

Bank of England Quarterly Bulletin



May 1995

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Bank of England publications

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Bound volumes of the *Bulletin* for the period 1960 to 1985 (in reprint form for the period 1960 to 1980) can be obtained from Schmidt Periodicals GmbH, Dettendorf, D-83075 Bad Feilnbach 2, Germany, at a price of DM 180.00 per volume or DM 4,100.00 per set.

See page 202 for details of the annual *Statistical Abstract*.

The gilt market

'Investing in gilts: A guide for the small investor', providing basic information for small investors, and 'British Government Securities: The Market in Gilt-Edged Securities', intended for those with a professional interest in gilts and the gilt market, may be obtained from the Bank of England, PO Box 96, Gloucester, GL1 1YB.

Working Papers

The following *Working Papers* have been published in the last ten months:

No	Title	Author
24	Estimating the term structure of interest rates	Mark Deacon Andrew Derry
25	Potential credit exposure on interest rate swaps	Ian Bond Gareth Murphy Gary Robinson
26	New currencies in the former Soviet Union: a recipe for hyperinflation or the path to price stability?	C L Melliss M Cornelius
27	Inflation, inflation risks and asset returns	Jo Corkish David Miles
28	The construction of RPIY	R Beaton P G Fisher
29	Pricing deposit insurance in the UK	David Maude William Perraudin
30	Modelling UK inflation uncertainty: the impact of news and the relationship with inflation	M A S Joyce
31	Measuring core inflation	Danny T Quah Shaun P Vahey
32	An assessment of the relative importance of real interest rates, inflation and term premia in determining the prices of real and nominal UK bonds	David G Barr Bahram Pesaran

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The Quarterly Bulletin and Inflation Report

Inflation Report (published separately)

The *Inflation Report* provides a detailed analysis of recent monetary, price and demand developments in the UK economy. Inflation on the Government's target (RPIX) measure was 2.8% in March, up from 2.5% in December; the RPIY measure of underlying inflation (which excludes the effect of indirect taxes) rose to 1.9% in March. Section 2 of the *Report* includes an analysis of different hypotheses to explain sterling's recent fall, and discusses their different implications for inflation. Section 3 assesses the latest news on demand and output, including the preliminary estimate for GDP in the first quarter. And Section 6 sets out the Bank's assessment of the prospects for inflation over the next two years.

Operation of monetary policy (pages 125–36)

To help keep inflation under control, the Chancellor decided to raise official interest rates by $\frac{1}{2}\%$ to $6\frac{3}{4}\%$ on 2 February; the increase was well received in the financial markets. In March, sterling was drawn into the disturbance seen in foreign exchange markets throughout the first quarter; domestic markets, however, remained calm. Sufficient gilt sales were made to achieve full funding against the Budget PSBR forecast.

The international environment (pages 137–46)

GDP growth was strong in the United States in the fourth quarter of 1994, but slowed in France and western Germany. Producer price inflation has risen further, but consumer price inflation has remained low. The effect of the recent exchange rate movements on growth and inflation will depend largely on why they have occurred and where rates settle.

Financial market developments (pages 147–53)

Yield curves flattened in most major government bond markets during the first quarter. The Mexican financial crisis led investors to reassess emerging-market risk. A number of the recent trends in international issuing continued.

Research and analysis (pages 154–84)

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

Bond yield changes in 1993 and 1994: an interpretation (by Joe Ganley and Gilles Noblet of the Bank's Monetary Assessment and Strategy Division) looks at a number of the explanations put forward for the turnaround in government bond markets, from their prolonged rally in 1993 to a protracted period of turbulence and reassessment for most of 1994. It presents the results of research exploring the role of monetary policy credibility in the yield changes over the two years.

Bond prices and market expectations of inflation (by Francis Breedon) describes the method—introduced last November—used for deriving from gilt prices the inflation expectations that appear regularly in the *Inflation Report*. It assesses how well the derived expectations would have predicted inflation in the past.

