But other factors, such as disinflationary pressures in the global economy or supply-side developments, may also have helped to keep inflation low.

Chart 4 Daily ten-year market inflation expectations



Chart 5 Surveys of one-year-ahead US and UK inflation expectations



At the time of the creation of the MPC, there were those who thought that we would act as 'inflation nutters', and that low inflation would be achieved at the cost of high unemployment. However, unemployment⁽¹⁾ has continued falling, from 7.2% in May 1997, to around 5.1% now (see Chart 6). Output growth has averaged 2.8% under the new monetary framework, which compares favourably with the 40-year historical average of 2.5%.

Chart 6 LFS unemployment



Are we biased towards undershooting the target?

Although much that has occurred has been encouraging, some have, nevertheless, argued that we have been biased towards undershooting the target. If we focus on the profile of inflation over the past two years or so, the period over which the MPC has had more influence, there has been a tendency for inflation to undershoot the target (see Chart 1). Moreover, recent forecasts, including those incorporated in the May 2001 *Inflation Report*, are for RPIX inflation to remain below target for much of the next two years (see Chart 7), suggesting an undershoot lasting nearly four years.

Chart 7 RPIX forecast



Relatedly, if we look at recent two-year-ahead forecasts for RPIX inflation, the outturns for RPIX inflation have *always* been lower than the forecast. This is demonstrated in Chart 8 below, which shows actual RPIX annual inflation together with the two-year-ahead forecast.⁽¹⁾





Of course, we have not been alone in making such forecast errors. Note that economic forecasters have been persistently too gloomy about the UK economy since the departure from the ERM in 1992. Table A displays the average (ie consensus) one-year-ahead forecast errors that have been made since 1993.⁽²⁾ On average, GDP growth has been underestimated by about 0.5% per year, which is a large error in relation to the actual average annual growth rate of around 2.9%. Now, if GDP growth were faster than expected over a sustained period of time, then standard economic theory⁽³⁾ would suggest that, on average, actual inflation must also be higher than expected. However, the actual inflation outturn over this period was, on average, 0.5% lower than the consensus inflation forecast and so most economic forecasters (including the Bank of England) appear to have been simultaneously too gloomy about both GDP growth and inflation.

Table A

Average forecast errors^(a) in the United Kingdom, 1993–99



Source: Consensus Economics.

(a) Four-quarter-ahead forecast errors.
 (b) 1993 Q1-1999 Q4.

(b) 1993 Q1-1999 Q4.(c) Using a t-test over this sample period, with Newey-West standard errors.

 That is, the value shown in Chart 8, for say, 1999 Q3, is the two-year-ahead forecast of RPIX inflation that was made in 1997 Q3, plotted against the actual RPIX inflation outturn for 1999 Q3.

(2) These numbers are based on preliminary work by Nick Davey and Jennifer Greenslade of the MPC Unit at the

Bank of England; they are a part of the group of economists who work with the 'external' members of the MPC.

⁽³⁾ Conditional on potential output growth having remained constant.

There are a variety of possible explanations for this phenomenon. Some point to the strong exchange rate since 1996. Obviously, this does not explain the forecasting errors in the 1993-96 period, when the exchange rate was weak. As for the post-1997 period, some preliminary work using the Bank's medium-term macroeconometric model suggests that even perfect foresight about the exchange rate would not have been sufficient to explain our persistent tendency to predict wage growth and price inflation to be higher than what materialised. An alternative class of hypotheses would envisage a significant change in the structural relationships that underlie the forecasting processes, perhaps an appropriate characterisation of the 'new economy'. Reasons for such a change in behaviour could include the far-reaching changes in the labour market over the past two decades, a possible intensification of product market competition (in part because of globalisation), and advances in the information and communications technology area (see Wadhwani (2001) for a further discussion of this issue). So the MPC has, in its inflation forecast, made some allowance for these possibilities,⁽¹⁾ and we continue to monitor developments in this area.

