



Quarterly Bulletin

Spring 2002

Bank of England

Volume 42 Number 1



Bank of England Quarterly Bulletin

Spring 2002

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Volume 42 Number 1

Quarterly Bulletin—Spring 2002

Markets and operations (pages 5–22)

Report (pages 23–25)

Research and analysis (pages 26–93)

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 26 October 2001 to 15 February 2002.

The London Foreign Exchange Joint Standing Committee: a review of 2001. This note reviews the work undertaken by the London Foreign Exchange Joint Standing Committee during 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.

Provision of finance to smaller quoted companies: some evidence from survey responses and liaison meetings (by Allan Kearns and John Young of the Bank's Domestic Finance Division). This article reports on some recent work by the Bank aimed at improving our knowledge of the smaller quoted companies (SQCs) sector. This has taken two forms: first, analysis of the results of a questionnaire survey of SQCs drawn from a sample of CBI members; and second, a series of liaison meetings with selected companies outside the sample. Our inquiries suggest that, by reasons of their size, SQCs do not generally have access to bond markets, and that banks are less willing to extend them long-term loans, except on a secured basis. However, we found no evidence of any general problem with access to debt finance. A large majority of firms are able to achieve desired levels of gearing and use a wide variety of debt instruments and derivative products.

Explaining trends in UK business investment (by Hasan Bakhshi and Jamie Thompson of the Bank's Structural Economic Analysis Division). The ratio of business investment to GDP at constant prices has been trending upwards over the past two decades, picking up sharply in the second half of the 1990s. This article investigates possible explanations. We argue that the rise largely reflects a sustained fall in the relative price of investment goods, given that there is little discernible trend in the current-price ratio. This is consistent with a significant role for rapid technological progress in the investment goods sector and, given the importance of imported investment goods, for exchange rate developments in explaining trends in UK firms' investment behaviour. But other factors, such as falls in the cost of finance and increases in replacement investment, may also have been important. This view is supported by an illustrative model-based analysis.

Building a real-time database for GDP(E) (by Jennifer Castle of Oxford University and Colin Ellis of the Bank's Structural Economic Analysis Division). The Bank's Monetary Policy Committee analyses a wide variety of data to inform its monetary policy decisions. Some of these data are revised over time, and taking account of possible revisions is an important part of assessing any data release. This article discusses the construction of a database that contains successive releases of data for the expenditure measure of gross domestic product and its components, dating back to 1961. The database is available to external users on the Bank's Internet site.

Electronic trading in wholesale financial markets: its wider impact and policy issues (by Helen Allen of the Bank's Market Infrastructure Division and John Hawkins of the Bank for International Settlements). Electronic trading is a force for change across

markets, enabling a greater variety of trading arrangements, which in turn can affect the performance of markets and welfare more generally. This article first considers why the extent and speed of adoption of new trading systems has been very different between markets. It then focuses on two important issues raised by recent developments. One is the degree of fragmentation or consolidation of trading arrangements, where it is argued that electronic trading can facilitate either effect. The other is the degree of transparency of trading information, where the hugely expanded possibilities that electronic trading offers highlight the choices in this controversial topic. Policy-makers are interested in the wider impact of changes to trading arrangements on the broader economic and financial system. But policy judgments need to be made carefully because the effects can be market specific, uncertain or even counter-intuitive. Moreover, problems arising in market arrangements may prove short term or self-correcting. These considerations all bear on the judgments on whether or how to intervene to address apparent market failures.

Analysts' earnings forecasts and equity valuations (by Nikolaos Panigirtzoglou and Robert Scammell of the Bank's Monetary Instruments and Markets Division). Equity valuations are important for monetary policy makers as the factors that drive equity valuations may contain information about the future course of the economy. Moreover, a possible correction in equity prices may be a source of shocks to which monetary policy may have to react. Such an equity market correction may also have negative implications for financial stability. We use a three-stage dividend discount model to see whether analysts' forecasts can explain the level of equity prices over the past ten years. This model is also used to decompose equity returns into changes to earnings, the yield curve and equity risk premia.

On market-based measures of inflation expectations (by Cedric Scholtes of the Bank's Reserves Management, Foreign Exchange Division). Prices of index-linked financial securities provide market-based measures of inflation expectations and attitudes to inflation risk. In the United Kingdom, 'breakeven' inflation rates derived from index-linked and conventional gilts reflect investors' forecasts of future inflation, and also act as a barometer of monetary policy credibility. Implied breakeven inflation rates are a useful alternative to surveys and econometric forecasts, and are regularly presented to the Bank's Monetary Policy Committee to inform its assessment of economic conditions. This paper outlines the technical and institutional factors that complicate the interpretation of UK breakeven inflation rates. Looking at data, we find that inflation expectations have fallen considerably since the adoption of inflation targeting and that UK monetary policy credibility is considerably stronger since the Bank of England was granted operational independence.

Equity wealth and consumption—the experience of Germany, France and Italy in an international context (by Ben Norman, Maria Sebastia-Barriel and Olaf Weeken of the Bank's International Economic Analysis Division). Consumption in Germany, France and Italy (the EU3) has generally been thought to be less responsive to wealth effects than in the United Kingdom or the United States. The aim of this article is to assess the evidence for changes in the responsiveness of EU3 consumption to changes in equity prices, given the rapid increase in share prices in recent years and the rising share of financial assets held in equities during the 1990s.

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 26 October 2001 to 15 February 2002.

- Dollar, euro and sterling money market yield curves steepened over the period.
- Long-term interest rates rose in the United States, the euro area and the United Kingdom.
- The effective exchange rates for sterling and the euro changed little during the period. The dollar continued to strengthen, while the yen depreciated.
- Most major international equity indices were broadly unchanged, while Japanese equity prices fell.

Macroeconomic background to market developments

Consensus surveys of economic growth presented a stronger picture for 2003 than for 2002 (see Table A). Between October and February, growth expectations for 2002 rose in the United States, but fell in the euro area; growth expectations for 2003 rose in the United Kingdom, but were little changed in the United States and the euro area. This followed sharp

Table AExpectations for GDP growth(a)

	2002 (b) 2003 (b)			Difference between 2003 and 2002 (c)		
	8 Oct.	11 Feb.	8 Oct.	11 Feb.	8 Oct.	11 Feb.
United States	1.2	1.6	3.6	3.6	2.4	2.0
United Kingdom	2.1	2.0	2.4	2.8	0.3	0.8
Euro area (d)	1.6	1.0	2.5	2.6	0.9	1.6

Source: Consensus Economics.

(a) Means of survey samples.

(b) Per cent.(c) Percentage points

(d) Weighted average for Germany, France and Italy.

downward revisions in growth expectations for the major economies after 11 September. Consensus surveys suggested that among the three regions, the United Kingdom was still expected to be the fastest-growing economy in 2002 and the United States in 2003.

Short-term interest rates

Monetary policy was eased further by the Federal Open Market Committee (FOMC), the European Central Bank (ECB), the Bank of England's Monetary Policy Committee (MPC) and the Bank of Japan (BoJ) (see Table B). The sterling, dollar and euro money market yield curves

Table BMonetary policy changes

FOMC	Reduction in the Federal funds target rate by 50 basis points on 6 November	Reduction by 25 basis points on 11 December
ECB	Reduction in the main refinancing rate by 50 basis points on 8 November	
вој	Increase in target balances from above ¥6 trillion to ¥10 trillion-¥15 trillion on 19 December, and increase of Rinban operations from ¥600 billion to ¥800 billion per month	
MPC	Reduction in the repo rate by 50 basis points on 8 November	

became steeper over the period, as measured by the differences between three-month interbank rates implied for three and twelve months ahead, one example of the so-called term spread (see Chart 1). The market-based term spreads shown in Chart 1 are derived from bank liability curves (BLC).⁽¹⁾ US term spreads measured on this basis rose to levels last seen in 1994.

(1) See Brooke, M, Cooper, N and Scholtes, C, 'Inferring market interest rate expectations from money market rates', *Bank of England Quarterly Bulletin*, November 2000, for more details.

Chart 1 Term spreads^(a)





Term spreads increased in mid-November, following signs that the war in Afghanistan might end earlier than was previously expected and also in light of stronger-than-expected US retail sales data. They increased again in early December, following better-than-expected US non-manufacturing Institute for Supply Management data. Unexpectedly strong UK average earnings data and publication of the Inflation Report in November also contributed to the rise in UK term spreads. The rise in US term spreads partly reflected a fall in near-term interest rate expectations, in contrast to the euro area and the United Kingdom (see Charts 2 to 4). US and UK term spreads fell back slightly in January. A time profile of changes in interest rates implied by money market futures contracts expiring in March 2003 is shown in Chart 5.

The rise in term spreads partly reflected market participants' expectations about future monetary policy, based on revisions of their expectations of economic growth and on their perceptions about the likely reactions of the FOMC, the MPC and the ECB. Growth expectations a year ahead appeared to rise compared with the near term as monetary easing and fiscal stimulus, particularly in the United States but also elsewhere, are expected to contribute to stronger economic growth. Official interest rates in the United States and the United Kingdom are currently at historically low levels, which market participants expect will contribute to stronger growth in the future, and which some do not expect to persist for much longer.

Other likely influences on the rise in term spreads were technical factors, including a reduction in liquidity in





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





Source: Bloomberg.

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





source: Bloomber

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

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



Source: Bloomberg

(a) As indicated by changes in interest rates implied by futures contracts maturing in March 2003.

the money markets and closing out of long positions in order to protect profits ahead of the year-end, as described below. Forward rates also reflect term premia (see the box on page 9), which may have risen over the period.

Among the technical factors, long positions in dollar, euro and sterling interest rate futures contracts had been profitable earlier in 2001, as official interest rates were reduced, and the implied rates of the futures contracts had fallen.⁽¹⁾ As implied future interest rates started to rise in mid-November, market participants reported widespread sales of these contracts, in order to lock in profits (see also the section on the sterling money market on page 19). The sale of futures contracts in turn would have contributed to further rises in implied interest rates, especially as money markets became less liquid for seasonal reasons in December. The number of short sterling futures contracts traded on the London International Financial Futures and Options Exchange (LIFFE) fell by around 55% in December compared with the previous month (see Chart 6), which was the largest monthly fall (in percentage terms) since 1985. Open interest in short sterling futures contracts also fell in December, by around 20%. This pattern is consistent with a closing out of long positions ahead of the year-end. The fall in short sterling futures turnover was mostly reversed in January, and the open interest in these contracts rose by around 20%, as market participants entered into new positions.

Chart 6 Monthly turnover of short sterling futures and options contracts



Comparing the term spreads derived from market interest rates with those from surveys of economists can illustrate how much market term spreads may reflect interest rate expectations. Chart 7 compares UK term spreads derived from the BLC with economists' term spreads since 1990. The term spreads of economists surveyed by Consensus Economics are calculated as the difference in their mean expectation of the three-month sterling interbank rate twelve months ahead and three months ahead. The market and survey term spreads are compared on the survey dates each month.⁽²⁾ Economists' UK term spreads have risen since October, and have remained close to the term spreads observed in the sterling money markets:

Chart 7 UK term spreads^(a)



(a) Spreads between three-month sterling interbank rates twelve months and three months ahead.(b) Derived using the Bank's BLC curve-fitting technique.

(1) The purchase of a contract is said to create a 'long' position.

(2) If the BLC data were not available on that date, data for the previous trading day were used.

on 11 February, the survey date of the Consensus Economics survey, the economists' UK term spread was 80 basis points, compared with 103 basis points for market rates, a difference that is not unusually large by historical standards. The recent closeness of market and survey-based UK term spreads suggests that technical factors have not driven a large wedge between the two. As can be seen from Chart 7, the two measures have sometimes been quite different in the past.

A comparison of US market and survey-based term spreads is shown in Chart 8. The market-based term spreads are derived from the BLC curves, which are based on unsecured interbank rates, as in the case of the United Kingdom. By contrast, Consensus survey expectations are available only for US Treasury bill yields. A larger difference has opened up between market and survey-based term spreads in the United States than in the United Kingdom, although some of this may be due to the mismatch in the instruments used. In the euro area, the difference between market and survey-based term spreads has increased in the past few months, but as in the United Kingdom it is not currently at an unusually high level.

Chart 8 US term spreads^(a)





(b) Derived using the Bank's BLC curve-fitting technique

Interest rate uncertainty in the United States, the United Kingdom and the euro area at the six-month horizon, as implied by options on money market futures, rose to relatively high levels in November and December (see Chart 9). The rise in sterling implied volatilities probably partly reflected higher actual volatilities of the underlying futures rates, as well as increased uncertainty about future official interest rates, as market participants began to speculate about a turning-point in the rate cycle. It is also likely to have reflected the reduction in liquidity ahead of the year-end noted above (see Chart 6). Some of the fall in implied volatilities in January may have been due to an increase in liquidity, as well as greater convergence of views by market participants about future official interest rates.

Chart 9 Interest rate uncertainty^(a)



Japanese short-term interest rate expectations were little changed over the period (see Chart 10). In addition to easing monetary policy (see Table B), the BoJ made a number of changes to its open market operations, which included loosening the criteria for the bonds accepted in its Rinban operations.

Chart 10 Japanese interest rates



Source: Bloomberg.

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

Interest rate term premia

Forward interest rates derived from financial market prices are routinely used as an indicator of market views about future policy rates. But care is required when interpreting such rates.⁽¹⁾ A number of factors can drive a wedge between forward rates and expected future policy rates, including liquidity, credit risk premia, inflation risk premia and institutional factors.

There may also be 'term premia', which vary according to maturity and reflect uncertainty about future interest rates. If interest rates rise unexpectedly, investors holding longer-dated securities will suffer capital losses. They may fear these losses more than the possible gains should rates turn out to be less than expected, and hence require compensation for bearing this risk. Such concerns are most likely in circumstances where investors' planned holding periods are short (less than the maturity of the asset) or if the holding period is uncertain.⁽²⁾

One approach to estimating the extent of such term premia for the short end of the yield curve is to compare forward rates with market expectations for policy or future short-term rates derived from surveys, as noted in the main text (see page 7). Another approach is to compare outturns for the policy rate directly with earlier forward rates. At any particular date, these *ex post* differences may mainly reflect errors in predictions of the policy rate. But over long periods we might expect these errors to be unbiased, in other words to average around zero. Hence, the average *ex post* difference gives us an estimate of the average term premium over the sample period, once we have corrected for any technical differences.

The chart shows average estimates based on the forward curve derived from gilt prices and general

Average differences by maturity between UK gilt/general collateral repo two-week forward curve and subsequent policy rate



(a) For maturities up to three months, the sample period is 1997-2001.

collateral repo contracts, for maturities up to two years. The estimated term premia are small at shorter maturities,⁽³⁾ but rise quite rapidly, reaching around 0.5 or more percentage points at the two-year maturity. This is true both for the average estimated using outturns of the policy rate from 1982 to 2001, and for the more recent period from 1995 to 2001. Note that since these historic estimates are long period averages, they do not take account of what could be substantial variations in term premia over time, for example according to the degree of uncertainty attached to future rates or attitudes to risk.

These estimates are broadly similar to those made by Brooke, Cooper and Scholtes of an average bias in interbank rates of some 0.2 percentage points at a one-year maturity, rising to more than 0.8 percentage points at two years (based on a sample for 1993–2000, and adjusting for credit risk). Similar analysis for the United States and euro area suggests the existence of term premia in these markets too, of a broadly similar order of magnitude.

⁽¹⁾ See Brooke, M, Cooper, N and Scholtes, C, 'Inferring market interest rate expectations from money market rates', *Bank of England Quarterly Bulletin*, November 2000, for an extensive discussion.

⁽²⁾ Term premia could be negative for some maturities, reflecting the relative weight of underlying supply and demand. Some investors such as pension funds wish to hold long-term assets to match their liabilities. If supply is low, for example if the government is running a budget surplus, this would tend to put downward pressure on forward rates. This is an example of the 'preferred habitat' theory of the yield curve (see Modigliani, F and Shiller, R (1973), *Economica*, Vol. 40, pages 12–43).

⁽³⁾ The spot two-week general collateral repo rate is on average around 15 basis points lower than the spot two-week policy rate for technical reasons (see Brooke, Cooper and Scholtes, *op cit*). This explains why the forward rate is below the outturn policy rate at very short maturities. Longer-maturity forward rates are estimated from gilt prices, so this spread is not relevant for them.

Longer-term interest rates

Ten-year government bond yields have risen in the United States, Germany and the United Kingdom, after falling to their lowest levels on 1 November since the start of 2000 (see Chart 11). Between 26 October and 15 February, ten-year US, German and UK government bond yields rose by around 25, 35 and 20 basis points respectively. Bond yields were highly correlated over the period, suggesting that factors common to all markets were important (see Chart 11 and Table C). Changes in government bond forward yield curves over the period are shown in Charts 12 to 14.

Chart 11 International ten-year government bond yields(a)



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

Table C Correlations of daily changes in ten-year government bond yields^(a)

	Gilts-US Treasuries	Gilts-Bunds	US Treasuries-Bunds
1998-2001	0.48	0.72	0.51
2001	0.49	0.73	0.61
2001 Q4 (b)	0.61	0.87	0.63

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

(b) 26 October 2001 to 15 February 2002.

Revisions to the economic outlook and expectations for future official interest rates were important for government bond yield movements during the period. Ten-year spot government bond yields internationally rose strongly in mid-November and early December, for similar reasons to money market interest rates, in particular stronger-than-expected US economic data and news about the war in Afghanistan. Ten-year government bond yields internationally reversed some of their rise in the first half of January, and did not show a clear trend thereafter.

Chart 12 Three-month forward gilt yields(a)



Chart 13 Three-month forward US Treasury yields^(a)



Chart 14 Three-month forward Bund yields(a)



While changes in perceptions about the economic outlook and monetary policy are likely to have been the most important factors behind ten-year government bond yield movements, other factors may have amplified these yield movements during the period. These factors include supply considerations, positioning, profit-taking

Markets and operations

and liquidity, as well as hedging of mortgage prepayment risk in the United States, and are described below. They seem to have contributed particularly to the volatility of ten-year US Treasury yields, which rose strongly in November and December, to levels last seen following the Long Term Capital Management crisis (see Chart 15).

Chart 15

Volatility of ten-year government bond yields(a)



⁽a) Twenty-day rolling standard deviations of daily yield changes. Derived using the Bank's VRP curve-fitting technique.

Revisions to expected government budget balances, and associated expectations of increased government bond supply, may have contributed to the rise in ten-year government bond yields over the period. According to Consensus surveys, economists became more pessimistic about the budget positions in all three countries between October and February (see Table D). In January, the Congressional Budget Office (CBO) documented a sharp deterioration in the US government's fiscal position, forecasting annual deficits for 2002 and 2003. Between January 2001 and 2002, the CBO revised down its projection for the cumulative fiscal surplus for the years 2002 to 2011 inclusive by \$4 trillion, to a total of

Table D Forecasts for government budget positions(a)

	United States (\$ billions) 2001/02	Germany (€ billions) 2002	United Kingdom (£ billions) 2002/03
October 2001	+17	-38.9	-3.3
November 2001	-40	-46.7	-4.7
December 2001	-23	-50.5	-5.1
January 2002	-18	-52.3	-7.5
February 2002	-38	-54.9	-9.1
Source: Consensus	Economics.		
(a) Survey means.			

\$1.6 trillion. About 60% of that decline resulted from legislation, including tax cuts and additional discretionary spending, and the remaining 40% was due to other factors, including changes in the economic outlook.⁽¹⁾

The announcement in December of heavy issuance of ten-year German government bonds in January may have contributed to the rise in ten-year Bund yields in December. Some of this effect was reversed in January as the issuance of \notin 20 billion was absorbed by the market. High issuance of sterling-denominated non-government bonds in November and early December put upward pressure on medium and long-maturity gilt yields. However, the effect was offset by strong demand for bonds from pension funds in anticipation of the introduction of a new financial reporting standard, FRS17 (see the section on bond issuance on page 13).

As in the money market, positioning and profit-taking ahead of the year-end are likely to have amplified government bond yield movements during the period. Many market participants in the United States were said to be long of US Treasuries relative to their benchmarks at the start of the period, both relative to other fixed-income and equity markets and also in duration terms-the securities they held were of longer maturities than their benchmarks. Such positions proved very profitable for much of 2001, as interest rates and US Treasury yields fell. From early November onwards, however, market participants were said to have begun to unwind those long positions, not only because of changing views on the future path of interest rates, but also in order to lock in profits.⁽²⁾ This put further upward pressure on Treasury yields. Similarly, positioning and profit-taking were thought to have exaggerated the rises in gilt yields in November and December. As in the money markets, a reduction in liquidity is also likely to have amplified government bond yield movements ahead of the year-end (see Charts 16 and 17, which show how turnover in cash and futures markets fell sharply in December). Some of the fall in government bond yields in the first half of January may have been due to an increase in liquidity.

Moreover, hedging of mortgage prepayment risk by holders of mortgage-backed securities (MBS)⁽³⁾ was

(1) See 'The Budget and economic outlook: fiscal years 2003–2012; statement before the Committee on the Budget, United States Senate by Crippen, D, Director, CBO, 23 January 2002.

(2) Many of the major US investment houses have a 30 November financial year-end.

⁽³⁾ For details about MBS and modelling of mortgage prepayment risk, see, for example, Fabozzi, F (ed), Handbook of mortgage-backed securities, Probus Publishing Company, 1995.



50 0 July Jan July Jan July Jan July Jan. Jan 1998 99 2000 01 02

Source: London Stock Exchange.





(a) Pit volumes.

thought by market participants to have amplified US Treasury yield movements, particularly at medium maturities. Given that bond yields have historically been correlated internationally (see Table C), some of the effect on US Treasury yields from this hedging activity may have spilled over to the gilt and Bund markets, also amplifying yield movements there to some extent.

MBS investors receive the cash flow from mortgage repayments. As yields rose, it became less likely that mortgage holders would decide to invoke the prepayment clause in their contracts in order to refinance their mortgages. The decreasing likelihood of prepayment increased the duration of MBS investors' portfolios. In order to remain duration-neutral, they needed to sell some of the US Treasuries that they had previously bought as hedges against prepayment risk, as yields had fallen earlier in 2001. These sales would have tended to lead to further rises in Treasury yields. Indeed, the duration of Merrill Lynch's Mortgage index increased by about 0.4 years over the period, reversing part of its previous fall following 11 September (see Chart 18). As Chart 18 shows, the duration of the mortgage index showed a large degree of co-movement with ten-year US Treasury yields.

Chart 18 Macaulay duration of Merrill Lynch Mortgage index



Sources: Merrill Lynch and Bank of England

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

Forward government bond yields in the United States, Germany and the United Kingdom have fallen or remained little changed at maturities of 20 years and above since 26 October (see Charts 12 to 14), even though they have risen at short maturities. This was partly since forward yields at long maturities are less affected by short-term cyclical considerations, and it also partly reflected supply considerations. On 31 October, the US Treasury announced the suspension of thirty-year US Treasury bond sales. Following the announcement, thirty-year US Treasury yields fell sharply, by 33 basis points on the day. Long-maturity gilt and Bund yields also fell, but by less than US Treasury yields. On 31 October, thirty-year dollar swap spreads widened by around 15 basis points, while ten-year swap spreads remained little changed. These yield changes are consistent with expectations of a reduction in long-maturity US Treasury supply. Given that thirty-year US Treasury bond issuance was being suspended, revisions to expectations of government budget positions (see Table D) and expectations of increased government bond supply may have affected ten-year bond yields more than they would have done if issuance had not been suspended at the thirty-year maturity.

Yields on Japanese government bonds (JGBs) changed little until mid-December, with the government reassuring investors that it would continue to adhere to the policy of capping net JGB issuance at ¥30 trillion a year. In addition, the decision by the three credit-rating agencies, Fitch, Moody's and Standard & Poor's, to downgrade Japan's sovereign rating by only one notch led market participants to believe that credit concerns might not be so much of an issue in the near term. However, a series of high-profile bankruptcies at the end of the year led to increased concerns about the stability of the financial system with the approach of the financial year-end. This, together with a fall in Prime Minister Koizumi's popularity and Moody's announcement that it would be undertaking a review of Japan's sovereign credit rating, led to a further rise in JGB yields.

Bond issuance and credit spreads

The nominal value of the outstanding stock of gilts fell by about £8 billion in the fourth quarter, to £275 billion, having fallen by £2.8 billion in Q3. About £13 billion of gilt-edged stock was redeemed, and the Debt Management Office (DMO) held two auctions of new stock during the quarter (see Table E).

Issuance of sterling-denominated bonds other than gilts increased in Q4 to about £22.5 billion (see Chart 19 and Table E), with issuance remaining fairly low in October, but more than doubling in November, and remaining high in December. The increase was mainly accounted for by a large increase in fixed-rate issuance, up to almost £17 billion from less than £9 billion in 2001 Q3.

Chart 19 Sterling-denominated non-government bond issuance



Fixed-rate borrowing by A-rated issuers rose sharply, and was the main component of the increase in fixed-rate issuance in 2001 Q4. By contrast, AAA-rated fixed-rate issuance in 2001 Q4 was less than half of the 2000 Q4 total (see Chart 19). Issuance of non-government bonds rated BBB and below also increased in 2001 Q4. UK corporates accounted for a higher proportion of issuance in 2001 Q4, which largely explains the relative rise in A and BBB-rated bonds, while issuance by overseas entities, particularly supranational organisations, halved in comparison with 2000 Q4, partly accounting for the fall in AAA-rated issuance. The strong increase in new issues by UK corporates in the fourth quarter of 2001 after a fall in Q3 partly reflected some being postponed following 11 September.

Table ESterling bond issuance in 2001 Q4

DMO gilt auctions (£ millions)

Conventional	Date 06.12.01	Amount issued 2,750	Stock 5% Trea	asury Stock	2025	
Index-linked	Date 24.10.01	Amount issued 425	$\frac{\text{Stock}}{2^{1/2}\% I}$	ndex-linked	Stock 20	16
Non-government bond issuance	Number	<u>Amount (£ billi</u>	llions) By credit rating:			PPP and
	of issues	Total (a)	AAA	AA	A	lower
Fixed-rate issues	32	8.2	1.0	17	3.2	23
UK financials	11	3.1	0.0	0.8	2.2	0.1
Supranationals	8	1.3	1.3	0.0	0.0	0.0
Overseas borrowers	25	4.2	0.6	0.7	1.5	1.4
Total (a)	76	16.8	2.9	3.1	6.9	3.8
FRNs						
UK corporates	10	1.7	0.5	0.3	0.6	0.3
UK financials	32	2.8	1.4	0.4	0.7	0.3
Supranationals	0	0.0	0.0	0.0	0.0	0.0
Total (a)	53	5.6	0.9 2.8	0.0 0.7	0.2 1.5	0.0 0.6

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

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

UK pension funds have increased their holdings of non-government bonds. As shown in Chart 20, non-gilt holdings as a proportion of insurance companies' and pension funds' asset portfolios have increased by almost 8 percentage points since 1997, with more than 16% of their assets now being held in non-government bonds. In contrast, equity holdings have fallen by more than 6 percentage points to 61%. An example of this change is that made by Boots plc which, over the 15 months following April 2000, switched the equity portion of its pension fund, worth an estimated £1.7 billion, to non-government bonds and invested in AAA-rated bonds issued by supranational organisations. Demand from

Chart 20





⁽a) Figures given are cumulative percentage point changes as a percentage of funds allocated to each asset.

other pension funds for non-government bonds, in anticipation of the abolition of the Minimum Funding Requirement (MFR) and introduction of the FRS17⁽¹⁾ accounting standard, has encouraged increased issuance. This strong demand may account, in part, for the fall in UK corporate bond spreads over the period (see Chart 21), although the fall could additionally reflect a reduction in the gilt premium as the influence of the MFR has decreased. Anticipation of the abolition of the MFR may also account for the greater fall in ten-year sterling swap spreads (the difference between swap rates and government bond yields) compared with euro and US dollar swap spreads (see Chart 22). Since the end of January corporate bond spreads have

Chart 21 Spreads of corporate yields over gilts



risen slightly, which may partly be due to credit concerns in light of questions raised about accounting practices following investigations into Enron in the United States.

Chart 22 Ten-year swap spreads^(a)



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

Total issuance of dollar-denominated non-government bonds decreased slightly in 2001 Q4 compared with Q3, but the amount issued was higher than in 2000 Q4. Euro-denominated non-government bond issuance showed an increase in 2001 Q4 on both 2001 Q3 and 2000 Q4. Ten-year euro-denominated swap spreads continued to narrow during the period, declining by

(1) Financial Reporting Standard 17 requires that companies' defined benefit pension scheme assets are measured at fair value, and that liabilities are discounted to present value using the prevailing yield on an AA-rated corporate bond with a maturity of similar term to the scheme liabilities. The net surplus or deficit is recorded in the balance sheet and ongoing service costs (including the basic cost of pension provision) are recorded in the profit and loss statement. Other surpluses and deficits arising from the fluctuating market values of fund assets (ie where fair/market value differs from the actuaries' predicted value) will be recognised in the statement of total recognised gains and losses (STRGL). There is a transition period prior to full adoption of the standard for accounting periods ending on or after 22 June 2003.

4 basis points. This narrowing partly reflected ongoing demand from the French government to receive fixed in longer-maturity interest rate swaps, so as to shorten the average duration of its debt portfolio. It also partly reflected some rise in ten-year European government bond yields, given strong government bond issuance in January. In contrast, ten-year dollar swap spreads have risen slightly. They rose sharply in November, and also in December following concerns about the Enron bankruptcy, but then fell back, reaching a low in mid-January. They then rose again when credit concerns re-emerged following speculation about the accuracy of corporate accounts in the wake of the Enron bankruptcy. In Japan, swap spreads have become negative, partly due to ratings concerns about JGBs, and also because swaps continue to be exempt from marking-to-market accounting rules for banks introduced in Japan this financial year, unlike JGBs, which are now covered by the new rules. The net effect is that receiving the fixed rate in swaps has become a more attractive investment for banks than holding JGBs, and this has contributed to negative swap spreads.

Equity markets

Most major international equity indices were broadly unchanged over the period (see Table F and Chart 23). There was little contagion from the events in Argentina and most of the major indices are close to levels reached just prior to 11 September. But there were large falls in equity prices in Japan.

Table F

International equity market performance

Percentage changes between start and end of period in local currencies

	<u>2001</u> Year	2001 1 Aug. to 26 Oct.	2001/2002 26 Oct. to 15 Feb.
United States			
S&P 500	-13.0	-9.2	0.0
Wilshire 5000	-12.1	-9.5	1.3
Europe			
Euro Stoxx	-19.7	-12.5	0.6
CAC 40	-22.0	-12.4	-2.3
DAX 30	-19.8	-174	0.9
FTSE All-Share	-15.4	-72	0.8
FTSE 100	-16.2	-6.5	-0.1
Ianan			
Topix	-19.6	-8.8	-10.8
Technology			
Nasdag Composite	-21.1	-14.5	2.0
FTSE techMARK 100	-42.6	-11.2	-10.1
Neuer Markt	-60.2	-16.2	-72
i veuer markt	-00.2	- 10.2	-/.2

Source: Bloomberg.

Correlations between the weekly changes in the FTSE All-Share and other major international indices increased over the period (see Table G), suggesting

Chart 23 International equity indices^(a)



(a) In local currencies.

increasing international interdependence, as in fixed-income markets (see Table C). While most major indices were broadly unchanged over the period, the Japanese Topix fell by more than 10%. The fall coincided with increasing concern over Japanese banks' bad loan problems, and indeed the banking sector sub-index fell by almost 25%. By contrast, the DAX rose by 0.9% despite continued weakness in all sectors of the German economy.

Table G Correlations between the FTSE All-Share and other equity indices^(a)

	S&P 500	Euro Stoxx	Topix
ince 1992	0.60	0.78	0.29
2001	0.83	0.95	0.46
2001 Q4 (b)	0.95	0.95	0.61

(a) Correlations between weekly percentage changes in the FTSE All-Share and other equity indices.

(b) 26 October 2001 to 15 February 2002.

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Conceptually, changes in equity prices can be decomposed into changes in current and projected profitability, risk-free interest rates and equity risk premia.⁽¹⁾ Indicators of expected profitability in the United Kingdom deteriorated over the period. The number of profit warnings was unusually high. In the fourth quarter of 2001, 158 UK firms issued statements warning that they would not meet profit expectations, the highest total since the Bank began collecting data in 1997 (see Chart 24). The figures for January were lower than in the October peak, but were still higher than in January 2001. The very high number in October may have been affected by the Financial Services Authority's reminder in late September of its powers to fine companies that delayed issuing profit warnings. Firms in

(1) See, for example, the box on decomposing equity price movements in the *Bank of England Quarterly Bulletin*, Winter 2001, page 378.

the cyclical services sector accounted for more than a third of the warnings over the period, while information technology and general industrials companies also reported a disproportionately high number.

Chart 24 Profit warnings by UK firms^(a)



(a) Monthly average number of UK firms listed on the FTSE All-Share index issuing a profit warning or negative trading statement. 2002 Q1 covers 1 January to 15 February.

Analysts have revised their expectations of equity earnings growth downwards since October, providing further evidence of a weaker outlook for profit growth. IBES (Institutional Brokers Estimate System) forecasts for earnings per share growth in 2002 fell for both the FTSE 100 and the S&P 500 indices between the 18 October 2001 and 14 February 2002 surveys. Expectations over the long term, which IBES defines as three to five years, are lower by 1.5 percentage points for the FTSE 100 and by 2.3 percentage points for the Topix. But expectations over the long term have fallen less for the S&P 500 and the Euro Stoxx (see Chart 25). These changes in earnings expectations have depressed equity prices.

Equity prices also depend on the rate at which future profits (and hence dividends) are discounted. Nominal ten-year government bond yields have risen over the period (see the section on longer-term interest rates). The correlation between movements in equity prices and long-term interest rates varies (see Chart 26), and depends on the underlying reason behind changes in interest rates (for example prospects of higher growth may increase expectations of future interest rates). But for given expectations about dividend growth, higher long-term interest rates will reduce equity prices by raising the discount factor.

Chart 25 Long-term earnings per share growth forecasts



Chart 26 FTSE 100 and ten-year spot yields



Sources: Bloomberg and Bank of England

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

The discount rate will also depend on the equity risk premium. There are indications that the premium required by investors to hold equities may have fallen over the period. On the basis of the changes in IBES forecasts of earnings expectations and risk-free interest rates, the equity risk premium for the FTSE 100 calculated from the three-stage dividend discount model⁽¹⁾ fell by around 1.1 percentage points between 18 October and 14 February. A fall in the equity risk premium would be consistent with options data, which suggest that investors have become less uncertain about short-term equity price developments. The implied volatility of equity returns has declined significantly for both the FTSE 100 and the S&P 500 (Chart 27), and the historical volatility, calculated as the standard deviation of returns, has also fallen for the FTSE 100. Investors also appear to attach a lower probability to large falls

(1) See Panigirtzoglou, N and Scammell, R, 'Analysts' earnings forecasts and equity valuations', on pages 59–66 of this *Bulletin.*

in equity prices. This may be partly due to the faster-than-expected resolution of the conflict in Afghanistan. The skewness of the distribution of returns, which is a measure of the balance of risk attached by the market, has become less negative for the FTSE 100, but is little changed for the S&P 500.



FTSE 100 three-month skewness and implied volatility(a)



(a) Derived from options on FTSE 100 futures.

The dividend discount model is a framework for quantifying these influences. Chart 28 suggests that the relative stability of the FTSE 100 may have reflected a fall in uncertainty counterbalanced by lower earnings expectations. Looking at the seven-month period spanned by the IBES surveys of 19 July 2001 to 14 February 2002, most of the fall in equity prices can be ascribed to lower current and projected profits, with no substantial effect from changes in long-term interest rates and a positive effect from a fall in the equity risk premium.

Chart 28 Decomposition of changes in the FTSE 100^(a)



(a) Change due to real interest rate in the first column is negligible.

Within the FTSE All-Share index, the best-performing sectors were basic industries and general industrials (see Chart 29), even though manufacturing output fell in December to its lowest level since April 1996. Basic industries, which includes the construction industry, may have benefited from an increase in public sector construction projects. Technology shares have remained volatile and fell overall over the period.

Chart 29

Changes in FTSE sectoral equity indices between 26 October 2001 and 15 February 2002^(a)



Source: Thomson Financial Datastream.

(a) Weights as of 13 February are in parentheses.

Foreign exchange markets

Over the period as a whole, the effective exchange rates of sterling and the euro have changed little (see Chart 30). The dollar continued to strengthen, while the yen depreciated significantly. Between 26 October and 15 February, the sterling trade-weighted exchange rate index (ERI) appreciated by 2.1%, while the euro ERI depreciated by 0.7%. The euro-sterling bilateral exchange rate fluctuated within a narrow range of 2.3 pence. The US dollar effective exchange rate index

Chart 30 Effective exchange rate indices



(ERI) appreciated by 3.3%, to a new 16-year high at the end of January, while the yen ERI depreciated by 6.5% over the period.

The appreciation of the dollar between 26 October and 15 February was fairly broad-based, with the dollar gaining 2.2% against the euro and 7.7% against the yen, while being unchanged against sterling. This was not well correlated with changes in short-term interest rates over the period; these fell in the United States, whereas euro short-term rates rose—nevertheless the euro fell against the dollar.

Despite the low correlation between short-term interest rates and exchange rates over the period, there was a stronger correlation with changes in relative growth prospects in the major economies. During the period there were a number of positive surprises in US data and survey releases, which the market interpreted as suggesting that activity was likely to rebound somewhat earlier and more strongly than had previously been expected. Also over the period, the Consensus Economics survey of growth expectations for 2002 was revised up for the United States, but down for the euro area (see Table A). Furthermore, according to the January Consensus survey, the balance of risks around the central expectation appeared fairly balanced for the United States. By contrast, growth expectations for Germany and France⁽¹⁾ were skewed downwards around the mean expectation.

The Japanese yen depreciated sharply over the period in contrast with the previous quarter, during which the Bank of Japan intervened to limit the appreciation of the yen. By the start of December the yen had gradually depreciated to ¥124 against the US dollar, as economic prospects continued to deteriorate. The yen's depreciation accelerated during December. The start of the depreciation coincided with the release of Q3 GDP, which showed a fall of 0.5%, following a downwardly-revised Q2 number of -1.2%. The depreciation gained momentum as the dollar-yen exchange rate moved through the ¥125 level, and as official comments were interpreted by the market as indicating some willingness to see the yen fall further. Market commentators also emphasised concerns over financial fragility, reflected in falls in Japanese asset prices. Towards the end of the period, the dollar-yen exchange rate stabilised within the ¥130-¥135 range.

The issue of capital flows generated much debate in the foreign exchange market around the turn of the year. A number of market commentators and press stories suggested that, on average, there is typically a net repatriation of capital to Japan during the first quarter of the year as investors (mainly financial institutions) adjust their balance sheets going into the fiscal year-end—and that this net inflow causes the yen temporarily to appreciate. Given the weakening condition of the financial sector, this effect was expected by many to be greater than usual this year. However, studies of the data since 1990 show that while there has on average been a net inflow of capital to Japan in the first quarter, this does not happen every year, and furthermore there is not, on average, an appreciation of the yen in the first quarter. Despite this, the perception that repatriation flows were likely to occur may have contributed to the stabilisation of the yen towards the end of the period.