Inflation and economic growth (by Professor Robert Barro) presents results assessing the effect of inflation on economic performance. These suggest that an increase in average inflation of ten percentage points a year reduces the annual growth of real GDP per head by 0.2–0.3 percentage points and the ratio of investment to GDP by 0.4–0.6 percentage points. The article continues the *Bulletin's* occasional series of pieces by contributors from outside the Bank.

Risk measurement and capital requirements for banks (by Patricia Jackson of the Regulatory Policy Division) reviews developments in banks' use of statistically based tests to measure risks in both their traditional lending and borrowing, and their securities and derivatives trading, activities. It discusses how their increasing use is influencing the development of international capital standards.

Reports (pages 185–91)

Statistical information about derivatives markets focuses on over-the-counter derivatives. It outlines the main accounting problems they raise, explains current initiatives to encourage firms to disclose information about their derivatives business and describes recent steps to improve the aggregate statistics available about OTC markets.

Operation of monetary policy

- *The evidence about the United Kingdom's economic performance remained favourable in the first quarter. Current retail price inflation increased slightly, but this was in line with the projection in the Bank's February Inflation Report.*
- *There were some indications that growth was slowing towards a more sustainable pace, but surveys continued to suggest a buoyant picture for the months ahead.*
- *At his meeting with the Governor on 2 February, the Chancellor decided to raise official interest rates by $\frac{1}{2}\%$ to $6\frac{3}{4}\%$ to help keep inflation under control. The increase was well received in the financial markets and implied forward interest rates declined steadily over the following weeks.*
- *Foreign exchange markets suffered disturbance throughout the quarter—and especially in early March, when sustained selling of the dollar and buying of the Deutsche Mark and yen gathered pace. Sterling was drawn into the disturbance in March and depreciated in the first half of the month. Domestic markets, however, showed little reaction and remained calm.*
- *International bond markets recovered some ground in the quarter and sufficient gilt sales were made to achieve full funding against the Budget PSBR forecast. The Government published its funding remit to the Bank for 1995/96.*

Overview

Decisions on monetary policy are based on a wide range of indicators. The Bank's current assessment is given in the *May Inflation Report*; this article reviews the operation of monetary policy in the first quarter of 1995.

Statistics published in the first quarter showed GDP growth continuing above the long-term rate of growth in productive capacity in a majority of industrialised countries, but generally at a slower pace than in the previous quarter. There were some signs that the pace of economic expansion in the United States was slowing compared with late 1994, following seven US interest rate rises over the previous year. The Japanese recovery remained sluggish, with output declining by nearly 1% in the fourth quarter; the Kobe earthquake on 17 January will have affected output more recently. There was a slowing in the growth of domestic demand in the United Kingdom's main European trading partners, and the growth of UK exports to the rest of the European Union moderated.

The United Kingdom's overall economic performance remained favourable, however. Upward revisions showed GDP to have risen by 4.2% in the year to 1994 Q4, with a larger contribution to growth from private consumption and investment in the fourth quarter than in previous quarters. Measured industrial production growth slowed, but surveys continued to suggest a buoyant picture for the months ahead. Unemployment continued to fall, and there was evidence of a pick-up in the rate of increase in full-time work. Private consumption seemed more buoyant than retail sales alone,

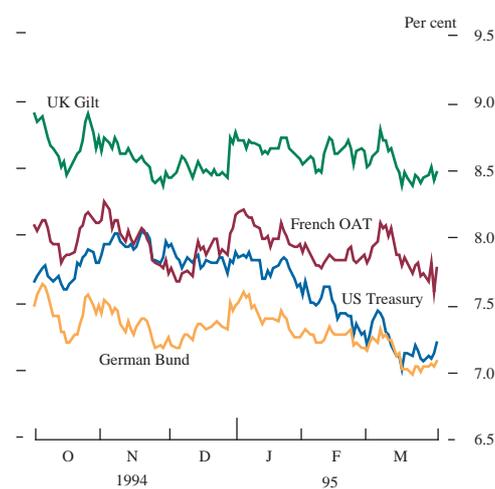
but the housing market remained flat and consumer confidence unchanged. There was a further slowing in M0 growth, while broad money growth edged higher.