A critical part of our monetary policy framework is that it specifies a symmetric target—treating deviations above the target in the same way as those below the target. If for example, the emphasis were on inflation being $2^{1}/_{2}$ % or less, then there would be an incentive for us to drive inflation down, so that the likelihood of breaching the target would be reduced, but at the cost of a detrimental effect on output and employment. A symmetric target potentially permits the highest level of growth that is consistent with the $2^{1}/_{2}$ % target.

However, the aforementioned tendency to undershoot the target appears to have led some to believe that the MPC is not operating a symmetric target. Hence, for example, the Treasury Select Committee, in their recent report on the MPC,⁽²⁾ argued that:

'... we are concerned that in an effort to establish credibility the MPC may have biased policy towards undershooting the target'.

Others have also argued along similar lines.⁽³⁾

On our current forecasts, the undershoot is expected to last around four years, so there is a risk that we shall continue to be accused of being biased for some time to come.

The MPC does, of course, have a symmetric approach to the target. It will, though, remain important for us to make sure that we continue to respond to the possible changes in the structural relationships that underlie our forecasting processes. If we were persistently to undershoot the target for well beyond the current anticipated duration, this might, at some point, come to damage our credibility.

Transparency and predictability

The monetary policy framework that has been in place since 1997 has increased transparency. As already mentioned, the minutes of the MPC meetings are published after just two weeks. In the United States and Japan, the minutes are normally published shortly after the next regular meeting (around a six-week interval in the United States and slightly less than this in Japan), whereas the ECB does not currently publish minutes.⁽⁴⁾ Another example of the high level of transparency in the United Kingdom is the publication of the quarterly Inflation Report. This contains a detailed analysis of the forecast, showing the best collective judgment of the Committee (and some discussion of different views, which will arise at times given the difficulties and uncertainty of forecasting future events). Note that not all central banks publish forecasts.

So, on the surface, the Bank of England appears more transparent. But is it more predictable? To consider this aspect, some preliminary work within the MPC Unit⁽⁵⁾ has used the three-month interest rates implied by the nearest-to-maturity short sterling, eurodollar or euribor contract.⁽⁶⁾ The average absolute change in the relevant contract on the day of policy meetings in that country is calculated using close-of-business data. This is a measure of the degree to which the markets are surprised by the results of the policy meeting on that

⁽¹⁾ An explicit adjustment for 'new economy' factors was first made in November 1999.

⁽²⁾ House of Commons Treasury Select Committee (2001).

⁽³⁾ See, for example, the evidence of Professor Willem Buiter and Mr Roger Bootle to the Treasury Select Committee, *op cit*, or the editorial 'Clean cut' in *The Times*, 5 April 2001.

⁽⁴⁾ Note that the Federal Reserve publishes a statement containing the policy decision and an assessment of the short-term risks to the attainment of its long-run goals of price stability and sustainable economic growth shortly after each meeting. Some details of the vote are also given in this statement.

⁽⁵⁾ I am grateful to Nick Davey and Jennifer Greenslade of the MPC Unit for help with these computations.

⁽⁶⁾ The contracts mature during March, June, September and December. We switch contracts at the beginning of the final month because contracts tend to lose liquidity just before they mature. So we take the June contract as the 'nearest' from 1 March.

day. These numbers have been computed for the period since the inception of the MPC in June 1997.

The results of this exercise suggest that the average market 'surprise' on the day of an interest rate decision has been higher in the United Kingdom compared with the United States or Europe, ie around 6 basis points in the United Kingdom and around 3 basis points in the United States and Europe (see Table B). Since European and American interest rates have been lower than those in the United Kingdom for much of this period, one might want to scale the average market surprise by the level of the interest rate. The results of doing so are also to be found in Table B (under the heading 'average scaled change'). They also suggest that the average 'surprise' associated with monetary policy decisions in the United Kingdom has been higher than in the United States or Europe. Note that Clare and Courtenay (2001) found that if one considered the top ten market-moving events for the short sterling contract (over a five-minute period) during the 1997-99 period, then seven of these were associated with announcements of MPC decisions, so the notion that the MPC has surprised in the past is familiar. What is less familiar about these results is that the MPC has surprised the markets by more than other central banks.