Between 26 October and 15 February sterling appreciated by 2.2% and 7.7% against the euro and yen respectively, and was unchanged against the dollar (see Chart 31).

Chart 31 Sterling bilateral exchange rates



Sterling's movements too were not well correlated with changes in short and medium-term interest rates, but were more consistent with changes in relative growth prospects. Consensus surveys suggest that the United Kingdom is expected to be the fastest-growing G7 economy in 2002, and UK growth prospects have been revised down by less than those of the euro area over the period. Sterling's appreciation against the euro was also consistent with the historical correlation between the euro-sterling and euro-dollar exchange rates. When the

(1) The distribution of forecasts around the mean expectation is available from the January Consensus Economics survey for the individual countries, but not for the euro area as a whole.

dollar appreciates against the euro, sterling tends also to appreciate against the euro.

The possibility that the United Kingdom might at some point enter EMU was again the subject of market commentary during the period, particularly in the period leading up to and immediately after the successful launch of euro notes and coins at the start of 2002. Over the period as a whole sterling appreciated against the euro, even though most market participants believe that if the United Kingdom were to enter EMU it would be at a weaker exchange rate than currently.

Looking forward, option prices can give an indication of how closely correlated the euro and sterling exchange rates are expected to be over the next year.⁽¹⁾ On this measure (see Chart 32), the implied correlation of sterling with the euro (against the dollar) is currently higher than the implied correlation of sterling with the dollar (against the euro). For much of 2001 the market generally expected sterling to be roughly equally correlated with both the euro and the dollar, but since August the implied correlations have diverged. Some in the market have interpreted this as implying that the market attaches a greater probability to sterling entering EMU, although the majority of the divergence derives from a fall in the sterling-dollar correlation, rather than a rise in the euro-sterling correlation. In contrast to the forward-looking implied correlations, backward-looking actual correlations show that sterling moved more closely with the dollar than with the euro over the past year.

Chart 32 One-year exchange rate implied correlations



Viewing the foreign exchange market as a whole, uncertainty does not appear to have changed significantly. Implied volatilities for most currencies are at or close to historically low levels (see Chart 33). Events in Argentina caused virtually no contagion to other currencies, or indeed other financial markets more generally. The price of gold did rise temporarily, perhaps indicating a short-term rise in risk-aversion, but it then fell back to its late-October levels. In February, however, the price of gold rapidly increased from a London fixing of \$282.30 on 31 January to a high of \$304.30 on 8 February. Whether this was a reflection of gold's role as a safe-haven asset and therefore symptomatic of an increase in risk-aversion is not clear. The rise was prompted by a series of announcements, including by the largest gold producer, Anglogold, that gold producers would reduce the extent to which they hedged gold production by selling it forward, prospectively reducing supply to the market in the near term.

Chart 33 Exchange rate uncertainty^(a)



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

The sterling money market

The amount outstanding in the sterling money market fell by £14 billion to £541 billion in 2001 Q4, having risen by £12 billion in the previous quarter (see Table H). Much of this change can be accounted for by movements in gilt repo,⁽²⁾ but there were also falls in certificates of deposit, stock lending and interbank deposits. These decreases were partly offset by a rise in Treasury bill issuance, its outstanding stock having risen by £8.6 billion since September to £11.2 billion. Following the Chancellor's November Pre-Budget Report, the Debt Management Office announced a further

 This methodology is set out in Butler, C and Cooper, N. 'Implied exchange rate correlations and market perceptions of European Monetary Union', Bank of England Quarterly Bulletin, November 1997.
 England Charles and Content and Conte

(2) For gilt repo, data are available only to end-November.

Table H Sterling money markets

Amounts outstanding: £ billions

		Interbank (a)	CDs (a)	Gilt repo (b)	Stock lending (b)	Eligible bills (a)	Commercial paper (a)	Other (c)	Total
2000	Q1	156	132	100	51	14	15	6	474
	Q2	159	135	124	54	12	16	7	507
	Q3	162	125	127	53	12	16	7	502
	Q4	151	130	128	62	11	18	9	509
2001	01	171	141	126	67	13	19	7	544
	Õ2	177	131	128	67	12	22	6	543
	03	187	134	144	52	11	21	6	555
	Õ4	185	131	130	48	11	20	16	541

(a) Reporting dates are end-quarters.

(b) Reporting dates are end-February for Q1, end-May for Q2, end-August for Q3, end-November for Q4 and end-year.

(c) Including Treasury bills, sell/buy-backs and local authority bills.

increase of £1.4 billion to the planned end-March 2002 stock of Treasury bills, bringing it to a total of £9.7 billion.

Nominal amounts outstanding in gilt repo at end-November fell by about £14.5 billion from end-August, having risen by £16 billion in the previous quarter. The strongest fall occurred in overnight repos. This fall appears to have been the result of a switch from secured to unsecured finance, with the interbank market growing by £9.7 billion between August and November before contracting in December. Spreads of unsecured interbank rates over secured general collateral (GC) repo rates were little changed on the previous quarter, although they have fallen since late 2000 (see Chart 34).

Chart 34





Average daily turnover in gilt repo contracts rose to $\pounds 20.0$ billion in the quarter to end-November from $\pounds 18.2$ billion in the previous quarter (see Table I), despite the decline in amounts outstanding, which may reflect the closing out of positions towards the end of the year. Anecdotal evidence suggests that the increase in activity occurred mainly in GC repo; 'specials' activity

remained focused on stocks that were cheapest to deliver into the long gilt futures contracts. While other gilts have traded at a premium to GC repo, volumes were lower than in the past and no use was made of the Debt Management Office's standing repo facility.

Table ITurnover of money market instruments

Average daily amount, £ billions

	2000	2001				
		Q1	Q2	Q3	Q4	
Short sterling futures (a)	45.0	60.0	66.0	71.5	69.6	
Gilt repo (b)	17.8	15.7	17.9	18.2	20.0	
Interbank (overnight) (c)	10.4	10.3	11.1	9.3	10.8	
CDs, bank bills and Treasury bills	n.a.	11.8	12.4	11.4	11.7	

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.
 (b) Reporting dates are end-February for Q1, end-May for Q2, end-August for Q3, end-November for Q4 and end-year.

(c) Brokered values.

As in previous years, activity in sterling money markets fell in the run-up to the year-end. This partly reflected balance sheet restrictions imposed by some banks prior to the calendar year-end and accounting or regulatory reporting deadlines. As might be expected, the fall in liquidity caused by such restrictions appeared to contribute to an increase in price volatility, which reportedly also deterred otherwise unconstrained players from actively participating at the year-end. The contraction that took place in UK resident banks' sterling balance sheets totalled £42 billion. In cash markets the year-end was marked by tight overnight rates. During December the sterling overnight index (SONIA) averaged 4.55%, 55 basis points above the Bank's repo rate. This compares with a Bank repo to SONIA spread of -29 basis points in December 2000 and -76 basis points in December 1999.

Open market operations

The stock of money market refinancing held on the Bank's balance sheet (which comprises the short-term

assets acquired via the Bank's open market operations) averaged £19 billion over November, December and January (see Chart 35). This was some £2 billion higher than over the previous three-month period, reflecting the temporary growth of the bank note circulation at Christmas (which is the principal sterling liability on the Bank's balance sheet).

Chart 35 Stock of money market refinancing and daily shortages



During November, December and January, daily money market shortages averaged £2.7 billion, compared with £2.4 billion over the previous three-month period (see Table J). This rise reflected larger-than-normal shortages in December (averaging £4.2 billion) as the rate of turnover in the stock of refinancing rose.⁽¹⁾ This was because the Bank's open market operations (OMO) counterparties chose to refinance as much as 32% of the month's daily money market shortages in the late rounds of operations, on an overnight basis (see Chart 36). Typically, less than 20% of the refinancing is undertaken on an overnight basis. When counterparties choose to obtain a higher proportion of the refinancing on an

Table J Average daily money market shortages

1996	Year	0.9
1998	Year	1.4
2000	Year	2.0
2001	Q1	2.5
	Q2	2.3
	Q3	2.3
	Oct.	2.5
	Nov.	1.9
	Dec.	4.2
2002	Jan.	2.1

Chart 36





overnight basis, the turnover of the stock of refinancing rises and, consequently, the average size of the shortages increases.

Some of the rise in counterparties' use of overnight refinancing in December may have been related to reduced demand for two-week refinancing relating to year-end balance sheet considerations.

Chart 37 shows various short-dated money market interest rates and the Bank's repo rate. The increased use of the Bank's overnight, penal facilities (and consequent tightness in overnight market interest rates) was reflected in the two-week interbank rate trading above normal levels for much of December. During December and January, the one and three-month

Chart 37 Bank's repo rate and interbank rates



(1) 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.

interbank rates traded nearer to the Bank's repo rate than had been the case in previous months, as market expectations of further interest rate cuts by the MPC diminished.

Counterparties made use of the Bank's deposit facility on five days during the review period. In order to leave the market square by close of business, the Bank increased the amount of refinancing available at the 4.20 pm late repo facility by the size of the deposit on each occasion that the facility was used, and the settlement banks borrowed the full amount of refinancing available. The deposit facility has continued to fulfil its objective of providing a 'floor' to the interbank overnight rate, and consequently to other short-dated market interest rates.

The Bank wrote to its OMO counterparties on 19 November 2001 to inform them that, from 10 December, it may, on a more frequent basis, scale down an individual counterparty's bid for OMO liquidity. This measure was intended to reduce what the Bank might consider to be an undue concentration of its operations in the hands of a few of its counterparties and so help to ensure that access to the liquidity provided by the Bank was available as smoothly as possible to all market participants. Individual counterparties can continue to make significant contributions to OMOs and, indeed, the Bank expects

Chart 38 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 November 2001 to January 2002. Figures in brackets relate to August to October 2001. Figures may not sum to 100% because of rounding. that it is unlikely that there will be any direct effect on the scale of most counterparties' money market operations with the Bank. The subject was discussed at the Sterling Money Market Liaison Group's meeting of 10 December 2001.⁽¹⁾

Gilts accounted for around 59% of the stock of collateral taken by the Bank in its open market operations during November, December and January (see Chart 38). Euro-denominated eligible securities⁽²⁾ (issued by EEA governments and supranational bodies) accounted for around 27% of the collateral, compared with 35% in the previous three-month period.

HM Treasury and Bank of England euro issues

The Bank of England continued to hold regular monthly auctions between November 2001 and February 2002. €1 billion of Bills were auctioned in November and December, comprising €200 million of one-month, €500 million of three-month and €300 million of six-month Bank of England Bills. In January 2002, the Bank of England announced that the amount of Bills to be issued would be reduced to €900 million of Bills per month, comprising €600 million of three-month and €300 million of six-month Bills. Auctions held during the period continued to be oversubscribed, with issues being covered an average of 6.3 times the amount on offer. Bids were accepted at average yields of between euribor minus 16.6 and euribor minus 9.3 basis points.

The first auction of the Bank of England Euro Note to mature in January 2005 was held on 22 January 2002. The auction for $\in 1$ billion of Notes was oversubscribed, with bids of 3.6 times the amount on offer. Bids were accepted in a range of 4.135%-4.175%; the coupon for the issue was set at 4.00%. Two reopening auctions of the 2005 Bank of England Euro Notes are scheduled for 19 March and 16 April 2002.

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 each of two auctions. On 27 November 2001 a price of \$273.50 per ounce was achieved and the auction was covered 2.6 times. On 16 January 2002 a price of \$283.50 was achieved and the auction was covered 1.4 times. The final auction in the programme will be held on 5 March 2002.

(1) Minutes of this meeting are available on the Bank's web site at www.bankofengland.co.uk/markets/money/smmlg.htm (2) A list of eligible securities is available on the Bank's web site at

www.bankofengland.co.uk/markets/money/eligiblesecurities.htm

The London Foreign Exchange Joint Standing Committee: a review of 2001

This note reviews the work undertaken by the London Foreign Exchange Joint Standing Committee during 2001.

Introduction and overview

The Foreign Exchange Joint Standing Committee (FXJSC) was established in 1973 under the auspices of the Bank of England, largely as a forum for banks and brokers to discuss broad market issues. The membership of the Committee has grown over the past two years and now includes senior staff from many of the major banks operating in the foreign exchange market in London, as well as brokers, corporate users of the foreign exchange market, and the Financial Services Authority (FSA).

The FXJSC met six times in 2001.⁽¹⁾ For most of the year the main focus of the Committee's work was the completion of the London Code of Conduct for Non-Investment Products (NIPS). In the latter months of the year, and partly prompted by the terrorist attacks of 11 September in the United States, the Committee considered whether the London market should form a group to focus specifically on operational issues in the foreign exchange market. The Committee also discussed the impact of e-commerce developments, which will be a recurring theme of discussions during 2002.

The Committee's work in 2001

Code of Conduct for Non-Investment Products

During the year the Committee, in conjunction with its sister committees in the London bullion and sterling deposit markets, completed the production of the Code for Non-Investment Products.⁽²⁾ The Code sets out standards of good market practice and guidance for market participants, although it has no statutory basis. In November 2000 a draft of the Code had been published for public consultation and the Committee spent the early part of last year finalising the Code in the light of the comments received from a range of interested parties. A new version of the Code was placed on the Bank of England's web site in August, largely unchanged from the first draft in content but with a number of changes to its format and presentation. For example, a number of references were included to improve the read-across to the relevant publications produced by the FSA, in particular to the Inter-Professionals Conduct chapter of the FSA Handbook and the FSA's Conduct of Business Sourcebook. While the products covered by the NIPS Code are outside the scope of the FSA's remit, many of the institutions undertaking transactions in non-investment products have been authorised by the FSA for other parts of their business and thus it is important for relevant sections in the NIPS Code and the FSA's regulations to be consistent with one another.

The Code became operational at the end of November 2001 when the FSA assumed its full statutory powers under the Financial Services and Markets Act. As well as being made available on the Bank's web site, 4,500 hard copies of the Code were distributed directly to market participants.⁽³⁾ A number of trade organisations⁽⁴⁾ endorsed the Code, which reflected the market's involvement in and support for the development of the Code. Looking ahead, the FXJSC, together with the other committees that coordinated the production of the Code, will maintain a watching brief to ensure that

⁽¹⁾ The review of the FXJSC's work in 2000 was published in the Summer 2001 edition of the Bank of England Quarterly Bulletin.

⁽²⁾ That is, transactions conducted in the sterling, foreign exchange and bullion wholesale deposit markets, and in the spot and forward foreign exchange and bullion markets.

⁽³⁾ Further hard copies are available on request from the Secretary of the FXJSC on 020 7601 5976 or by e-mail at nipscode@bankofengland.co.uk

⁽⁴⁾ The trade organisations that endorsed the Code were the Association of Corporate Treasurers, the British Bankers' Association, the Building Societies Association, the Chartered Institute of Public Finance and Accountancy, the London Bullion Market Association, the London Investment Banking Association and the Wholesale Market Brokers' Association.

the Code is kept up to date to reflect market developments.

The creation of an operations group for the foreign exchange market

Since September, much of the Committee's time has been spent discussing whether the London market should form a group to focus specifically on operational issues in the foreign exchange market. The Committee had discussed this in the past but the terrorist attacks of 11 September in the United States led market participants to consider the question again.

In the United States the Operations Managers Working Group, a sub-group of the New York Foreign Exchange Committee (a sister committee of the FXJSC), has existed for a number of years and meets regularly to discuss a wide variety of operational foreign exchange issues. As a well-established market-led group that fostered regular communication between market participants, the sub-group was in a position to play an important role in facilitating the effective operation of the foreign exchange market in New York following the terrorist attacks on 11 September. The profile of the group outside the United States was significantly raised by its work over this period.

Within the London foreign exchange market, there has been widespread support for the creation of a group that would meet regularly to focus specifically on operational matters, based partly on the New York model. In principle the group would be comprised mainly of senior professionals currently active on the operational (rather than trading) side of the foreign exchange market. It might also include representation from the international money markets given the synergies between that market and foreign exchange. Such a group would need to maintain close liaison with groups covering the United Kingdom's domestic wholesale markets and trade organisations more widely, and also co-operate closely with those in the major overseas markets. If such a group became established in London then it might also be in a position to undertake a suitable role in times of market stress, for example in coordinating information flow and liaison with the financial authorities, although this would not be the group's primary function. Further discussions on this proposal will continue during 2002 and it is hoped that the first meeting of the operations group might take place in the first half of this year.

E-commerce

During 2000 the Committee discussed developments in e-commerce and their potential impact on the foreign exchange market. The development of Internet-based trading platforms had been identified as a possible driver of structural change in the foreign exchange industry and, while these developments were still at a relatively early stage, they were evolving rapidly and were expected to have a significant impact on the market.

During the year, the Committee set up a sub-group to give some initial consideration to the impact of e-commerce developments on the foreign exchange market and to examine whether the NIPS Code needed to be updated to reflect these developments. The initial conclusion of the sub-group was that it was still early to assess precisely what impact e-commerce would be likely to have on the market, or to set out detailed guidance on market practice tailored specifically to the new trading platforms. Some minor drafting changes were nevertheless incorporated into the NIPS Code in order to emphasise that the Code encompassed all transactions in non-investment products irrespective of the means of execution. A number of issues were identified for further discussion, such as the way in which the relationship between a bank and its customers might change and the security implications of electronic trading. The Committee agreed that the sub-group would reconvene in 2002, once developments were further established, to undertake a more detailed review of e-commerce developments and the impact (actual or potential) on market practice.

Other issues discussed in 2001

The Committee discussed a number of other issues during the year. These included:

- The results of the latest BIS triennial survey of activity in the foreign exchange and derivative markets, which was undertaken in April 2001 and the results of which were published in October.⁽¹⁾ The results were broadly in line with the Committee's expectations.
- Whether confirmations are still necessary where foreign exchange trades are executed through electronic systems.

(1) A discussion of the UK results can be found in the Winter 2001 *Bank of England Quarterly Bulletin*, while the global results are available from the Bank for International Settlement's web site at www.bis.org

• The development of the Continuous Linked Settlement Bank (CLSB) and the implications for market practice.

Looking ahead: 2002

Looking ahead, most of the themes discussed during 2001 will continue to be active issues for the Committee this year. The Committee will aim to progress further the work developing the operations working group and continue to liaise closely on this initiative with relevant parties in the foreign exchange and other markets, both in London and overseas. As noted previously, the e-commerce sub-group will reconvene to consider further how these developments have affected the foreign exchange market. This too is an area that lends itself to global co-operation and the results of the sub-group's work will therefore be shared with the FXJSC's sister committees abroad. The Committee will continue to monitor any other issues that arise in the foreign exchange market during 2002, such as any necessary changes to the NIPS Code, including those arising from the development of the CLSB.

Provision of finance to smaller quoted companies: some evidence from survey responses and liaison meetings

By Allan Kearns and John Young of the Bank's Domestic Finance Division.

This article reports on some recent work by the Bank aimed at improving our knowledge of the smaller auoted companies (SQCs) sector. This has taken two forms: first, analysis of the results of a questionnaire survey of SQCs drawn from a sample of CBI members; and second, a series of liaison meetings with selected companies outside the sample. Our inquiries suggest that, by reasons of their size, SQCs do not generally have access to bond markets, and that banks are less willing to extend them long-term loans, except on a secured basis. However, we found no evidence of any general problem with access to debt finance. A large majority of firms are able to achieve desired levels of gearing and use a wide variety of debt instruments and derivative products.

For some years, the Bank, working with the Government and private sector financial institutions, has played a prominent role in initiatives to improve the provision of finance to small and medium-sized enterprises (SMEs).⁽¹⁾ SMEs (typically firms employing fewer than 250 people with a balance sheet of less than about £5 million) are almost invariably private companies. But there is another important group of small enterprises comprising quoted companies. We have taken as our definition of smaller quoted companies (SQCs) those firms that are below the market capitalisation of the FTSE 350 index but either have a full listing on the London Stock Exchange, or are quoted on the Alternative Investment Market (AIM), or on a non-regulated investment exchange such as OFEX. Table A gives some comparative statistics for the major sub-groups of SQCs. On these data (which do not include OFEX companies), SQCs accounted for 5% of the total market capitalisation of all quoted companies but 13% of their total sales and 18% of total employment.

In the past three years, several working groups, sponsored by both government and private sector organisations, have considered ways of improving the environment for smaller quoted companies. The main

Table A Comparative statistics of larger and smaller quoted companies(a)

Index	Number of members (b)	Total market capitalisation £ billion (b)	Average market cap. £ billion (b)	Average employment (c)	Average sales £ million (c)
FTSE 350	354	1,420.0	4.01	21,224	2,990.8
FTSE SmallCap	371	50.0	0.13	2,544	260.7
FTSE Fledgling	641	14.6	0.02	763	67.6
FTSE AIM	598	10.5	0.02	289	19.2

Sources: Bloomberg, Thomson Financial Datastream and Bank of England

(a) The London Stock Exchange in its report, *A statistical analysis of smaller companies on the London Stock Exchange 2000*, defines smaller companies as those outside the FTSE 350 (ie companies in the FTSE SmallCap and Fledgling indices and companies quoted on AlM).
(b) Data as at 28 February 2002.
(c) Data as at end-2001 accounts (2000 year-end accounts if 2001 accounts not yet released).

focus of their reports has been on factors affecting the ability of SQCs to raise equity capital.⁽²⁾ But debt finance is also used widely by SQCs and there is some suggestion in aggregate data that the use of debt by SQCs has diverged from that of larger firms in the recent past. Chart 1 shows gross capital gearing for the median firm among the largest 350 companies, and the corresponding gearing of the median SQC.⁽³⁾ Until about eight years ago, gearing of the representative SQC was not markedly different from that of a representative larger firm. But since about 1996, gearing of large companies has increased quite sharply, while SQC gearing has remained relatively stable. Figures for 2000

⁽¹⁾ This work is summarised in a series of annual reports, Finance for Small Firms, available on the Bank's web site at www.bankofengland.co.uk/fin4sm08.pdf

⁽²⁾ See, for example, Smaller quoted companies: a report to the Paymaster General, ('Riches Report') HM Treasury (1998); Improving share liquidity for smaller quoted companies, ('Waterstone Report') DTI (1999); A bigger share: encouraging growth in smaller quoted companies, CBI (2001).

Charts 1-3 are based on data sourced from the company accounts of all quoted non-financial companies held on the Thomson Financial Datastream database (1974–2001 for Chart 1 and 1974–2000 for Charts 2 and 3). (The share of (3)bank finance in all debt is available only from 1983 onwards.) LQCs are defined as the top 350 companies ranked by market value in each year. SQCs are defined as those outside the top 350 by market value. The median rather than the average value of each variable is presented because the distribution of each variable is skewed. We interpret the median firm as a representative smaller or larger quoted company.

Chart 1 Capital gearing of the median SQC and LQC^{(a)(b)}



Sources: Thomson Financial Datastream and Bank of England

(a) Defined as gross debt divided by capital stock at replacement cost. (b) 2001 data are provisional and based on 622 company accounts.

on 927 SQCs and 350 larger companies show that the level of capital gearing of the median SQC is 22.4%, compared with 41.6% for the median larger quoted company (LQC). This raises the question of whether SQCs have recently experienced constraints on the overall supply of debt finance.

Charts 2 and 3 show some further comparisons between the debt positions of smaller and larger companies. Chart 2 shows the share of debt with a residual maturity of less than one year. Although reliance on short-term debt has fallen compared with the early 1980s, it still accounts for more than half of total debt for the median SQC, compared with about 30% for the median LQC.

Chart 3 shows the share of all debt sourced from banks for the median smaller and larger quoted company. The data suggest that while LQCs have diversified into non-bank sources of debt, SQCs by comparison remain relatively more reliant on bank-sourced debt. Figures based on year-end company accounts for 2000 show that the median SQC obtained 78% of all debt finance from banks. This represents a modest reduction compared with the early 1980s, when the median SQC obtained more than 90% of its debt from banks. However, over the same period LQCs have diversified their debt financing to a greater degree, so that the share of bank debt for the median LQC has fallen from a peak of 75% in 1985 to 48% by end-2000.

In an attempt to explore what might lie behind these aggregate trends, the Bank conducted a questionnaire survey of SQCs drawn from a sample of CBI members.

Chart 2 Share of gross debt due within one year for the median SQC and LQC^{(a)(b)}



(a) Defined as gross debt due within one year divided by total gross debt.(b) Data are to year-end 2000.

Chart 3 Share of bank debt for the median SQC and LQC^{(a)(b)}



Sources: Thomson Financial Datastream and Bank of England

(a) Defined as bank debt divided by total gross debt.(b) Data are to year-end 2000.

This was followed by a series of liaison meetings with selected SQCs outside the sample. The questionnaire focused on debt finance and sought to establish the extent to which SQCs across a range of sectors are able to achieve target levels of gearing, a desired maturity profile, and a balance between fixed and floating-rate debt. We also investigated the role of different debt instruments in achieving these targets. Where firms were not making use of particular types of debt finance, our interest was in knowing whether this was the result of an unfavourable cost trade-off or because of factors, unrelated to price, affecting the willingness to borrow or lend. The liaison round ranged more widely and also sought to uncover evidence relating to the supply of equity finance to SQCs.

Survey of CBI members

The survey results are based on 50 replies received to a questionnaire on debt finance distributed on the Bank's behalf by the CBI in May 2001 to 300 of their SQC⁽¹⁾ members. The average number of employees in our sample of respondents was 3,801, with an average turnover (in 2000) of £440 million. A comparison of the estimates of average sales and employment in our sample with those presented in Table A shows that our sample representative firm is larger than the average FTSE SmallCap quoted company. The responses came from firms covering a wide range of sectors, including construction, retailing, engineering, metal manufacture, food manufacture, distribution, healthcare and pharmaceuticals.⁽²⁾ However, the small overall size of the sample should be borne in mind, especially given that in places the questions sub-divided the respondents. A number of respondents included comments that were helpful in interpreting their responses to the formal questions. The survey investigated three issues: the aggregate level of company borrowing and its composition by maturity; factors affecting the use of individual types of debt instrument; and the nature of the company's relationship with its bank(s).

Overall debt and gearing levels

The survey responses suggested that gearing levels for this sample of SQCs are high by historical standards and are not constrained by the availability or expense of debt finance. The median level of gearing in the sample was 30% (with a range of 0% to 181%). This is higher than the gearing of the median SQC (see Chart 1). Some 49% of respondents indicated that their level of gearing was high by historical standards, 20% average and 31% low.

Around 42% of companies said that they had a target gearing level. In cases where current gearing levels were lower than target, respondents were explicitly asked whether this was because debt was unavailable or too expensive. Only about 10% of firms with gearing below target said that these factors were responsible. Of the firms whose gearing was constrained by the *supply* of funds, most attributed this to weak financial performance, particularly operating losses. Two technology-based companies said that their access to bank finance was constrained by a lack of tangible assets. Another firm in the construction sector explained that a large part of its bank credit limit was used up by contract performance bonds.

But in general, gearing appeared to be determined by non-price-related factors constraining the *demand* for funds. Comments accompanying the responses suggested that a number of firms could potentially increase their debt levels but chose to adopt a more conservative level of gearing. Some firms indicated that their financing structure reflected a high degree of risk aversion. Some had a policy of normally financing capital investment out of retained earnings. Several firms indicated that they would be willing, at least temporarily, to increase gearing for acquisitions but at the time of the survey did not have a target. The lack of a suitable acquisition was the factor most frequently cited as limiting the demand by firms for debt finance.

Individual sources of debt finance

Companies were questioned in greater depth on their sources of finance. The responses suggest that overdrafts, short-term loans, leasing, letters of credit and interest rate swaps were the most commonly used instruments. Longer-term loans, secured lending, commercial bills and commercial paper, bonds, factoring and invoice discounting were less widely used.

Sterling bank finance

Overdraft financing was still the most commonly used instrument, with almost 90% of respondents currently using a facility. Term loans of up to five years (by original maturity) were used by more than half the respondents—but longer-maturity loans were much less common. More than two-thirds of the sample had never borrowed for longer than five years.

The absence of long-term lending does appear in part to be a supply constraint. Two-fifths of respondents claimed that loans for longer than five years were unavailable and there was some indication (in a small sample) that long-term loans were regarded as too expensive. However, an equal proportion cited factors other than cost and availability as reasons for the absence of long-term borrowing. Comments suggest that in the current interest rate environment, firms are

⁽¹⁾ Defined as above, ie quoted companies outside the FTSE 350 index. Our sample included AIM companies as well as those officially listed.

⁽²⁾ The questionnaire and liaison meetings combined included firms in just under half of the approximately 30 two-digit

SIC industrial groups.

less worried about renegotiating their borrowing at relatively frequent intervals. Indeed, some respondents said that they regarded longer-term commitments as reducing flexibility. Some firms indicated that they did not have long-term assets to match long-term borrowing.

Slightly less than half the respondents had loans secured on property or other fixed assets. Here again, where secured lending was absent it appeared to be the choice of borrowers. Only one of the seven respondents to the question on why they did not have secured loans said that secured lending was unavailable, their comment suggesting that this was the result of an absence of fixed assets on which to secure loans. Other comments suggested a general aversion to secured borrowing, which was thought to restrict business options. The small size of the sample respondents should, however, be borne in mind.

Table B Sterling bank finance

Per cent of respondents responding in each category

Facility	Currently use	Have never used	Would not expect to use	Number of respondents
Overdraft	89	9	2	47
Term loan less than one year	55	30	15	33
Term loan 1–5 years	67	25	8	36
Term loan 6-10 years	19	68	14	37
Term loan more than 10 years Secured on commercial	3	83	14	35
property	39	42	19	36
Secured on other fixed assets	42	42	17	36

Foreign currency bank finance

The respondents divided clearly into those that actively used foreign currency facilities and those that never did. Perhaps surprisingly, as many as a third of respondents currently had foreign currency term loans. As with sterling loans, these were mostly for five years or less. Again, there is some evidence of a lack of willingness by banks to lend at longer maturities (a third of respondents reported loans unavailable) but demand factors appear to be more important.

Table CForeign currency bank finance

Per cent of respondents responding in each category

Facility	Currently use	Have never used	Would not expect to use	Number of respondents
Overdraft	55	38	7	42
Term loan less than one year	31	59	10	39
Term loan 1-5 years	30	63	7	43
Term loan 6-10 years	5	87	8	38
Term loan more than 10 years Secured on commercial	5	87	8	39
property	19	67	14	43
Secured on other fixed assets	17	68	15	41

Other debt instruments

In contrast to the relatively wide use of foreign currency borrowing, only a small proportion of firms raised funds through issue of debt securities. Once again firms were mainly current users of these instruments or not users at all. At both short and long maturities, traditional instruments were more commonly encountered; users of commercial bills and (secured) debentures outnumbered users of commercial paper and unsecured bonds by a factor of about three to one.

There was somewhat stronger evidence of a lack of supply of funds in this area—but only in the case of bonds was unavailability the main determining factor. From the respondents' comments, the main reasons why funds were unavailable included the (small) size of company and absence of a formal credit rating.

Table DOther debt instruments

Per cent of respondents responding in each category

Facility	Currently use	Have never used	Would not expect to use	Number of respondents
Commercial bills	29	66	5	41
Commercial paper	8	83	8	36
Debenture stock	24	73	3	33
Bonds (unsecured)	9	89	3	35

Asset-based financing

Asset-based financing, particularly leasing and hire purchase, was widely used among the sample. Indeed, operating leasing ranked with sterling overdraft financing as the most commonly used instrument of all. This left a very small number of firms to answer the question on why they did not use leasing. None claimed that leasing or hire purchase was unavailable. A majority of non-users of leasing said that it was too expensive. Hire purchase was thought by half of the firms to be expensive and described by one respondent as 'too restrictive'.

Table E Asset-based financing

Per cent of respondents responding in each category

Facility	Currently use	Have never used	Would not expect to use	Number of respondents
Finance leasing	82	7	$\begin{array}{c}11\\4\\8\end{array}$	44
Operating leasing	87	9		46
Hire purchase	65	27		37

Receivables financing

Turning to receivables financing, there was a marked contrast between the response on letters of credit and on factoring and discounting.⁽¹⁾ Letters of credit were used by just over half the respondents. This is an almost identical proportion to those using foreign currency overdrafts, which is perhaps not surprising given the role of both in export finance. Factoring and invoice discounting, however, was used by less than one in six of the respondents. This appears to be mainly a matter of cost but the comments indicate that some firms see factoring as unattractive for other reasons. One firm commented that to use it could signal to the market that a company had liquidity problems, a view echoed by some firms in the liaison meetings. Aggregate statistics indicate, however, that funds raised through factoring and invoice discounting have risen quite rapidly in recent years for privately-owned SMEs, albeit from a low base.⁽²⁾ This could reflect the fact that SMEs have fewer alternative sources of finance and also face greater difficulties collecting debts than SQCs.

Table F Receivables financing

Per cent of respondents responding in each category

Facility	Currently use	Have never used	Would not expect to use	Number of respondents
Factoring	15	50	35	41
Invoice discounting	10	56	33	40
Letters of credit	56	36	8	39

Other financial instruments

Almost half the respondents used either interest rate or foreign currency swaps. Of the non-users, only a small number claimed that swaps were unavailable to them. The responses suggest that availability was not significantly worse for currency swaps than for interest rate swaps but this again is on the basis of a very small sample. Cost was an issue for a somewhat larger number of firms but once again other factors were more important. In the case of foreign currency swaps, the main reason for non-usage was simply an absence of foreign currency exposure. In the case of interest rate swaps, some firms felt more relaxed about floating-rate debt in the present economic climate.

Table GOther financial instruments

Per cent of respondents responding in each category

Facility	Currently use	Have never used	Would not expect to use	Number of respondents
Foreign currency swap	42	49	9	43
Interest rate swap	52	43	5	44

Fixed and floating-rate debt

The survey suggests that SQCs currently rely more heavily on floating-rate debt than on fixed-rate debt. The average percentage of company debt that was fixed in our sample was 34% (with a range of 0% to 100%). About one-fifth of our sample had in excess of 75% fixed-rate debt but nearly half of the sample had less than 25% fixed-rate debt. For half the sample, the proportion of fixed-rate debt is average by historical standards, while the remaining half is roughly equally divided between firms for whom the proportion of fixed-rate debt is high by historical standards and those for whom it is low.

Some 35% of respondents had a target ratio of fixed to floating-rate debt. Two-thirds of these companies were at their target levels while about one-third were below their target levels. None of these companies said that the proportion of fixed-rate debt was too low because fixed-rate debt was unavailable. However, the explanatory comments suggested that fixed-rate debt might be regarded as expensive, in the sense that long-term interest rates exceeded the firms' expectations of the average level of future floating rates over the relevant maturity.

There were also respondents who said that their use of debt related to working capital needs and was of its nature very short term. Another respondent operated in a market with a regulatory regime based on '*k*' plus RPI, giving an element of natural hedge to floating-rate debt.

Bank relationships

On average, respondents had relationships with four banks. The minimum number was one and the maximum twelve. The average time a company had spent with the most-used bank was 28 years. Four had used the same bank for more than 100 years. However, some 28% of the sample had been with the most-used bank for less than ten years and more than a fifth of firms had changed banks recently.

One of the firms changing banks recently said that current facilities were uncompetitive while two said that facilities were no longer available at their current bank. A large majority of firms indicated that their likelihood

(1) Factoring involves the purchase of book debts due to a company, together with management of its sales ledger and the collection of accounts under the terms agreed by the seller. The factor may assume the credit risk for accounts within the agreed limits (non-recourse), or this risk may be retained by the seller. Invoice discounting involves the purchase of book debts but with the sales accounting functions retained by the company and the facility usually provided on a confidential basis.

(2) This work is summarised in a series of annual reports, *Finance for Small Firms*, available on the Bank's web site at www.bankofengland.co.uk/fin4sm08.pdf

of moving bank would be increased if current facilities became uncompetitive relative to other banks, if facilities were no longer available at their bank, and/or if existing facilities could only be maintained by moving bank. Other reasons given for actually or potentially changing bank included a need for more international coverage, a concern to maintain active communication with the relationship bank, or takeover by another bank.

Some companies had enlarged their banking group because of a need for additional funds or because of a desire to diversify their funding sources. Some firms had slimmed down their banking group so as to concentrate their ancillary business on a smaller core group.

Some 90% of respondents said that their main bank understood their business sufficiently well to make reasoned decisions on credit, while 80% believed that banks had improved in this area over time.

Liaison meetings with SQCs

Following the survey, the Bank conducted liaison meetings with about 30 SQCs, mainly in the fourth quarter of last year. Within the limitations of this number we attempted to get a degree of variation by size, sector, age of company and geographical distribution. The sample included firms with market capitalisation as low as £5 million and as high as £250 million. Their activities included food manufacture, metal and vehicle manufacture, biopharmaceuticals, support services, retailing, entertainment and leisure. These meetings corroborated the findings of the survey in a number of ways. As a generalisation, most firms had few concerns about their ability to access debt finance.

Overall debt and gearing levels

Larger SQCs (with turnover of, say, more than £100 million) said that their gearing was determined more by shareholder preference, financial prudence or the nature of the firm's business than by any constraint on the supply of funds. Not surprisingly, the more highly-geared firms tended to be those that had substantial fixed assets and that made greater use of secured lending. One firm, with very high levels of gearing through debt secured on fixed assets, said that private companies with which it competed operated with higher gearing levels than would be acceptable to its own shareholders.

Most of the larger companies also borrowed on an unsecured basis. Several firms had used bank borrowing for acquisitions. A number of the larger companies had borrowed in the syndicated loan market, either in the form of term loans or revolving facilities. Most borrowing was for up to five years but firms willing to offer security and accept a relatively restrictive covenant package could borrow for longer periods.

Some firms with tangible assets on which debt could be secured had issued sterling debentures. The strong security and restrictive covenant package in debentures enabled firms to borrow for maturities of around 25 years. However, in the present interest rate environment, firms saw shorter-maturity unsecured debt as more attractive. None of the firms had issued eurobonds (because they were too small or lacked a rating), but two had accessed the US private placement market. In most cases firms achieved the desired balance between fixed and floating-rate debt through use of interest rate swaps.

Smaller firms, not surprisingly, were more likely to be single-banked. They borrowed mainly for working capital purposes using overdraft or revolving facilities.

Other debt instruments

A number of firms made use of leasing, although perhaps a smaller proportion than in the survey sample. But firms that used leasing did so extensively.

Receivables financing was not relevant to some of the firms (such as the retailers) because they had no trade creditors. There was again something of an aversion to factoring, which was regarded variously as expensive, entailing an unacceptable loss of control over the sales process, or signalling to the market that the firm had liquidity problems.

Bank relationships

Firms appeared to attach considerable importance to their bank relationships. Most felt that the banks understood their business. A number clearly made an active effort to inform their banks (for example supplying management accounts and forecasts). One firm said that it had changed its lead bank because a merger had resulted in the replacement of bankers with expertise in their sector. Another had switched because a merger had taken away local senior management.