Current retail price inflation increased slightly, but in line with the projection in the Bank's February *Inflation Report*. Producer input prices continued to rise, though with suggestions that the rate of increase was slowing: the annualised three-month rate of increase fell to 9.5% in February from 15.4% in January. CBI surveys suggested that producers raised prices by less than they had expected (which is not unusual); competition in the retail sector may have reduced their ability to pass on cost increases. The three-month annualised increase in output prices (excluding food, beverages, tobacco and petroleum) remained around 5% between November and February. Nevertheless, survey evidence continued to suggest that producers intended to pass on price rises to a greater extent if demand conditions allowed.

There was a strong rise in the workforce in employment and a continuation of the steady decline in unemployment; vacancies fell, however. Underlying average earnings growth fell to 3½% in January and median wage settlements were 3%.

Against this background, the Chancellor decided at his meeting with the Governor on 2 February that a further moderate rise in interest rates was appropriate to help keep inflation under control. The Bank implemented the ½% rate rise to 6¾% that day and the move—which was widely expected—was well received in the financial markets: money-market rates, gilt yields, equities and sterling were all stable on the day, and implied forward interest rates declined steadily over the following weeks.

Ten-year government bond yields^(a)



(a) Gross redemption yield on semi-annual basis.

International bond market sentiment improved in the quarter. Gilts benefited from the general improvement, helped by a rally in the US bond market: ten-year gilt yields fell from 8.77% at the start of the year to 8.49% by the end of March. The US and other major bond markets performed even better: over the quarter, the average yield spread between gilts and equivalent US and German bonds widened by 35 and 12 basis points respectively (to 112 and 134 basis points). Growing perceptions—perhaps encouraged by the further tightening in monetary policy—that steady economic growth with low inflation could be maintained, and an associated gradual moderation in expected future interest rates, led to greater confidence in the gilt market among domestic investors. Some overseas investors, however, were deterred by what they saw as heightened political uncertainty.

Market perceptions that growth in the United States was slowing to a more sustainable pace were reinforced by official comment. Market participants became more confident that a 'soft landing' could be achieved, and revised down their expectations of future US interest rates. Between the end of December and the end of March, the level of three-month interest rates expected at the end of 1995 eased from 8½% to 7%. In Germany, the strength of the Deutsche Mark and slower M3 growth led to a moderation in interest rate expectations, though the Bundesbank's cuts in its repo rate and discount rate on 30 March surprised most market participants. The three-month rate expected in Germany at the end of 1995 fell by 140 basis points over the quarter to 5¼%.

Table A
Interest rates, gilt yields and exchange rates; selected dates^(a)

1995	Interest rates (per cent per annum)					Gilt yields (b) (per cent per annum)				Exchange rates		
	Sterling interbank rates (c)				Short-sterling future (d)	Conventionals			Index-linked	ERI	\$/£	DM/£
	1 month	3 months	6 months	12 months		3 months	Short	Medium				
3 January	61/8	619/32	75/32	731/32	8.22	8.67	8.75	8.57	3.90	88.6	1.5625	2.4286
24 January	65/16	623/32	71/8	77/8	7.91	8.65	8.71	8.60	3.95	89.0	1.5963	2.4149
1 February	61/2	625/32	73/32	723/32	7.69	8.48	8.51	8.41	3.89	88.7	1.5815	2.4082
2 February	69/6	625/32	73/32	723/32	7.68	8.51	8.53	8.42	3.90	88.6	1.5820	2.4038
7 March	61/2	625/32	75/32	77/8	7.67	8.70	8.80	8.66	3.96	86.5	1.6242	2.2604
17 March	69/32	621/32	73/32	711/16	7.52	8.39	8.48	8.38	3.86	84.4	1.5847	2.1964
21 March	611/32	621/32	73/32	721/32	7.45	8.31	8.40	8.31	3.85	84.8	1.5807	2.2319
31 March	63/8	611/16	71/16	719/32	7.34	8.38	8.50	8.44	3.88	85.3	1.6280	2.2271

(a) Close-of-business rates in London.