Table B

Average change in implied interest rates on days of policy announcements, 3 June 1997–18 April 2001

	Rate	Average absolute change (basis points)	Average scaled change (a)
United Kingdom	Short sterling	6.2	0.97
United States	Eurodollar	3.4	0.67
EU11 (b)	Euribor	3.3	0.85

(a) Rescaled by implied market interest rates.

(b) Using Bundesbank DM data until 8 December 1999 and euribor data thereafter.

Given that the MPC has strived to be transparent, it might, at first sight, seem odd that we have been less predictable. There are various possible explanations.

First, it is possible that the markets receive greater 'guidance' about future interest rate changes from speeches made by central bankers from other countries. It is more difficult for such hints to be offered under the system of individual accountability that operates in the United Kingdom. It is plausible that, on average, a system of individual accountability would contribute to better decision-making over time than, say, a system that depended on a single individual or on consensus decision-making. However, a cost of such a system may be that one occasionally surprises the markets a little more.

Second, the empirical results presented above should be thought of as a preliminary exercise that deserves further investigation.⁽¹⁾ Third, it is important to recognise that the results in Table B may have been distorted by some surprises in the early years of the MPC, when the markets were still trying to learn more about the reaction function of the newly-created MPC. Table C contains a comparison of the average market surprise in the first two years of the MPC with the subsequent two-year period. Rather reassuringly, the average market surprise associated with Bank of England decisions in the 1999–2001 period is broadly in line with other central banks. This is consistent with the markets having taken time to learn how we would react to developments in the economy.

Table C

Average change in implied interest rates on days of policy announcements, 1997–99 versus 1999–2001

	Average absolut (basis points)	Average absolute change (basis points)			
	1997-99 (a)	1999-2001 (b)			
United Kingdom	8.3	4.1			
United States	1.6	5.0			
EU11	2.5	4.2			
(a) 3 June 1997–12 M	1ay 1999. April 2001				

Of course, we should always endeavour to explain our actions better and, for that reason, the MPC will continue to review alternative communication strategies. For example, many market participants have told me that the *Inflation Report* would be more useful for them if it contained more information on the distribution of individual forecasts among different members of the Committee, so although we currently provide some information on the heterogeneity of forecasts, we might need to go further. This, along with the broader issue of the link between the individual forecasts and the policy decision, is something that we might need to review.⁽²⁾

(1) For example, note that we have computed the 'surprise' over the entire trading day—yet, usually, there will be factors other than our policy announcement that will also move the prices of these interest rate contracts. So we also used intra-day data for the short sterling contract. Rather reassuringly, we found that the average absolute change computed over the 11.45–12.45 (GMT) time period (the monetary policy decision is announced at 12.00 GMT) was around 80% of the average absolute change computed over the whole day. This is also consistent with the previously cited Clare-Courtenay result that interest rate decisions account for a majority of the top market-moving events over a five-minute interval. This suggests that we are, indeed, largely measuring the effect of the monetary policy decision. Further, note that using the daily change does not, of course, impart any systematic bias to our cross-country comparisons. Nevertheless, further work using intra-day data across countries would be desirable.

(2) See Kohn (2000) for a discussion of some of the issues in this area.

Conclusions

The new monetary framework in the United Kingdom has made an encouraging start, with inflation expectations having come down at a time when unemployment has also continued to fall. However, we have undershot the inflation target for the past two years, and only expect to return to target in around two years' time. Were we to continue to undershoot beyond the current two-year forecast horizon, this could damage our credibility. So it will remain important for us to make sure that we continue to respond to the possible changes in the structural relationships that underlie our forecasting processes.

I also argued today that although the Bank of England is more transparent than most central banks, our interest rate decisions did, in the early years, appear to surprise the markets by more than the corresponding decisions of other central banks. More reassuringly, our performance in this regard is now in line with other central banks, though we shall continue to endeavour to explain our actions better.