There seemed to be a convergence in the size of banking groups towards around three to six banks. Firms that had large groups (usually as a result of an oversubscribed syndication) were generally seeking to reduce this coverage. This was partly because the administrative effort of dealing with so many institutions was too great, and partly because they had too little ancillary business to share out among this number of banks. Firms that had previously been single-banked wanted to diversify their sources of funding and force the banks to become more price-competitive.

Some firms had sought to develop relations with foreign banks as part of an effort to expand internationally. One firm had acquired and maintained a relationship with an overseas (European) bank as a result of its takeover of a local business. Another had extended its banking group to foreign banks in the belief that this would help to develop business in the banks' domestic market.

Equity finance

In our meetings, we also raised the question of access to equity finance. Only a minority of companies had recently raised new equity. These tended to be in two groups. First, larger companies (with a market capitalisation of, say, above £200 million), whose shares were more likely to be held by institutional investors. These companies had raised funds in amounts of £30 million-£50 million, through both rights issues and institutional placings. The second group consisted of AIM companies, some of which had returned to the market to raise cash, typically in amounts of less than £10 million.⁽¹⁾

However, a significant proportion of firms saw no prospect of raising new equity. Family ownership appeared to discourage raising additional equity capital, through internal opposition to dilution.

Even the larger firms said that the secondary market for their shares was highly illiquid, with only a small number of dealers quoting prices, with wide bid-offer spreads and large day-to-day price movements. Some of these firms attributed the lack of liquidity fundamentally to institutional investors' preferences for larger corporates at the FTSE 350 level. It was interesting nevertheless that there were two AIM companies in our sample that had each succeeded in attracting several thousand individual investors. Their shares traded on narrow spreads in relatively large overall volume.

In interpreting these findings on equity finance, it is difficult to distinguish cyclical from structural factors.

The liaison meetings took place during a period of particular weakness in equity markets, so it is hardly surprising that many firms were at that time finding equity markets a less important source of finance than bank finance. But many SQCs gave the impression that a listing had been sought partly to improve their longer-term access to debt rather than equity finance.

How representative are these findings?

We are conscious that both these exercises have sampled only a tiny proportion of the universe of SQCs, and in the case of the survey some questions received only a partial response. One source of comfort is that the results are similar to those of the annual survey on the provision of finance to member firms conducted for the Institute of Directors.⁽²⁾ That report concluded, inter alia, that bank overdrafts and loans are the most common forms of external finance for SMEs, the majority of loans are under five years' duration, and the vast majority of firms have a good relationship with their bank. Perhaps the most likely source of bias in both the survey respondents and the firms interviewed is that they failed to pick up the weakest and/or smallest companies. However, preliminary analysis shows that although the SQCs in our sample are on average larger and more profitable relative to the average SQC, the only statistically significant difference is size.

Summary

The results of the survey and the liaison meetings were broadly corroborative. By reasons of their size, SQCs do not generally have access to bond markets and there is some suggestion that banks are less willing to extend them long-term loans, except on a secured basis. However, we found no evidence of any general problem with access to debt finance. A large majority of firms are able to achieve desired levels of gearing and use a wide variety of debt instruments and derivative products. Banking relationships are generally highly valued and a majority of firms considers that banks have improved their understanding of the needs of businesses. Difficulties are, however, encountered in raising equity finance, reflecting both the particular weakness of equity markets during the period of the liaison meetings and longer-term structural factors associated with lack of liquidity in smaller company stocks.

⁽¹⁾ Six of the nine companies in our group that had come to the market since 1995 had done so via AIM. Most cited tax advantages as the main reason for choosing this route.

⁽²⁾ See Wilson, R (2002), 'Business finance', IoD Policy Paper.

Explaining trends in UK business investment

By Hasan Bakhshi and Jamie Thompson of the Bank's Structural Economic Analysis Division.

The ratio of business investment to GDP at constant prices has been trending upwards over the past two decades, picking up sharply in the second half of the 1990s. This article investigates possible explanations. We argue that the rise largely reflects a sustained fall in the relative price of investment goods, given that there is little discernible trend in the current-price ratio. This is consistent with a significant role for rapid technological progress in the investment goods sector and, given the importance of imported investment goods, for exchange rate developments in explaining trends in UK firms' investment behaviour. But other factors, such as falls in the cost of finance and increases in replacement investment, may also have been important. This view is supported by an illustrative model-based analysis.

Introduction

UK firms' investment behaviour can be characterised by some key stylised facts:

 The business investment to GDP ratio at constant prices has been trending upwards over the past two decades, rising particularly sharply in the second half of the 1990s (see Chart 1).⁽¹⁾



Chart 1 Business investment to GDP ratios

- There is little discernible trend in the business investment to GDP ratio at current prices.
- The corollary is that over the past two decades the price of investment goods has fallen sharply relative to other goods in the economy—and that decline was particularly marked in the latter half of the 1990s (see Chart 2).



 By sector, the rapid constant-price growth in business investment in the latter half of the 1990s was largely accounted for by services (see Chart 3).

(1) Note that ONS aggregate series for the United Kingdom are calculated on a 'fixed-weight' basis—that is, the components of aggregate series (such as business investment or GDP) are weighted together using weights that are only changed at five-year intervals. This means that in recent years, assets (such as computers) that have experienced declines in relative prices have been given more weight than in alternative aggregation systems that update weights more regularly. The ONS is planning to introduce a 'chain-linked' system for the United Kingdom with the publication of the 2003 *Blue Book*. The wedge between growth rates of investment and GDP in recent years is likely to be less pronounced in this system problematic. See Tuke and Reed (2001) and Whelan (2000) for further details.



• By asset, investment was particularly strong in 'other machinery and equipment'—that is, investment in goods other than buildings and transport equipment (see Chart 4).⁽¹⁾ And it was the price of these investment goods that fell most markedly during the 1990s.⁽²⁾

Chart 4 Contributions to annual whole-economy investment growth by asset



 Within 'other machinery and equipment', the contribution of investment in information and communications technology (ICT) was particularly important (see Chart 5).⁽³⁾

Chart 5 Contribution of ICT to annual whole-economy investment growth



The rest of this article investigates the factors that might explain these stylised facts about UK firms' recent investment behaviour.

Investment and firms' desired capital stocks

Theory suggests that the level of firms' desired capital stocks is determined by their planned production levels and the 'real user cost of capital'. And investment decisions are made to bring current capital stocks to their desired levels. Below we consider why firms' desired capital stocks may have changed.

General economic activity

Cyclical movements in investment

Investment is highly variable. Between 1970 and 2001, the standard deviation of growth in quarterly business investment was some three and a half times greater than for GDP. And investment is typically strongly procyclical. But, importantly, while GDP growth tends to revert over time to its average rate, Chart 1 shows that the constant-price business investment to GDP ratio has trended up over time. In other words, the rise in the ratio—and the associated fall in relative investment prices—is unlikely to be purely cyclical.

⁽¹⁾ This asset breakdown is of whole-economy investment. The ONS does not publish an asset breakdown of business investment.

⁽²⁾ As discussed in the November 2001 Inflation Report, page 18.

^{(3) &#}x27;Software' in Chart 5 represents total software investment—that is, both the software investment that the ONS allocates to 'other machinery and equipment' and the software investment that is allocated to 'intangible fixed assets'. Current-price estimates of investment in computers, software and telecommunications are derived from supply and use tables for 1992–99 consistent with the 2001 *Blue Book*. These data are then deflated by the relevant ONS deflator series in order to be consistent with the National Accounts. See Oulton (2001).

Increases in trend growth

An increase in the underlying trend growth rate of the economy would cause firms to revise upwards the expected marginal return on their investments. That would lead to a rise in the constant-price investment to GDP ratio. It is sometimes argued that this accords with the experience of the United States in the latter half of the 1990s. But it is difficult to reconcile with research suggesting that total factor productivity (TFP) growth in the United Kingdom has actually been weaker than its historical average for most of the 1990s.⁽¹⁾

Reductions in the real user cost of capital

Survey evidence points to a sustained fall in the cost of capital in the second half of the 1990s. In particular, the CBI survey of manufacturers' investment appraisal techniques conducted in June 2001 finds that where financial hurdle rates are used, real rates may have fallen by around 5 percentage points since 1994.⁽²⁾

Theory suggests that there are several key components of the real user cost of capital. When deciding whether or not to invest, a firm first faces an acquisition cost, the relative price of capital. As the relative price of capital declines (rises), profit-maximising firms will substitute towards using proportionately more (less) capital in the production process. The firm then faces additional costs when actually holding the unit of capital: any fall in the price of the capital; the interest foregone by not selling the capital and saving the proceeds; taxes on income from this capital, less investment allowances; and depreciation of the capital.⁽³⁾ We examine each of these components in turn.

Relative price of investment goods

Technological progress specific to the production of investment goods

One explanation for the fall in relative investment prices is that the rate of technological progress in the production of investment goods has outstripped that in other sectors. Brayton and Reifschneider (2001) assert that this may have accounted for some of the strength of US investment in the second half of the 1990s.

Bank research argues that investment-specific technological progress has been particularly marked in the production of ICT goods.⁽⁴⁾ Firms have responded to the marked fall in ICT investment prices over time by substituting into ICT investment. As shown in Chart 5, the contribution of ICT to whole-economy investment growth was important in the late 1990s.

• Technological progress and sterling

Technological progress specific to the production of investment goods may arguably have been stronger in the United Kingdom than in some countries. Although the relationship between productivity and exchange rates is complex, this might conceivably explain some of sterling's appreciation since 1996. It is interesting that sterling has not appreciated over this period against the US dollar, where technological progress in the investment goods sector in the 1990s is perceived to have been, if anything, even more marked.⁽⁵⁾

But even if sterling's appreciation since 1996 had nothing to do with relative rates of technological progress, there could still have been important implications for the actual and relative price of investment goods.

The appreciation would have had two key effects on the price of investment goods: the direct effect of cheaper imports of investment goods; and the indirect effect of cheaper imported raw materials used in the domestic production of investment goods. Import content estimates attempt to capture both of these effects. As Table A shows, the import content of investment expenditure is rather higher than for other expenditure components of final demand in the United Kingdom.⁽⁶⁾ As a result, the appreciation of sterling since 1996 probably contributed to the marked fall in the price of

⁽¹⁾ See Oulton (2001). This appears to be a robust conclusion: Oulton reports similar results when ONS data are adjusted for possible ICT mismeasurement.

⁽²⁾ CBI (2001).

⁽³⁾ Depreciation here is measured as the difference between the prices of a new and, say, a one-year old asset at a point in time, rather than the total change in the price of an asset between two periods.

⁽⁴⁾ See Bakhshi and Larsen (2001) for a macroeconomic analysis of investment-specific technological progress in the United Kingdom. There is some evidence that productivity growth in the ICT sector has been rapid in the United Kingdom, as well as in the United States. See IMF (2001).

⁽⁵⁾ Bailey, Millard and Wells (2001) argue that the appreciation of the US dollar in recent years might reflect a productivity shock concentrated in highly traded goods, such as ICT.
(6) These current-price estimates are taken from the 1990 ONS input-output tables for the United Kingdom. More timely

⁽⁶⁾ These current-price estimates are taken from the 1990 ONS input-output tables for the United Kingdom. More timely input-output data are not available, but the share of imported final investment goods in whole-economy investment captures the direct effect discussed above. This share has risen strongly (at both current and constant prices) since 1990.
investment goods relative to other goods in the economy (see Chart 6).⁽¹⁾

Table A

Import content estimates for the United Kingdom

Per cent

Final demand expenditure components	Import content
Consumption	20.0
Investment	31.8
Government	13.2
Domestic demand	20.0
Exports	22.4
Total final demand	21.0

Chart 6 GDP, business investment and capital goods import prices



This could also imply rather different investment behaviour in the tradable and non-tradable goods sectors. Although sterling's appreciation is likely to have depressed the price of capital goods faced by firms in both sectors, exporters have also had to lower the sterling price of their output to remain competitive. We might therefore expect a greater fall in the price of capital relative to firms' own output price—and a greater rise in desired capital stocks—in sectors that can choose to import their capital inputs from abroad but are more sheltered from international competition in the goods market. That is consistent with the markedly different investment behaviour of manufacturing and service sector companies in the mid to late 1990s.

If the exchange rate explanation could account for the strength of the constant-price business investment to GDP ratio in the United Kingdom in the second half of the 1990s, then we might expect similar developments in other countries whose currencies have appreciated strongly over that period. Chart 7 shows that as in the United Kingdom, the sharp appreciation of the US dollar in the latter half of the 1990s was accompanied by a rise

in the constant-price business investment to GDP ratio. Interestingly, there was little or no rise in the ratio for the G7 countries that experienced exchange rate depreciation, with the notable exception of Canada.



G7 real exchange rates and business investment to GDP ratio at constant prices (1996-2000 v 1991-95)^(a)





Expected change in relative price of investment goods

It is probable that firms' expectations in the second half of the 1990s were that the relative price deflation in the investment goods sector discussed earlier would continue, on the back of continued technological improvements in that sector. But if firms had expected the future rate of relative price deflation to be even *more* rapid than in the past, these expected capital losses would have encouraged firms to reduce their demand for capital. And this would tend to counteract the effect on investment of the actual relative price falls. Firms' expectations are not directly observable, though, so it is difficult to establish the quantitative importance of this factor.

Cost of finance

Another key component of the real user cost of capital faced by firms is the cost of finance. This might have fallen for several reasons:

Adjustment to lower-inflation environment

The lower-inflation environment in the 1990s may conceivably have led to a fall in the cost of finance. First, the decline of inflation and a more certain macroeconomic environment may have led to a fall in

Correspondingly, the post-ERM depreciation of sterling was associated with a rise in the relative price of investment goods. This might help to explain some of the weakness of investment in the early to mid-1990s.

the equity risk premium. As Chart 8 shows, some estimates suggest that the equity risk premium fell sharply in the mid to late 1990s, reducing the cost of equity finance for firms, before rising markedly more recently.⁽¹⁾ Second, the shift in inflation environment may have been accompanied by falls in the inflation risk premium on the cost of longer-term corporate debt.⁽²⁾

Chart 8 Equity risk premium estimates



Other things being equal, falls in the equity risk premium and inflation risk premium would have lowered the cost of finance, which might have led firms to revise upwards their desired capital stocks.

Credit market imperfections and financial liberalisation

Financial liberalisation may also have had important implications for firms' behaviour. Greater competition between lenders should have lowered the cost of finance for many firms. And if financial liberalisation improved the operation of the financial system and reduced the costs faced by banks in monitoring borrowers' performance, theory suggests that this too should have lowered the cost of finance.⁽³⁾

Access to funds may also have increased, as the UK corporate bond market has become more liquid. But some have argued that greatly increased access to credit for consumers, which has perhaps been a more striking feature of financial liberalisation in the United Kingdom, could actually have reduced the net supply of savings for investment.

• 'Crowding out'

Some researchers claim to have established a link between government consumption and private investment in industrialised economies.⁽⁴⁾ These might be related if increases in government expenditure and borrowing 'crowd out' private sector activity by bidding up long-term real interest rates through increased competition for available funds. And conversely, periods of fiscal retrenchment might, other things being equal, be associated with lower real rates of interest and a lower cost of finance for firms.⁽⁵⁾ Some estimates suggest that real rates did fall in the United Kingdom and other G7 countries in the latter half of the 1990s.⁽⁶⁾ And Chart 9 does show an inverse correlation between business investment and government consumption (both expressed as constant-price shares of GDP) in the United Kingdom, although that does not of course establish causality.





Taxation

Government behaviour might affect business investment not only via the 'crowding out' channel discussed above, but also through taxation. Governments might finance their consumption through distortionary taxes, which are harmful for private investment. But it is not obvious that changes in government consumption are

⁽¹⁾ These estimates are discussed in more detail in the article by Panigirtzoglou and Scammell on pages 59–66 of this *Bulletin.*

⁽²⁾ As discussed in the article by Scholtes on pages 67–77 of this *Bulletin*.(3) See Hall (2001).

 ⁽⁴⁾ See, for example, Barro (1991). Barro found no negative link between private investment and government investment,

though, which may cast some doubt on a simple taxation argument.

⁽⁵⁾ For further discussion of the relationship between fiscal consolidation and real interest rates, see Jenkinson (1996).(6) For example, estimates derived from government bond yields and inflation forecasts from Consensus Economics, or

those derived from index-linked gilt yields.

necessarily associated with changes in distortionary taxation.⁽¹⁾

Depreciation rate

A further component of the real user cost of capital is the depreciation rate. In principle, a reduction in the average depreciation rate might have contributed to a fall in the real user cost of capital faced by firms. But the average depreciation rate should have risen as short-lived ICT assets have become more important in the capital stock. That would serve to raise the cost of capital.

Other factors

'Over-investment'

Some commentators have suggested that part of the strength of investment in the United States in the second half of the 1990s reflected 'over-investment'. Specifically some firms might have invested on the back of unrealistic expectations of their marginal returns, particularly on ICT. And then, as firms later revised down their expected returns, investment growth weakened.

One diagnostic when evaluating the over-investment hypothesis is the current-price share of business investment in GDP. This tells us what proportion of all the money spent in the economy is allocated to



purchasing investment goods. It is constrained by the resources of the economy, and large movements in the share may be unsustainable. Chart 10 shows that the current-price ratio has been close to its historical average in recent years (unlike in the United States).⁽²⁾ This does not, by itself, lend weight to the over-investment hypothesis for the United Kingdom. In the next section, we evaluate over-investment and other hypotheses for the United Kingdom using an econometric model.

Replacement investment

Given that depreciation rates on ICT assets are typically high (partly because firms replace their assets to keep up to date with more modern products), the increasing importance of these assets should have been accompanied by an increase in the level of replacement investment. Other things being equal, that implies that firms need to undertake higher levels of gross investment to achieve any desired net capital stock. In contrast with the effect of a rising depreciation rate on firms' cost of capital, the replacement investment effect might help to explain some of the rise in the constant-price business investment to GDP ratio.

Temporary factors may also have affected firms' replacement investment decisions, though. Ahead of the millennium date change, firms may have brought forward replacement investments in ICT. And ICT-related investments do appear to have made a significant contribution to the rise in the investment to GDP ratio (see Chart 5). But it is difficult to identify how much of this was related to Y2K.⁽³⁾ One might speculate that Y2K factors are plausible explanations for a relatively short period of strong investment growth in the very late 1990s and subsequent weakness.

Decomposing the rise in the constant-price business investment to GDP ratio

This section decomposes the rise in the constant-price business investment to GDP ratio using a simple econometric model. An important note of caution is that it is notoriously difficult to model firms' investment

(1) Government policy could also have important though less obvious implications for business investment. Investment projects undertaken through schemes such as the Private Finance Initiative and public private partnerships are mostly included in 'business investment' in the National Accounts. Such activity was too small to be able to account for much of the strength of business investment in the latter half of the 1990s, however.

(2) From a longer-term perspective, over-investment cannot explain the persistent decline in the relative price of investment goods discussed earlier. But Wadhwani (2001) points out how previous waves of technological innovation have often been associated with initial elements of 'over-investment', which were not a *long-run* precursor of a reversion to lower historical investment rates before the innovation.

(3) The Bank's regional Agents found in March 2000 that only a small minority of companies were planning much lower IT investment over the next two years than in the previous two years. That might suggest that other factors were rather more important in explaining the strength of IT investment in the latter half of the 1990s. decisions at the aggregate level, and our attempt is no exception. But the model may usefully illustrate the relative importance of the factors discussed above.

The single-equation model is derived in a theoretical framework that allows explicitly for long-term falls in the relative price of investment goods. It also contains the other components of the real user cost of capital⁽¹⁾ and a dynamic term to capture the higher replacement investment associated with increases in the average depreciation rate. Further details on the equation specification are provided in the appendix on page 40.

Chart 11 uses the model to decompose the rise in the constant-price business investment to GDP ratio since 1995 into its 'long-term' or fundamental determinants. Between 1995 and 2001 Q2, the ratio rose by more than 4 percentage points. According to the equation, around 1.5 percentage points of this rise reflected 'long-term' factors. And among these, most important is the fall in the relative price of investment goods, followed by falls in the cost of finance.

Chart 11 Contributions to long-term rise in constant-price business investment to GDP ratio since 1995



Some of the residual rise in the ratio is explained by increased replacement investment and 'cyclical'

considerations, both of which are captured by the model dynamics. And some represents a return of the ratio to 'equilibrium', following pronounced weakness in the first half of the 1990s. Some might also be explained by 'over-investment', although the absence of any systematic under-estimation of investment growth over this period does not obviously support this.

Conclusions

This article sets out a number of possible explanations for UK firms' investment behaviour over the past two decades. This has been a period when business investment, expressed as a constant-price share of the economy's output, has trended upwards. And this trend was particularly marked in the second half of the 1990s, a period also characterised by strong investment by the service sector and in high-tech goods such as ICT.

The rise largely reflects a sustained fall in the relative price of investment goods, given that there is little discernible trend in the current-price measure of the ratio. But our illustrative model-based analysis supports the idea that other factors have also been relevant. Firms are likely to have undertaken higher levels of replacement investment in the United Kingdom as ICT and other high-depreciation rate assets have become more important. And falls in the cost of finance and marginal tax rates may have been important.

The simple econometric model suggests that of all these factors, the fall in the relative price of investment goods has been quantitatively most significant. This is consistent with simple economic theory: as the relative price of capital declines, firms substitute towards using proportionately more capital in the production process. It suggests an important role for investment-specific technological progress and, given the importance of imported investment goods, for exchange rate developments in explaining trends in UK firms' investment behaviour.

(1) With the exception of the unobservable expected change in the rate of relative price deflation term. Investment equations are typically quite sensitive to how we attempt to measure this term, although alternative equations using actual and smoothed price inflation produced a similar ranking to that shown in Chart 11.

Appendix

The equation described on page 39 is characterised by a simple long-term relationship between the constant-price business investment to GDP ratio and the real user cost of capital. We follow Bean (1981) in exploiting the steady-state relationship between investment and capital to substitute out the capital stock from the long-run condition relating the capital stock to output and the real user cost. That has the advantage of allowing us to decompose long-term movements in the investment to output ratio without recourse to capital stock data, a notoriously difficult series to measure. The Bean specification for the long run of the investment equation is also convenient in our context, as the dependent variable is the business investment to GDP ratio. Bean shows that a constant depreciation rate and growth rate in steady state implies a simple relationship between the constant-price investment to output ratio and the real user cost.⁽¹⁾

The model assumes that past investment behaviour affects current investment, and so the dynamics of the equation contain lagged business investment growth. The dynamics also contain a depreciation rate term and a survey-based measure of capacity utilisation.⁽²⁾ The capacity utilisation variable plays the role of an 'integral correction mechanism', reflecting cumulated past equation errors that affect the level of the capital stock and so have implications for investment.

Each variable is expressed in logs, apart from the capacity utilisation measure, and t-statistics are given in brackets. The model is estimated for the period 1972 Q2 to 2001 Q2.

$$\begin{split} \Delta ibus_t &= -0.335 + 0.148 \Delta ibus_{t-3} + 0.195 \Delta ibus_{t-4} \\ & (-3.789) \ (1.769) \qquad (2.368) \\ & -2.912 \Delta beta_{t-2} - 3.754 \ \Delta beta_{t-4} \\ & (-1.767) \qquad (-2.265) \\ & + 0.001CU_{t-1} - 0.112 \ (ibus_{t-1} - gdp_{t-1}) \\ & (3.834) \qquad (-4.000) \\ & - 0.039rcc_{t-1} \\ & (-2.969) \\ & + \ dummy + dummy_{t+1} \end{split}$$

where:

dummy = 1985 Q2
ibus = real business investment
beta = one minus the average implied depreciation rate
CU = survey-based capacity utilisation measure
gdp = real GDP
rcc = real cost of capital

(1) Specifically, Bean (1981) worked with the steady-state relationship between investment, capital and output in a one-sector growth model. In a two-sector model, such as Bakhshi and Larsen (2001), where technological progress in the investment goods sector *persistently* outstrips that of other sectors, the steady-state relationship is much more complicated. Current Bank research is investigating potential implications for aggregate modelling in this framework.

⁽²⁾ The capacity utilisation variable is based on CBI Industrial Trends survey responses until 1989 and a GDP-weighted BCC measure thereafter.

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Building a real-time database for GDP(E)

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The Bank's Monetary Policy Committee analyses a wide variety of data to inform its monetary policy decisions. Some of these data are revised over time, and taking account of possible revisions is an important part of assessing any data release. This article discusses the construction of a database that contains successive releases of data for the expenditure measure of gross domestic product and its components, dating back to 1961. The database is available to external users on the Bank's Internet site.

Introduction

One of the main questions raised by new data is how much weight should be placed on initial estimates that are likely to get revised. Economic policy decisions must take account of possible revisions to the data that are used to inform the assessment of the current state of the economy. In attempting to improve our understanding of how data are revised, we have constructed a real-time database that contains successive sets of data for a number of different series. This article discusses the construction of the database for the major components of the expenditure side of gross domestic product (GDP) in the UK National Accounts.⁽²⁾

Database construction

The real-time database is a collection of different 'vintages' of data series, where a vintage is defined as a set of data that was the latest estimate at a particular moment in time. As data are revised over time, our interpretation of them could also change (the box on pages 44–45 discusses data revisions in more detail). Chart 1 shows three different vintages of GDP growth published by the Office for National Statistics (ONS) in the past three years.

There are three ways of calculating GDP, namely by measuring expenditure, income or production. In theory all three measures should be equal. This article focuses

Chart 1 Different vintages of GDP growth



Note: Dates refer to dates of publication in Economic Trends.

on the expenditure measure of GDP, GDP(E), and its component series, namely:

- private consumption;
- investment;
- government consumption;
- changes in inventories;
- total exports; and
- total imports.

The database comprises every different vintage of data for the quarterly expenditure components of GDP from 1961 Q1 to 2001 Q4 (the latest available). These data were published by the ONS (formerly the Central

⁽¹⁾ This work was compiled while both authors were working in the Bank's Conjunctural Assessment and Projections

A version of the database is available to external users on the Bank's Internet site at www.bankofengland.co.uk/statistics/gdpdatabase

Statistical Office) in *Economic Trends* and the *Economic Trends Annual Supplement*.⁽¹⁾ All variables are real, ie are measured in constant price terms. This means that users must take care when using the database, as occasionally the base year will change.

In 1961, only one vintage of data was usually published each quarter. This has increased over time so that now three vintages of the latest quarter's GDP growth and two vintages of the expenditure components are published each quarter. Some other real-time databases have collected only one vintage per quarter, such as the database constructed by the Federal Reserve Bank of Philadelphia for the United States.⁽²⁾ For completeness we have constructed a full back-series of every vintage for each component. However users may wish to focus on one release per quarter.

Some preliminary results

As our database incorporates a complete listing of all successive vintages of the expenditure components, we could potentially look at revisions over any period, eg the average revision over one year, or the average revision between the second and third data releases. Similarly we could look at revisions to either levels or growth rates.⁽³⁾ Note, however, that we cannot compare levels series across different price bases.⁽⁴⁾

In this article we define a revision as the later vintage minus the earlier vintage. For example, the revision to consumption growth (ΔC) in any period *i* is:

$$\Delta C_i^R = \Delta C_i^L - \Delta C_i^E$$

where *R*, *L* and *E* denote revision, the later vintage and the earlier vintage respectively.

The 'later' vintage refers to the data published in *UK Output, Income and Expenditure—fourth quarter* 2001 released on 27 February 2002. All 'earlier'

vintages are defined as the estimate of growth published at the time.⁽⁵⁾ All revisions are to quarterly growth rates and were calculated over the entire sample period (1961 Q1–2001 Q3) unless otherwise stated. Data published only recently may not yet have been substantially revised, and these observations could bias our results. However, when we ended the sample at 1997 Q4 to exclude these most recent data, our results were broadly unaffected.

Chart 2 presents the average (mean) revision to quarterly growth of selected GDP components, calculated over the entire sample period. The average revision to quarterly GDP growth is +0.2 percentage points, on an average quarterly growth rate of 0.6%. Average revisions to different expenditure components vary. Growth of private consumption and government consumption are revised relatively little. In contrast, investment and, to a lesser extent, exports tend to be revised by more. Statistical tests⁽⁶⁾ show that the revisions to GDP(E), investment and export growth are biased upwards at the 5% significance level. Revisions to private consumption and import growth are biased upwards at the 10% and 15% significance levels respectively, but revisions to government consumption

Chart 2 Average revisions to GDP(E) components



(1) Our thanks go to Carmen Birbeck, Danielle Palumbo, Rachel Pigram and Alison Schomberg for their assistance in collecting, inputting and checking these data.

⁽²⁾ See Croushore and Stark (1999). The Philadelphia database includes a wider range of variables, eg unemployment and the money stock.

⁽³⁾ Note, however, that the latest vintage of data will suffer from 'non-additivity', ie the components of GDP will not sum to the level of GDP prior to the 'link year'. This is a statistical feature of real GDP data in the United Kingdom. The 'link year' (currently 1994) is the year from which the most recent sectoral/component weights are used to calculate the aggregate level and growth rate of GDP. Different sets of weights are used prior to the link year. For example, in the latest vintage of data, the real levels of private consumption, investment and government consumption do not sum to the real level of final domestic demand pre-1994. For more on additivity and how growth is calculated, see Lynch (1996).

⁽⁴⁾ We could re-base the series so that the levels appeared to be the same, but we would implicitly be assuming that the 'real' level was the same in the re-basing period.

⁽⁵⁾ When more than one vintage were published per quarter, we have taken the final vintage published in that quarter for the analysis in this article.

⁽⁶⁾ Testing for one-sided bias, calculated as in Symons (2001).

Background on ONS data and revisions

Why are data revised?

The Office for National Statistics (ONS) compiles quarterly National Accounts for the United Kingdom. These data are subject to revision in subsequent releases. In general, revisions are made due to:

- 1 The receipt of additional and/or more comprehensive data.
- 2 The replacement of judgmental adjustments and model-based estimates with source data.
- 3 Changes in methodology.
- 4 Re-basing.

The first two types of revision are closely linked. The National Accounts are based largely on returns from ONS sample surveys, but also on other source data, eg tax data from the Inland Revenue. Over time the ONS receives more comprehensive data (eg as more survey returns come in), and the new information contained in those data is incorporated into the National Accounts estimates.

Moreover, some source data may be unavailable at the time of publication, meaning that the ONS must 'fill the gap' with a mixture of model-based estimates and judgmental adjustments. When these missing data become available, they replace the adjustments that had been incorporated.

An example of where judgmental adjustments are incorporated is in the 'preliminary estimate' of GDP. For instance, the main ONS press release⁽¹⁾ explicitly states that the ONS has 'limited information' on the output of some sectors at the time of publication:

'This preliminary estimate for gross domestic product is based on the estimate of the index of output of the production industries for the first two months of the quarter, as published on 6 July 2001, and the retail sales estimates for the three months to end-June, as published on 20 July 2001, together with limited information on the output of the rest of the economy. At this stage, estimates for the latest quarter for most individual industry series are not sufficiently reliable for publication.'

Similarly, the published briefing notes⁽²⁾ for the release also explicitly state that many service sector components are not based on final data:

'A final reminder: many of the service industry components include large proportions based on estimates rather than final data, and so even the qualitative commentary should be treated with caution.'

For example, Reed (2000) notes that for the 1999 Q3 preliminary release of GDP, 16% of the data used were internal ONS estimates.

Revisions may also occur because of changes in how the ONS calculates the National Accounts. In principle, methodology changes could cause time series to be revised all the way back to 1948. Some recent examples of substantial changes are:⁽³⁾

- Pickford Report (Cabinet Office (1989)).
- Chancellor's initiatives (ONS (1991), and Caplan and Daniel (1992)).
- Reporting of GDP (Wroe (1993)).
- European System of Accounts 1995 (*Blue Book* (1998)).
- New capital stock estimates (*Blue Book* (2000)).
- Inclusion of alcohol and tobacco smuggling (*Blue Book* (2001)).

The fourth reason for revisions, re-basing, could also have significant effects on the real series. The effective weights in the base year become less representative over time as the latest observation for different series moves further away from the base year. This could result in

(1) Taken from ONS (2001a). For more on the preliminary estimate of GDP, see Reed (2000).

⁽²⁾ Taken from ONS (2001b).
(3) For more information about changes to economic statistics in the past ten years, see Jenkinson and Brand (2000).

real growth estimates being different from their 'true' values, as the estimates are distorted by the unrepresentative weights. In essence re-basing brings forward the weights used, and changes growth rates after the last link year. A re-based measure would more accurately reflect the relative contributions of the different economic sectors.

For example, measuring real investment in 1996 at 1990 prices is likely to use unrepresentative weights. Re-basing to 1995 prices would be likely to result in different real growth estimates for 1996 than using a 1990 price base.

Important caveats

Before analysing the behaviour of revisions, three important points must be borne in mind.

First, without detailed (but unpublished) information about the raw data and the methodology changes, we are unable to determine whether revisions are the result of new information or a change in methodology. In principle, we could examine revisions before and after methodology changes to see if they were different. But we would be unable to say exactly how much of any change in the behaviour of revisions was due to the methodology change. As such, we can only calculate the total revision to a given variable.⁽⁴⁾

Second, although the database allows us to calculate the past behaviour of revisions, this does *not* mean that future revisions will necessarily follow the same pattern.

Third, prior to the introduction of alignment adjustments in 1989, the quarterly paths of the separate GDP measures were very different. Alignment adjustments are statistical series that the ONS includes in the expenditure and income measures of GDP, so that quarterly growth in these two series matches quarterly growth in the production measure. As such, comparing the expenditure-based measure of GDP (or changes in inventories, where the alignment adjustment is included) before and after 1989 could be misleading, because GDP(E) is smoother after 1989.⁽⁵⁾

In addition, the scope for revisions in any given release will be limited by the ONS revisions policy at that time. A good example of this is the different revisions policies for successive *Blue Books*.

The Blue Book

The *Blue Book* is an annual ONS National Accounts publication, and normally incorporates the first complete balancing of the three measures of GDP (expenditure, income and production). Although the three different measures should in theory all be equal, in practice they will often be different. The ONS includes a statistical discrepancy in each of the three measures, which ensures that all three levels are the same.

The balancing process ensures that the three measures all give the same estimate of GDP without any statistical discrepancy in the two years prior to publication (denoted 't-2'). For example, the 2001 *Blue Book* was the first time that the three measures of GDP in 1999 were balanced.

Blue Books often also incorporate methodology changes, but the scope for back-revisions is limited by the revisions policy in any given year. For recent *Blue Books*, the revisions policy (for annual data) has been:

- 1999 Restricted to *t*-2 (1997) onwards.
- 2000 Mainly restricted to t-2 (1998) onwards.
- 2001 Open policy (in principle back to the start of the series).

So a comparison of the revisions in the 2000 and 2001 *Blue Books* would be affected by their different revision policies.⁽⁶⁾

⁽⁴⁾ The 1998 *Blue Book* calculates the revisions to annual GDP growth (both nominal and real) due to the implementation of the 1995 European System of Accounts (ESA95), and the revisions due to other factors. The ONS does try to provide estimates of the impact of methodology changes, but such estimates are not published on a regular basis.

⁽⁵⁾ For more information on alignment adjustments, see Snowdon (1997).

⁽⁶⁾ For more information on Blue Books and recent revisions policy, see ONS (2001c).

growth are unbiased even at the 20% significance level. This suggests that initial estimates of growth in most of the series are on average too low (biased downwards).

But Chart 2 does not tell us anything about the relative impact of these revisions on GDP(E) growth itself. This can be examined by calculating the revisions to the contributions of components, shown in Chart 3.⁽¹⁾ We have split the data into five-year blocks to show whether the pattern of revisions has changed over time.

Chart 3 shows that, in terms of contributions, investment is the only component of GDP(E) to be consistently revised up. Revisions to the contribution of private consumption are generally small, as are revisions to the contribution from government consumption. Most of the impact on GDP tends to come from investment, stockbuilding and net trade, although the last two have tended to be revised in opposite directions.





Another way to analyse the revisions is to look at the mean absolute revision alongside the mean revision. The former can give an indication of the uncertainty surrounding an estimate, while the latter gives an indication of the average bias in initial estimates.

Chart 4 shows that the uncertainty and bias around estimates of investment growth have varied over time. Though the revisions are reported in decades for simplicity, this choice is arbitrary and the results might be sensitive to different time periods. An alternative

Chart 4 Revisions to quarterly investment growth



Chart 5 Moving mean revisions to investment growth



Chart 6





(1) Note that we cannot imply anything about causality. In calculating Chart 3 the latest vintage of contributions pre-1994 has to be adjusted to sum to GDP(E) growth because of non-additivity, but the relative proportions of different components' contributions are unchanged. would be to take moving mean and mean absolute revisions, as shown in Charts 5 and 6, which also demonstrate how the behaviour of revisions has varied over time.

Pattern of revisions

We can also use the database to ask specific questions about the pattern of revisions. For example, is there any pattern to revisions for 'strong' or 'weak' initial estimates? Chart 7 examines this for private consumption, defining strong and weak as first estimates lying outside the average first estimate of growth, plus or minus one standard deviation respectively.⁽¹⁾ It shows that on average strong estimates are revised down and weak estimates are revised up, ie strong and weak initial estimates tend to get revised back towards average growth.

Chart 7 Revisions to strong and weak private consumption growth



Similarly we could examine whether there is any cyclical pattern to revisions. For example, does growth tend to get revised down in what are subsequently known to be recessions? If so, this might suggest that contemporaneous estimates of growth may not be a good indicator of turning points in the economic cycle. Chart 8 looks at this for GDP(E) growth. Here we define recessions as peak-to-trough in the level of GDP where GDP fell in at least two consecutive quarters,⁽²⁾ but we could have used alternative definitions (for example, defining a recession as negative annual growth). The chart shows that estimates of GDP(E) growth tend to get revised down slightly in (what are subsequently known to

Chart 8 Revisions to GDP(E) growth in recessions and non-recessions



be) recessions, although these revisions are not significantly different from zero at the 10% significance level. So although growth appears to get revised down in recessions, there is little statistical evidence that the initial estimates are too high. Revisions in non-recessions are biased upwards at the 5% significance level. Note however that the usual small sample caveats apply to Charts 7 and 8.

What next?

There is a potentially inexhaustible list of questions that users could try to address using this database. For example, Egginton, Pick and Vahey (2002) use their own real-time UK database to analyse how data revisions affect recursive models. Orphanides et al (2000) examine the implications of real-time US output gaps for monetary policy, and Nelson and Nikolov (2001) conduct a similar exercise for the United Kingdom. As well as considering policy implications, the data could be examined for rationality (see, for example, Swanson and van Dijk (2001)) or for bias in initial estimates; considerable work has already been done on this by the ONS (eg Symons (2001)). Further work on revisions analysis is currently ongoing at the ONS. Real-time data could also be used to see if other variables are helpful in refining current estimates of output (see, for example, Svensson and Woodford (2001)), or to revisit previous work but using real-time data instead of a single (particular) vintage (see, for example, Croushore and Stark (1999)). In addition, information about the

⁽¹⁾ Strong and weak estimates are calculated over the whole sample using the latest vintage of GDP data at the time of

writing (published on 27 February 2002). Note that only three of the (weak) estimates in Chart 6 were from the 1990s.