(b) Gross redemption yield. Representative stocks: short—8½% Treasury 2000; medium—8½% Treasury 2005; long—8½% Treasury 2017; index-linked—2½% Index-Linked Treasury 2016 (real yield assuming 5% inflation).

(c) Middle-market rates.

(d) Implied future rate: June 1995 contract.

Sterling's effective exchange index



The first quarter was a volatile period in foreign exchange markets. The dollar depreciated by 14% against the yen and by 12% against the Deutsche Mark. Many European currencies also recorded new lows against the Deutsche Mark, and the central rates of the peseta and escudo were devalued within the exchange rate mechanism (ERM).

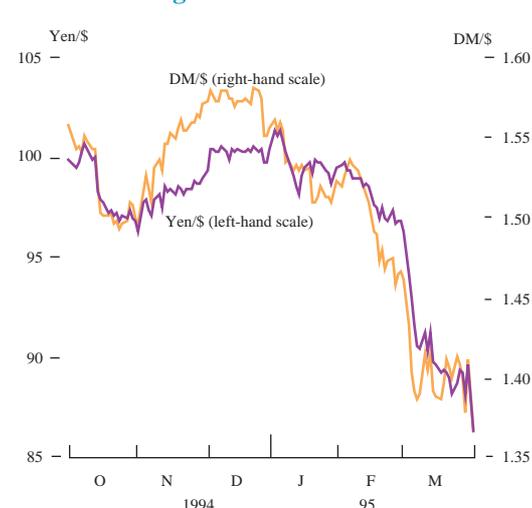
Sterling was largely insulated from the volatility in January and February, declining against the strong Deutsche Mark and appreciating against a weaker dollar, with only a slight fall in its effective rate index (ERI). The relatively strong fiscal position and current account balance, together with low inflation, may have provided some support. But in early March, as the global turmoil intensified and the dollar became progressively weaker, sterling was drawn into the general disturbance. It reached a low on 17 March of 84.4 in effective terms and DM 2.1875, but had recovered somewhat to 85.3 and DM 2.2271 by the end of the quarter (it fell further after the end of the first quarter).

Foreign exchange markets

Foreign exchange markets were turbulent throughout the first quarter. A sharp appreciation of the Deutsche Mark led to the first ERM realignment since the bands were widened to 15% in August 1993; and the continuing Mexican crisis provided a backdrop of financial market uncertainty against which the dollar in particular suffered. It depreciated 6% in effective terms,⁽¹⁾ and reached new lows of DM 1.3410 and ¥86.20. Sterling's effective exchange rate was steady at the start of the period, but was later affected by the currency's close association with the dollar. The dollar's depreciation against the Deutsche Mark raised sterling to \$1.65 at one point, but technical resistance and a market feeling that this level was unsustainable on competitive grounds led to a fall in sterling against the dollar, which in turn weakened sterling against the Deutsche Mark.

The markets started the year nervously, following Mexico's decision to devalue the peso on 20 December. There was a growing awareness that there would be no rapid solutions to the country's financing problems; some market participants were concerned that

Dollar exchange rates

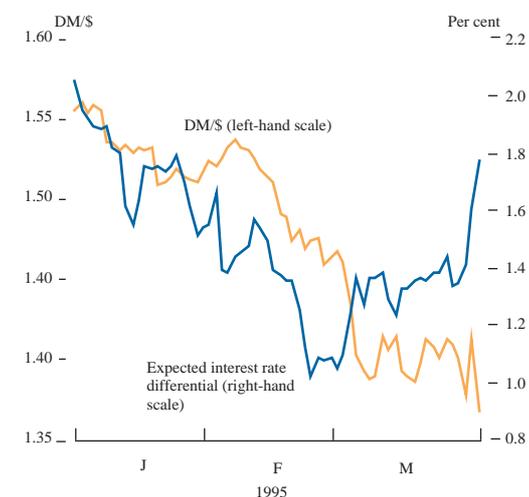


(1) The effective index widely used was developed by the IMF and measures changes in the value of the dollar against 20 industrial-world currencies; see the article on pages 24–25 of the February 1995 *Quarterly Bulletin*, which explained recent changes in the calculation of these effective exchange rate indices. Indices which include the dollar's value against additional major trading partners of the United States in Asia and Latin America—notably Mexico—suggest a smaller fall in its overall value.