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Contents of recent Quarterly Bulletins

The articles and speeches which have been published recently in the *Quarterly Bulletin* are listed below. Articles from November 1998 onwards are available on the Bank's web site at www.bankofengland.co.uk/qbcontents/index.html

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August 1998

The UK personal and corporate sectors during the 1980s and 1990s: a comparison of key financial indicators Are prices and wages sticky downwards? Why has the female unemployment rate in Britain fallen? Testing value-at-risk approaches to capital adequacy The cyclicality of mark-ups and profit margins: some evidence for manufacturing and services Three views of macroeconomics (S) Trade and investment in the light of the Asian crisis (S) The UK economy and monetary policy—looking ahead (S)

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November 1998

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February 1999 (continued)

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May 1999

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August 1999

What makes prices sticky? Some survey evidence for the United Kingdom
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The Asian crisis: lessons for crisis management and prevention (S)
The MPC two years on (S)
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rublic sector debt. end March 1999

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August 2000

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Mortgage equity withdrawal and consumption
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Summer 2001

The Bank of England inflation attitudes survey The London Foreign Exchange Joint Standing Committee: a review of 2000 Over-the-counter interest rate options Explaining the difference between the growth of M4 deposits and M4 lending: implications of recent developments in public finances Using surveys of investment intentions Can differences in industrial structure explain divergencies in regional economic growth? Has there been a structural improvement in US productivity? International efforts to improve the functioning of the global economy (S) Monetary stability as a foundation for sustained growth (S) The 'new economy': myths and realities (S) The impact of the US slowdown on the UK economy (S)

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Bank of England publications

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No.	Title	Author
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 <i>(February 2000)</i>	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 <i>(May 2000)</i>	Shamik Dhar Darren Pain Ryland Thomas
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117	A limited participation model of the monetary transmission mechanism in the United Kingdom <i>(June 2000)</i>	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
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126	New estimates of the UK real and nominal yield curves (March 2001)	Nicola Anderson John Sleath
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131	The structure of credit risk: spread volatility and ratings transitions (May 2001)	Rudiger Kiesel William Perraudin Alex Taylor
132	Ratings versus equity-based credit risk modelling: an empirical analysis (May 2001)	Pamela Nickell William Perraudin Simone Varotto
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135	Hybrid inflation and price level targeting (May 2001)	Nicoletta Batini Anthony Yates
136	Crisis costs and debtor discipline: the efficacy of public policy in sovereign debt crises <i>(May 2001)</i>	Prasanna Gai Simon Hayes Hyun Song Shin
137	Leading indicator information in UK equity prices: an assessment of economic tracking portfolios (May 2001)	Simon Hayes
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139	The United Kingdom's small banks' crisis of the early 1990s: what were the leading indicators of failure? (July 2001)	Andrew Logan
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141	The fallacy of the fiscal theory of the price level, again (July 2001)	Willem H Buiter

External MPC Unit discussion papers

The MPC Unit discussion paper series reports on research carried out by, or under supervision of, the external members of the Monetary Policy Committee. Papers are available from the Bank's web site at www.bankofengland.co.uk/mpc/extmpcpaper0000n.pdf (where n refers to the paper number).

No.	Title	Author
1	Monetary conditions indices for the United Kingdom: a survey (September 2000)	Nicoletta Batini Kenny Turnbull
2	Inflation dynamics and the labour share in the United Kingdom (November 2000)	Nicoletta Batini Brian Jackson Stephen Nickell
3	Core inflation in the United Kingdom (March 2001)	Joanne Cutler
4	A disaggregated approach to modelling UK labour force participation (May 2001)	Joanne Cutler Kenny Turnbull

Monetary and Financial Statistics

Monetary and Financial Statistics (Bankstats) contains detailed information on money and lending, monetary and financial institutions' balance sheets, analyses of bank deposits and lending, international business of banks, public sector debt, money markets, issues of securities and short-term paper, interest and exchange rates, explanatory notes to tables, and occasional related articles. Bankstats is published quarterly in paper form, priced at £60 per annum in the United Kingdom (4 issues). It is also available monthly free of charge from the Bank's web site at: www.bankofengland.co.uk/mfsd/latest.htm