⁽²⁾ Based on the vintage of GDP data published on 27 February 2002. We have included the period 1974 Q3–1975 Q2, despite a small rise in GDP in 1975 Q1.

distribution of revisions could be incorporated directly into model formulation; this could be done by using a specific form of weighted least squares estimation, which places a lower weight on more recent data that have yet to be revised. Finally, there are ongoing plans at the Bank of England to extend the database to include other variables, for example nominal series and deflators.

The above examples are by no means a complete list. But they do serve to show that the results presented in this article are but a few simple examples of what the database can be used for. We encourage users to follow their own avenues of research using the data that we have made available.

Conclusion

This article has discussed why revisions to official data occur, and some of the issues that data users face when examining data revisions. It has documented how we have constructed a real-time database for the expenditure components of GDP, and presented some simple results from the database.

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Electronic trading in wholesale financial markets: its wider impact and policy issues

By Helen Allen of the Bank's Market Infrastructure Division and John Hawkins of the Bank for International Settlements.⁽¹⁾

Electronic trading is a force for change across markets, enabling a greater variety of trading arrangements, which in turn can affect the performance of markets and welfare more generally. This article first considers why the extent and speed of adoption of new trading systems has been very different between markets. It then focuses on two important issues raised by recent developments. One is the degree of fragmentation or consolidation of trading arrangements, where it is argued that electronic trading can facilitate either effect. The other is the degree of transparency of trading information, where the hugely expanded possibilities that electronic trading offers highlight the choices in this controversial topic. Policy-makers are interested in the wider impact of changes to trading arrangements on the broader economic and financial system. But policy judgments need to be made carefully because the effects can be market specific, uncertain or even counter-intuitive. Moreover, problems arising in market arrangements may prove short term or self-correcting. These considerations all bear on the judgments on whether or how to intervene to address apparent market failures.

Introduction

Electronic trading is transforming financial markets. It can reduce costs, extend participation and remove many physical limitations on trading arrangements. It allows much greater volumes of trades to be handled, and permits customisation of processes that until recently would have been technically impossible or prohibitively expensive. It is a major force for changes in 'market architecture'—the key features of market structure such as participation arrangements, venues and trading protocols.

These effects of electronic trading in turn have a real influence on the prices and quantities that result from the trading process.⁽²⁾ And they can also affect aspects of a market's 'quality'—its performance across attributes such as liquidity, trading costs, price efficiency and resilience to shocks. This matters because market quality has broader welfare implications—such as through the contribution of the efficiency of the financial system to economic growth and through the performance of markets and their resilience to financial instability. So the impact of electronic trading is of considerable interest to market participants and policy-makers alike.

Many recent changes in securities market arrangements are closely associated with the effects of electronic trading (and wider technological innovation). Some market features that have lasted for years now seem to be changing. There are now choices to be made in market design in areas that were previously dictated by physical limitations. This article highlights some areas where electronic trading has had a particular impact on trading arrangements and discusses policy questions that arise.

Contrasting developments in electronic trading⁽³⁾

Though electronic trading has been used in some markets for well over a decade, its penetration has been very uneven across different sectors. Take-up has been

⁽¹⁾ More comprehensive versions of this article are in Bank for International Settlements (2001b) and Mullineaux (ed) (2002). The authors thank colleagues, associates and participants at a SUERF colloquium for helpful comments. They also benefited from discussions while participating in the Electronic Trading Working Group of the G10 Committee on the Global Financial System.

⁽²⁾ This is the area of market microstructure literature, which studies the processes/outcomes of exchanging assets under explicit trading rules—O'Hara (1995) provides a theoretical review; see also the survey by Madhavan (2000).

⁽³⁾ To a lesser or greater extent all financial markets have been influenced by electronic trading developments. For example, Tsang (1999) reviews automation in futures trading, where electronic trading has been well established for some time. Banks (2001) describes electronic trading in a range of markets, with particular focus on the role of the Internet. Reserve Bank of Australia (2001) and Bank of Japan (2001) review developments in their national markets.

affected by the form of existing market structures, regulatory and competitive factors, and the varied needs of traders. Typically, deep, liquid markets, with broadly standard asset classes and straightforward trade types are 'easiest' to migrate to electronic trading. The spread of electronic trading depends also on what is achievable with current trading technology: further innovation will enable further waves of change to market arrangements.

Equity markets

The liquidity and relative homogeneity of major equity securities make it reasonably straightforward and cost-effective for them to move to electronic trading. But experience in the United States and Europe has been very different even for the same type of assets. The US equity market has seen a proliferation of alternative electronic trading venues, whereas Europe has been more notable for electronic systems being incorporated within mainstream exchanges. The regulatory and competitive environments appear to have been significant influences on these outcomes.

The two largest markets in the United States have broadly maintained the framework of their 'traditional' arrangements—the floor trading of the New York Stock Exchange and the telephone/screen-based market of Nasdaq—albeit both with very high levels of automation. This meant that wholly electronic systems were able to position themselves as alternatives, offering trading methods (especially electronic order books) unavailable at mainstream venues. The entry of a number of alternative electronic venues around the Nasdaq market was also encouraged by a regulatory change affecting the display of orders.⁽¹⁾

In contrast, existing exchanges in Europe moved many of their own systems to electronic trading. Compared with the United States, their environment was probably less influenced by regulation; competitive pressures (including from demutualisations) encouraged exchanges to introduce electronic trading themselves. It has meant less opportunity for separate off-exchange trading systems—it is more difficult for entrants to offer some particular advantage that could not be found on the exchanges.

Electronic trading⁽¹⁾

The meaning of 'electronic trading' differs according to context and can encompass a wide variety of systems. Discussions in this article relate to a range of features of electronic trading including: *electronic order routing* (the delivery of orders to the execution system); *automated trade execution* (the transformation of orders into trades); and *electronic dissemination of pre and post-trade information* (eg bids/offers, depth, transaction prices and volumes—discussed in the box on page 53).

So-called 'traditional' (non-electronic) markets often also include a high degree of associated automation but rely to a greater extent on physical involvement/interaction actually to match buy and sell orders—especially on a trading floor or over the telephone. Though there is no absolute delineation between the two, some characteristics differentiating electronic trading from traditional means are:

- it is location neutral and allows continuous multilateral interaction, whereas for telephone trading only the former applies and for floor trading only the latter;
- it is scaleable—it can allow additional users and exploit economies of scale to a much greater extent than can non-electronic arrangements; and
- it can be integrated—allowing many (or all) steps in the trading process to be linked.

Electronic trading can be applied in various ways to different types of market arrangements—to markets that are: either (i) *order driven*, where prices are established by matching incoming bids and offers according to an algorithm; trading can either be continuous (*order books*) or periodic (*call auctions*), or (ii) *quote driven*, where prices are established by dealers competing for orders by quoting prices at which they will buy and sell.

There are also numerous hybrids, offering some combination of these trading arrangements.

(1) The definition of electronic trading above follows Committee on the Global Financial System (2001), which provides more information on electronic trading. For overviews of electronic finance more generally, see Bank for International Settlements (2001b), which includes a glossary; Allen, McAndrews and Strahan (2002); Claessens, Glaessner and Klingebiel (2000); and Sato, Hawkins and Berentsen (2001).

⁽¹⁾ The regulatory trigger was the SEC's change to order-handling rules in 1997; see, for example, Davis and Steil (2001) and McAndrews and Stefanadis (2000). These country-specific effects illustrate why studies of a single market may not generalise. This is pertinent given Goodhart and O'Hara's (1997) and Gravelle's (2002) observation that the literature concentrates on equity rather than debt markets. Moreover, many studies of equity trading only discuss major US markets.

Fixed-income markets

Electronic trading is being adopted more slowly in fixed-income markets than in equity markets. Fixed-income products are far less homogenous, with many individually less liquid issues (varying in coupon, maturity, frequency of interest payments, etc). Relative to equity markets there are also fewer but larger trades. These factors all make it technically more difficult and more expensive to introduce automation. Moreover, the decentralised telephone dealer markets typical of fixed-income products were probably less conducive to a rapid, widespread introduction of automation than were the centralised exchanges in equity markets.

Within the fixed-income sector,⁽¹⁾ electronic trading is more widely used in certain government bond markets reflecting their greater standardisation and liquidity, which (as with equities) makes their trading more straightforward. Platforms have tended to begin trading government bonds, and later expand into other, more heterogeneous, fixed-income issues. It seems that electronic trading of the latter is becoming more feasible as systems develop more effective ways to trade less liquid issues, opening up a much broader market for these securities. (As discussed further in the sub-section on fragmentation and consolidation on page 54.)

Foreign exchange markets

Electronic trading has had an important presence in the inter-dealer spot foreign exchange market for more than a decade. In the major currency pairs probably some 50%-70% of turnover is now conducted electronically, up from 40% in $1998.^{(2)}$

Though the previous structure of the market was a fragmented bilateral telephone market, similar to fixed income, foreign exchange experienced an early and

widespread adoption of electronic trading (notably through the EBS and Reuters systems in the inter-dealer market). This reflects the extremely liquid, homogenous nature of the product, which can be readily traded in standardised units.

Market architecture and market quality

As electronic trading changes market structure, it influences significantly the performance of these markets. Most obviously, substantial falls in trading costs can be attributed directly to the effects of electronic trading.⁽³⁾ The impacts on other aspects of market quality are more varied and may be unclear or controversial. Two such areas relate to the transparency of trading information and the degree of market fragmentation.

Effects on transparency

Electronic trading creates the *potential* for a high degree of transparency across the whole trading process. In principle, systems can disseminate real-time pre and post-trade information market-wide. For example, electronic order books can facilitate greater transparency by showing a list of trading opportunities. Conversely, other systems can operate with minimal information leakage, for example eliminating any information about pending orders, enabling users to avoid giving away valuable, potentially market-moving information to competitors.⁽⁴⁾

Though electronic trading enables greater choices about transparency, there is no simple answer about the appropriate form and degree of disclosure. Decisions are market-specific. Factors include the role of the information in attracting liquidity to the system, users' needs (for example, whether retail or wholesale business, or whether immediacy of execution matters) and the commercial value of the data. Different classes of

⁽¹⁾ Fixed-income systems proliferated in type and number in the late 1990s, though few achieved significant volumes and the market is clearly rationalising. An annual survey by the Bond Market Association (2001) identified some 68 systems in the United States in 2000, up from only 11 three years earlier. However, by 2001 only 49 were still in operation.

⁽²⁾ Data cited in Galati (2001). For further discussion of the development of electronic trading in foreign exchange markets, see Chaboud and Weinberg (2002).

⁽³⁾ Numerous studies demonstrate cost reductions, typically by a third to a half. See, for example, Domowitz, Glen and Madhavan (2001), Domowitz and Steil (2001, 2002) and Jiang, Tang and Law (2002). Savings can occur across all components of trading costs—explicit costs (such as physical overheads), bid-ask spreads and market impact costs (ie the adverse effect on price due to information about the trade leaking out ahead of its execution). Moreover, trading costs are one of the more direct indicators of the broader welfare benefits from electronic trading. Domowitz and Steil (2002) present evidence that associates lower trading costs with a lower cost of equity capital, which has macroeconomic significance.

⁽⁴⁾ Such systems are a response to the issues noted in the box opposite, that in a transparent environment, wholesale traders may disguise these orders in some way to avoid giving away information on their strategy which may lead to the market moving against them. The pre-trade opaque class of systems allow traders to input their true order preferences with complete accuracy since the information is only 'seen' by the computer system. If the implementation of such systems gives 'appropriate' incentives in trading behaviour (such as to input 'truthful' orders), one result could be greater efficiency of price formation.

Transparency

Transparency is the ability of market participants to observe information about the trading process pre-trade information concerns order sizes and quotes, while post-trade information centres on prices and quantities of executed trades. Other considerations include the timeliness of the information, which (subset of) participants can observe certain aspects, and pre and post-trade anonymity (whether identities are revealed). For a discussion, see O'Hara (1995).

The precise arrangements and rules regarding transparency vary greatly between markets and sectors within them. Segregation largely according to transparency regime has long been a feature of markets' organisation. Notably, virtually all exchanges have particular arrangements for block trades ('upstairs trading'), with lower transparency requirements than their main market, often in the form of delayed publication. Whereas in retail markets, greater transparency is seen as desirable, largely due to its role in consumer information and protection.

Transparency arrangements affect the balance of information among market participants. Evidence from a range of studies (see Madhavan (2000)) demonstrates that this influences the degree of information in the order flow, price discovery and liquidity.⁽¹⁾ While in many respects inconclusive, the literature (see, for example, Ganley *et al* (1998)) highlights that changes in transparency rules often benefit one group of participants at the expense of another. Some flavour is given in the following stylised examples. A tension between post-trade transparency and liquidity can occur in a multiple dealer setting such as in many government bond markets. Faced with an unpredictable flow of large customer orders, dealers with a continuous presence in the market seek to manage risks arising from sharp variations in their inventory of securities by inter-dealer trading to rebalance their holdings. Were stricter post-trade transparency imposed in terms of requiring more rapid publication of large transactions, it would reduce dealers' opportunity to conduct this inventory adjustment. This could increase their risk management costs-which may be passed onto customers-and could lead to a less efficient allocation of risks in the market. Both liquidity and price discovery could be impeded (see Gravelle (2002) for a further explanation).

Equivalent tensions with pre-trade transparency requirements can arise where transactions contain (and are motivated by) private information reflecting legitimate investor research/beliefs or portfolio strategy. Were disclosure imposed that revealed 'too much' about intended trades, it could effectively expropriate that private information for the public trading venue. The predictable result of such rules would be that traders would act to minimise the cost of the loss, for example by splitting the trade to reduce the observable information content or by switching venues to avoid the regime. Or they might exit the market if their business is no longer viable.

(1) Madhavan (2000) surveys results regarding transparency from theoretical, empirical and experimental literature. Much of the work uses underlying models based on asymmetric information—these consist of two classes of market participants, informed traders with private information on future asset values and uninformed (liquidity motivated) traders, and explores how these groups trade under different conditions. Such models are mostly applicable to equity markets, in which private information on assets plays an important role. There is also a range of models based around inventory adjustment, consisting of dealers who attempt to restore their inventories to some desired level by adjusting their quotes and trading behaviour. These fit closer with the structures typically seen in fixed-income and foreign exchange markets.

trading systems lend themselves to different forms of transparency: the style of information concerning a call market differs from that readily available from an order book or a dealer arrangement. Moreover, regulatory requirements may influence the decision.

There is strong regulatory interest in this area. In large part this stems from concerns over market integrity and fairness. Regulatory and policy instincts typically—and probably rightly—are attuned to the benefits of greater transparency.⁽¹⁾ However, and as set out in the box above, this highlights the importance of recognising that insistence on greater trading transparency may, beyond a certain point, be detrimental to aspects of market quality such as liquidity and price formation.

In many areas of public policy greater openness is widely recognised as beneficial to processes, expectations and outcomes—disclosure practices in accounting and the transparency of the monetary policy process are two important such cases.

Effects on fragmentation and consolidation

Electronic trading can exert both fragmenting and consolidating influences. For example, in fixed-income and foreign exchange markets, new systems consolidate areas that formerly relied on fragmented, bilateral telephone communication. By contrast, in equity markets, typically dominated by centralised exchanges, alternative trading venues can increase apparent fragmentation. Yet equity markets' numerous mergers, alliances and linkages can also be associated with electronic systems' ability to consolidate sources of liquidity and harness efficiencies.

There is no single measure against which to evaluate these effects. For example, if individual venues can offer a wider choice of order routing, order flow may seem more dispersed. Alternatively it may matter little how many underlying venues exist if linkages can give traders seamless access to a range of markets (eg as single screens combine information from multiple venues— 'virtual consolidation').

Fragmentation and consolidation raise clear issues about market quality. Probably best known are arguments that alternative trading venues in equity markets act to fragment and so reduce liquidity in the 'main' market. The importance of liquidity⁽¹⁾ is well known—reducing trading costs by narrowing bid-ask spreads and giving depth such that prices are less affected by particular trades. Liquid markets are better placed to absorb shocks than less liquid ones, contributing to the robustness of financial systems. Moreover, liquidity is an important ingredient of price discovery and hence price signals for the wider economy.

However, it is also argued that additional execution routes can improve market liquidity and quality. They can stimulate innovation and variety in trading services and heighten competition to cut costs. And the alternative trading arrangements may directly consolidate liquidity rather then fragmenting it. For example, they might offer new systems that:

• can trade less liquid assets by sweeping them into automated trading of portfolios that offer certain

characteristics. The securities are pulled into a larger liquidity pool rather than being traded individually; and

 may allow more effective trading; for example, by facilitating periodic call auctions. These concentrate trading activity at a single point in time, so may suit the trading of less liquid securities (whose limited volumes may otherwise have traded thinly over a longer period)⁽²⁾.

Developments to date indicate that technology can quickly develop which overrides negative effects of fragmentation. The powerful influence of network effects in this area (see the box opposite) also means that a proliferation of similar trading systems, which individually attract little liquidity, might be expected to be a transitory phenomenon. Those that become established will need both to offer some real improvement and—crucially—to attract, retain or link to a sufficient amount of liquidity.

Discussion of policy implications

Electronic trading technology enables new forms of market architecture that a few years ago would not have been possible. As well as offering these choices in market design, it presents policy-makers with questions.⁽³⁾ Notable issues include:

- frameworks for regulation: especially whether to (continue to) differentiate the institutional status and oversight regimes applying to exchanges and to non-exchange trading systems;
- the appropriate level of detail for regulatory involvement in microstructure matters: for example, whether transparency rules are necessary and can be enforced, and in what degree of detail; or whether fragmentation of markets requires an active response to protect the price formation process; and
- cross-border issues highlighted by remote access to trading, including: whether countries' different regulatory regimes lead to problems caused by

⁽¹⁾ Characteristics of liquidity in markets are discussed in the policy context in Bank for International Settlements (2001a) and from a theoretical perspective in O'Hara (1995). There is more discussion of electronic trading and market quality in Allen, Hawkins and Sato (2001). Some evidence on electronic trading and market resilience is discussed in Committee on the Global Financial System (2001).

⁽²⁾ For example, Steil (2001) describes how the Warsaw Stock Exchange, re-established in 1991, initially traded stocks in a weekly call, moving to daily calls and later (for some stocks) to continuous trading as volumes grew to give sufficient liquidity.

⁽³⁾ For examples of policy questions and discussions see: Boisvert and Gaa (2001) for Canada; Financial Services Authority (2000) and Wisbey (2000) for the United Kingdom; US Securities and Exchange Commission (1998) and Unger (2001) for the United States.

Network economics effects(1)

Network economics effects feature strongly in trading systems and help to explain commonly observed features of markets—such as consolidation of market liquidity, the advantages experienced by incumbent trading systems, and 'tipping effects' when a market shifts from one centre to another. The underlying economics of these features occur in a number of industries that are structured around a network arrangement, such as telecommunications.

In these markets, positive network externalities arise because the value of the network to each participant rises as other participants join. Telephones are a traditional example—in the early days of telephony it was relatively unattractive to join the network since there were few other participants to whom to make calls. However, as the number of subscribers increased, the opportunities for making and receiving calls also increased, enhancing the usefulness and value of the network for all participants, making all users better off.

These positive network externalities similarly apply to market liquidity. All other things being equal, it is better to participate in a bigger than a smaller trading network, since each trader brings additional trading opportunities/liquidity. Positive feedback comes about as a liquid market attracts more participants, all participants benefit from the additional liquidity, making the network more attractive to others, and so on.

In the absence of rigidities or other barriers, the presence of these network externalities in a market would imply a tendency to consolidation. In the trading context, this would work to bring isolated pools of liquidity together. However, such consolidation may not occur around an 'optimal' system. One reason is 'first mover advantage'. An incumbent system may have gained a critical mass of users simply because it was the earliest available. A system that comes to the market later may face formidable hurdles to attract a viable level of participation, even if it offers a better product. Potential users need to believe that the costs of switching to the new system are worthwhile. Moreover, they must expect that enough other users will also switch to make the new system an effective, liquid trading venue.

These hurdles may mean that users feel 'locked in' to a dominant system, in which case a sub-optimal equilibrium can be sustained. This position can arise whether a system has become dominant through first mover advantage or through consolidation. In the latter case, even if the consolidation occurred around an efficient, technically advanced system, if it comes to be a (near-) monopoly the incentives to maintain those advantages can be eroded. The well-known problems of monopoly pricing, technical inefficiencies and abuse of dominant market position may arise.

However, it is by no means inevitable that dominant market positions will be sustained. If an alternative system manages to attract users, it too can enter a virtuous circle of positive feedback. Once a critical level of participation is achieved, the market can tip away from the incumbent and towards the alternative. This switch can be abrupt. It was seen when Eurex within around six months in early 1998 took all the volume in the futures on the ten-year German Bund contract from the previously dominant LIFFE floor.

 This box draws on Shapiro and Varian (1999), which explains the impact of positive network externalities on industries, and Domowitz and Steil (2001), which analyses how network externalities apply to securities trading.

regulatory arbitrage; and clarification of legal and regulatory jurisdiction.

In any decision, policy-makers face multiple objectives and make different trade-offs—there is no unanimity on what constitutes 'optimal' trading arrangements. For example, securities regulators may focus on market integrity and consumer protection while central banks concentrate on systemic risk and financial stability implications. However, a number of general factors bear on any policy in this area.

Perspective. Policy-makers' objectives are aimed at market quality and welfare more generally, which suggests that market architecture itself should be seen as an intermediate target towards these goals. (This is illustrated below.) An example comes from the uneven, sometimes counter-intuitive, effects of transparency

rules. Making greater transparency a policy objective in itself risks ignoring potentially negative effects on market quality—and hence on broader investor welfare and the effectiveness of the economy and financial system. Indeed, were transparency to be 'maximised' as a policy end in itself, that aim could prove precisely at odds with these wider objectives to which policy is typically addressed.



Market differences and uncertainties. The many differences between/within individual markets suggest avoiding a 'one size fits all' approach and being wary of imposing detailed, cross-market rules at a high level. Added to this is the imprecise understanding of the net effects of changes in market structures and rules. There are also striking ambiguities—for example, that electronic trading is credited with both fragmenting liquidity and enabling its consolidation from disparate sources. These uncertainties and ambiguities argue for caution in policy-making.

Network effects in fast-changing markets. Policy judgments are difficult in innovative markets. They need to tread a difficult line between imposing requirements that restrict innovations, while maintaining market integrity and confidence in periods of rapid change. The questions concerning market fragmentation show that problems may be sustained, or temporary, or even illusory. Given that such concerns change rapidly, and that problems may prove self-correcting, the presumption may be that intervention is inadvisable unless there is demonstrably a sustained problem. Network effects in markets, however, can limit the scope for self-correction. It may also be necessary to act to deal with even 'temporary' problems if they are clearly detrimental to an important sector of a market.⁽¹⁾

As a final comment, new trading technology itself may help resolve many difficult issues in market arrangements. For example:

- offering better information on market performance and behaviour, which can help oversight and understanding of markets. For example, the fulfilment of market-maker obligations could be monitored automatically, or erratic market movements, whether due to trader errors or more fundamental reasons, could be identified rapidly;
- directly providing solutions to problems, such as the means to build information systems or link fragmented pools of liquidity; and
- helping participants to make better-informed decisions, for example by enabling appropriate transparency arrangements and providing better information on order routing and assets' features.

No one can predict the precise form of new market structures. But it is clear that electronic trading technologies have already hugely expanded the possibilities, decisions and policy questions and changed the way practitioners and policy-makers think about the design of market infrastructure. It cannot be long before the issues discussed in this article cease to be particularly 'associated with electronic trading' but simply referred to as choices in market architecture.

(1) Where action is deemed preferable (for example where correcting market forces are believed to be weak), there will also be differing regulatory stances about solutions. These could range from ensuring facilitating frameworks such as clear legal codes, through action on competition policy such as removing restrictive practices, to specific micro-rule-making on, say, trading protocols.

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Analysts' earnings forecasts and equity valuations

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Equity valuations are important for monetary policy makers as the factors that drive equity valuations may contain information about the future course of the economy. Moreover, a possible correction in equity prices may be a source of shocks to which monetary policy may have to react. Such an equity market correction may also have negative implications for financial stability. We use a three-stage dividend discount model to see whether analysts' forecasts can explain the level of equity prices over the past ten years. This model is also used to decompose equity returns into changes to earnings, the yield curve and equity risk premia.

Introduction

Recent developments in equity prices have revived interest in equity valuation, on which there is already a large literature. Many models are based on the idea that equity prices represent the present value of the future income to be derived from equities. Thus they analyse equity valuation in terms of the current level and expected growth of dividends together with the rate at which future dividends are discounted, including any allowance for the risks attached to owning equities (the equity risk premium). For many in the private sector, equity valuation is an aid to investment decisions and the focus is on whether equities are in some sense 'fairly' valued. For monetary policy the focus is somewhat different. Monetary policy makers are interested in the factors underlying equity valuations for the light they may shed on the future course of the economy. Expected dividend growth may reflect the market's view of company profitability or the growth of the economy more generally. The equity risk premium is an element in the cost of capital and hence in principle an influence on real investment. Moreover, expected equity returns may affect future consumption through the equity wealth channel. Of course equity markets may be a source of shocks to which monetary policy may have to react. So for monetary policy makers too measures of over or undervaluation may be of interest, as a guide to the risks of possible 'corrections' in equity price levels. For example, the minutes of the May 2000 MPC meeting contain the following statement: 'Whereas the

possibility of a large and disorderly equity price fall remained one of the key risks to the world economy, the equity market had risen so far over the past few years that an orderly correction need not give rise to concerns about the macroeconomic outlook; some correction was welcome, and indeed could usefully contribute to restraining US domestic demand growth.'⁽¹⁾

Equity valuations are also important for financial stability as equity overvaluation increases the risk of a sharp correction, with potential negative implications for the financial system. For example, the June 1999 *Financial Stability Review* comments that: 'Another possibility is that some other development triggers a fall in the equity market, which would be a shock to domestic demand through the effect on household wealth and the cost of capital. Whether these or other possible scenarios have any implications for financial stability turns largely on the extent and duration of any price adjustments, and on the balance sheet strength of market participants.'⁽²⁾

Analysis using the 'dividend discount model' often makes the simplifying assumption that future dividend growth is constant. Earlier Bank work has typically used models of this kind to investigate the combinations of dividend growth, discount rate and equity risk premium needed to account for the level of equity prices actually observed (see, for example, the box on equity market valuations in

(1) Minutes of the Monetary Policy Committee meeting held on 3–4 May 2000.

⁽²⁾ Bank of England Financial Stability Review, The financial stability conjuncture and outlook, June 1999, page 18.

the June 2001 *Financial Stability Review*)⁽¹⁾. The main innovation here is that we do not assume that dividends grow at a constant rate into the future (a one-stage model). Rather we use a three-stage model in which dividend growth is projected over the next few years on the basis of analysts' earnings forecasts, then adjusts in a second period towards the long-run growth which is obtained in the third period (extending into the indefinite future) and which is tied down by equating the rate of return that investors require (cost of equity) with the projected equity return.

The objective of this work is to investigate whether analysts' forecasts are useful in explaining the level of equity prices over the past ten years. We can then derive estimates of equity risk premia by equating the observed values of prices to those derived from the three-stage model. This helps us to decompose equity price movements into changes in earnings, changes in the risk-free rate and changes in the equity risk premium. This can be a useful tool for policy-makers. Although we find that Institutional Brokers Estimate System (IBES) forecasts do help to explain the level of equity prices, any judgment that this level is a fair one depends on how one views the plausibility of the earnings forecasts used within the model.

IBES earnings forecasts

The forecasts used in this work are those published by IBES. They are forecasts of corporate earnings (not dividends) and are consensus forecasts by sell-side analysts of the earnings per share (EPS) growth of an index, sector or company over a specific period of time.⁽²⁾ Here we use the 'long-term' EPS projections over the course of a business cycle, which IBES specifies to be between three to five years. We use them as four-year average EPS growth projections. Analysts' long-term forecasts for the FTSE 100 and S&P 500 indices are shown in Charts 1 and 2 along with their outturns.⁽³⁾ They are usually revised by small amounts and are less cyclical than actual earnings growth. This means that

Chart 1 US IBES earnings forecasts versus outturns







they overpredict actual earnings in downturns and underpredict in upturns of the economic cycle, ie the forecast error is cyclical.

IBES earnings forecasts are criticised for being biased.⁽⁴⁾ This is true for the IBES long-term projections for the S&P 500 and FTSE 100 indices for the periods March 1985 to February 1998 and January 1989 to February 1998 respectively. In particular, both the mean absolute and the mean squared errors were significantly different from zero (the mean absolute error being 5.5% for the S&P 500 and 8.9% for the FTSE 100).⁽⁵⁾

(2) The analysis make their forecasts on a continuing operating basis. IBES receives an analysi's forecast after discontinued operations, extraordinary charges and other non-operating items (one-off or special charges that do not reflect the ongoing business) have been taken out.

(3) Euro-area forecasts are not reported due to the small sample size available.

(4) Work done in the Bank in the past found that IBES aggregate forecasts of earnings per share growth in both the United Kingdom and the United States for the first, second and third year (fixed-event forecasts) are biased (non-zero average error) and inefficient (errors correlated with past information). In particular, they are excessively optimistic during economic downturns and too pessimistic in recoveries. Harris (1999) found also that analysts' long-run earnings forecasts for US companies are biased and inefficient. However, the largest part of analysts' forecasts error is made at the individual firm level and there is increasing accuracy with the level of aggregation.

(5) We also test for weak efficiency, which requires that the forecast error is uncorrelated with the forecast itself. We cannot reject the hypothesis that the forecasts are weakly efficient in both the S&P 500 and FTSE 100 cases (at the 5% significance level). However, the fact that the forecast errors shown in Charts 1 and 2 are cyclical means that they are forecastable, and the hypothesis of strong efficiency (which requires that the forecast error is uncorrelated with the entire information set at the time of the forecast) is likely to be rejected.

⁽¹⁾ Bank of England Financial Stability Review, June 2001, pages 36-37.

However, this could be the result of the small sample, which contains no more than one economic cycle (it contains two downturns and one upturn of the economic cycle). For this reason we use the IBES projections without any adjustment for the bias observed in the available sample.

Equity valuation

As noted above, the fundamental value of an asset can be thought of as the present value of expected cash flows returned to the asset holder. In the basic dividend discount model (DDM) these cash flows are assumed to be the dividend payments. An equity valuation model is therefore given by the following equation:

$$P_t = \frac{D_{t+1}}{1 + R_{t+1}} + \frac{D_{t+2}}{1 + R_{t+2}} + \dots$$
(1)

where P_t is the current equity price, D_{t+k} is the expected dividend payments to shareholders at time t + k, and R_{t+k} is the discount rate or the opportunity cost of holding equity in the period to t + k. The cost of equity is equal to the risk-free rate at the given maturity plus a risk premium that compensates investors for the uncertainty about future cash flows (dividends). In the simple case in which dividends are expected to grow at a constant rate g over the lifetime of the asset, equation (1) becomes:

$$P_t = \frac{D_t \cdot (1+g)}{(ERP+r) - g}$$
(2)

where *ERP* is the equity risk premium and *r* is an expected, constant risk-free rate over the life of the asset. Of the above variables only the current equity price, the risk-free rate and current dividends are observable. The *ERP* and the dividend growth rate *g* are not observable, but we can investigate combinations of *g* and *ERP* that are consistent with the other, observable, variables. In this exercise, however, we generally assume that the *ERP* is constant and equal to 4%, which is close to the average annual excess return over US and UK Treasury bills for the S&P 500 and FTSE 100 indices since the early 1960s.

IBES 'long-term' earnings projections provide some information about the growth of earnings over the next four years. Assuming that the ratio of dividends to earnings (the payout ratio) is constant, the growth of dividends will be equal to the growth of earnings over the first four years. These four years correspond to the first stage of the three-stage model. After the first four years we assume a transition period of eight years in which dividend growth will move towards a long-run rate determined by the long-run equilibrium restriction that the return on equity is equal to the cost of equity, ie ROE = ERP + r. After year twelve (in the maturity stage), growth is assumed constant at the long-run rate. It is easy to show (see the appendix on page 65) that a company earning a return on its equity that is equal to the cost of equity for all periods should have a value equal to the replacement cost of its net assets (book value of equity capital)-this is equivalent to the one-stage model. In the three-stage model that we examine, we allow a company to earn a return on its equity above or below its cost of equity (abnormal or below-normal earnings) for the first twelve years, ie the value of its equity can differ from the book value. The long-run equilibrium restriction in the third stage (from year twelve onwards) means that a company cannot earn abnormal earnings in this stage (maturity stage).

The three stages are shown in Diagram 1. The two blue lines correspond to the three-stage model: the solid line represents a case where the company earns abnormal returns in the first twelve years and therefore is valued above its book value, while the dotted line represents the case where the company earns less than normal returns in the first twelve years and therefore its value is below its book value. The red line corresponds to the case where a company earns normal returns in every period, that is, its equity value is equal to the book value. A company cannot earn abnormal earnings indefinitely, so we should observe equity valuations that fluctuate around the benchmark one-stage model in the long run.

Diagram 1



The choice of the length of the transition period is subjective. A transition period of eight years has been

used in the academic literature⁽¹⁾ and by practitioners.⁽²⁾ However, the results are not very sensitive to changes in the length of the transition period length between six and ten years.

With the assumption of a constant payout ratio *b*, dividend growth in the maturity stage will be equal to:

$$g = ROE \cdot (1 - b) \tag{3}$$

The payout ratio *b* is observable. It is equal to the ratio of current dividends D_t to current earnings E_t ,⁽³⁾ ie

 $b = \frac{D_t}{E_t} \cdot ROE$ is given by the long-run restriction ROE = ERP + r.

The intuition of equation (3) is that the higher the current payout ratio *b*, the lower the fraction of earnings used for investment and the lower the future growth of the company.

In the case of the three-stage model described above, the valuation equation (1) is modified as follows:

$$P_t = \frac{D_t}{(ERP + r) - g} \left[(1 + g) + 8 \cdot (g_{IBES} - g) \right]$$
(4)

where ERP = 4%, $r = \text{long-term real rate},^{(4)}$ $g = ROE \cdot (1 - b) = (ERP + r) \cdot (1 - \frac{D_t}{E_t})$ is the long-run $\frac{D_t}{E_t}$

real growth rate, and g_{IBES} is the real growth rate from IBES forecasts. Equation (4) is a simplified formula for the three-stage model given by Fuller and Hsia (1984).

The value of the S&P 500 and FTSE 100 indices using equation (4) are shown in Charts 3 and 4.

The charts show that the values of the two indices implied by the three-stage model track the observed index values. We can also see the incremental effect of IBES projections on equity valuations above that derived from a one-stage model (growth in every period equal to the long-term growth of the three-stage model), which is a measure of the book value of equity. The contribution of the IBES earnings



Chart 3



projections is significant in explaining the level of equity valuations.

Charts 5 and 6 show the relation between the third-stage growth rate used in the model (equation (3)) and real GDP growth. In the long run we would expect company earnings and dividends at an aggregate level to grow at the same rate as whole-economy income. The two growth rates follow similar patterns consistent with the above view. As the charts show, long-term growth has been close to real GDP in recent years in both the United Kingdom and the United States. It is also less variable than current real GDP growth, since it reflects growth expected in the long run, which is likely to be more stable than current or short-term growth. Indeed

⁽¹⁾ See, for example, Lee, Myers and Swaminathan (1999).

⁽²⁾ See, for example, Reimer, Zanker and Nawroth (2001) or the dividend discount model used by Bloomberg.

⁽³⁾ Earnings and dividends for both the FTSE 100 and S&P 500 indices are calculated from the price/earnings ratios and dividend yields of Datastream.

⁽⁴⁾ In the case of the FTSE 100 the ten-year index-linked zero-coupon yield is used. In the case of the S&P 500 the ten-year nominal benchmark yield is used, reduced by the Philadelphia Fed quarterly long-term (ten-year) inflation expectations. An alternative for the S&P 500 index would be to use index-linked yields from US Treasury inflation-indexed securities (TIPS). However, TIPS have only been traded since 1997 and are relatively illiquid.

Chart 5 Third-stage implied earnings growth rates versus real GDP growth for the United States



Chart 6 Third-stage implied earnings growth rates versus real GDP growth for the United Kingdom



during the current downturn GDP fell faster than the implied long-term growth rate.⁽¹⁾

The factors that drive the valuation of the two indices using the three-stage model described above are:

• **Current earnings:** current dividends have a minimal effect on valuation because the positive effect of higher current dividends is offset by lower long-term growth. This is because a company that pays high dividends today invests less and is expected to grow less in the future. The reduced sensitivity of the valuation to current dividends is a desirable feature of the model as dividends are

often distorted by factors such as share buy-backs and cash-financed mergers/acquisitions/leveraged buyouts etc.⁽²⁾ An increase in current earnings increases the equity value, since earnings are expected to grow from a higher starting level.

- **IBES real earnings projections:** a rise in IBES earnings projections has a positive effect on equity valuations by raising growth in the first stage of the model.
- Yield curve: the long-term real yield is used in equation (4). A rise in the long real yield has a negative effect on the value of the index implied by the model because of the higher discount rate. It also has a positive effect by raising long-term real growth (a rise in the long real rate implies higher economic growth in the future, which has a positive impact on long-term earnings growth). The first effect dominates the second, so a rise in long real rates decreases valuations.
- **Equity risk premium:** this has so far been assumed constant and equal to 4%. But any increase in the equity risk premium would have a negative effect on equity valuations by raising the discount rate.

Charts 3 and 4 use an assumed equity risk premium to give the level of the index consistent with the model. But we can easily use equation (4) in the opposite direction, to find the level of the risk premium that equates the observed level of the index with that produced by the three-stage model (ie the estimated equity risk premium is the residual). This is shown in Chart 7.

It is interesting to note the rises in the equity risk premium in the LTCM crisis and in the period after the March 2000 peak. Also the equity risk premia for the S&P 500 and FTSE 100 indices are highly correlated.

The high correlation between the risk premia in Chart 7 is consistent with the high correlation observed between other measures of corporate risk such as US and UK corporate spreads (see Chart 8).

⁽¹⁾ When calculating the growth rate that is used in the final stage of the model, and is shown in Charts 5 and 6, we use equation (3). This assumes that the current payout ratio prevailing in the market holds through time. However each month the payout ratio is recalculated and we re-estimate equation (3) using the new dividend yield, price/earnings ratio and real rate. This calculation gives us a new third-stage growth rate. It is the variation over time in this growth rate, caused by the monthly recalculation, which is shown in Charts 5 and 6. The cyclicality of the third-stage growth rate results from its dependence on current earnings under the assumption of a constant payout ratio.

⁽²⁾ See Wadhwani (1999).

Chart 7 Implied equity risk premia



Chart 8

Equity risk premia and corporate spreads(a)



Source: Merrill Lynch.

(a) Option-adjusted spread over government yields.

We can also use the three-stage model to decompose equity price movements into changes to the real rate, changes to earnings (current and projected by analysts) and changes to the risk premium (the residual). Chart 9 shows this decomposition for the S&P 500 and

Chart 9 Equity decomposition July 2001 to February 2002



FTSE 100 price changes from July 2001. The equity risk premium made a positive contribution to the value of the two indices as it fell over the corresponding period. We can also see that the risk-free rate made a positive contribution as it also fell. The current level of earnings combined with analysts earnings projections fell over the period, contributing negatively to the valuation of the two indices. Changes in earnings and the real rate were not enough to explain changes in the values of the two indices since last July. Significant changes in the risk premia were needed to explain the observed movements in the indices.

Conclusions

This article suggests that sell-side earnings forecasts help to explain the level of equity prices (though when they are included the explanation is still far from complete). Even though we can explain the level of prices, that does not mean that they are 'fair value' judgment is still required on the plausibility of the forecasts that go into the explanation.

Appendix

The value derived from the one-stage dividend discount model (DDM) can be used to measure the book value of the equity. This is because it assumes that return on equity is equal to the cost of equity for all periods, and abnormal returns on equity are not allowed. We can easily see this by using the framework of clean surplus accounting and the DDM.

The clean surplus equation states that:

$$y_t = y_{t-1} + x_t - \delta_t \tag{A1}$$

where y_t is the book value of the equity, x_t is earnings and δ_t is dividends paid out of earnings. Earnings are determined by return on equity capital, ie $x_t = ROE \cdot y_{t-1}$.

This leads to:

$$y_t = y_{t-1} + ROE \cdot y_{t-1} - \delta_t \Rightarrow \delta_t = (1 + ROE) \cdot y_{t-1} - y_t$$
(A2)

If R_t is the cost of equity at period t, ie the risk-free rate plus the equity risk premium, the value of the equity according to DDM is:

$$S_{t} = \sum_{i=1}^{\infty} (1+R)^{-i} E_{t} \Big[\delta_{t+i} \Big]$$
(A3)

By combining equations (A2) and (A3) we get:

$$S_t = \sum_{i=1}^{\infty} (1+R)^{-i} E_t \Big[(1+ROE) \cdot y_{t+i-1} - y_{t+i} \Big]$$
(A4)

We define abnormal earnings as $x_t^a = (ROE - R) \cdot y_{t-1}$, is returns earned above the cost of equity. Then we can rewrite equation **(A4)** as:

$$S_{t} = y_{t} + \sum_{i=1}^{\infty} (1+R)^{-i} E_{t} \left[x_{t+i}^{a} \right]$$
(A5)

Equation (A5) says that the value of the equity is equal to the equity capital (book value of equity) plus the expected discounted value of future abnormal earnings. When return on equity is equal to the cost of equity in every period, the equity value is simply equal to the book value of the equity.

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On market-based measures of inflation expectations

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Prices of index-linked financial securities provide market-based measures of inflation expectations and attitudes to inflation risk. In the United Kingdom, 'breakeven' inflation rates derived from index-linked and conventional gilts reflect investors' forecasts of future inflation, and also act as a barometer of monetary policy credibility. Implied breakeven inflation rates are a useful alternative to surveys and econometric forecasts, and are regularly presented to the Bank's Monetary Policy Committee to inform its assessment of economic conditions. This paper outlines the technical and institutional factors that complicate the interpretation of UK breakeven inflation rates. Looking at data, we find that inflation expectations have fallen considerably since the adoption of inflation targeting and that UK monetary policy credibility is considerably stronger since the Bank of England was granted operational independence.

Introduction

Inflation-linked financial securities can be used to infer market-based measures of expectations of future inflation and investors' attitudes to inflation risk. Inflation-linked securities are a useful alternative to surveys and econometric forecasts as a source of information on inflation expectations, with the advantages of being forward-looking, timely, and frequently updated for a range of maturities.

This article discusses how inflation-linked securities are used to derive measures of market expectations of future inflation. The first section briefly outlines the history of the price indexation of financial securities, and looks at the UK inflation-linked debt and swap markets. The second section discusses why investors are concerned about inflation, and outlines suggested criteria for choosing a price index in designing an inflation-proof financial security. The third section explains the concept of 'breakeven' inflation rates. Despite technical and institutional complications, discussed in the following section, breakeven inflation rates contain useful information for policy-makers, and are regularly presented to the Bank's Monetary Policy Committee to inform its assessment of economic conditions. To gauge what incremental information can be extracted from breakeven rates, the next section compares the

forecasting performance of breakeven inflation rates with that of Basix inflation surveys. Longer-term breakeven inflation forwards also provide a barometer of monetary policy credibility. We investigate five-year-ahead five-year breakeven forward rates for the United Kingdom since 1985, and find that anti-inflationary credibility is considerably stronger since the Bank was granted operational independence for monetary policy. The last section summarises and concludes.

The UK index-linked gilt market

A brief history of inflation-linked securities

Price indexation of financial contracts is not a new phenomenon. The idea of designing contracts to protect both parties from fluctuations in the price level dates back at least as far as 1780 when the state of Massachusetts issued 'Depreciation Notes' as wages to its soldiers during the American Revolution.⁽¹⁾

There are four main arguments for debt indexation: to remove the uncertainty about the real cost of borrowing and return on lending (an *ex ante* benefit for both issuers and lenders); to deliver cheaper *ex ante* debt funding (benefiting the issuer); to provide an inflation hedge (expanding investors' investment opportunities

⁽¹⁾ The Massachusetts notes had the following terms: 'Both principal and interest to be paid in the then current Money of said State, in a greater or less sum, according as five bushels of corn, sixty-eight pounds and four-seventh parts of a pound of beef, ten pounds of sheeps wool, and sixteen pounds of sole leather shall then cost more or less than one hundred and thirty pounds current money, at the then current prices of the said articles.'

and generating general welfare improvements); and to remove the monetary authorities' incentives to reduce the value of government debt through inflationary measures (benefiting bond investors and the general public).

In countries with high inflation, indexed debt may also improve monetary control (by increasing the flexibility of funding), and provide access to and foster the development of long-term capital markets (though it has also been argued that debt indexation can perpetuate the inflationary process by encouraging inflation-linking of other contracts). Since 1980, however, issues of indexed debt have come largely from relatively low inflation countries: the United Kingdom (1981),⁽¹⁾ Australia (1985), Canada (1991), Sweden (1994), the United States (1997) and France (1998).⁽²⁾

The UK index-linked gilt market

In 1980, the Chancellor of the Exchequer announced the Government's intention to issue index-linked stock. The index chosen was the general index of retail prices (RPI)—the inflation measure already used for uplifting state pensions. The first index-linked gilt was auctioned in March 1981, and, although initially restricted to pensioners and pension funds, by March 1982 access to the index-linked market was open to all investors. Since then the index-linked gilt (ILG) market has grown steadily: by the end of 2001, the inflation-uplifted amount outstanding, at £70.5 billion, was more than 25% of the size of the total outstanding debt stock (£274.9 billion). Turnover is much lower in the index-linked gilt market, however: in 2001 Q4, ILG turnover by transaction value was only £20.4 billion, around 4.2% of total gilt market turnover by gilt-edged market-makers.⁽³⁾ Nevertheless, the UK ILG market is special because of its size and range of maturities. The UK market is second only to the United States in terms of absolute size, though it has the most bonds. This is a great advantage as there are enough ILGs distributed sufficiently evenly along the maturity structure to allow a reasonably well-specified yield curve to be fitted.

Given the advantages of issuing index-linked debt, it is perhaps surprising that the private sector sterling index-linked market has only begun to develop in the past two or three years. The corporate and supranational sterling index-linked bond market is currently only around £6.5 billion (uplifted) nominal value in size. This was partly due to previous tax regimes which discouraged corporate issuance of index-linked securities. But another reason must be that for many private issuers, index-linked debt does not help to match liabilities to corporate earnings. Issuing long-term index-linked debt can make little sense to a company with cost and revenue streams that may not be correlated with general inflation, and could merely increase uncertainty in financial planning. One exception (at least in the United Kingdom) are the various utilities sectors whose earnings are directly linked to the RPI through the price-capping formulae used by UK regulators. Indeed, most of the recent private sector index-linked sterling issues by private non-financial companies have been by water companies, electricity generators and gas distribution companies. The non-gilt index-linked market, however, is not sufficiently developed yet to allow comparisons with same-issuer conventional bonds, from which measures of market inflation expectations might be derived.

The UK inflation swap market

In recent years, investor demand has prompted the development of structured financial derivative products designed to deliver a hedge against price inflation. One of these products is the inflation swap, which is a bilateral contractual agreement requiring one party (the 'inflation payer') to make periodic floating-rate payments linked to the RPI in exchange for predetermined fixed-rate 'coupon' payments on the same notional principal from the 'inflation receiver'. Inflation swap contracts are priced directly from the inflation forward rates implied by conventional and index-linked gilts.

Inflation payers are typically institutions with incomes linked to inflation. Examples include utility companies (whose incomes increase with inflation), private finance initiatives (with government-guaranteed cash flows linked to the RPI), and guaranteed return products (which face higher capital gains taxes on indexed gains when inflation is low). Typical inflation receivers are investors with inflation-linked liabilities, such as pension funds, and investors with liabilities on inflation-protected investment products.

⁽¹⁾ Admittedly not a low-inflation country in 1981.

⁽²⁾ The French Trésor has recently issued a new bond (OATei 3% 25/07/2012) indexed to the eurozone harmonised index

of consumer prices minus tobacco. (3) Source: UK Debt Management Office.

Inflation swaps are generally tailored to the client's particular requirements. Despite being only a fraction of turnover in the index-linked fixed-income market, the use of inflation swaps is growing, and inflation swap activity may enhance the market's liquidity by providing a hedging facility for investors. However, market contacts report that trading is relatively infrequent, and that products are not sufficiently standardised to be able to track and interpret historical prices meaningfully.

Designing inflation-protected debt securities

Why are investors concerned about inflation risk?

Inflation affects the current value of conventional fixed-income securities in two ways. First, *anticipated inflation* determines the expected real value of a fixed nominal income stream. Second, *unanticipated inflation* may further alter the price of a conventional bond—higher-than-anticipated inflation outturns, for example, reduce the real value of a fixed nominal income stream. Hence unanticipated inflation can redistribute wealth between lenders and borrowers. So investors are concerned both about the level and the volatility of price inflation.

We would expect markets to incorporate participants' views of future inflation in prices payable today for conventional fixed-income securities. Investors are ultimately concerned about real returns, and therefore about the likely real value of an asset's payoffs and the risks surrounding those payoffs. For a conventional bond held to maturity, investors will look at the *real yield to maturity*. When the holding period is shorter than the bond's maturity, investors will be interested in *expected real holding period returns*.

If inflation were certain and stable, the nominal yield $(Y_{n,t})$ on a conventional security with a given term of n at time t can be decomposed into a real yield $(R_{n,t})$ and an average inflation component $(\pi_{n,t})$:

$$(1 + Y_{n,t}) = (1 + R_{n,t})(1 + \pi_{n,t})$$

In practice, however, both issuers and purchasers of conventional fixed-income assets are vulnerable to unexpected developments in the general price level. A financial asset that delivers an income stream of known purchasing power may offer a hedge against unpredictable inflation for risk-averse agents, helping to complete the financial markets and generate welfare improvements for both issuers and lenders.⁽¹⁾

Selecting the reference price index

The choice of reference price index is critical in providing issuers and investors with real value certainty. In principle, bonds could be indexed to any of a number of variables, including price indices, commodity prices, foreign currencies or wage or earnings measures. Price (1997) suggests that the selection of a reference index should be guided by a number of criteria (though these are ideal criteria and may not be achieved in practice):

- The reference index should meet the hedging requirements of both issuer and investor, though in practice these are often unlikely to coincide. Governments, for example, may prefer indexing debt to a broad price measure that is closely correlated with taxation and spending schedules, such as the GDP deflator. Retail investors, on the other hand, may wish to purchase protection against consumer price inflation, while institutional investors (such as pension funds) might want to match liabilities to earnings growth.
- The index should be free of measurement bias. Price indices are subject to measurement and sampling errors and periodic reweighting. In the short to medium term, this may cause consumer price indices to be both an inaccurate and a sometimes upwardly biased reflection of the true cost of living. So index-linked bonds might actually (on average) *overprotect* against inflation risk. Of course, if the biases were known and stable, bond prices could be expected to fully discount for the bias, and the distortion could be negligible. But if index measurement biases were unstable, investors might demand higher real yields on index-linked bonds to compensate.
- The reference price index should be understood, recognised and calculated by a body regarded as independent from the issuer (to avoid any possible conflict of interest). The bond prospectus should describe the index, allocate responsibility for its calculation, and detail the frequency and place of publication. The data behind the index should be reliable and transparent. In addition, the index

⁽¹⁾ A market is complete when, for any possible future state of the world, a security can be purchased that will generate a known payoff in that state and nothing in all other states.

should be free from regular revision, and, should such revisions occur, the procedures for dealing with payment calculations should be outlined in the prospectus. The prospectus should also outline provisions for the index ceasing to exist.

The indexation lag should be short.⁽¹⁾ For price-indexed bonds to provide complete real value certainty, all cash flows would have to be corrected for changes in purchasing power right up to the moment at which they were due. In practice, however, unavoidable delays between actual movements in prices and adjustment to bond cash flows distort the inflation-proofing properties of indexed securities. Indexation lags produce a period at the end of a bond's life when there is no inflation-proofing, counterbalanced by a period of equal length prior to issue for which inflation compensation is paid. Since inflation in the two periods is unlikely to be the same, the real return on an indexed bond will not be fully invariant to inflation—the longer the lag and the greater the variability of inflation, the poorer the security's inflation-proofing. Because real rates are then distorted. the information content from index-linked bonds will also be affected, with short and medium-term bonds (which may be of particular interest to the monetary authorities) the worst affected.

In practice, most indexed government bonds have been linked to an index of consumer prices. Consumer price indices reflect price developments faced by many bond investors, are generally well understood, widely disseminated, broadly based, rarely revised, and issued with a short time lag (which is important for pricing and trading in the secondary market).

Calculating real interest rates and breakeven inflation rates

Real and nominal yield curves can be derived from conventional and index-linked bond markets. These nominal and real rates can then be used to calculate implied 'breakeven' inflation rates that provide a guide to market inflation expectations. This section describes how index-linked bonds are used to derive real interest rates, from which breakeven inflation rates can be calculated.

Breakeven inflation rates

If conventional and index-linked bond markets are efficient and arbitraged by investors, such that both markets incorporate the same information about real interest rates, then the difference between nominal and real interest rates should contain information about investors' expectations of future inflation. With perfect foresight and no liquidity premia, the difference between nominal and real rates should be equal to the inflation rate over the same period. In practice, however, these are unrealistic assumptions—interest rates and price inflation can be volatile and unpredictable. So implied inflation forward rates are related to, but are not equal to, investors' expectations of future inflation. Implied inflation rates calculated in this way are better referred to as *breakeven* inflation rates.

Calculating a breakeven inflation spot rate for zero-coupon bonds is straightforward.⁽²⁾ The breakeven inflation zero-coupon rate is the ratio of the zero-coupon yields on two same-maturity conventional and perfectly indexed bonds. Breakeven inflation is the average inflation rate that would have to occur over the life of the bonds for the uplifted index-linked bond to generate the same nominal return to maturity as the conventional bond-hence the term 'breakeven'. Another way to think of breakeven inflation rates, however, is as scaling factors applied to future real payments to transform them into future nominal payments of equal present value. Looking at breakeven inflation rates in this way suggests that for coupon bonds. breakeven inflation rates should be calculated by comparing the yields to redemption on same-coupon, same-maturity index-linked and conventional bonds.

Technical complications

Investors prefer to consume wealth today, rather than in the future. Consequently, (zero-coupon) bonds, which promise wealth in the future, trade at a discount, the discount rate for each maturity being the zero-coupon

⁽¹⁾ The minimum indexation lag is determined by two factors: (1) reporting delays, and (2) the method used for calculating accrued interest payments (essential for trading in the secondary market). The indexation lag on US Treasury inflation-indexed securities (more commonly known as TIPS) and Canadian Real Return Bonds is three months, and accrued interest is calculated by interpolating between the three-month lagged CPI and the two-month lagged CPI value. In the United Kingdom, on the other hand, accrued interest is calculated as a linear interpolation to the next coupon payment (which must therefore be known in advance). Consequently, an eight-month lag is required: two months for reporting delays, and six months to calculate the next semi-annual coupon.

⁽²⁾ A 'zero-coupon' or 'pure discount' bond is a bond that has only one cash flow—the face value (by convention £100) which is paid at maturity. There are no intermediate cash flows (coupons). Prior to maturity, zero-coupon bonds trade at a discount to face value.

or 'spot' rates. Taken together, spot rates contain implicit forward rates—today's terms for the lending of funds between two dates in the future.⁽¹⁾

The *expectations hypothesis* of the term structure states that in a world with perfect foresight, expected rates of return on different maturity bonds are equalised only when all forward rates equal expected short-term interest rates. Combined with the *efficient market hypothesis* which has several forms, all of which require investors to use information efficiently—the pure expectations hypothesis states that market forward rates provide the best forecast of future spot rates.

Of course, in reality, investors do not have perfect foresight. But in a complete and efficient market without distortions, breakeven inflation forward rates should be determined by three factors: (i) inflation expectations; (ii) the convexity adjustments present in conventional and index-linked bonds; and (iii) inflation risk premia. This section considers how convexity biases and risk premia drive a wedge between breakeven inflation forward rates and true inflation expectations.

The convexity adjustment

Interest rate compounding means that bond prices respond asymmetrically to changes in yield—bond prices are more sensitive to reductions in yield than to increases in yield.⁽²⁾ In other words, bond prices are a convex function of yield. This combination of bond convexity and interest rate volatility raises bond prices, which pushes down forward rates. This effect is known as the convexity bias, and it grows with maturity (as compounding increases) and can vary across time (as yield volatilities change).

Differences in convexity bias between index-linked and conventional bonds mean that breakeven inflation

forward rates may differ from actual inflation expectations. For example, if the convexity adjustment for the nominal forward curve was greater than for the real forward curve, perhaps because inflation uncertainty was adding to the volatility of nominal rates, then the net convexity adjustment could be expected to bias long-term breakeven inflation forward rates below actual expectations.

The inflation risk premium

The return to maturity on a conventional bond is fixed in nominal terms, but is uncertain in real terms because of inflation. Investors are interested ultimately in real returns, so may be willing to pay a premium for a security that provides real value certainty. The inflation risk premium will depend on how inflation (and hence the real returns on a conventional bond) varies with the discount factor that the market applies to real wealth in future states of the world. As with the convexity bias, these inflation risk premia may vary over time and maturity.

Fitting breakeven inflation rates

The United Kingdom has a sufficient number of index-linked government bonds to be able to fit a real yield curve.⁽³⁾ When combined with a nominal yield curve, one can derive breakeven inflation yields. But the breakeven rates obtained will be influenced by the choice of curve-fitting technique, and the differences between techniques will be most pronounced when there are relatively few bond price data.

The Bank aims to use a curve-fitting technique that delivers a relatively *smooth* yield curve, since the aim is to estimate market expectations for monetary policy purposes rather than to fit prices precisely. The ideal technique should also be sufficiently *flexible* to capture movements in, and key features of, the underlying term

(1) If z(t) and z(T) are the annualised zero-coupon rates for t and T years maturity (where t < T), then the annualised forward rate at time 0 for lending between t and T is given by:</p>

$$f\left(0,t,T\right) = \left(\frac{\left(1+z\left(T\right)\right)^{T}}{\left(1+z\left(t\right)\right)^{t}}\right)^{\frac{1}{T-t}} - 1.$$

(2) For example, consider a ten-year zero-coupon bond with face value £100 and initial zero-coupon yield 5%. Its current price is £61.39—since the price at time *t* of a zero-coupon bond maturing at *T* with annually compounded yield, $y_{t,T}$ is $P_{t,T} = 1/(1 + y_{t,T})^{T \cdot t}$. Now consider the effect of a 1 percentage point change in yield. If yield rises to 6%, the bond price falls to £55.84 (down £5.55). If yield falls to 4%, the bond price increases to £67.55 (up £6.17). So bond prices are more sensitive to falls in yield than to increases in yield, and will therefore rise as yield volatility increases.

(3) Apart from the UK Treasury, no other major government issuer currently has a sufficient number of outstanding index-linked bonds to permit estimation of a well-specified real yield curve. So for most countries it is not possible to estimate spot or forward breakeven inflation rates, and one is limited to calculating crude breakeven inflation yields from differences in redemption yields on particular conventional and index-linked bonds. However, when comparing index-linked and conventional gilts with similar coupon rates and maturities, this crude approach usually generates breakeven inflation yields that are very close to estimates derived from the difference between fitted real and nominal yields.
structure. Also the yield curves produced should be *stable*, in the sense that fitted yields at one maturity should be robust to small changes in bond data at another maturity. The Bank currently fits yield curves using both smoothed cubic spline (Anderson and Sleath (1999)) and parametric (Svensson (1995)) approaches.⁽¹⁾

Institutional distortions to breakeven inflation rates

In theory, breakeven inflation rates derived from conventional and index-linked government bonds should reflect rational expectations of future inflation plus an adjustment for inflation convexity biases and risk premia. Under certain conditions, however, the breakeven inflation rates can be distorted. The first of these is the way differences in tax treatment between conventional and index-linked bonds may affect relative prices. The second is institutional factors, which may create price-inelastic demand for gilts. In practice, these technical complications and distortions may limit the usefulness of breakeven inflation rates as a measure of inflation expectations.

Taxation

Investors are concerned about real net-of-tax cash flows. so differences in tax treatment between conventional and index-linked bonds could influence relative prices, and therefore breakeven inflation rates. Tax authorities have to decide whether income and capital gains taxes should be applied to nominal or real cash flows-in other words, whether taxes should be levied on the inflation uplift for coupon and principal payments. However, since real value certainty is the most important characteristic of indexed bonds, a tax system that taxes the inflation uplift in effect reintroduces inflation risk. Under such a system, even if pre-tax real yields remained constant, an increase in inflation that raised the nominal yield on indexed bonds would increase the tax liability and lower the post-tax real yield. In the United Kingdom, the inflation uplift on the principal is considered a capital gain (and is not taxed). But the uplift on coupon payments is treated as income, and taxed accordingly. The implication is that the post-tax real returns on index-linked gilts are not entirely protected from erosion by high inflation, and this will be reflected in prices.

The variety of possible investor tax profiles also complicates the calculation of post-tax yields and breakeven inflation rates for the 'representative' marginal investor. In the United Kingdom, conventional and index-linked gilt stocks are mostly held by largely tax-exempt institutional investors. So if we assume these investors to be the marginal purchasers of gilts, then it is not unreasonable to set aside tax considerations when looking at implied breakeven rates—at least in the United Kingdom.

Other institutional considerations

UK life assurance and pension funds (LAPFs) are estimated to hold a high proportion of the outstanding gilt stock—perhaps more than a half. So the portfolio allocation decisions of these institutions could have significant effects on gilt prices. In the United Kingdom, there are a number of factors that may have helped to generate price-inelastic demand for gilts from LAPFs. In particular, pension funds have raised their holdings of gilts in response to: (i) ageing of the UK population; (ii) the introduction of Minimum Funding Requirement legislation; (iii) the need to hedge old policies with (previously unhedged) guaranteed annuity rates; and (iv) the practice of appraising pension fund and bond portfolio managers' performance against either industry peer group or gilt yield benchmarks, thereby providing an incentive to hold gilts.

In 1997, government legislation came into force designed to ensure that defined benefit pension funds would protect fund members in the event of the employer becoming insolvent. The Minimum Funding Requirement (MFR) was designed to ensure that a scheme would have sufficient assets to be able fully to protect pensions already in payment, and to provide younger members with a transfer value that would give them a reasonable expectation of replicating scheme benefits if they transferred to another pension scheme.

The MFR values a fund's assets at current prices by marking-to-market. However, to ensure that defined benefit schemes hold sufficient assets to meet their liabilities, the MFR applies a set of liability valuation rules linked to yields on a set of gilt indices.⁽²⁾ Although not actually requiring pension funds to purchase gilts,

⁽¹⁾ For a full description of the Bank of England's yield curve fitting techniques, see Anderson and Sleath (1999) and Deacon and Derry (1994).

⁽²⁾ In March 2001, the Chancellor of the Exchequer announced that the MFR would be replaced when new legislation could be formulated and passed through Parliament. Note, however, that by June 2003 a new financial reporting standard (FRS17) will come into force. FRS17 will show pension fund net assets or liabilities as an item in the balance sheet of the employer company, and will value defined benefit pension scheme liabilities using the prevailing yield on an AA-rated corporate bond of appropriate maturity.

legislation that requires the use of 15-year conventional gilt and 5-year index-linked gilt indices as discount factors for valuing liabilities also generates strong incentives for defined benefit pension funds to hold these gilts on the asset side. Matching assets and liabilities in this way, by making the same discount rates common to both, reduces the likelihood that fluctuations in financial prices will result in the fund becoming underfunded. Furthermore, work at the Bank has found evidence that the widespread use of FTSE gilt indices can also prompt gilt prices to respond to changes in the composition of the index. By influencing the demand for gilts in this way, it is possible that the MFR and the use of FTSE gilt indices may have distorted (and may continue to distort) implied breakeven inflation rates at certain points along the yield curve.

The distortionary impact of price-inelastic demand from the pension fund industry has arguably been aggravated by concerns, in recent years, about the outlook for future new supply and the outstanding stock of government debt. In the United Kingdom, net debt issuance as a percentage of GDP has been shrinking since 1996 Q1, and has been negative since 1997. A diminishing supply of UK government debt, together with a shortage of alternative high-quality long-dated fixed-income sterling securities (such as supranational or high-grade corporate paper) and a strong inelastic-demand from institutional investors may have driven prices out of line with economic fundamentals.

An indication of the impact of institutional factors may be obtained from: (i) comparisons of common currency borrowing rates on government bonds, (ii) comparisons of breakeven inflation rates in different countries, and (iii) breakeven inflation forward curve profiles for sterling.

Using interest rate and currency swaps, it is possible to calculate and compare the common currency costs of borrowing for government bond issuers. For example, on 1 December 1999, the UK Treasury 9% 06/08/2012 gilt could be swapped into a bond paying sterling (GBP) 6-month Libor minus 103 basis points. The French government OAT 8.5% 26/12/2012 bond, on the other hand, could be swapped into GBP 6-month Libor minus 48 basis points. This difference in spreads to GBP 6-month Libor meant that HM Treasury was effectively able to borrow some 55 basis points more

cheaply than the French Trésor. Since both issuers are almost identical in terms of credit quality, this difference must have reflected institutional factors, including MFR legislation. But note that relative funding costs also change over time—by February 2002 both the gilt and OAT swap spreads to GBP Libor had narrowed considerably, and the United Kingdom's funding cost advantage had shrunk to around 18 basis points. To the extent that institutional factors have asymmetric effects on the conventional and index-linked markets, one might see an impact on breakeven inflation rates.

Chart 1 provides an international comparison of breakeven inflation rates on selected index-linked government bonds from 1994 to 2001. Given the small absolute size of the differentials, the sterling breakeven inflation yield for the 2011 index-linked gilt was not obviously out of line with breakeven rates for other economies at similar maturities. Furthermore, any divergence could be attributed to economic fundamentals and investor preferences rather than to institutional distortions.

Chart 1 International breakeven inflation yields

- GBP Conv. 6.25% 25/10/2010 - GBP Link 2.5% 23/08/2011 USD Conv. 6.25% 15/02/2007 - USD Link 3.375% 15/01/2007 FRF Conv. 4% 25/04/2009 - FRF Link 3% 25/07/2009 CAD Conv. 8% 06/01/2023 - CAD Link 4.25% 12/01/2021 Per cent _ 5.0 - 4.5 -4.0- 3.5 - 3.0 -2.5- 2.0 1.5 - 1.0 - 0.5 0.0 Feb 95 Mar May 98 July Sept Apr 97 June 1994 96 99 2000 01 Source: Bloomberg

However, it is also worth looking at the profile of breakeven inflation forward curves. During the period covered by the MFR, one might expect to see conventional gilts at and around 15 years' maturity trading at relatively expensive levels, driving down nominal spot and forward rates. At the same time, one might also observe episodes with price discontinuities between index-linked gilts either side of the 5-year maturity mark, translating into 'humped' real forward curves. So nominal and real interest rate and breakeven inflation forward profiles such as for 20 December 1999 (see Chart 2) suggest that the MFR was affecting the conventional and index-linked markets.

Chart 2 raises the question of whether investors could really have had sufficient information to foresee inflation following the path indicated. Can we really believe that investors anticipated inflation 15 years ahead to be lower than in 25 years' time? Arguably, breakeven inflation forward curves such as the one shown in Chart 2, taken during a period of low and stable inflation, are difficult to reconcile with investor rationality. More likely, inflation forward profiles such as that for 20 December 1999 reflect the various distortions in the gilt markets, and provide a salutary lesson for those wishing to extract inflation expectations from breakeven inflation rates. The reality is that it is difficult to isolate and quantify the distortions that can affect breakeven inflation rates.





Note: Breakeven inflation, nominal and real one-year forward curves are calculated using the Bank of England's variable roughness penalty spline-based technique (see Anderson and Sleath (1999, 2001)).

Extracting information from breakeven inflation rates

Breakeven inflation rates as forecasts of inflation

Breakeven inflation rates are useful in providing an indication of investors' views of the longer-term inflation outlook that is unavailable elsewhere. But monetary policy makers are also interested in inflation over the short-to-medium term. So it is interesting to compare the forecasting performance of breakeven inflation rates with survey-based measures of inflation expectations.

Breakeven inflation rates can be compared with the Barclays Basix survey of expectations for RPI inflation over the next two years.⁽¹⁾ The survey samples a number of groups, including business economists, investment analysts, academic economists, trade union secretaries and the general public. For this study, we consider only the measure that excludes the general public.⁽²⁾

Chart 3 plots the actual (monthly) RPI inflation outturn for the past two years against the zero-coupon breakeven inflation rates and (quarterly) Basix survey inflation forecasts made for those two years. The chart shows a number of interesting features: first, both the survey and breakeven series underpredicted actual RPI inflation outturns during 1989-91 but generally overpredicted inflation after 1991. Second, the two-year breakeven inflation rate tracks two-year-ahead RPI inflation better than survey forecasts. Third, breakeven inflation and survey forecasts have both been falling since 1990, though the adjustment process appears to have been lagged (and slow) compared with actual RPI inflation.⁽³⁾ Fourth, two-year spot breakeven inflation and survey rates have differed, often quite considerably, during the sample period. Fifth, revisions to survey expectations have been less volatile than those of breakeven inflation rates.

Chart 3

Breakeven inflation and Basix survey two-year spot rates against RPI two-year inflation outturns



⁽²⁾ Two-year breakeven inflation zero-coupon rates are calculated by the Bank of England (see Anderson and Sleath (2001) and Deacon and Derry (1998)).
(3) The two-year spline-based breakeven inflation series is broken due to occasional absence of sufficiently short index-linked bonds.

⁽¹⁾ Comparisons at shorter-maturity horizons are not possible because the absence of bond data points makes the real yield curve too unreliable at less than two years.

⁽²⁾ We exclude the general public survey figures because of their consistent positive bias.

⁽³⁾ This apparent delay in the forecast error correction process is consistent with an overlapping forecast horizon problem.

An important feature of the data is the possible structural break in the differential between the breakeven and survey inflation series-this is shown in Chart 4. The difference between surveys of two-year inflation expectations and the breakeven inflation rate implied from bond prices can be used as a proxy for the inflation risk premium. Prior to 1992 Q3, breakeven inflation rates were consistently above survey expectations (on average by 1.89 percentage points). After this date, however, this differential became negative, though smaller in absolute size (on average -0.42 percentage points), as survey respondents raised their forecasts of two-year inflation after 1992 Q3. This apparent structural break roughly coincides with sterling's exit from the European Exchange Rate Mechanism (ERM).

Chart 4

Difference between two-year breakeven and survey-based inflation expectations



Note: The differential is the two-year breakeven spot rate minus the (quarterly) two-year spot Basix survey (excluding general public).

This break in the breakeven/survey differential series also poses a puzzle, since sterling's ejection from the ERM and the associated loss of policy credibility would have been expected to drive up the inflation risk premium, and so to have widened rather than narrowed the differential, at least until the inflation-targeting framework had become established. An alternative explanation is that the United Kingdom's abandonment of exchange rate targeting in favour of an inflation-targeting policy could have been expected to lower short-term inflation volatility, and therefore to reduce immediately the short-term inflation risk premium. This argument allows for a simultaneous fall in the short-term inflation risk premium and a reduction in long-term policy credibility.

Although short-term breakeven inflation rates are not perfect forecasts of inflation (due to time-varying inflation risk premia and lags in error correction), our analysis does indicate that breakeven inflation rates are better than Basix surveys in terms of forecasting performance, and may therefore be a useful source of information on short-term inflation expectations for policy-makers.

Breakeven inflation rates as a measure of central bank credibility

Investors' longer-term expectations of inflation depend on their confidence in the ability and determination of the monetary authorities to control inflation. Breakeven inflation rates may not be easily decomposed into inflation expectations and inflation risk premia, but these components are linked to investors' views and preferences about the level and volatility of future inflation. As King (1995) notes, 'both the government and private sector have subjective distributions over the possible outturns for inflation at any future date. Credibility is a measure of how close are these two distributions'. The private sector's distribution can be summarised by its mean-the expected inflation rateand the spread of possible outturns around the mean, as proxied by the inflation risk premium. Since breakeven inflation rates capture both of these components, they are a potentially useful indicator of anti-inflationary credibility.

Forward inflation rates are more informative than spot rates of inflation as an indication of monetary conditions, as they allow policy-makers to assess both the expected average rate of inflation and its evolution over time. Implied breakeven forward rates can be used to assess the impact of monetary policy on inflation credibility. To illustrate this, Chart 5 presents annualised breakeven inflation five-year forwards five years ahead since 1985. It is interesting to compare these forward rates with the Consensus economists' expectations of five-year annualised inflation five years ahead. The chart illustrates the impact of two major developments in monetary policy over the period: the United Kingdom's exit from the ERM in September 1992, and the establishment of the RPIX inflation target soon after, followed by the Government's concession of operational independence to the Bank of England and the formation of the Monetary Policy Committee framework in May 1997.

The breakeven inflation forward rates clearly indicate that the United Kingdom's exit from the ERM in 1992 had a dramatic impact on market confidence, driving up breakeven forwards by 125 basis points. This indicates

Chart 5 Long-term breakeven inflation forwards and Consensus expectations



Note: Breakeven inflation forward rates are derived using the Bank of England's variable roughness penalty spline-based technique (see Anderson and Sleath (1999, 2001)).

that the loss of the ERM's external discipline on policy had a serious negative impact on the credibility of UK monetary policy in the financial markets. Although the new inflation-targeting policy became established in late 1992 and early 1993 and economists began gradually to revise downwards Consensus long-term forecasts of RPI inflation, one can see that there continued to be a significant differential between the breakeven forward rates and Consensus forecasts for a number of years. This suggests that although the exchange rate target had been replaced with an inflation target, and the policy process been made more transparent and accountable through the publication of a regular Inflation Report by the Bank of England, there was still some 'doubt [about] the United Kingdom's willingness to remove operational decisions on interest rates from the political arena' (King (1999)). In other words, the gap between Consensus forecasts and breakeven inflation forwards was probably pointing to an inflation risk premium stemming from a policy credibility shortfall.

In May 1997, the Chancellor of the Exchequer declared that the Bank of England would be granted operational independence for the conduct of monetary policy, with a clear remit to achieve, on average, 2.5% RPIX inflation. Looking at movements in conventional and index-linked gilt prices, one finds that breakeven inflation forwards fell by 50 basis points at ten years' maturity on the day of the announcement, and by even more thereafter.⁽¹⁾ But credibility generally takes longer to establish than it

does to lose, and as the Chancellor, Gordon Brown, stated at the time, 'the ultimate judgement of the success of this measure will not come next week, or indeed in the next year, but in the long term.' Since May 1997, the gap between long-term breakeven inflation forwards and long-term inflation expectations has narrowed considerably. Indeed, breakeven inflation five-year forwards five years ahead have fallen by around 180 basis points, and are currently close to both the Government's 2.5% RPIX inflation target and Consensus RPI inflation forecasts.

Summary and conclusions

This paper has outlined how inflation-linked securities can be used to infer market-based expectations of future inflation. Inflation-linked securities provide an alternative source of information on inflation expectations to surveys and econometric forecasting approaches, with the advantages of being available for a wide range of maturities, entirely forward-looking, timely, and updated every working day.

In the United Kingdom, market inflation expectations can be derived from a comparison of conventional and index-linked gilt prices or (with difficulty) directly from inflation swaps. By fitting real and nominal yield curves to conventional and index-linked gilts, it is possible to infer zero-coupon and forward breakeven inflation rates. These breakeven inflation rates contain information about inflation expectations, though to extract this information one has to allow for both technical complications and the possibility of institutional distortions.

Due to the near-continuous nature of gilt trading activity, breakeven inflation rates can provide policy-makers with an immediate verdict on the market's view of the impact of economic news on the anticipated path of future inflation, and investors' attitudes to inflation risk. To gauge what incremental, policy-relevant information can, in practice, be gained from a comparison of index-linked and conventional gilt prices, we compared the two-year breakeven inflation rates with two-year Basix inflation surveys. Our results indicate that, despite the possible influence of risk premia and institutional distortions, two-year breakeven inflation rates do provide information additional to that already contained in surveys of inflation expectations. Longer-term breakeven inflation rates, meanwhile,

See King (1999). This speech may be found on the Bank's web site at www.bankofengland.co.uk/speeches/speech41.pdf

provide a barometer of inflation credibility. It is interesting, for example, to compare the immediate (negative) impact of September 1992 on UK monetary policy credibility in long-term breakeven forward rates with the gradual gains in credibility accumulated since Bank of England independence.

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Equity wealth and consumption—the experience of Germany, France and Italy in an international context

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Consumption in Germany, France and Italy (the EU3) has generally been thought to be less responsive to wealth effects than in the United Kingdom or the United States. The aim of this article is to assess the evidence for changes in the responsiveness of EU3 consumption to changes in equity prices, given the rapid increase in share prices in recent years and the rising share of financial assets held in equities during the 1990s.

Introduction

The sharp rise in global equity prices during the 1990s (see Chart 1) and wider share ownership in a number of countries may have altered the way in which aggregate consumption reacts to fluctuations in both wealth and income. These developments may have contributed in a number of countries to the strength of consumption through a wealth effect,⁽¹⁾ yet such a wealth effect has been less evident in the EU3 than in the United States, where share ownership is relatively wide. A number of macroeconometric models⁽²⁾ suggest that a 20% fall in global equity prices would lower US GDP within a year by between 0.4 and 1.0 percentage points relative to a baseline simulation. This compares with a range of 0.2 to 0.4 percentage points for countries in the euro area.⁽³⁾

The model simulations noted above tend to reflect historical relationships between economic variables, but they may not fully capture recent developments. Nor do they identify the determinants of cross-country differences. In this article we assess how the relationship between consumption, wealth and income varies across countries and over time. The determinants of the relationship can usefully be examined by noting that the elasticity of consumption with respect to changes in financial wealth is the product of the ratio of wealth to consumption and the marginal propensity to consume from financial wealth. Trends in the wealth to consumption ratio are easily observable and below we interpret movements in various components of financial and in particular equity wealth. Less readily available are time series data on the demographic factors that theory predicts may affect the marginal propensity to





consume from income and wealth. Nevertheless we present such data for a limited time span in the 1990s as they may help to explain cross-country variation in our derived estimates of the marginal propensity to consume.