Further details are available from: Daxa Khilosia, Monetary and Financial Statistics Division, Bank of England, Threadneedle Street, London, EC2R 8AH: telephone 020 7601 5353; fax 020 7601 3208; e-mail daxa.khilosia@bankofengland.co.uk

The following articles have been published in recent issues of *Monetary and Financial Statistics*. They may also be found on the Bank of England web site at www.bankofengland.co.uk/mfsd/article

Title	Author	Month of issue	Page numbers
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UK banks' income and expenditure	Will Kerry and Daniel Wallace	March 2001	4-6
Banks' average interest rates	Jonathan Bailey and Jim Thame	February 2001	1-3

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. An update was published in September 2000 and is available free of charge.

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.

Quarterly Bulletin

The *Quarterly Bulletin* provides regular commentary on market developments and UK monetary policy operations. It also contains research and analysis and reports on a wide range of topical economic and financial issues, both domestic and international.

There is a new format for the *Quarterly Bulletin* (introduced at the start of 2001). The *Bulletin* now carries a somewhat broader range of material than before, particularly in relation to the formulation and conduct of monetary policy.

The *Quarterly Bulletin* and *Inflation Report* are no longer published on the same day. Publication dates for 2001 are as follows:

Quarterly Bulletin		Inflation Report		
Spring	12 March	February	14 February	
Summer	11 June	May	16 May	
Autumn	29 August	August	8 August	
Winter	26 November	November	14 November	

The Bank's quarterly *Inflation Report* was first published in 1993. Since then the *Bulletin* and *Inflation Report* can be bought as a combined package. The *Inflation Report* can also be bought separately. Current prices are set out overleaf.

Back issues of the *Quarterly Bulletin* from 1981 are available for sale. Summary pages of the *Bulletin* from February 1994, giving a brief description of each of the articles, are available on the Bank's web site at www.bankofengland.co.uk/bulletin/index.html

The *Bulletin* is also available from ProQuest Information and Learning: enquiries from customers in Japan and North and South America should be addressed to ProQuest Information and Learning, 300 North Zeeb Road, Ann Arbor, Michigan 48106, United States of America; customers from all other countries should apply to White Swan House, Godstone, Surrey, RH9 8LW, telephone 01444 445000.

An index of the *Quarterly Bulletin* is also available to customers free of charge. It is produced annually, and lists alphabetically terms used in the *Bulletin* and articles written by named authors.

Bound volumes of the *Quarterly Bulletin* for the period 1960–85 (in reprint form for the period 1960–85) can be obtained from Schmidt Periodicals GmbH, Ortsteil Dettendorf, D-83075 Bad Feilnbach, Germany, at a price of DM 200 per volume or DM 4,825 per set.

Inflation Report

The Bank's quarterly *Inflation Report* sets out the detailed economic analysis and inflation projections on which the Bank's Monetary Policy Committee bases its interest rate decisions, and presents an assessment of the prospects for UK inflation over the following two years.

The *Report* starts with an overview of economic developments; this is followed by six sections:

- analysis of money, credit and financial market data, including the exchange rate;
- analysis of demand and output;
- analysis of the labour market;
- analysis of costs and prices;
- summary of monetary policy during the quarter; and
- assessment of the medium-term inflation prospects and risks.

The minutes of the meetings of the Bank's Monetary Policy Committee (previously published as part of the *Inflation Report*) now appear as a separate publication on the same day as the *Report*.

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	1	2001			2000					
		<i>Quarterly Bulletin</i> and <i>Inflation Report</i> package		Inflation Report only (1)		<i>Quarterly Bulletin</i> and <i>Inflation Report</i> package		Inflation Report only (1)		
		Annual	Single	Annual	Single	Annual	Single	Annual	Single	
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