See, for example, Poterba (2000). We acknowledge that other aspects of wealth, such as housing wealth, may also be important in explaining consumption in some countries, but tracking such developments is beyond the scope of this article.

⁽²⁾ Such as those developed by the National Institute of Economic and Social Research (NIESR), or the Organisation for Economic Co-operation and Development (OECD). For details of specific simulations, the results of which are referred to here, see Boone, Giorno and Richardson (1998) and Barrell, Pain, te Velde, Holland and Hubert (1999).

⁽³⁾ Extending these simulations to a two-year horizon reduces GDP to 1.0 percentage point lower than baseline for the United States in year two, compared with 0.4 to 0.6 percentage points lower than baseline for euro-area countries.

Equities and wealth

The share of equities in EU3 households' financial assets increased in the 1990s as a result of both valuation gains from the sharp rise in equity prices and net purchases of equities. The latter may reflect substantial privatisation programmes in these countries. But the prolonged increase in equity prices over the 1990s may also have fostered increasing investment in mutual funds.

The sharpest increases in stock market capitalisation were in Italy and France (see Table A), albeit from a very low base. In Italy market capitalisation as a percentage of GDP increased approximately sixfold between 1991 and 2000, and in France it almost quadrupled. French stock market capitalisation did not fully catch up with that of the United States over the period, but did increase from 41% of US levels in 1991 to 72% in 2000. In spite of market capitalisation almost trebling in Germany, the level in Germany and Italy remains much lower than in France, the United Kingdom or the United States.

Table A Stock market capitalisation as a percentage of GDP

	France	Germany	Italy	United States	United Kingdom
1991	28.1	20.2	12.7	68.5	89.9
2000	110.5	58.4	70.8	154.1	185.6

Notes: Excludes investment funds. US data include NYSE, Nasdaq and AMEX.

Sources: International Federation of Stock Exchanges (FIBV) and IMF International Financial Statistics.

Data on household holdings of equity wealth as a percentage of financial assets, shown in Table B, are consistent with trends in stock market capitalisation. The share of directly held equity in financial assets has risen more quickly in Germany and Italy than in the United Kingdom and the United States (see Table B).⁽¹⁾ Households' equity holdings appear to be particularly large in France and Italy, accounting for more than 40% of financial assets in 1999/2000, compared with about 20% in the United Kingdom and 28% in the United States. But in France, for example, these holdings contain a large proportion of unquoted equity, which may be less liquid and more difficult for households to quantify with precision.⁽²⁾ In the EU3, there are no large-scale private pension schemes to supplement the state pension system.⁽³⁾ By contrast, households in the United Kingdom and the United States also own equity in the form of private pension plans. The inclusion of such data would indicate that households in these countries hold a markedly greater proportion of wealth in equities relative to the EU3 average. As with unquoted equity, however, it is possible that changes in the value of these pension plans may (similarly) feed less directly into consumption. This view is supported by Thaler (1990) and Poterba (2000), who suggest that consumers may keep 'mental accounts' of assets that are earmarked for a specific purpose. Assets held in private pension plans, for example, may be considered to be 'long-term assets', set aside to provide for consumption later in life.⁽⁴⁾

Table B Equity holdings of households and non-profit institutions serving households

Percentage of financial assets

	1991	1993	1995	1997	1999	2000
Germany All direct equity (excluding unquoted	10.9	11.9	11.8	15.3	20.5	19.5
shares)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
France (a) All direct equity (excluding unquoted	44.5	46.0	34.1	37.7	46.7	45.8
shares)	30.0	29.4	22.9	22.0	22.8	22.8
Italy (a) All direct equity (excluding unquoted	20.6	20.8	17.2	25.4	43.3	n.a.
shares)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
United Kingdom All direct equity (excluding unquoted	17.7	19.1	19.4	21.6	22.8	23.0(b)
shares) Memo item	12.0	13.1	13.9	15.5	15.8	15.8(b)
All direct and indirect equity (excluding unquoted	48.9	54.7	54.4	55.4	62.8	60.7(b)
shares)	45.4	51.3	51.3	52.0	59.4	57.1 (b)
United States All direct equity (excluding unquoted	16.9	19.9	22.2	27.4	32.9	27.7
shares)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Memo item All direct and indirect equity (excluding unquoted	26.6	30.9	35.2	42.7	49.1	44.0
shares)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

n.a. = not available.

Notes: Direct equity comprises shares and other equity, including quoted, unquoted and mutual fund shares. Indirect equity comprises equity pension assets.

Sources: Deutsche Bundesbank, Deutsches Aktieninstitut, Banque de France, National Statistics, OECD, and Federal Reserve Board.

(a) In Italy and France, there is a break in the data between 1993 and 1995 because of reclassifications.

- (b) 2000 Q2.
- (1) In the United Kingdom, direct holdings are normally defined to include mutual fund shares. This is different from the usual definition used in the United States, where mutual fund shares tend to be classified as indirect holdings. Table B follows the convention used in the United Kingdom, and where necessary adjusts the data of other countries accordingly.
- (2) Because the precise value of unquoted equity is difficult to ascertain, these data have in some countries been revised strongly in the past. Therefore, where available, Table B shows data excluding unquoted equity from both the denominator and the numerator of the equity to financial assets ratio.
- (3) In early 2001 the German Government proposed a pensions reform initiative along these lines.
- (4) The empirical results in Byrne and Davis (2001) run against conventional results, in suggesting that illiquid financial wealth, including pension funds, tends to be a more significant long-run determinant of consumption than more liquid forms of financial wealth.

In summary, and notwithstanding data limitations, the data presented in Tables A and B show that both stock market capitalisation as a percentage of GDP and the share of households' financial wealth held in equities is markedly lower in Germany than in the other EU3 economies. In turn, market capitalisation is lower in France and Italy than in the United Kingdom and the United States.

Wealth and consumption

The distribution of equity and other wealth may affect the marginal propensity to consume out of both equity wealth and income. The life-cycle/permanent income hypothesis (PIH) postulates that households will maximise lifetime utility by smoothing consumption of their expected lifetime resources (income and wealth) across all periods of their lifetime.⁽¹⁾ If households regard equity price changes as leading to a change to their lifetime resources, they will 're-optimise' their consumption path and hence adjust consumption over their remaining lifetime. The response of a household's current consumption to a change in lifetime resources depends on the marginal propensity to consume. In the simplest form of the PIH,⁽²⁾ the marginal propensity to consume is the same for everybody.

There are various reasons why the simplest form of the PIH may not hold and why marginal propensities to consume may differ across households. For example, the response of consumption to unanticipated equity price changes may differ according to income or age group, since an increase in wealth among low-income households may be more likely to ease any liquidity constraints they are facing on their borrowing.⁽³⁾ Thus, because the economy-wide marginal propensity to consume is roughly the average of the marginal propensities of all households in the economy, the response of consumption to a change in both income and equity prices is likely to depend on the distribution of equity wealth across households. The next section considers why differences in the distribution of equity wealth across countries may affect both the marginal propensity to consume of each group out of

income, and their marginal propensity to consume out of wealth.

Equity wealth and income distributions

Tables C, D and E show data relating to the distribution of wealth across income and age groups. The data relate to wealth held in equities and in bank accounts, so come with the proviso that these are not an exhaustive description of wealth.

Table C shows equity holdings across different income groups in the mid to late 1990s and (for Germany and France) in 2000. Data are grouped by different income brackets for each country and the definition of equities may be broader in the United Kingdom relative to other countries; so it is difficult to establish exact comparisons between the five countries. The overall totals in the final column reveal that a relatively small percentage of EU3 citizens owns shares; in contrast there is wider share ownership in the United Kingdom, a function of active privatisation programmes, and in the United States, where 401 (k) schemes have increased shareholdings.⁽⁴⁾

Below we assess how the distribution of equity holdings may affect the marginal propensity to consume from each of income and wealth. To the extent that the marginal propensity to consume out of income is higher in cohorts facing liquidity constraints, then, other things being equal, excluding the wealthiest cohorts (proxied by the 25% of highest-income earners in each country) may reveal more about the likely impact of liquidity constraints than considering all income groups for each country as a whole. Table C confirms that these high-income earners are much more likely to own equity shares. Aggregating the most recent data for the low and middle-income earners representing the lower 75% of income distribution in each country shows that only 3.1% of these low and middle-income earners own equity shares in Italy.⁽⁵⁾ The figures for the other countries are: Germany 6.8%, France 10.4%, United States 13.1% and United Kingdom 19.1%. As low and middle-income households are much less likely to hold

⁽¹⁾ For an overview of consumption theory see Deaton (1992), Muellbauer (1994) and Attanasio (1999). For an

introduction to the life-cycle/permanent income hypothesis see (amongst others) Banks and Tanner (1999). (2) The simplest form of the PIH is characterised by perfect capital markets and the absence of uncertainty, and assumes

that agents are infinitely lived. (If agents care for their offspring as they care about themselves, they will behave as if they were infinitely lived—see Barro (1974).)

⁽³⁾ Blundell, Browning and Meghir (1994), Attanasio (1995), Merrigan and Normandin (1996) and Attanasio, Banks, Meghir and Weber (1999) all (indirectly) point to theory and evidence for various other disaggregations that may result in different marginal propensities to consume—for example, households with different educational attainments, comprising different numbers of income earners, etc.

⁽⁴⁾ A 401(k) plan allows employees to save and invest for their own retirement.

⁽⁵⁾ To make such analysis possible we need to make an assumption about the distribution of share ownership within the different categories. Here we assume it is linearly distributed, though our results are not particularly sensitive to other assumptions regarding the distribution.

Table C						
Percentage	of	equity	holders,	by	income	group

Germany (a) Income group (€) (b)	Percentage of population	1997	2000
<1,300	21.1	1.7	3.0
1,300-2,050	29.4	3.9	5.8
2,050-3,050	33.1	8.3	11.4
3,050-4,100	9.8	14.6	20.4
>4,100	6.6	18.7	25.9
Total	100.0	6.2	9.8
France Income group (€) (b)	Percentage of population (c)	1997	2000
<1,500	32.3	6.1	7.4
1,500-2,300	32.2	10.1	11.2
2,300-3,050	18.3	15.5	14.3
3,050-3,800	8.4	19.1	21.1
>3,800	8.5	32.6	31.4
Total	100.0	12.0	12.7
Italy Income group (€) (b)	Percentage of population	1995	1998
<850	17.6	0.2	0.6
850-1,700	33.4	2.0	2.4
1,700-2,600	22.9	5.0	5.7
2,600-3,450	13.5	10.3	11.9
>3,450	12.6	21.7	31.7
Total	100.0	5.0	7.8
United Kingdom (d) Income group (e)	Percentage of population	1993	1996
Lowest quartile	25.0	8.2	13.4
Middle-lower quartile	25.0	14.8	15.6
Middle-upper quartile	25.0	27.0	26.5
Highest quartile	25.0	41.3	37.9
Total	100.0	22.8	23.3
United States Income group (US\$) (b)	Percentage of population	1995	1998
<850	12.6	2.3	3.8
850-2,100	24.8	8.4	7.2
2,100-4,150	28.8	13.9	17.7
4,150-8,350	25.2	24.7	27.7
>8,350	8.6	43.6	56.6
Total	100.0	15.2	19.2

Notes: The table shows the proportion of each income group holding direct equities excluding mutual funds—for example, in 1997, 1.7% of all German households earning less than €1,300 per month owned direct equities excluding mutual funds. Percentage of population in each respective income group for latest available year.

Sources: Deutsches Aktieninstitut, Deutsche Bundesbank, Banque de France/Paris Bourse, Banca d'Italia, Institute for Fiscal Studies, and Federal Reserve Board

(a) German data include employee share ownership schemes

(b) Income groups by monthly net income, rounded to nearest unit of 50.

(c) Total does not sum exactly due to rounding λ

Includes unit trusts, PEPs and government gilts. UK data by income quartiles, based on net household income. (e)

equities in Germany and Italy than in France, the United Kingdom and the United States, they are correspondingly less able to use equity wealth to insulate their consumption from income fluctuations.

These data suggest that the increased stock market capitalisation shown in Table A and the increases in equity prices shown in Chart 1 are unlikely yet to have had much direct impact on the aggregate marginal propensity to consume from income for EU3 consumers, since the great majority do not own equity and are therefore unable to use equities to ease liquidity constraints. We are not able, however, to provide any quantitative assessment of the effect on aggregate consumption using these data.

The distribution of equity wealth in each country may also affect the economy's marginal propensity to consume from financial wealth. It is plausible that low-income earners who own equity could face liquidity constraints. They could sell the shares to ease these constraints. However, it is likely that households prefer to maintain a stock of precautionary savings to guard against unforeseen problems. Yet when the value of that stock rises above a particular threshold level, they may feel able to finance spending from it. So it is possible for households to hold wealth and be liquidity constrained at the same time. Rising equity prices could also raise the consumption of equity-owning households by providing extra collateral and therefore reducing their borrowing costs.

Table D shows that the distribution of equity holders among different income brackets is particularly skewed

Table D

Savings account holders and equity holders, by income group

France (2000)

Income group (€) (a)	Percentage of population (b)	Savings account	Equity holders
<1,500	32.3	72.3	7.4
1,500-2,300	32.2	79.2	11.2
2,300-3,050	18.3	80.1	14.3
3,050-3,800	8.4	81.2	21.1
>3,800	8.5	83.0	31.4
Total	100.0	77.5	12.7
Italy (1998)	Percentage of population	Bank	Equity
Income group (€) (a)		deposits	holders
<850	17.6	47.5	0.6
850–1,700	33.4	79.6	2.4
1,700–2,600	22.9	93.5	5.7
2,600–3,450	13.5	98.0	11.9
>3,450	12.6	99.7	31.7
Total	100.0	82.1	7.8
United Kingdom (199 Income group (d)	6) (c) Percentage of population	Interest-bearing account	Equity holders
Lowest quartile Middle-lower quartile Middle-upper quartile Highest quartile Total	25.0 25.0 25.0 25.0 25.0 100.0	44.0 55.2 66.2 76.1 60.4	13.4 15.6 26.5 37.9 23.3
United States (1998) Income group (US\$) (a)	Percentage of population	Transactions account	Equity holders
<850	12.6	61.9	3.8
850-2,100	24.8	86.5	7.2
2,100-4,150	28.8	95.8	17.7
4,150-8,350	25.2	99.3	27.7
>8,350	8.6	100.0	56.6
Total	100.0	90.5	19.2

Notes: The table shows the proportion of each income group that has a bank account of some description and the proportion holding direct equities excluding mutual funds—for example, 72.3% of all French households earning less than $\leq 1,500$ per month had a savings account in 2000, compared with 6.4% of the same group that owned direct equities excluding mutual funds. German data not available.

Sources: Banque de France/Paris Bourse, Banca d'Italia, Institute for Fiscal Studies, and Federal Reserve Board.

(a) Income groups by monthly net income, rounded to nearest unit of 50.

(b) Total does not sum exactly due to rounding.

(c) Includes unit trusts, PEPs and government gilts.(d) UK data by income quartiles, based on net household income

towards higher-income groups, relative to different asset categories such as savings accounts.⁽¹⁾

Equity wealth and household age

Recent empirical research⁽²⁾ suggests that the young may have a relatively high marginal propensity to consume from income; they have a tendency to let consumption track income very closely thus avoiding the accumulation of excessive amounts of debt.⁽³⁾

Table E shows equity holdings by different age groups. Again, data are not directly comparable across countries and in some cases are not for the same time period. Nevertheless, a key stylised fact from the data is that considerably fewer EU3 citizens under the age of 40 hold equities relative to their counterparts in the United Kingdom and the United States. That provides one possible reason for the lower marginal propensity to consume out of equity wealth in the EU3. The EU3 results for the under-40s are relatively similar to each other, in contrast to those above that showed that a greater percentage of French lower and middle-income groups owned equities than did their German counterparts.

In summary, these data show that a markedly smaller proportion of EU3 households hold equities relative to those in the United Kingdom and the United States. Furthermore, the demographic distribution of share ownership suggests that the marginal propensity to consume out of financial wealth may be lower in the EU3 than in the United Kingdom and the United States, where a greater proportion of low-income and young households own equity. The data suggest that, on average, low-income households in Italy and Germany are less than half as likely to hold equities than their UK and US counterparts. Low-income households in France are more likely to hold equity than their Italian and German counterparts, but equity ownership in France is relatively highly skewed towards older households.

Econometric results

We present the results of econometric work carried out on German and French data. The equations estimated

Table EPercentage of equity holders, by age group

Germany (a) Age group	Percentage of population (b)	1997	2000	
14-19 20-29 30-39 40-49 50-59 ≥60 Total	6.7 11.9 17.2 14.5 12.2 23.0	1.0 4.4 7.3 8.7 8.7 4.9 6.2	2.4 7.6 13.5 11.7 13.1 7.2 9.8	
France Age group	Percentage of population (b)	1997	2000	
15-24 25-34 35-44 45-54 55-64 ≥65 Total	13.0 14.5 14.6 13.9 9.2 15.9	3.7 7.9 10.2 14.6 17.9 19.2 12.0	3.3 9.1 11.6 17.6 16.9 18.3 12.7	
Italy Age group	Percentage of population (b) (c)	1995	1998	
<30 31-40 41-50 51-65 >65 Total	22.2 15.5 13.5 17.9 16.3	2.1 5.7 5.6 6.6 2.9 5.0	3.9 9.8 7.9 9.5 5.5 7.8	
United Kingdom (a Age group	d) Percentage of population (b)	1993	1996	
25–34 35–49 50–64 ≥65 Total	16.0 20.7 15.6 15.7	12.8 24.1 30.4 24.7 n.a.	12.9 21.6 30.2 31.2 n.a.	
United States Age group	Percentage of population	1995	1998	
<35 35-44 45-54 55-64 65-74 275 Total	23.3 23.3 19.2 12.8 11.2 10.2	10.8 14.6 17.7 15.0 18.6 19.7 15.2	13.1 18.9 22.6 25.0 21.0 18.0 19.2	

n.a. = not available.

Notes: The table shows the proportion of each age group that holds direct equities excluding mutual funds—for example, 1.0% of all German households aged between 14 and 19 in 1997 owned direct equities excluding mutual funds. Percentage of population in each respective age group for latest available year.

Sources: Deutsches Aktieninstitut, Deutsche Bundesbank, Banque de France/Paris Bourse, Banca d'Italia, Institute for Fiscal Studies, Federal Reserve Board, and Eurostat.

(a) German data include employee share ownership schemes

(b) Data obtained from Eurostat, and do not necessarily correspond to sample groups from national sources.

(c) The percentage of the Italian population for the lowest age bracket (ie \leq 30) is calculated on the basis of Eurostat data for those aged between 15 and 30.

(d) Includes unit trusts, PEPs and government gilts.

are of a form that maps short-run changes in consumption to changes in real disposable income, changes in financial wealth and (for Germany) real interest rates.⁽⁴⁾ The long run is characterised by a constant consumption to wealth ratio. Charts 2 and 3

⁽¹⁾ As with Table C, the data are not directly comparable across different countries.

⁽²⁾ See, for example, Hubbard, Skinner and Zeldes (1994), Attanasio, Banks, Meghir and Weber (1999), and Gourinchas and Parker (2001).
(3) Such empirical results are different from predictions based on the version of the PIH with finitely lived agents and no

bequest motive, when households' marginal propensities to consume increase with age because younger households have longer time horizons than older households.

⁽⁴⁾ In practice, our econometric results could be sensitive to the precise definition of personal disposable income used. We conducted sensitivity tests on German data using alternative specifications of disposable income that excluded income derived from ownership of wealth. In this particular case, such alternative specifications made little difference to our results. We use the instrumental-variable techniques suggested by Pesaran, Shin and Smith (1996).

show rolling estimates of the long-run coefficients on real financial wealth and real disposable income. We calculate the marginal propensity to consume out of financial wealth by multiplying our estimates of the long-run coefficients on real financial wealth by the consumption to wealth ratio. Consistent data are available only over a relatively short period, covering 50–60 quarters, limiting the strength of inferences that may be drawn from this econometric work.⁽¹⁾

Chart 2 Germany: rolling long-run coefficients



Chart 3

France: rolling long-run coefficients



The long-run coefficients on wealth and income are not very stable over time, particularly in France, where the uncertainty surrounding these estimates prevents us from drawing firm conclusions regarding changes in the strength of wealth effects.⁽²⁾ In Germany there is also considerable uncertainty around the estimates, yet there is some indication that both the long-run coefficient on wealth and the marginal propensity to consume from financial wealth may have fallen over the second half of the 1990s. The main inference we draw from these estimates, however, is that our econometric results do not provide support for the proposition that changes in the pattern of wealth holdings may have led to increasing wealth effects in the larger euro-area economies.

For the entire sample, Table F shows estimates of the marginal propensity to consume from financial wealth in France, Germany and the United States, based on estimates of the long-run coefficient for the entire sample and the consumption to wealth ratio at the end of the period. There is some tentative evidence that the marginal propensity to consume out of wealth may be lower in Germany and France than in the United States.⁽³⁾ The results would be consistent with our earlier analysis of the distribution of equity holdings by age and income group. There is, however, considerable uncertainty surrounding our results as the equations are estimated for a period of structural change, including, for example, German economic and monetary union.

Table F Consumption out of wealth

	Long-run coefficient on real financial wealth	Consumption to wealth ratio (a)	Marginal propensity to consume out of financial wealth (b)
Germany	0.05	0.12	0.5
France	0.10	0.06	0.6
United State	s 0.16	0.05	0.8
Notes: Gern Frenc For U exclu may	an estimation period 1985 Q3- th estimation period 1988 Q1– IS estimation, see Bank of Engle de housing wealth. In contrast olur comparison.	–1999 Q4. 2000 Q2. and (2000). Data for 1 , US data include hous	France and Germany sing wealth, which

(a) French and German consumption to wealth ratio in 2000 Q2.

(b) The marginal propensity to consume out of financial wealth (per cent) is equal to the estimated long-run coefficient on real financial wealth (ie the first column) times the consumption to wealth ratio (ie the second column) times 100 (subject to roundings). For example, in Germany an extra 0.5 cents is consumed for each extra euro of financial wealth.

Conclusion

A number of macroeconometric models show weaker equity wealth effects in the EU3 relative to the United States. Demographic factors may be important in explaining cross-country differences in consumption patterns, particularly through their effect on the marginal propensity to consume from income and wealth. In the EU3 equity wealth is relatively skewed

This limitation arises from changes in data definitions, in particular following the introduction of the latest European System of Accounts (ESA95).

⁽²⁾ As the series are not stationary, the coefficients are not normally distributed even in large samples and the resulting standard error bands cannot be used to calculate confidence intervals.

⁽³⁾ See Bank of England (2000) for summary of results of US analyses. Also, the econometric results in Boone, Giorno and Richardson (1998) suggest a marginal propensity to consume out of equity wealth in a range of 4%–7% for the United States.

towards high-income and 'middle-aged' households, and the great majority of households hold insufficient equities to be able to use their equity wealth to dampen the impact of income changes on consumption. We have also offered tentative though empirically untested explanations as to why our measures of the marginal propensity to consume from equity wealth may be lower in the EU3 than in the United States.

We also looked for evidence that the impact of wealth on consumption may have varied over time in the EU3. The

proportion of equity holdings in households' financial assets has risen over the course of the 1990s in the EU3, yet share ownership is still relatively uncommon among all but high-income earners. So there is limited scope for consumers to use equity wealth to ease liquidity constraints and this may have dampened any impact of increased share ownership on the marginal propensity to consume from income. Our econometric estimates do not provide a firm indication that the responsiveness of aggregate consumption to income and wealth in the EU3 has changed during the 1990s.

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Skill imbalances in the UK labour market: 1979-99

Working Paper no. 145

Pablo Burriel-Llombart and Jonathan Thomas

This paper examines the evolution of skill imbalances in the UK labour market over the past two decades. A rise in skill imbalances is defined as an increase in the difficulty of recruiting skilled workers compared with unskilled workers. Our investigation is primarily motivated by the observation that different balance indicators often send conflicting messages. These differences could reflect several factors, including the underlying definitions of skilled and unskilled workers, and the sensitivity of each measure to different types of labour market shock.

We consider three approaches in the literature to measuring skill imbalances:

• Comparing the growth rate of the ratio of the skilled and unskilled wage bill shares with the growth rate of the ratio of the skilled and unskilled labour force shares. This measure, which uses educational attainment to define skill groups, suggests that imbalances have been rising steadily over the past two decades, especially in the market for graduates. This implies that the widely perceived decline in the NAIRU over the recent cyclical upswing does not reflect an improvement

in the relative ease with which firms can hire educated workers. Movements of this index seem to reflect genuine reallocations of labour demand/supply across educational groups.

- The dispersion of wages and unemployment rates across education groups. These measures also point to rising imbalances since 1979. However, our analysis suggests that the unemployment measures are primarily driven by aggregate labour demand/supply shocks that have no implications for the skill balance. This undermines their reliability as measures of it.
- The Confederation of British Industry (CBI) ratio of skilled labour shortages and unskilled labour shortages in manufacturing. The CBI ratio indicates that imbalances have declined over 1979–99. This does not necessarily contradict the other measures, because the CBI data are not based upon an explicit definition of skilled and unskilled workers and only cover the manufacturing sector. However, the robustness of the CBI ratio to skill-neutral shocks is also questionable.

Indicators of fragility in the UK corporate sector

Working Paper no. 146

Gertjan W Vlieghe

This paper investigates the determinants of corporate failures in the United Kingdom using aggregate time series data. It is part of a continuing programme of empirical research being undertaken in the Bank of England's Domestic Finance Division on the causes and consequences of financial health or distress in the UK corporate sector (see, for example, Benito and Vlieghe (2000) using micro-data).

Corporate failures are important in several respects. A high *ex post* corporate failure rate might be evidence of a financially fragile corporate sector, which may have important macroeconomic consequences. When firms are financially fragile, problems of asymmetric information between firms and their lenders are likely to become worse. This could result in an inefficiently high rate of corporate failure. Corporate failures may also affect bank capital: if realised losses on the corporate loan book are unanticipated, bank capital is eroded, thereby weakening the banking system. For these reasons, it is important to understand what drives corporate liquidations, and this is the objective of this paper.

A stylised model of the firm is derived. This model suggests that the corporate failure rate should be determined by profits, by the level of indebtedness, and, if firms face borrowing constraints, by the level of inflation. As there is no single perfect measure for profits or indebtedness, a range of variables that may proxy for these determinants is explored.

The main findings are the following. Capital gearing ratios based on the market value of the company's assets are found to be marginally less satisfactory in explaining corporate failures than are ratios that measure debt relative to the replacement cost of assets or relative to GDP. Furthermore, the determinants of profits (real wages, aggregate demand, real interest rates) have better explanatory power than aggregate profits. This may be because aggregate profit levels mask important differences in profitability between firms.

Property prices are found to have a significant short-run effect on company failures, which is consistent with the important role property plays as collateral for corporate borrowing. The birth rate of new companies is also found to have a significant short-run effect on company failures. This is consistent with other evidence that new companies are more likely to fail than more experienced ones.

Real interest rates, rather than nominal interest rates, are found to be a significant long-run determinant of corporate failures. This is consistent with the debt-deflation theory. The additional short-run effect of nominal interest rates is consistent with the adverse effect of higher inflation on company cash flows in the presence of borrowing constraints or non-neutralities in the tax system.

The spread of corporate bond yields over government bond yields does not predict corporate failures well. This may be due to the fact that corporate bond spreads are determined more by liquidity factors, especially during periods of low bond market issuance, than by investors' assessment of default risk. Moreover, bond-issuing corporates may not be a representative sample of the corporate sector as a whole.

The empirical relationship between the liquidation rate, debt levels, the interest rate and profitability has been surprisingly stable over time. But variation in the liquidation rate has been driven by variation in different explanatory factors over the sample period. Whereas the rise in the liquidation rate in the early 1990s is attributed primarily to rapidly increasing levels of indebtedness, the decline after 1992 is explained largely by falling real wages, the cyclical recovery of GDP relative to trend and falling real interest rates.

Hard Times or Great Expectations?: Dividend omissions and dividend cuts by UK firms

Working Paper no. 147

Andrew Benito and Garry Young

The payment of dividends is one of the key unresolved puzzles of company financial behaviour. The importance of understanding dividends also partly stems from their significance as a form of balance sheet adjustment. But relatively little is known about the determinants of a company's propensity to omit or cut its dividend in a particular year. The analysis presented in this paper, which addresses such issues, can also be interpreted in the wider sense of examining how firms respond to financial pressure.

Such analysis is important not least because it sheds light on the transmission mechanism of monetary policy through the corporate sector. If shocks to corporate cash flows affect the real economy through levels of investment then a dividend omission (or cut) may help protect investment plans and thereby attenuate any real effects on investment. Indeed, one view of dividend policies is that they are the central means through which companies attempt to maintain independence of financial and real decisions, adjusting payouts (albeit in a sticky manner) in order to preserve investment plans in the face of shocks to the balance sheet.

In examining the dividend policies of UK companies, the paper draws on the 'new view' model of taxation and corporate finance developed by King (1977). Theoretical suggestions from this approach are confronted with micro-data on large numbers of quoted UK companies over the period 1974 to 1999 in order to understand the propensity for a company to omit and cut its dividend. The analysis produces several novel results. First, an increase in the proportion of quoted UK companies that omit a dividend from 1995 is uncovered. In 1995, the proportion of non-payers stood at 14.3% and reached 25.2% in 1999. Earlier high-points of omission were 16.1% and 17.9%, witnessed in 1982 and 1992 respectively, both periods of recession. This increase in dividend omission since 1995 is largely accounted for by an increase in the proportion of companies that have never paid a dividend. Second, firms with the highest levels of payout in 1999 (that is, at the 90th percentile) distribute more than double the amount to shareholders, relative to sales, than did their counterparts in 1977. Dispersion in the level of dividend payment has increased in recent years.

Third, the paper sheds light on the characteristics associated with a dividend omission and dividend cut. Low levels of cash flow, high levels of income gearing and leverage, small scale and greater opportunities for investment are all associated with an increased propensity to omit a dividend. These factors, in particular those of cash flow and leverage, are more strongly related to the propensity to cut the dividend suggesting that dividend cutting is a stronger indicator of financial fragility than is dividend omission.

Fourth, the paper uses these results to account for the observed increase in dividend omission. The analysis indicates that these characteristics can account for much of the increase in the proportion of zero-payout firms. This implies that there is a more limited role for a change in dividend policies per se, controlling for changes in the characteristics of firms, although we do find evidence of a change in the responsiveness of omission propensities to financial characteristics for the post-1995 period. Analysis of aggregate effects on the propensity to omit suggests that there is relatively little evidence to link this to the major tax reform of 1997 that abolished tax refunds on dividend income payable to tax-exempt institutions. We also consider a role for state dependence in the incidence of dividend omission and find that the propensity to omit and cut is highly persistent, controlling for financial characteristics and unobserved heterogeneity. Companies are slow to adjust their balance sheets through their dividends.

These results have a number of implications. The recent increase in dividend omission is associated with a larger number of companies who have never paid dividends. For the most part, these are relatively small companies with strong investment opportunities. It might be felt then that the recent increase in dividend omission is less worrying than in previous periods when the dividend omitters were former payers who were attempting to repair their balance sheets. In this sense, the changes we have identified reflect 'Great Expectations' rather than 'Hard Times'. Nevertheless, the evidence suggests that it is low levels of profitability among dividend-omitting companies that is the single most important factor accounting for the increase. As such, concerns may remain until the investment opportunities are converted into higher profitability.

Another implication is that those investors, such as trustees, that require a record of dividend payments are restricted to a materially smaller share of the quoted company sector than in the past. The increasing incidence of non-dividend-paying companies also implies that the usefulness of company valuation methods based on the existence of such payments, such as the dividend discount model, is called into question.

Finally, for dividend-omitting companies the potential role of dividend policy to respond to balance sheet shocks while maintaining independence of nominal and real outcomes is forsaken. Rather than have the option of adjusting payouts in order to maintain investment plans such companies must instead borrow more or raise more equity finance. The existence of a wedge between the price of internal and external funds makes it more likely that such companies' real investment decisions will be affected by shocks to cash flow.

UK inflation in the 1970s and 1980s: the role of output gap mismeasurement

Working Paper no. 148

Edward Nelson and Kalin Nikolov

The amount of spare capacity in the economy is a vital input for policy-makers' decisions on monetary policy. When expressed as a fraction of GDP, a frequently used summary statistic for the degree of spare capacity is the output gap—the percentage difference between actual output and the level of output consistent with sustainable full employment of resources. But the output gap available to policy-makers in real time is subject to two sources of error: both initial GDP estimates and the estimates of (unobserved) potential output may be revised subsequently.

Recent work on the United States has argued that the breakout of inflation in the 1970s was largely due to real-time output gap mismeasurement. Policy-makers, it is argued, were slow to realise that long-term US productivity growth had fallen, and therefore misinterpreted slow economic growth as indicating deficient aggregate demand. Consequently, monetary policy stimulus to the economy was excessive.

This paper concentrates on the following questions: (1) how important is the real-time output gap measurement problem in the United Kingdom?; and (2) did output gap mismeasurement play a significant part in bringing about the high inflation in the United Kingdom in the 1970s and 1980s?

In order to address our questions, the paper constructs the first real-time output gap series for the United Kingdom. It consists of a real-time GDP series (obtained from past issues of *Economic Trends*) and a real-time potential GDP series, derived using policy-makers' statements about their views on the output gap or the productive potential of the UK economy. The 'final' output gap series is a measure based on the deviations of actual GDP (2000 Q3 vintage) from a linear trend with breaks in 1973 Q4 and 1981 Q4. The measurement error in real-time output gap estimates is calculated by subtracting the real-time output gap series from the 'final series'.

The paper investigates the effect of output gap mismeasurement on UK inflation by simulating a small, forward-looking macroeconomic model, augmented with a monetary policy rule and output gap measurement error. It also presents graphical evidence in the form of interest rate prescriptions from 'Taylor rules' using both real-time and final output gap data.

The results indicate that output gap estimates have, at times, been subject to substantial measurement error. The most serious measurement errors occurred in the 1970s, when policy-makers believed that output was more than 7 percentage points further below potential than now seems to have been the case. Errors were also large in the 1980s, with the average real-time output gap measure more than 5 percentage points below the average final measure. This was due both to initial GDP revisions and to inaccurate estimates of potential output. Stochastic simulations suggest that, as a result of output gap measurement errors, average inflation was 2 to 7 percentage points higher in the 1970s, and 1 to $5^{1/2}$ percentage points higher in the 1980s. Although output gap measurement errors made a significant contribution to average UK inflation in the 1970s and 1980s, other sources of monetary policy errors were also important.

Monetary policy rules for an open economy

Working Paper no. 149

Nicoletta Batini, Richard Harrison and Stephen P Millard

The literature on simple rules for monetary policy is vast. However, the literature does not contain a thorough normative analysis of simple rules for open economies, ie for economies where the exchange rate channel of monetary policy plays an important role in the transmission mechanism. The most popular simple rule for the interest rate—the 'Taylor rule'—for example, was designed for the United States and, thus, on the assumption that the exchange rate channel is less important. And the main open-economy alternatives such as a rule based on a monetary conditions index (MCI)—may perform poorly in the face of specific types of exchange rate shocks.

This paper analyses the performance of a variety of simple rules using a model of the UK economy. To do so, we specify and evaluate a family of simple monetary policy rules that may stabilise inflation and output at a lower social cost than existing rules. These rules parsimoniously modify alternative closed or open-economy rules to analyse different ways of explicitly accounting for the exchange rate channel of monetary transmission. We compare the performance of this family of rules to that of the Taylor rule, naïve MCI-based rules as well as Ball's MCI-based rule, and inflation-forecast-based rules when the model economy is buffeted by various shocks.

To test the rules, we stylise the economy—that we calibrate to UK data—as a two-sector open-economy dynamic stochastic general equilibrium model. The export/non-traded sector split is important because it allows us to discern different impacts of the same shock on output and inflation in the two sectors. Identification of sectoral inflation and output dynamics is a key element on which to base the design of efficient policy rules.

To mimic observed stickiness in the adjustment of prices and wages in the United Kingdom, our model also features a wide range of nominal rigidities, modelled using the Calvo (1983) approach. These nominal rigidities have two crucial implications for our model. First, in our model economy macroeconomic equilibrium is inefficient, as with sticky prices changes in aggregate demand give rise to 'Okun gaps', in turn arising from specific microeconomic distortions. Second, monetary policy has real effects, and can be designed optimally to offset these various distortions. Specifically, since in an open economy monetary impulses are transmitted via multiple channels, in our model an efficient simple policy rule is one that offsets distortions by exploiting effectively all those channels.

Finally, because it is theoretically derived on the assumption that consumers maximise utility and firms maximise profits, the model has a rich structural specification. This enables us to contemplate shocks that could not be analysed in reduced-form small macro-models. For example, we can analyse the impact of a relative productivity shock on the two sectors. The ability to examine this range of shocks is important when comparing alternative policy rules for an open economy, because the efficient policy response to changes in the exchange rate will typically depend on the shocks hitting the economy-with different shocks sometimes requiring opposite responses. One drawback to this approach is that it is difficult to account for some features of the UK economy (most notably, the persistence of inflation) using a micro-founded model.

We find that a good rule for our small open-economy model is an inflation-forecast-based rule (IFB), ie a rule that reacts to deviations of expected inflation from target, if the forecast horizon is chosen appropriately. This rule is associated with a lower-than-average variability of inflation when compared with the other rules. Adding a separate response to the level of the real exchange rate improves stabilisation only marginally, suggesting that the inflation forecast contains all of the information relevant to policy-makers, including information about the exchange rate channel of the transmission mechanism. Importantly, an IFB rule, with or without exchange rate adjustment, appears quite robust to different shocks, in contrast to the MCI-based rules we examine.

These results on the relative performance of the rules are broadly confirmed by results using the utility losses faced by the households in our model economy under each rule, implying that the distortions in our economy are quantitatively and qualitatively similar to those envisaged in existing closed-economy models.

Financial accelerator effects in UK business cycles

Working Paper no. 150

Simon Hall

The depth and persistence of the UK recession of the early 1990s came as a surprise to many forecasters, particularly the prolonged weakness of corporate investment growth. Views on the causes of sluggish investment growth in this period vary. However, a number of subsequent analyses have suggested a potential role for financial factors, noting the coincidence of weak corporate investment with a marked financial retrenchment by the sector.

The non-financial corporate sector was far more dependent on external borrowing entering the 1990s recession than at the start of the previous downturn in the early 1980s: the financial deficit was around 4% of GDP in 1989 compared with a surplus of about 1% of GDP in 1979. The unexpected deterioration in economic prospects in the late 1980s may have led to a sharp downward revision to companies' desired levels of capital and debt. Marked rises in survey measures of demand uncertainty at this time suggest that demand-side factors were probably important determinants of weaker investment and borrowing. It is also possible that poor corporate financial health may have led to a general rise in lenders' perceptions of the expected risks of lending, reducing the supply of finance. Evidence for this is less clear. In the early 1990s the proportion of respondents to the CBI Industrial Trends survey citing the cost of finance as a constraint on investment increased and corporate bond yields rose relative to default risk-free rates on government debt. These movements were more pronounced than in the early 1980s recession when corporate financial conditions were (arguably) more favourable. It may be that these shifts simply reflected a substantial shift in the riskiness of corporate lending in the early 1990s. However, it is also consistent with a tightening in the terms of finance for borrowers of equivalent risk. This supply-side influence might have added to the demand-side factors weakening corporate investment at this time.

This paper does not attempt to settle this debate, but instead uses a theoretical model to consider the potential for corporate financial conditions and investment to interact. Many macroeconomic models assume perfect capital markets with the implication that financing decisions have no impact on real economic behaviour. In reality of course capital markets are not perfect and in recent years economists have developed models to show that in practice the way that companies fund their investment is likely to affect finance costs and investment activity. For example 'balance sheet models' suggest that companies will often prefer to use internal funds (such as retained profits) rather than external borrowing to finance investment. In other words, external borrowing is more costly than internal finance, with the difference termed 'the external finance premium'. This premium may arise because external lenders cannot perfectly observe and/or control the risks involved in supplying funds to borrowers and

require compensation for expected losses. Borrowers using internal funds do not face this problem. These models also suggest that the risks to lending may rise as companies' own stake in investment finance falls relative to that of external lenders. As a result, the external finance premium may well vary with borrowers' financial health. The resulting interaction between corporate financial positions and borrowing costs can lead to amplification and propagation of shocks, termed 'financial accelerator effects' in the academic literature.

The paper considers the potential role of corporate financial health in recent recessions using a macroeconomic model explicitly designed to allow for these sorts of real-financial interactions. The financial accelerator model developed by Bernanke, Gertler and Gilchrist (1999) introduces a wedge between the cost of internal funds and external finance that responds endogenously to borrower financial health, measured by the share of investment that can be self-financed. When firms can finance most of their investment using retained internal funds, borrowing costs are relatively low. But when firms rely heavily on external finance, borrowing costs rise. The model is calibrated broadly to match UK financial conditions prevailing at the start of recent recessions, and is simulated with and without its financial accelerator mechanism. The simulations highlight the potential episodic nature of financial effects. In particular, the model indicates that financial factors are unlikely to have had much incremental impact on real activity in the early 1980s recession when corporate external borrowing was relatively low. By contrast, the model suggests that the heavy dependence of the corporate sector on external borrowing at the start of the 1990s recession might have been a contributory factor to persistent weakness of investment growth over this period.

These results are at best indicative and certainly do not suggest that financial accelerator effects were the single, or even the most important, determinant of corporate investment behaviour in the early 1990s recession. The relatively simple theoretical modelling framework adopted excludes several potentially important features of reality and can only offer a very stylised representation of the actual experience of the UK corporate sector in recent recessions. However the exercise does illustrate the potential use of balance sheet models as an analytical tool for examining relationships between financial and real factors in the transmission mechanism, interactions absent in many standard macroeconomic models. Further work could usefully explore the robustness of the results by considering alternative calibrations of the specific model employed and/or different theoretical specifications of real-financial interactions. But perhaps the most important development would be an extension to the household sector, where financial factors may if anything play a more pervasive role in determining spending behaviour.

Other financial corporations: Cinderella or ugly sister of empirical monetary economics?

Working Paper no. 151

K Alec Chrystal and Paul Mizen

UK monetary data are typically analysed at the sectoral level, as it has been found easier to identify stable money demand functions for households and for 'private non-financial corporations' (PNFCs) than for the private sector as a whole. This is, at least in part, because the behaviour of 'other financial corporations' (OFCs) has been hard to explain and fairly volatile. As a result there are few studies of OFCs, even though they hold a significant component of the broad money stock. There is also a question of relevance for monetary policy makers here. OFCs' money holdings and borrowing have grown rapidly in recent years and it is important to understand whether this has any consequences for aggregate demand and ultimately for inflation.

This paper offers an empirical analysis of the determinants of OFCs' money holding. It does so in a framework in which OFCs' sterling borrowing from the banking system is modelled simultaneously. Both OFCs' money holdings and bank borrowings are shown to be cointegrated with a common set of driving variables. These cointegrating equations could be interpreted as evidence of stable long-run OFCs' money demand and credit demand relationships.

The long-run relationships identified perhaps add to the literature on the links between financial activity and

economic growth. But the main point of this analysis that is of potential relevance for monetary policy, is to test whether links can be identified between OFCs' money and borrowing and UK aggregate demand. We use models of household and PNFC behaviour (developed by us elsewhere) to test for linkages from OFC money and borrowing to consumption and investment.

The main results are that there is no detectable relationship between OFCs' money and borrowing and consumption, but there does appear to be a long-run relationship between OFCs' borrowing and aggregate investment. This could be because some OFCs borrow in order to buy capital equipment, which is then leased to PNFCs. Or it could be that OFCs provide financial services to PNFCs which make them better able to invest (for example, by lowering the cost of capital as suggested in the finance and growth literature). This implies that there may be a link from OFCs' financial behaviour to aggregate demand and inflation via investment and so it would be dangerous to ignore OFCs entirely. However, only a study of OFCs' behaviour at a disaggregated level will be able to distinguish whether this link is via leasing companies or whether there is a more general influence of financial firms on the investment behaviour of PNFCs. This remains for future work.

How uncertain are the welfare costs of inflation?

Working Paper no. 152

Hasan Bakhshi, Ben Martin and Tony Yates

Inflation makes it costly to hold non-interest-bearing cash and reserves. For a long time economists have known that this cost could be eliminated if monetary policy acted to bring about a steady state of zero nominal interest rates, where there is no penalty to holding cash. (In such a regime, inflation would be equal to the negative of the real interest rate, the rate that equalises the return to holding cash and a risk-free real asset.) Since then a number of researchers have sought to quantify how much time (and utility) is thrown away as nominal interest rates rise above zero. But why all this effort, when the 'optimal' inflation rate has been worked out? The interest stems from the apparent consensus in modern monetary regimes that policy should aim at a positive rate of inflation. Those regimes are predicated on the notion of setting the costs of staying away from the 'Friedman rule' on the one hand against the costs of lowering inflation further on the other. These costs of lowering inflation are highly uncertain and difficult to model coherently, but could be important. Leaving aside measurement problems, researchers have examined whether low inflation could cause problems if nominal wages or prices are downwardly rigid. And they have also sought to quantify the costs of monetary policy becoming impotent as nominal rates hit the zero bound in regimes of very low inflation. Models tractable enough to calculate the costs of inflation are typically simplified to the point where the economic behaviours that could generate these 'benefits' of positive inflation are not included. So the interest in calculating the welfare cost of positive inflation is a pragmatic one. Absent an all-singing, all-dancing model that includes a zero bound and downward nominal frictions, take a monetary general equilibrium model, calculate the costs of positive inflation, and balance these in an informal way against the 'benefits'.

This paper adds to the literature on quantifying the costs side of the inflation 'balance sheet'. It makes two distinct contributions. First, it offers a UK calibration of some of the general equilibrium costs of inflation that complements the efforts of Bakhshi *et al* (1999) and Chadha *et al* (1998), which take partial-equilibrium approaches. The estimate is a 'general equilibrium' one in the sense that, following Wolman (1997), it takes as its benchmark a model of money demand due to McCallum and Goodfriend (1987), who argued that individuals hold cash in order to economise on shopping time. This approach to calculating the welfare costs of inflation is distinct from an older literature that stretches from Bailey (1956), Sidrauski (1967), through Lucas (1994) and most recently to Chadha et al (1998). The intuition behind those papers was that just as you can use the area under the demand curve for apples to calculate the consumer surplus that accrues from apple consumption when the market clears at a certain price, so you can do the same with money. If money is a consumption good then you can compare the area under the demand curve for money when nominal rates are *x* per cent with when they are zero, and thereby derive a measure of the benefit of reducing steady-state nominal interest rates. In the shopping-time model, money is modelled not as directly utility-providing but as enabling consumers to translate work into consumption more efficiently. So the fact that our paper offers a 'general equilibrium' estimate of the welfare cost of inflation comes from the chosen shopping-time model that tells us that inflation has consequences for consumption and leisure decisions, whereas the 'money gives you utility all by itself' approach says that it does not.

Our 'general equilibrium welfare cost of inflation' comes, following Wolman (1997), from applying a shopping-time money demand function to UK data and combining it with a model of consumption and leisure choice.

The second contribution of our paper is that we look at the uncertainties surrounding those welfare costs of positive inflation that we capture. One dimension of this is to look at how uncertainties surrounding our shopping-time parameter estimates translate into uncertainties in the welfare calculation. The intuition we seek to confirm is that the more ill-determined are the parameters of the estimated money demand equation, the greater will be the uncertainty about the welfare costs of inflation. Another dimension of uncertainty is whether or not real money balances tend to a finite number at zero nominal interest rates. Wolman (1997) develops a test of satiation interpretable within the shopping-time model that we implement for UK data. We also explore how powerful these tests are when there are few—if any—observations at very low nominal interest rates. Intuitively, if there are no observations near zero nominal rates, then we cannot observe whether real balances tend to a finite number or not. Simulations using our model support this intuition.

Monetary policy, the global economy and prospects for the United Kingdom

In this speech,⁽¹⁾ the **Governor** discusses the task of setting monetary policy in the context of the synchronised economic downturn in the world economy, and notes the difficult conditions for the internationally exposed sectors in all the major economies including the United Kingdom. Looking forward, the **Governor** says he is 'cautiously optimistic' that the overseas environment will improve through the year and that the United Kingdom will return to somewhat stronger and better-balanced growth.

Let me open my defence by trying to explain to you what we at the Bank—through the MPC—are tasked to do, and why.

The task sounds straightforward. It is to set short-term interest rates with the consistent aim of hitting the Government's symmetrical $2^{1}/_{2}$ % inflation target (on a precisely defined measure of retail price inflation— RPIX). Now the reason we've been set that task is not as some people imagine—because either we or the Government think that consistently low inflation is the be-all and end-all of economic life. It is because we've learned from long experience that consistently low inflation is a necessary (though not in itself sufficient) condition for the sustained growth of output of the economy as a whole, for high levels of employment, and for rising living standards, which are more fundamentally the things that we are all seeking to achieve.

Carrying out our task is not as straightforward as it sounds because there is not, of course, a simple, direct link between interest rates and the rate of inflation.

Interest rates essentially affect the demand side of the economy. They do not directly influence the supply side, which depends upon a whole host of structural characteristics of the economy that are largely beyond the direct reach of monetary policy. What we have to do in managing short-term interest rates is to keep overall demand growing broadly in line with the underlying sustainable—supply-side capacity of the economy as a whole to meet that demand. In other words we are trying to maintain overall macroeconomic stability in a much broader sense, in the medium and longer term, and not just the short term; and the Government's inflation target is the criterion against which our success, or otherwise, in achieving that broader macroeconomic stability is to be measured.

Our problem is that we don't know with any great precision or confidence exactly what is happening on the supply side—that's to say precisely what rate of growth we can hope to sustain. We don't know precisely either what is currently happening, or what is likely to happen looking forward over the next couple of years or so to overall aggregate demand. And we don't know precisely what the full impact of a change in interest rates will be on aggregate demand, or how long it will take before the full impact is felt.

Ours is not a precise science. In fact it's more of an art than a science. And, although we bring as much economic and statistical science to bear as we can, we know that our forecasts, and indeed our policy judgments, are subject to a range of error. They cannot be accurate to every last digit. We can't expect to hit the target all the time, but by consistently aiming to do so (and we do consistently aim to do so looking two years or so ahead—whatever you may have read in some recent media commentaries) we can hope to get reasonably close to the target on average over time.

Given the uncertainties, which are well illustrated by the sudden—and no doubt to some extent erratic—jump in the RPIX inflation rate in the year to January of 2.6% announced this morning, the overall results over the past decade since the recession of the early 1990s have been encouraging. Whether that's a result of good luck or good judgment I leave to others to decide—I'm more interested in the outcome.

(1) Given at the EEF Biennial Dinner in London on 12 February 2002. This speech can be found on the Bank's web site at www.bankofengland.co.uk/speeches/speech161.htm Since the Summer of 1992, inflation on the target measure has averaged just 2.6%—and has been more stable than at any time in our history. And it has been consistently remarkably close to target over the past five years.

But the even better news is that stable, low, inflation has been accompanied by steadily increasing overall output and employment, and by a progressive fall, until very recently at least, in the rate of unemployment.

Over the same period, to the fourth quarter of last year, GDP growth averaged just under 3% a year—which is well above most estimates of our trend rate of $2^{1/4}$ %- $2^{1/2}$ %. GDP has in fact grown for 38 successive quarters, which is the longest period of sustained quarter-by-quarter growth we have enjoyed since quarterly records began in the United Kingdom in 1955.

Employment has increased steadily from a low point of $25^{1/2}$ million people in the Spring of 1993 to its current level of 28 million. And the rate of unemployment fell from a peak of over $10^{1/2}$ % on the LFS measure to around 5% last summer; while on the claimant count measure it fell from some 10% to just over 3%, which meant that the number of people claiming unemployment benefit, at under 950,000, was the lowest for 26 years.

Now some of you—given what's happening to your own businesses—are probably thinking that I must come from a different planet. And yes, we do have a problem. Once you look beneath this apparently benign surface of the economy as a whole, you find very substantial differences between many internationally exposed sectors of the economy—including particularly many manufacturing businesses—which have recently been having a really tough time, and other businesses largely serving our domestic market which have been doing pretty well.

There are two main reasons for the pressures affecting the internationally exposed sectors: the synchronised economic slowdown over the past year or so in all major industrial countries on the one hand, and the puzzling persistent weakness of the euro in foreign exchange markets, not just against sterling but even more against the dollar, on the other.

What that has meant for the UK manufacturing sector is that output in the year to November (the latest month for which we have internationally comparable data) fell by 5.7% and employment fell by 153,000 people, or by nearly 4%. For what it's worth, we were not alone. Comparable figures show that manufacturing output fell by over 13% in Japan, by 6.7% in the United States and by 4.3% in Germany, while manufacturing employment fell by 5% in Japan, over $6^{1}/_{2}$ % in the United States and around $\frac{3}{4}$ % in Germany.

The frustrating thing is that, with the best will in the world, there was not much that either we at the Bank or the UK Government could have done to ward off the pressures on UK manufacturing, which had their origins abroad.

That's fairly obvious where we are talking about the global slowdown—with negative growth last year of about $1^{5}/_{4}\%$ in Japan (fourth quarter on a year earlier) and roughly zero growth in the United States and Germany. We can go to international meetings and encourage the respective authorities there to stimulate their economies, but there is nothing that we can do about it directly ourselves.

It's perhaps less obvious that we cannot control the exchange rate. Many people think that we could weaken sterling against the euro quite simply by cutting our interest rate relative to the interest rate in the eurozone. But it's not as simple as that. The United States has reduced its interest rate far more aggressively than the ECB over the past year or so, but the dollar is actually stronger against the euro than it was to begin with; and the same is true, to a lesser degree, of ourselves, here in the United Kingdom, with sterling also stronger against the euro (though weaker against the dollar) than it was a year ago.

So there was nothing much—as I say—that we could have done directly to affect the weakness of the global economy and the resulting weakness of external demand on the United Kingdom.

But what we were able to do—given that inflation was marginally below target—was to try to compensate for that external weakness by stimulating domestic demand here in the United Kingdom. The Bank sought to do this by cutting interest rates to buoy up consumer spending. And the Government has stepped up its own spending, which is helpful in the present international environment. Although we couldn't avoid an overall slowdown altogether we have managed to keep the UK economy as a whole moving forward despite the recession in the internationally exposed sectors of manufacturing. In fact overall GDP growth in the year to the fourth quarter of 2001, at 1.9%, was by, some margin, the highest among the G7 countries, and the rate of UK unemployment is currently the lowest, on a comparable basis, in the G7. And interest rates are the lowest they've been in this country in a generation.

Of course we'd all have been much happier with better-balanced growth. Stimulating domestic demand to offset the external weakness—the only option available to us—was very much a second-best option, and not without its own risks, but it was better than doing nothing at all. That would have meant a much sharper slowdown, and probably recession, in the economy as a whole. And, given what was happening on the inflation front, it would have meant a quite unnecessary loss of overall output—and income and employment. In effect we took the view that unbalanced growth was better than no growth.

The question now, of course, is where do we go from here.

There have recently been encouraging, but tentative, signs that the worst of the global slowdown may now be behind us, and that the US and eurozone economies are now beginning to bottom out and are likely to pick up as we go through this year, perhaps to around trend. And the euro, which has, as I say, been puzzlingly weak since soon after its introduction three years ago, still seems likely to strengthen eventually. As it becomes clearer that the international environment really is improving, and that external demand really is picking up, then we can look forward to better-balanced and generally stronger growth in our own economy.

That will in due course mean that domestic demand growth—and consumer demand growth in particular will need to moderate if we are to avoid a build-up of inflationary pressure. But let me be quite clear—that's not a warning, still less is it a threat, as some more excitable commentators suggested earlier this year. It is—as I explained elsewhere recently—essentially a matter of arithmetic! It's quite possible, even quite likely, that the necessary moderation of consumer demand and I emphasise the word moderation—will come about of its own accord, given the gradual increase in unemployment we are currently seeing, and the build-up of household debt. And provided it does not happen too abruptly, that would be the best possible outcome. But if consumer spending were not to moderate of its own accord, we would, in the context of strengthening external demand, clearly need at some point to consider raising interest rates to bring that moderation about. I don't suggest that the timing of any such move is imminent—that would obviously depend upon the timing and the strength of the recovery abroad.

But for the time being, and whatever the precise numbers, the overall prospect for the British economy over the next couple of years is for output growth picking up to around trend and inflation to around target. And it was against that background that we left interest rates unchanged at our MPC meeting last week.

I gather that the EEF was 'deeply disappointed' at that decision, having been hoping for a cut. And I really do understand why, seeing things from the perspective of the manufacturing sector in particular, you might take a somewhat more pessimistic view of the prospects than did the MPC. We are—as I have explained—well aware of the degree of uncertainty inherent in any forecast, and do not pretend we have a crystal ball. But I can assure you that if, as we move forward, it seems likely that the overall economy will be weaker than we currently expect, and inflation lower, then we are prepared to reduce interest rates further, just as we stand ready to raise them if the overall economy, and inflation, appear likely to be stronger than we currently anticipate.

Mr President, the past year or so has been a difficult time for the world economy, which has made life increasingly difficult for the internationally exposed sectors of our own economy—including large parts of manufacturing. And things could remain difficult for a time. But it won't last for ever. I am 'cautiously optimistic' that the overseas environment will improve as we move through the year, and that by this time next year we here in the United Kingdom will have seen a return to somewhat stronger and better-balanced growth, with unemployment not far above its recent lows, and with continuing low inflation. If that is indeed how things turn out, we will have weathered the international storm as well as anyone could reasonably have expected.

So it is in the hope—and indeed the expectation—of improving prospects for the internationally exposed sectors of British manufacturing that I ask you all now to rise and to join me in a toast to the Engineering Employers Federation, and its President, Mr Paul Lester.

Three questions and a forecast

In this speech,⁽¹⁾ Mervyn King, **Deputy Governor**, asks, and then tries to answer, three questions concerning the current economic slowdown. First, why has the world economy turned down so rapidly? Second, is the United Kingdom heading for recession? Third, when will the imbalance between manufacturing and services come to an end? Mr King concludes that the United Kingdom has been affected by sharp swings in the world economy, but now is the moment for prudence to be joined by patience as the watchwords of economic policy.

Two weeks ago the Bank of England lowered its interest rate to 4%. You have to go back to 1955, not only to find the year in which Newcastle United last won a major domestic trophy, but also the year when official interest rates were last lower than 4%. The intervening 46 years were lean indeed. The absence of trophies at St James's Park was mirrored by a macroeconomic performance marred by high and volatile inflation. During the 1970s inflation averaged over 13% a year, and even in the 1980s it averaged 7% a year. But over the past decade, and especially in the past few years, the new monetary policy framework has brought low and stable inflation. In turn, that has led to the most stable decade for output growth since the Second World War, with 37 consecutive quarters of positive economic growth.

I know that some of you will be thinking that stability is fine in the abstract, but what use is it to a manufacturing business facing falling world demand for its products and an exchange rate that makes production unprofitable. So let me ask, and then try to answer, three questions concerning the current economic situation. First, why has the world economy turned down so rapidly? Second, is the United Kingdom heading for recession? Third, when will the imbalance between manufacturing and services come to an end?

Why has the world economy turned down so rapidly?

Last year world GDP growth was 4.7%; this year it is likely to be little more than 1% or so. World industrial production is now falling. It grew by 6.5% in the year to August 2000 and then fell by 3% in the following year.

The speed and severity of the slowdown reflects a downturn in business investment, especially in information technology. In the United States, business investment grew at an average annual rate of over 10% between 1994 and 2000. This year investment fell, led by the IT sector, and the contraction has not been confined to the United States. Take one example, worldwide sales of personal computers fell this year for the first time since 1986.

Business investment is import intensive. Almost one half of spending on capital goods in the industrialised world is on imports. So the fall in business investment led to a sharp slowdown in world trade. Last year the growth of world trade was the fastest for over 30 years; this year trade is likely to grow at its slowest rate for nearly 20 years.

The link from investment to trade helps to explain why industrial production slowed at the same time in all the major economies. This should not have been surprising. Movements in output in those economies have been highly correlated for much of the post-war period, and, contrary to some recent comment, the degree of correlation has remained broadly constant since the 1970s.

The role of the IT sector in the investment-driven slowdown is revealed by the remarkably similar falls in share prices of the high-tech sector across the industrialised world. Since their peak, high-tech share

(1) Given at the annual dinner of the CBI North East Region in Newcastle upon Tyne on Thursday 22 November 2001. This speech can be found on the Bank's web site at www.bankofengland.co.uk/speeches/speech151.htm

prices in the United States, in continental Europe, in the United Kingdom and Japan have all fallen by around two-thirds.

The key to a revival of world economic growth is an end to this IT-led downturn in business investment. For the moment, investment has been affected by the climate of uncertainty following the terrorist attacks on 11 September. According to the October CBI Industrial Trends Survey, the number of respondents citing uncertainty about demand as a factor limiting investment was the largest since the question was first asked in 1979. Business confidence has fallen to historically low levels.

Nevertheless, there are two reasons for believing that the world economy will not remain in the doldrums indefinitely. First, by its very nature, an investment downturn of the kind that we have seen is usually sharp but temporary. Excess capacity eventually disappears through depreciation and obsolescence, and new investment becomes profitable again. And that process is faster when the excess investment is in the form of IT capital, which depreciates more rapidly than other types of capital.

Second, both monetary and fiscal policy have responded quickly to signs of a downturn. This year alone, the Federal Reserve has lowered interest rates on ten occasions, and by a total of $4^{1/2}$ percentage points. The Bank of England has lowered rates on seven occasions and by two percentage points, and the European Central Bank on four occasions and by $1^{1/2}$ percentage points. Fiscal policy has also been playing its part. As ever, there are long time lags between changes in policy and their impact on the economy. That these time lags are alive and well can be seen clearly in the United States, where growth has slowed from around 5% in the middle of last year to around zero in the middle of this, despite a substantial reduction in interest rates.

But the proposition that it takes time before monetary policy has its full impact on the economy is quite different from the proposition that monetary policy is ineffective. And the Monetary Policy Committee takes the view that the influence of policy easing will gradually come through and its effects will be seen over the next year or so. Of course, there are many risks to this outlook. None of us knows how the present uncertainties will be resolved. Again, however, monetary policy stands ready to respond to any unexpected developments, whether on the upside or the downside.

Is the United Kingdom heading for a recession?

Let me turn to my second question—is the United Kingdom heading for a recession? Some of you may think that the answer is obvious because manufacturing is already in recession. That is true. Output in manufacturing has now fallen for three consecutive quarters, and by around 3% over the past year. But the economy as a whole has continued to grow steadily. In the latest official data, released this morning, GDP is estimated to have grown by 2.1% over the past few quarters, and by 0.5% in the third quarter of this year, close to the historical average. Total output, in the judgment of the Monetary Policy Committee, is likely to continue to rise. Over the next year private consumption and investment may slow quite noticeably, and the small rise in unemployment in October, and signs of cooling in the housing market, are consistent with this picture. But public sector spending will help to maintain the growth of demand overall, and, in due course, the effect of the monetary policy easing this year will feed through. That is why the Committee believes that a recession in the United Kingdom is not the most likely outcome.

But there are risks—in both directions. Projecting a slowing of consumption has, for some time, represented the triumph of hope over experience, and the data published today, showing a rise in consumption in the third quarter of 1.3% and of $4^{1/2}$ % on a year ago, do nothing to change that. It would be very unusual for output to fall immediately after a year in which money and credit have grown, in real terms, as fast as they have over the past twelve months. On the downside there are clear risks from the world economy. Whenever the United States has experienced two consecutive quarters of falling output, GDP in the United Kingdom has fallen in at least one of those quarters. And in the October CBI Survey, optimism regarding export prospects fell to its lowest level since 1980. So there are risks aplenty. But the most likely outcome is a continuation of growth, albeit at a slower pace for a while, with low inflation.

I would urge you, however, to consider the wider picture. Relatively small changes to quarterly growth rates are neither of critical importance in themselves, nor something over which monetary policy has much influence. No policy framework can abolish the business cycle. It is the large and persistent fluctuations of output which are damaging, and which the MPC can influence by the application of a pre-emptive monetary policy in pursuit of the inflation target looking beyond the next few months to the outlook two years or so ahead.

When will the imbalance between manufacturing and services come to an end?

Despite the overall balance in the economy, with growth close to trend and inflation close to the target, there has been, for over four years now, a considerable imbalance between different sectors. The impact of, first, the high level of sterling against the euro and, second, the recent slowdown of the world economy have exacerbated the long-run difference between manufacturing and services, or, to be more precise, between the tradable and non-tradable sectors of the economy. Domestic demand has been strong and the trade position weak. This year net trade will make a negative contribution to economic growth for the sixth year in a row. Further negative contributions are expected over the next two years. That is unprecedented in our modern economic history, by which I mean since 1800. It cannot continue for many more years without leading to a trade deficit that would be painful to correct.

A reduction of this imbalance would be helped by a recovery of the world economy. But an unwinding of the imbalance between domestic demand and output is likely to involve a slowdown of consumption growth in order to release resources that could be directed to investment and an improvement in the trade balance. In turn, that is likely to imply a fall in the sterling exchange rate to a more sustainable level. When and how these adjustments will occur, and the imbalances unwind, is extremely difficult to know.

Over the past five years, final domestic demand has grown at an average annual rate of nearly 4%, much faster than the $2^{3}/_{4}$ % growth rate of output. If the imbalances are to unwind over the next five years, then final domestic demand will have to grow more slowly than output. That would lead to a better balance between different sectors of the economy, and between different parts of the country. In recent years, those regions that have a higher than average proportion of manufacturing activity and a lower than average proportion of business and financial services, such as the North East, have found conditions more difficult than have regions where the reverse is true.

Differences between sectors must be seen in their long-run context. Productivity increases at a faster rate, on average, in manufacturing than in other parts of the economy. As a result, employment in manufacturing falls as a share of the total. In 1900 there were over one hundred blast furnaces along the banks of the Tees. Today there is just one—the Corus plant at Redcar. But that one produces more iron than all 106 combined a century ago. It is that sort of productivity growth which generates a rising standard of living, but which also means that the share of manufacturing in total employment continues to decline.

Conclusions

40 years is a long time. Inflation and interest rates are at their lowest level for over 40 years. And unemployment is now lower in this country than in any other G7 country for the first time since Newcastle were the FA Cup holders.

The new monetary policy framework, based on a clear symmetric inflation target, has brought inflation down and enabled output to grow for almost a decade with falling unemployment. From time to time, sharp swings in the world economy will affect the United Kingdom. That has clearly been the case this year. But, given time, monetary policy will be able to promote stability. Now is the moment for prudence to be joined by patience as the watchwords of economic policy. By setting interest rates in a pre-emptive fashion, the Monetary Policy Committee is determined to prove that it really is a Committee for all sectors, all regions and all seasons.

Twenty-first century markets

In this speech⁽¹⁾ Ian Plenderleith, Executive Director and member of the Monetary Policy Committee, highlights the successful launch of delivery versus payment (DvP) in the United Kingdom's securities settlement system. He discusses how the payments and settlements systems have been linked to provide full DvP, so that securities transactions are now settled in real time in CREST versus a simultaneous real-time payment in the high-value payment system, with the Bank of England operating the central system that links the two. He notes that this is a major advance in reducing risk in the financial system and in increasing its efficiency. Ian Plenderleith also reviews the growing importance of financial markets in the economic policy process. He notes that, if markets develop sound and efficient structures, they have the potential to be 'enormously beneficial' in helping 'to promote growth in output and employment and rising living standards—the aims that we are all ultimately pursuing.'

I am delighted to have this opportunity to contribute to the 15th Annual European Finance Convention. The event is a valuable feature in the international calendar and the agenda is as wide-ranging and stimulating as ever. But this occasion is special because it is the last time we shall meet in this forum before the euro moves from book entry to tangible notes and coins—from virtual reality to actual currency. It is for all of us a historic time to be meeting.

As my contribution, I want to offer some thoughts tied to the theme of the growing and pervasive importance of financial markets in the economic policy process. I want to point out the important role that financial markets now play in the pursuit of economic growth and development and in the conduct of stable macroeconomic policies. I want to try to show what this means at the global level, at the level of national economies, at the level of individual business enterprises and at the level of the individual citizen. I want to suggest that this enhanced role for markets has the potential to be enormously beneficial. But I also want to argue that, if markets are to help us manage our economies, we need to take a continuing interest in both the safety and soundness of the markets and their efficiency and effectiveness. How we do this needs careful thought: we need to work with the grain of the markets, co-operating closely with market participants and drawing on their expertise. Only in this way, with market structures that are sound and efficient, can we

hope to capitalise fully on the potential the financial markets offer to promote growth in output and employment and rising living standards—the economic aims that we are all ultimately pursuing.

At the global level, the growing size and interconnectedness of financial markets is not a new phenomenon, but the pace of growth and the degree of global interconnection has arguably intensified in recent years. To take just one measure of growth, global issuance of bonds and equities has risen from \$700 billion in 1995 to \$2,000 billion in 2001 so far. In sterling, that increase has been almost four-fold: from \$33 billion to \$120 billion. The high degree of interconnection among markets is illustrated by the increased tendency for major money, bond and equity markets to move, if not in tandem, at any rate in broadly the same pattern. Local developments, relevant to local conditions, can still be an important influence on movements in markets in the local area. But just as often movements in the major internationally traded markets tend to occur together, as all of them react simultaneously to events in the global economy. In this way, markets moving together can transmit developments across the world economy faster than direct linkages through, for example, trade and investment. We indeed these days all live and work in one world.

At the national level, too, it has never been truer that no man is an island. Private capital flows, moving across

(1) To the 15th Annual European Finance Convention in Brussels on 29 November 2001. This speech may be found on the Bank's web site at www.bankofengland.co.uk/speeches/speech152.htm

economic boundaries more freely than ever in modern times, have long since overtaken official financing as the major source of funds for development. This is true of both direct and portfolio investment. One result is that exchange rates seem, in recent years, to have become less influenced by differences in short-term interest rates and more responsive to longer-term capital flows, and hence more influenced by relative growth prospects and by the rates of return available on longer-term investment in soundly-growing economies.

Another consequence has been to increase the importance for economic policy-makers of putting in place, and maintaining, a stable medium-term framework for macroeconomic policy, as a demonstration to financial markets of the country's commitment to sound economic policies. Hence the value attached to setting clear monetary objectives, directed at maintaining low inflation, with the conduct of monetary policy then delegated to an independent, but accountable, central bank. Hence too the focus on setting a sustainable medium-term framework for fiscal policy, and on developing a coherent programme of structural reform to improve the supply side of the economy. The discipline that markets can exert in the macroeconomic sphere is an important reason why transparency in the policy process is for many countries now an important design feature in their policy framework.

An important consequence of this heightened role of the markets in encouraging stable economic policies is the increased focus now given to financial stability—that is, to ensuring that financial markets operate on the basis of sound trading systems and operational infrastructure. I shall say more about this in a moment, but it is plainly critical to ensure that we develop financial systems that are sound enough to carry the role that financial markets now play in the economic process.

At the level of the individual business enterprise, it is the task of the financial markets to supply the range of facilities that firms need to conduct their business, and firms similarly need to equip themselves to tap the range of services they require. Alongside a continuing role for financial intermediaries, disintermediated markets play a critical role in mobilising savings and channelling them to productive investment and in enabling market participants to manage actively the portfolio of return and risk exposures that best meets their investment and business needs. The constant flow of new instruments and new trading techniques are testimony to the role that the markets can play. A sound structure of financial markets, just as much as a successful national sports team, has become the mark of a modern advanced economy.

The same is true at the level of the individual citizen. even if (happily) he or she still probably shows more emotional attachment to the national sports team. The progressive increase in personal wealth and the heightened emphasis on personal financial provision has greatly increased the focus on active management of personal finances. Individuals and households need a range of saving outlets and competitive choices among mortgages and pension plans tailored to their individual circumstances. Financial intermediaries can most effectively provide these retail facilities by managing their own exposures in the wholesale financial markets. And, of course, as personal wealth is increasingly invested in market-related forms, such as housing and equity-related products, movements in market prices may through the wealth effect have a progressively greater or speedier impact on personal consumption spending across the economy as a whole.

In all these ways, financial markets are playing an increased role in the economic process, all of the way from the global economy to that of the individual citizen. I have no doubt that it is a process that can offer enormous benefits, because markets, if soundly based and trading freely, offer the best mechanism we have yet devised for optimal allocation of resources. But the proviso is important: it is only if markets are soundly based and trade freely that we can hope to reap the benefits.

For that reason, we have a continuing and live interest in promoting the soundness and efficiency of financial markets, so that they can reliably undertake the role we have assigned them in promoting economic growth. The range of exercises being pursued with this general purpose in view is legion. Here in Europe, the rapid integration of financial markets within the European Union and the euro area is a significant case in point. So too is the progressive process in many emerging market economies of modernising their market structures to facilitate greater international participation in their markets. Other initiatives that work in the same direction are the standards that are being developed by international institutions for good practice in a wide range of economic and regulatory policy areas, the work on developing a new Basel Accord, and the attention

being given to the respective roles of official funds and private financing in crisis management. A more recent example is the heightened attention now being given to contingency planning in the light of the tragic events of 11 September.

Out of this array, I want to draw your attention to one particular initiative, purely because it represents the culmination of a long programme of work in my own country and, as it happens, has come to successful fruition this very week. This is the introduction of real-time payments with immediate finality in central bank money into CREST, the United Kingdom's main securities settlement system. The United Kingdom, along with many other countries, introduced real-time gross settlement (RTGS) for our sterling high-value payment system several years ago, and since 1999 we have been offering the same capability in euro, both for domestic and, through TARGET, for cross-border high-value payments. In parallel, we have long had electronic book-entry settlement facilities for securities, operated in London by CREST. But the securities settlement system, while offering finality of securities settlement in real time, has until now depended upon end-of-day net settlement of the associated payment obligations. This very week we have linked the payments and settlements systems to provide full delivery versus payment (DvP), so that securities transactions are now settled in real time in CREST versus a simultaneous real-time payment in the high-value payment system,

with the Bank of England operating the central system that links the two. This is a major advance in reducing risk in the financial system and in increasing its efficiency. It was a big step for the UK financial markets when we inaugurated the system on Monday of this week, 26 November, and we are all delighted that it is operating so smoothly and so successfully.

Central banks have a critical interest in the work of promoting the efficiency and effectiveness of markets and strengthening their soundness and safety, and indeed are involved in many of the exercises, precisely because the soundness and efficiency of markets is a key adjunct to the macroeconomic responsibility central banks have for the conduct of monetary policy. Monetary policy, however well conceived and conducted, is unlikely to be able to deliver effective results in terms of maintaining low inflation as a basis for sustainable growth if policy has to be conducted in a flawed financial system. For that reason, central banks have increasingly in recent years developed a closer focus on financial stability-the safety and soundness of the financial system as a whole—and on the efficiency of the financial system in serving the needs of the economy, as integral adjuncts to a central bank's responsibility for monetary stability. That work has made great progress but, given the continued growth of activity in the financial markets, there is plenty still to do that will keep us all fully occupied for years to come.

The stock market, capacity uncertainties and the outlook for UK inflation

In this speech,⁽¹⁾ Sushil B Wadhwani⁽²⁾ argues that expectations of earnings growth and stock market performance are still high, which implies that a further downward valuation adjustment may be necessary over the medium term. He also discusses some of the recent difficulties associated with assessing supply capacity, and argues that the tendency for prices to come in lower than the Bank's model appears to imply that there might be less inflationary pressure than has been assumed.

Introduction

It is a great privilege to be among you to discuss the outlook for the UK economy.

I shall begin today by considering the prospects for the global economy. I will then spend some time examining current global equity market valuations, as any setback in the markets could have a significant impact on economic growth.

I will then come home and discuss, by way of example, the recent difficulties that we have had in assessing the supply capacity of the UK economy. As all good economics students know, this is an important issue as prices emerge from the interaction of demand-side and supply-side forces.

The outlook for the global economy

In recent weeks, a number of surveys of business opinion have shown a notable weakening in the United States and Europe. Chart 1 shows the purchasing managers' indices (PMI) for manufacturing, while those for services are displayed in Chart 2. Notice that both sectors show falls, with a clear deterioration in the last month. Moreover, the business surveys are below the levels they were at during the financial crisis of the Autumn of 1998, when there was also some anxiety about the health of the world economy.

Some of these surveys are designed to measure business perceptions about tangible magnitudes like current

Chart 1 US and euro-area manufacturing PMI







production, employment and new orders, and the published composite index is not supposed to reflect vague notions like 'optimism'. Therefore, the observed

(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 Jennifer Greenslade, Nick Davey and Kenny Turnbull for their help and advice. Chris Allsopp, Kate Barker, Charlie Bean, Joanne Cutler, Kathy McCarthy, Stephen Nickell, Gus O'Donnell and Peter Rodgers provided me with useful comments on an earlier draft. Of course, the views expressed in this speech are entirely personal, and do not reflect the views of either the Monetary Policy Committee or the Bank of England. This speech may be found on the Bank's web site at www.bankofengland.co.uk/speeches/speech150.pdf

⁽¹⁾ Delivered to the Edinburgh University Economics Society in Edinburgh on 21 November 2001.

deterioration is of potentially greater concern,⁽¹⁾ though, depending on political and military developments, this could turn around quickly.

There is also clear evidence of weakening consumer confidence in the United States and Europe (see Chart 3). Notably, US consumer sentiment had already weakened significantly in August and early September (before the tragic events of 11 September), with mixed evidence on whether there has been any further weakening thereafter (see Table A), ie the different indices yield divergent answers.





Table A

Consumer sentiment in the United States in 2001

	University of Michigan	Conference Board
June	92.6	118.9
July	92.4	116.3
August	91.5	114.0
Preliminary September	83.6	n.a.
Final September	81.8	97.0
October	82.7	85.5

n.a. = not available.

It is difficult precisely to disentangle the economic effects of the September terrorist attacks. The global economy had, of course, been weak for some time before the attacks. In the United States, although the NAPM indicators had appeared to edge up before the attacks, consumer confidence was still weakening, as was employment. Business sentiment in Europe was still deteriorating ahead of the attacks. In the United States, those who survey business opinion say that the 11 September attacks solidified earlier tentative decisions to reduce business commitments and employment. It is still too early to understand the full economic effects of the attacks. For the present, a survey carried out in the United Kingdom by the Bank's Agents for the November MPC meeting suggested that while a number of firms have cut back on current discretionary expenditure (eg travel, entertainment etc) and have scaled back their plans for investment and hiring, a clear majority of firms have not, as yet, reacted. A related survey carried out for the CBI⁽²⁾ in the United Kingdom also contained broadly similar findings, with, for example, just over a quarter of the sample having cut back on investment plans. Somewhat more worryingly, the CBI survey suggested that the respondents did not see the economic effects as being purely temporary. For example, the fraction of businesses expecting their orders to be negatively affected over the next twelve months (39%) was higher than the proportion who had already experienced the cancellation or postponement of orders (29%) as a result of the 11 September events. Moreover, 31% of respondents expected the effects of these events to last at least two years (53% said that it would last at least a year). An upside risk to activity is that, contrary to these expectations, the shock to business confidence proves to be relatively transient after all.

While the surveys have suggested a significant weakening in confidence in the future with the effects of the attacks expected to be relatively long-lived, global stock markets have behaved in a way that is more consistent with the dip in growth being relatively short-lived. Most major equity market indices are now at or above their levels of 10 September. The markets appear to be willing to 'look through' the valley in earnings associated with recent economic weakness to the sunlit uplands that are expected to result from the significant monetary and fiscal stimulus that has been injected. Traditionally, stock markets bottom before recessions end, so it is not that unusual to have weak business confidence and stock market rallies co-existing. A key question is whether the markets are right to expect an economic recovery in the United States by the middle of 2002.

All year, policy in the United States has had a race against time in its effort to keep consumer spending resilient while the corporate sector dealt with its capital stock overhang. The danger has been that the layoffs resulting from the corporate sector's woes would undermine consumer spending before companies had

(1) One cannot, of course, entirely rule out the possibility that those who answered these questions were, nevertheless,

somewhat swayed by current sentiment.(2) Economic Outlook Survey—post-11 September, October 2001.

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completed the necessary adjustments. The 11 September events were an obvious setback to this endeavour. Layoffs have now accelerated, consumer confidence has dipped, and business perceptions of new orders have weakened markedly. That is why further policy steps have been necessary, and we shall now have to wait and see whether the economic recovery arrives on schedule.

The equity markets appear to be relying on a significant recovery in profits next year-for example, the IBES consensus is for a 14.4% increase in operating earnings in 2002. Not only is this forecast dependent on an economic recovery, but it also assumes that profits will rise significantly faster than GDP. Yet firms have little pricing power, as capacity utilisation is at an 18-year low and nominal GDP growth has slowed to just under 2% per year. On the other hand, unemployment is still low by long-term historical standards, and workers appear to be able to secure real wage increases significantly in excess of productivity growth. The implied squeeze on profitability does not bode well, because firms are likely to respond by scaling back on their investment and employment plans, which could then feed back onto consumption.

I shall discuss current equity market valuations later in this lecture, and will return to considering whether a postponement of economic recovery and/or earnings disappointments could prove problematic for the equity markets. Obviously, a further setback to share prices would generate additional headwinds for the hoped-for recovery.

To return to the theme of the perceived lack of pricing power among firms, Charts 4 and 5 display the responses to questions on pricing that are embedded in the PMI surveys discussed before. They point to inflation pressures being extremely benign (recall that 50 reflects the no-change level), with both manufacturing and services now in deflation territory. Note also that the price of oil and industrial metals are down by around 20% this year. In addition, capacity utilisation in the United States and Japan has not been lower since the early 1980s. For all these reasons, it is likely that global inflation will remain low over the next year or so. Indeed, this is one reason why I am especially optimistic that, assuming unchanged interest rates, UK inflation will remain low (below target) over the next two years.⁽¹⁾ If one thinks that inflation is likely to remain subdued, it is easier to contemplate proactive monetary policy actions to counter the confidence-destroying effects of recent events.





Chart 5 US and euro-area non-manufacturing prices



In terms of the United Kingdom, for much of 2001, we have eased policy to offset global economic weakness, notwithstanding the relatively robust growth of domestic demand. However, the labour market now appears to have turned, and there are some signs of a deceleration in house price inflation. The prospects for consumption are uncertain, though, until recently, growth has been strong.

As discussed above, a key issue is whether the global equity markets are likely to remain resilient. For that reason, I turn to a detailed consideration of current equity market valuations in the United States.

⁽¹⁾ I am one of those members who believes that the global inflation rate in finished goods prices has a direct effect on UK domestic prices—an effect that is not currently built into the Bank's medium-term macroeconometric model. This is one reason why my personal inflation projection is lower than the best collective projection published in the November *Inflation Report*.

Do current stock market valuations pose a risk to the global economy?

Global stock markets have fallen significantly since their peaks in 2000. Table B shows that the declines in the major equity indices from their peak values have ranged from over 20% for the FTSE 100 to around 60% for the Nasdaq. It is, therefore, tempting to believe that, perhaps, stock markets are unlikely to go down much further.

Table BStock market performance since the peak

	FTSE 100	S&P 500	DAX	CAC	Nikkei	Nasdaq	Euro Stoxx
Peak	6930.2	1527.5	8046.0	6922.3	20833.2	5048.6	466.2
15 Nov. 2001	5238.2	1142.2	5006.3	4577.3	10489.9	1900.6	307.5
Percentage chang	e -24.4	-25.2	-37.8	-33.9	-49.6	-62.4	-34.0

Normally, bear market bottoms are associated with clear signs of the purging of the excesses that built up during the euphoria associated with the preceding bull market. However, Chart 6a shows that the current price-earnings (P/E) ratio for the S&P 500 index in the United States remains high by long-term historical standards.⁽¹⁾ While it is true that current earnings are at cyclically depressed levels, Chart 6b, which is computed using a ten-year moving average of past earnings, suggests that the market is still trading at a relatively high multiple. These high absolute valuations have led some commentators to argue that the US stock market is still vulnerable to a further, significant decline. Of course,





Chart 6b S&P 500 price-earnings ratio (ten-year average of earnings)



were they to be correct, this would be likely to have an important impact on global growth.

It must be noted that P/E ratios have been high by historical standards for some years, and several Wall Street strategists have argued that this has been appropriate because interest rates and inflation have been low and that holding equities has become less risky. Indeed, at present, a survey of Wall Street strategists' recommendations suggests that they believe that this is one of the best times to buy equities in the past 16 years.⁽²⁾

In attempting to form a view about the likely evolution of the global economy, it is important to form a judgment about the equity valuation debate, and it is why I shall consider it in some detail today.

A simple valuation model

For simplicity, consider the following valuation model for stock prices:⁽³⁾

$$DY + g = r + rp \tag{1}$$

where

DY= dividend yield

- g = expected long-term, real growth rate of dividends
- *r* = real interest rate
- *rp* = equity risk premium

 Computed at an index value of S&P 500 = 1084. Note that, using operating earnings, the current P/E ratio would be lower (22.4), but this level remains comfortably above its long-term historical average.

(2) This is based on a survey of sell-side recommended asset allocations ('Sell Side Consensus Indicator'), compiled by Merrill Lynch Quantitative Strategy since 1985. The recommended equity allocation (71.2%) in October 2001 is the second-highest since 1985 (the highest was at the end of September 2001). The average equity allocation since 1985 is about 55%.

(3) This is known in the literature as Gordon's (1962) growth model, and is just a steady-state version of the dividend discount model (DDM).

Currently, in the United States (computed at S&P 500 = 1142, on 15 November), *DY* = 1.4%, *r* = 3.3% (ie, the yield on US Treasury inflation-protected securities), and we may initially assume that g = 2%, which is approximately equal to the long-term average growth rate of real dividends.⁽¹⁾ This yields an estimate of the equity risk premium (ERP) of 0.1%, which is extraordinarily low in relation to long-term historical standards, eg the actual, ex post ERP has been about 7% over the 1926-2000 period, while some estimates⁽²⁾ of the ex ante ERP suggest a value of around 4% over the same period. Some believe that the appropriate level of the ERP has fallen in the post-World War II period, and, indeed, estimates of the ex ante risk premium suggest that it has averaged around 2.4% since 1965. If one assumed that the ERP needed to rise to 2.4%, then that would imply a very significant decline in the S&P 500, ie from its current value of 1142, to around 430!(3) Fortunately, the above analysis needs to be modified.

Allowing for higher dividend growth

There is significant variation in the rate of productivity growth over time, ie although the long-term growth rate of labour productivity in the United States is about 2% per year, there are long periods of time where actual productivity growth has been maintained at a rather higher level, eg it averaged nearly 3% per year over the 1948-73 period, or just under 4% during the 1917-27 period. When valuing stocks, given that US productivity growth appears to have accelerated in the mid-1990s, it is reasonable to allow for a period of above-average dividend growth, before allowing the growth rate to fall back to its long-term average. In this regard, it is notable that analysts had become significantly more optimistic about medium-term earnings growth prospects during the past two decades-Chart 7 displays the three to five-year-ahead consensus real earnings growth forecast-it had risen from around 8% per year in the mid-1980s to a peak of almost 16% per year in 2000, though it has fallen back to around 12% per year now.⁽⁴⁾

If one assumes that the longer-term earnings growth forecasts are likely to be an accurate guide over the

Chart 7 Consensus expectations of S&P 500 real earnings growth





Chart 8





(a) Computed using three-stage DDM based on long-term earnings expectations.

next four years, and additionally assumes that the growth rate will gradually diminish towards its long-term average of 2% per year over, say an eight-year period,⁽⁵⁾ then the implied ERP today is around 2.7% (see Chart 8).⁽⁶⁾

Obviously, this makes the US stock market actually look undervalued—requiring an *ex ante* risk premium of 2.4% would imply a rise in the S&P 500 index from 1142 to around 1285. Indeed, the post-1985 average of the implied ERP is even lower (2.1%), so one could derive an even higher implied value for the S&P 500.

to rise from its current value of 1.4% to 3.7%.

⁽¹⁾ That is, over the 1926–2000 period.

⁽²⁾ See, for example, Blanchard (1993) or Wadhwani (1999)

⁽³⁾ This is because, holding interest rates and the expected growth of dividends constant, the dividend yield would have

⁽⁴⁾ Incidentally, for the period that such data on long-term earnings expectations have been available, there is no evidence of these expectations being biased. This is in contrast to the data on one-year-ahead earnings expectations, where analysts appear to have been over-optimistic.

⁽⁵⁾ Hence, real dividend growth is assumed to rise at a faster than average rate over the next twelve years.

⁽⁶⁾ I have used a three-stage DDM here, and am grateful to Nikolaos Panigirtzoglou and Robert Scammell of the Bank of England's Monetary Analysis Division for their help with these calibrations.
But, a low ERP must accompany lower expected returns

At first sight, one might take some comfort from the fact that the ERP appears to have risen from around 1/2% at the peak of the market of 2000, (see Chart 8), to a value above its post-1985 historical average. However, in the long bull market that we have had, investors have increased their expectations of equity returns. It is important that investor expectations for returns on the stock market are consistent with the ERP. Specifically, with long-term bond yields of around $4^{3}/4\%$, an ERP of $2^{1}/_{2}\%$ implies a long-term return on equities of $7^{1}/_{4}\%$ per year. This implied level of equity returns is, though, considerably lower than what investors say that they expect to earn on their stocks. Specifically, the UBS Paine Webber/Gallup poll of investor attitudes asks individual investors to estimate the annual rate of return on the stock market over the next ten years. The October 2001 survey suggested an expected return of around 15% per year! Chart 9 shows that the expected return has fallen a little (it was as high as 19% per year in December 1999), but it remains more than twice as high as implied by the current constellation of interest rates, ERP and earnings growth expectations. The mismatch between what the stock market is likely to deliver versus what individual US investors expect it to deliver is a potential source of concern about the medium-term viability of existing stock market valuations.





UBS Paine Webber/Gallup survey of expected returns

Of course, the recent bear market has had some impact on expected returns-indeed, one-year-ahead expected returns have fallen significantly over the past two years

(see Chart 9), but as already noted, ten-year-ahead expected returns have moved relatively little. Individual investors appear to believe that the current bear market is only going to have a relatively temporary effect on the path of equity returns-their longer-term expectations for returns are still what some may consider to be extraordinarily high.⁽¹⁾

Are earnings growth expectations too high?

A related concern about possibly over-exuberant expectations is associated with the fact that analysts still expect earnings growth over the next four years to average almost 15% per year in nominal terms, or around 12% in real, inflation-adjusted terms. Of course, in the long term, earnings growth must match GDP growth, and not even the most ardent advocate of the New Economy in the United States believes that the economy is likely to grow faster than 4% per year. Historically, since 1875, this rate of real earnings growth of 12% per year over a four-year period has been exceeded only about 10% of the time. Hence, the next four years would have to be unusually good in terms of corporate earnings growth in order to match the expectations of analysts. While this is possible, it is not particularly reassuring that the current optimism of stock market pundits is predicated on a high decile outcome. Actually, the estimate of the current ERP of 2.7% derived above is based on a three-stage DDM where real earnings growth falls only gradually from its elevated level over the next four years. I have implicitly assumed an average growth rate of real earnings of around 8.2% per year over the next twelve years. Yet, as Chart 10 shows, this has been a very

Chart 10 Real earnings growth (twelve-year average growth rate)



(1) In theory, if the ERP were to fall further for some years to come, then it is possible that the expectations of individual investors might be validated by subsequent stock market performance. However, I regard it as an unlikely possibility since the ERP is already quite low.

unusual event over the past 125 years. Specifically, this rate of earnings growth has only been exceeded around 1% of the time.⁽¹⁾

We also discussed before (in the first section) that expectations for a vigorous profits recovery in 2002 are threatened by a combination of little pricing power and positive unit labour cost growth.

The link between inflation and the P/E ratio might be unreliable

Wall Street strategists typically justify the current level of the P/E ratio in the United States by appealing to the evidence that, at least over the past 30 years, lower inflation appears to have been associated with higher P/E ratios. Equivalently, the ERP appears to have been positively correlated with inflation.

A significant problem associated with relying on this relationship is that it is not stable over time. In an earlier paper,⁽²⁾ I report evidence using three centuries of UK data suggesting that over the 1705–1949 period, the correlation between inflation and stock returns was the opposite sign of the post-1950 correlation. Similarly, in Japan, the post-1992 correlation has also switched signs relative to what prevailed before.

In Japan, the failure of the economy to recover convincingly, associated with fears relating to deflation implied that lower interest rates no longer stimulated higher share prices. Some commentators believe that there is some risk that the same might eventually occur in the context of the US stock market.

Some tentative conclusions

Although global stock markets are down significantly over the past 18 months, it is not, as yet, possible to assert that all the previous 'excesses' have been purged. Current valuations still appear to be predicated on estimates of medium-term earnings growth which, while not impossible, only occur infrequently. Individual investors appear to still have an unrealistic expectation of future, long-term equity returns.

However, none of these 'excesses' are necessarily inconsistent with a significant move up in equity prices over the next few months if, say, clear signs of an economic recovery do emerge. It behoves us to recall the fact that equities rallied by almost 60% over the subsequent 17 months from the lows reached in October 1998, even though levels of the ERP and long-term earnings expectations were not significantly different from today. Valuation considerations only matter on a longer-term basis. An economic recovery that brought forth a significant bounce in profits and share prices is unlikely to lead anyone to question their current, longer-term expectations about earnings and equity returns. Also, if the military campaign were to be seen to be continuing to be proceeding well, equity markets and business confidence could recover significantly.

If, on the other hand, for whatever reason, the recovery is delayed further, then we might see a valuation adjustment as investors come to re-evaluate their expectations about longer-term earnings growth and returns. Recall that, earlier this year, we have already had two failed rallies (January, and April-May) in the expectation of a recovery. When it appeared that the economy was actually getting weaker, the stock market fell significantly, and provided further downward impetus to the economy. Hence, were the US economy to not recover on the expected schedule, there is the risk that the stock market might then act to amplify the extent of the weakness. Alternatively, even if the economy and the stock market were to recover strongly over the next few months, it is possible that the potentially over-exuberant returns and earnings growth expectations prove problematic for the markets at some future date. We shall have to wait and see.

Uncertainties relating to the supply potential of the economy

At a theoretical level, most existing macroeconomic models produce forecasts of inflation that depend on some assessment of demand pressures relative to the supply potential of the economy. However, in practice, assessing the true degree of supply potential is very difficult. We have, for some time, had to make some difficult judgments about, among other things, the level of spare capacity and the degree of competitive pressure. One way of assessing whether our assumptions about these key, hard-to-measure variables are appropriate is to look at the performance of the equation which helps

(2) See Wadhwani (1999).

⁽¹⁾ Some may want to argue that these earnings forecasts are not truly believed by the market. If so, this would imply that the level of the ERP is rather lower than the current estimate of 2.7%, and might still imply that the market was

^{&#}x27;overvalued' unless one also thought that the appropriate equilibrium ERP was very low.

predict prices that is embedded in the Bank's medium-term macroeconometric model (MTMM).

Now, there has been a tendency since around 1998 for actual prices to come in below what the MTMM equation predicted—these errors have been both economically and statistically significant.⁽¹⁾ Much of the 'art' of forecasting lies in the judgments that are made. Different assumptions about whether or not these errors would persist can have a large effect on the inflation forecast. If one assumes that these errors are relatively transient, then the forecast would tend to follow the prediction of the equation. If, instead, one felt that the factors that explain these errors were likely to endure, then this can lead to a significantly different forecast of inflation.

In deciding on appropriate assumptions, we have had to take into account the upward revisions to the historical capital stock data that were unveiled by the ONS in September 2001. The new measure of the capital stock had a significant effect on the MTMM measure of capacity utilisation.⁽²⁾ This new measure is rather closer to survey measures than was true of the previous measure, and implies that we are operating below full capacity, while the previous measure implied that we were operating above full capacity.⁽³⁾ The revised measure of capacity utilisation has the considerable advantage that it reduces the size of the price forecasting errors that would have been made. It is also more plausible as it is more closely correlated with survey measures.⁽⁴⁾ One is normally more confident about projecting the future when one understands the past better. Since this alternative explanation of the price forecasting errors was of a more enduring character. this reduced the medium-term inflation forecast that was mechanically produced by the model.⁽⁵⁾

Indeed, this partly explains why, as was noted in the November 2001 *Inflation Report* (page iii), although the

broad outlook for growth was similar to August, underlying inflationary pressures were a little weaker.⁽⁶⁾

However, important uncertainties about the degree of inflationary pressure remain. This is unlikely to be the final word on the capital stock.⁽⁷⁾ Moreover, although the new capital stock data imply smaller forecast errors in the price equation, there is still some tendency to over-predict price inflation since 1998.⁽⁸⁾ These forecasting errors are still economically significant. If, for example, we projected the average forecast error that has been made over the post-1998 period into the future, Chart 11 shows that the implied path for inflation would have been quite different from what was published in the November 2001 Inflation Report, with a difference in the two-year-ahead inflation projection of as much as 1.8 percentage points.⁽⁹⁾ Of course, the model-based inflation forecast is very sensitive to different technical assumptions about the behaviour of forecast errors. Chart 11 shows that projecting the post-1997 error forward would yield a path for inflation that was lower than the November Inflation Report projection by 0.9 percentage points instead. Hence considerable uncertainty remains, though all reasonable assumptions regarding the historical errors would point to lower inflation.⁽¹⁰⁾ Of course, the forecast that we publish is not mechanically generated, and depends on a host of judgments.

This suggests that there might still be important missing/poorly measured variables in the MTMM price equation, and that there is much work for us to do. Progress here could help reduce the degree of dispersion in alternative inflation forecasts in Chart 11. Candidate explanations include the possibility that the capital stock remains mis-measured and we still need to investigate alternative conceptual measures of the capital stock, eg the volume index of capital services. More generally, the evidence that prices have been coming in below what the equation predicts is consistent with the growth rate of potential output being

⁽¹⁾ See Wadhwani (2001) for a more detailed discussion.

⁽²⁾ The Bank's measure of capacity utilisation is defined in Bank of England (2000), pages 28–29.

⁽³⁾ See Wadhwani (2001) for a discussion of the lack of correlation of the previous measure with survey measures.

⁽⁴⁾ We have compared it to a composite measure based on surveys carried out in manufacturing and services.

⁽⁵⁾ As the previous adjustments that had been made to deal with the price forecasting errors were unwound over time. Note also that we have now assumed a faster, prospective growth rate in the capital stock over the forecast period.

which, in a mechanical sense, implies a faster growth rate of potential output.

⁽⁶⁾ Other explanatory factors included lower input prices and, perhaps, the fact that quarterly growth in the second half of 2002 is a little lower than in the August projection.

⁽⁷⁾ I have previously (Wadhwani (2000, 2001)) considered the possibility that we use alternative conceptual measures of the capital stock.

⁽⁸⁾ A t-ratio to assess the statistical significance of the forecasting errors was previously -2.19. It is now -1.5. Although this is not statistically significant, it is economically significant, as I discuss in the text.

⁽⁹⁾ This simulation was carried out within the External MPC Unit at the Bank.

⁽¹⁰⁾ Note that, in any case, the variance of our August 2001 inflation forecast was around 0.8 percentage points at the two-year horizon.

higher than we have assumed. Another issue is that the equation does not currently allow the world price of competitor goods to influence domestic pricing and, thereby, potentially fails to pick up the intensification of competitive pressure that has occurred⁽¹⁾ as the ratio of world prices to domestic prices has fallen significantly in recent years. There is also survey evidence suggesting that an intensification of competitive pressures since mid-1997 has been perceived to have an important effect on profitability. Further, it may be that we need to revisit the conceptual measure of capacity utilisation that is used in the model. In any case, while there are considerable uncertainties, my personal judgment is that the current published best collective projection is overstating the degree of inflationary pressure.⁽²⁾

Chart 11 Alternative 'inflation forecasts'



I have used the above example to illustrate some of the difficult decisions that we have to make in terms of assessing supply potential. While I have concentrated on issues relating to physical capacity and the degree of competitive pressure today, trying to assess slack in the labour market is just as difficult, though that can be left for another occasion.

Conclusions

Let me end by summarising what I have said today.

In terms of the outlook for the global economy, the consensus forecast is for a recovery to begin in the United States by the middle of 2002. This view is based on the significant degree of fiscal and monetary stimulus in the pipeline. I did though discuss the risks to this view, including the possibility that the ongoing deterioration in the labour market would impact on consumption, and also that weak profitability might keep layoffs high.

Turning to the stock market, while valuations are much more moderate than in early 2000, expectations of medium-term earnings growth and stock market performance are still high. While none of this would preclude a significant rise in stock prices over the next few months, it does increase the risk to the stock market if the economic recovery were delayed. Moreover, over the medium term, a downward valuation adjustment may still be necessary.

Finally, I discussed some of our recent difficulties associated with assessing supply capacity. The recent upward revisions for the capital stock have helped us to understand the past better and increased the measured degree of spare capacity in the economy. Major uncertainties remain, but my own view is that the tendency for prices to come in lower than the Bank's model appears to imply that there might be less inflationary pressure than has been assumed.

(1) See Wadhwani (2001), Section 6 for further discussion of this hypothesis.

⁽²⁾ It is one reason why I personally favoured the lower modal inflation projection, represented in Table 6.B of the November 2001 Inflation Report.

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Wadhwani, S B (2000), 'Monetary challenges in a 'New Economy', *Bank of England Quarterly Bulletin*, November, pages 411–22.

Wadhwani, S B (2001), 'Do we have a new economy?', Bank of England Quarterly Bulletin, Winter, pages 495-510.

Bank of England speeches

Speeches made by Bank personnel since publication of the previous Bulletin are listed below.

Euromoney Bond Investors' Congress.

Speech by The Rt Hon Sir Edward George, Governor, at the Euromoney Bond Investors' Congress in London on 19 February 2002. www.bankofengland.co.uk/speeches/speech162.htm

EEF Biennial Dinner: 'Monetary policy, the global economy and prospects for the United Kingdom'.

Speech by The Rt Hon Sir Edward George, Governor, at the EEF Biennial Dinner in London on 12 February 2002. www.bankofengland.co.uk/speeches/speech161.htm Reproduced on pages 94–96 of this *Bulletin*.

Bankers Club/Guild Banquet.

Speech by The Rt Hon Sir Edward George, Governor, at the Guildhall in London on 4 February 2002. www.bankofengland.co.uk/speeches/speech160.htm

The future of macroeconomic policy in the European Union.

Speech by Christopher Allsopp, Member of the Monetary Policy Committee, in Vienna on 23 January 2002. www.bankofengland.co.uk/speeches/speech159.pdf

Opportunity International UK's 10th anniversary reception.

Speech by The Rt Hon Sir Edward George, Governor, at Commerzbank in London on 22 January 2002. www.bankofengland.co.uk/speeches/speech158.htm

The euro, the UK and the City of London.

Speech by John Townend, Director for Europe, at Bank Negara in Kuala Lumpur, Malaysia on 22 January 2002. www.bankofengland.co.uk/speeches/speech157.htm

Association of Business Community Dinner.

Speech by The Rt Hon Sir Edward George, Governor, in Scotland on 14 January 2002. www.bankofengland.co.uk/speeches/speech156.htm

Financial frictions and the monetary transmission mechanism: theory, evidence and policy implications.

Paper by Charles Bean, Chief Economist and Member of the Monetary Policy Committee, and Jens Larsen and Kalin Nikolov, Monetary Assessment and Strategy Division, to the Monetary Transmission Network Conference at the European Central Bank, Frankfurt on 18 December 2001.

www.bankofengland.co.uk/speeches/speech155.pdf

Second City of London biennial meeting.

Speech by The Rt Hon Sir Edward George, Governor, at the International Maritime Organisation on 12 December 2001. www.bankofengland.co.uk/speeches/speech154.htm

Banking supervision and financial stability from an international perspective.

Speech by Alastair Clark, Executive Director, at the FBSA Annual Conference 2001 in London on 29 November 2001. www.bankofengland.co.uk/speeches/speech153.htm

Twenty-first century markets.

Speech by Ian Plenderleith, Executive Director, to the 15th Annual European Finance Convention in Brussels on 29 November 2001. www.bankofengland.co.uk/speeches/speech152.htm Reproduced on pages 100–02 of this *Bulletin*.

Three questions and a forecast.

Speech by Mervyn King, Deputy Governor, to the annual dinner of the CBI North East Region in Newcastle upon Tyne on 22 November 2001.

www.bankofengland.co.uk/speeches/speech151.htm Reproduced on pages 97–99 of this Bulletin.

The stock market, capacity uncertainties and the outlook for UK inflation.

Speech by Dr Sushil Wadhwani, member of the Monetary Policy Committee, to the Edinburgh University Economics Society in Edinburgh on 21 November 2001.

www.bankofengland.co.uk/speeches/speech150.pdf Reproduced on pages 103-12 of this Bulletin.

Contents of recent Quarterly Bulletins

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

Articles and speeches (indicated S)

May 1999

The transmission mechanism of monetary policy Monetary policy and the yield curve The Bank's use of survey data Monetary policy and uncertainty An effective exchange rate index for the euro area The financing of small firms in the United Kingdom Structural changes in exchange-traded markets Developments in small business finance (S) Economic models and monetary policy (S) Inflation and growth in the services industries (S)

August 1999

What makes prices sticky? Some survey evidence for the United KingdomThe use of explicit targets for monetary policy: practical experiences of 91 economies in the 1990sFinancial sector preparations for the Year 2000The Asian crisis: lessons for crisis management and

prevention (S)

The MPC two years on (S)

Price stability in the United Kingdom (S) The impact of the international environment on recent monetary policy (S)

November 1999

Sterling market liquidity over the Y2K period
Public sector debt: end March 1999
The external balance sheet of the United Kingdom: recent developments
News and the sterling markets
New estimates of the UK real and nominal yield curves
Government debt structure and monetary conditions
Challenges for monetary policy: new and old (S)
Sterling's puzzling behaviour (S)
Monetary policy and asset prices (S)
Interest rates and the UK economy—a policy for all seasons (S)

February 2000

Sterling wholesale markets: developments in 1999 Recent developments in extracting information from options markets Stock prices, stock indexes and index funds

February 2000 (continued)

Private equity: implications for financial efficiency and stability Back to the future of low global inflation (S) British unemployment and monetary policy (S) Before the Millennium: from the City of London (S)

May 2000

A comparison of long bond yields in the United Kingdom, the United States, and Germany Money, lending and spending: a study of the UK non-financial corporate sector and households Monetary policy and the euro (S) The new economy and the old monetary economics (S) The impact of the Internet on UK inflation (S) Monetary policy and the supply side (S)

August 2000

Public sector debt: end-March 2000 Age structure and the UK unemployment rate Financial market reactions to interest rate announcements and macroeconomic data releases Common message standards for electronic commerce in wholesale financial markets The environment for monetary policy (S) Monetary union and economic growth (S) The exchange rate and the MPC: what can we do? (S) The work of the Monetary Policy Committee (S)

November 2000

The external balance sheet of the United Kingdom: implications for financial stability? Economic models at the Bank of England International financial crises and public policy: some welfare analysis Central banks and financial stability Inferring market interest rate expectations from money market rates Central bank independence (S) Britain and the euro (S) Monetary challenges in a 'New Economy' (S)

Spring 2001

Sterling wholesale markets: developments in 2000

Spring 2001 (continued) The Kohn report on MPC procedures Bank capital standards: the new Basel Accord The financing of technology-based small firms: a review of the literature Measuring interest accruals on tradable debt securities in economic and financial statistics Saving, wealth and consumption Mortgage equity withdrawal and consumption The information in UK company profit warnings Interpreting movements in high-yield corporate bond market spreads International and domestic uncertainties (S) Current threats to global financial stability-a European view (S)

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)

Autumn 2001

Public attitudes about inflation: a comparative analysis Measuring capital services in the United Kingdom Capital flows and exchange rates Balancing domestic and external demand (S) The international financial system: a new partnership (S) 'Hanes Dwy Ddinas' or 'A Tale of Two Cities' (S)

Autumn 2001 (continued) Has UK labour market performance changed? (S) Some reflections on the MPC (S) Winter 2001 The external balance sheet of the United Kingdom: implications for financial stability Public sector debt: end-March 2001 The foreign exchange and over-the-counter derivatives markets in the United Kingdom The Bank's contacts with the money, repo and stock lending markets The formulation of monetary policy at the Bank of England Credit channel effects in the monetary transmission mechanism Financial effects on corporate investment in UK business cycles Why house prices matter The prospects for the UK and world economies (S) Maintaining financial stability in a rapidly changing world: some threats and opportunities (S) Monetary policy: addressing the uncertainties (S) Economic imbalances and UK monetary policy (S) Do we have a new economy? (S)

Spring 2002

The London Foreign Exchange Joint Standing Committee: a review of 2001 Provision of finance to smaller quoted companies: some evidence from survey responses and liaison meetings Explaining trends in UK business investment Building a real-time database for GDP(E) Electronic trading in wholesale financial markets: its wider impact and policy issues Analysts' earnings forecasts and equity valuations On market-based measures of inflation expectations Equity wealth and consumption-the experience of Germany, France and Italy in an international context Monetary policy, the global economy and prospects for the United Kingdom (S) Three questions and a forecast (S) Twenty-first century markets (S) The stock market, capacity uncertainties and the outlook for UK inflation (S)

Bank of England publications

Working papers

(April 2001)

Working papers are free of charge; a complete list is available from the address below. An up-to-date list of working papers is also maintained on the Bank of England's web site at www.bankofengland.co.uk/wp/index.html, where abstracts of all papers may be found. Papers published since January 1997 are available in full, in PDF format.

No.	Title	Author
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 (May 2000)	Shamik Dhar Darren Pain Ryland Thomas
114	Testing the stability of implied probability density functions (May 2000)	Robert R Bliss Nikolaos Panigirtzoglou
115	Trade credit and the monetary transmission mechanism (June 2000)	Marion Kohler Erik Britton Tony Yates
116	Persistence and volatility in short-term interest rates (June 2000)	Nikolaos Panigirtzoglou James Proudman John Spicer
117	A limited participation model of the monetary transmission mechanism in the United Kingdom <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
120	UK monetary policy 1972–97: a guide using Taylor rules (July 2000)	Edward Nelson
121	Sovereign liquidity crises: analytics and implications for public policy (September 2000)	Michael Chui Prasanna Gai Andrew G Haldane
122	Direct effects of base money on aggregate demand: theory and evidence (October 2000)	Edward Nelson
123	An analysis of the relationship between international bond markets (December 2000)	Andrew Clare Ilias Lekkos
124	Age structure and the UK unemployment rate (December 2000)	Richard Barwell
125	Assessing the impact of macroeconomic news announcements on securities prices under different monetary policy regimes <i>(February 2001)</i>	Andrew Clare Roger Courtenay
126	New estimates of the UK real and nominal yield curves (March 2001)	Nicola Anderson John Sleath
127	Sticky prices and volatile output (April 2001)	Martin Ellison Andrew Scott
128	'Oscillate Wildly': asymmetries and persistence in company-level profitability	Andrew Benito

129	Investment-specific technological progress in the United Kingdom (April 2001)	Hasan Bakhshi Jens Larsen
130	The real interest rate gap as an inflation indicator (April 2001)	Katharine S Neiss Edward Nelson
131 132	The structure of credit risk: spread volatility and ratings transitions (May 2001) Ratings versus equity-based credit risk modelling: an empirical analysis (May 2001)	Rudiger Kiesel William Perraudin Alex Taylor Pamela Nickell William Perraudin Simone Varotto
133	Stability of ratings transitions (May 2001)	Pamela Nickell William Perraudin Simone Varotto
134	Consumption, money and lending: a joint model for the UK household sector <i>(May 2001)</i>	K Alec Chrystal Paul Mizen
135	Hybrid inflation and price level targeting (May 2001)	Nicoletta Batini Anthony Yates
136	Crisis costs and debtor discipline: the efficacy of public policy in sovereign debt crises (May 2001)	Prasanna Gai Simon Hayes Hyun Song Shin
137	Leading indicator information in UK equity prices: an assessment of economic tracking portfolios (May 2001)	Simon Hayes
138	PPP and the real exchange rate-real interest rate differential puzzle revisited: evidence from non-stationary panel data <i>(June 2001)</i>	Georgios E Chortareas Rebecca L Driver
139	The United Kingdom's small banks' crisis of the early 1990s: what were the leading indicators of failure? (July 2001)	Andrew Logan
140	ICT and productivity growth in the United Kingdom (July 2001)	Nicholas Oulton
141	The fallacy of the fiscal theory of the price level, again (July 2001)	Willem H Buiter
142	Band-pass filtering, cointegration, and business cycle analysis (September 2001)	Luca Benati
143	Does it pay to be transparent? International evidence from central bank forecasts (November 2001)	Georgios Chortareas David Stasavage Gabriel Sterne
144	Costs of banking system instability: some empirical evidence (November 2001)	Glenn Hoggarth Ricardo Reis Victoria Saporta
145	Skill imbalances in the UK labour market: 1979–99 (December 2001)	Pablo Burriel-Liombart Jonathan Thomas
146	Indicators of fragility in the UK corporate sector (December 2001)	Gertjan W Vlieghe
147	Hard Times or Great Expectations?: Dividend omissions and dividend cuts by UK firms <i>(December 2001)</i>	Andrew Benito Garry Young
148	UK inflation in the 1970s and 1980s: the role of output gap mismeasurement <i>(December 2001)</i>	Edward Nelson Kalin Nikolov
149	Monetary policy rules for an open economy (December 2001)	Nicoletta Batini Richard Harrison Stephen P Millard
150	Financial accelerator effects in UK business cycles (December 2001)	Simon Hall
151	Other financial corporations: Cinderella or ugly sister of empirical monetary economics? <i>(December 2001)</i>	K Alec Chrystal Paul Mizen
152	How uncertain are the welfare costs of inflation? (February 2002)	Hasan Bakhshi Ben Martin Tony Yates

External MPC Unit discussion papers

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

No.	Title	Author
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
5	Monetary policy for an open economy: an alternative framework with optimising agents and sticky prices <i>(October 2001)</i>	Bennett T McCallum Edward Nelson
6	The lag from monetary policy actions to inflation: Friedman revisited (October 2001)	Nicoletta Batini Edward Nelson
7	The future of macroeconomic policy in the European Union (February 2002)	Christopher Allsopp

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: 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
Statistics for financial stability: a report on a meeting of the Financial Statistics Users' Group	Pat O'Connor Andrew Moorhouse and Lisa Zammit	November 2001	1–3
2000 gilt ownership survey	Bruce Devile	September 2001	7-9
Measuring the service earnings of financial intermediaries: the role of the balance sheet in the production process	Chris Wright	August 2001	5-6
Recent developments in statistical requirements for financial stability, and in their use—the perspective of a central bank of a developed country	Sarah Warmby	August 2001	2-4

Targeting Inflation book

In March 1995, the Bank hosted a conference of central banks adhering to inflation targets. The book draws together contributions from each of the countries represented at the conference. It details cross-country experiences of this monetary framework and the key operational and theoretical issues it raises. The price of the book is £20.00.

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. This book contains revised versions of the papers presented at the conference, as well as the background papers circulated by the Bank ahead of the conference. The price of the book is $\pounds 10.00$.

Openness and Growth book

The *Openness and Growth* book, published in October 1998, contains the proceedings of an academic conference held at the Bank in September 1997, investigating the link between productivity growth and the international openness of the UK economy. The price of the book is \pounds 10.00.

Economic models at the Bank of England

The *Economic models at the Bank of England* book, published in April 1999, contains details of the economic modelling tools that help the Monetary Policy Committee in its work. The price of the book is £10.00. An update was published in September 2000 and is available free of charge.

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.

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.

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

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.

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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.

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- 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.

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Quarterly Bu	lletin	Inflation Report				
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Summer	17 June	May	15 May			
Autumn	23 September	August	7 August			
Winter	16 December	November	13 November			

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		Annual	Single	Annual	Single	Annual	Single	Annual	Single	Annual	Single
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