US monetary policy might be compromised as a result, and the dollar fell gradually during January. Its depreciation was, however, limited by a weakening of the yen following the Kobe earthquake on 10 January and a belief that the Federal Reserve would raise interest rates at the 31 January/1 February meeting of the Federal Open Markets Committee (FOMC). The $\frac{1}{2}\%$ rise agreed at that meeting boosted the dollar, and it was driven higher by buoyant bond and equity markets.

During January, sterling traded in a narrow range around 89 on the ERI and DM 2.40—well within its recent trading range. It was underpinned by market perceptions of strong economic fundamentals—sound fiscal policies and data indicating that an export-led recovery was improving the current account position—as well as by expectations of an interest rate rise in the short term. The $\frac{1}{2}\%$ rate rise on 2 February was calmly received, but with subsequent attention increasingly focused on domestic political uncertainties, sterling weakened a little to reach DM 2.37 by mid-February.

DM/\$ exchange rate and expected interest rate differentials^(a)



(a) Spread of US over German three-month rates implicit in June 1995 futures contracts.

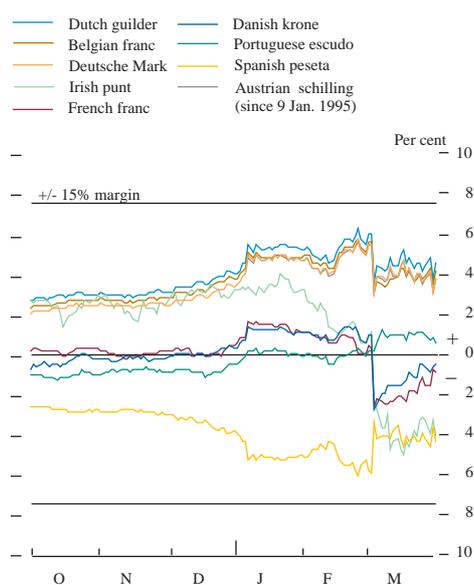
The movement since mid-1994 in expected interest rate differentials seems to have been an important factor behind the dollar's continuing weakness in recent months, but it did not explain its sharp depreciation in March, when expected interest rates fell faster in Germany and Japan than in the United States. Market participants appeared to have growing concerns about the effects on the capital markets of the US budget and trade deficits (especially *vis-à-vis* Japan). In addition, the Mexican crisis raised market anxiety about the potential sale of dollars in intervention operations; and there were indications that several emerging Asian countries were adjusting the level of dollar holdings in their official foreign exchange reserves.

At the same time, the Deutsche Mark benefited from the perception that it was a 'safe haven' among continental European currencies. The currency also appreciated against the yen following the Kobe earthquake.

Market concerns about inflationary pressures in the United States resurfaced around the middle of February. At the same time, expected future US interest rates continued to decline, as the belief strengthened among market participants that US growth was easing and interest rates were close to their peak. This led to a further deterioration in sentiment about the dollar, and it fell steadily from mid-February against most major currencies. The speed of its decline quickened at the start of March, following statistics showing a faster-than-expected German recovery and what was perceived as a generous settlement agreed with IG Metall—usually a benchmark for subsequent agreements—which reduced market expectations of a further cut in German interest rates. This enhanced the Deutsche Mark's safe-haven status, as investors looked to sell the dollar and those European currencies that they believed to be particularly vulnerable to political or budgetary difficulties (including the French franc, Italian lira, Swedish krona and Spanish peseta).

Sterling was on the sidelines for much of February. Although it made some progress against the dollar, it fell back against the Deutsche Mark, reaching DM 2.34 in late February. Its effective rate fell to 87.1, towards the bottom of its trading range for the past two years.

Movements in the exchange rate mechanism, October 1994–March 1995



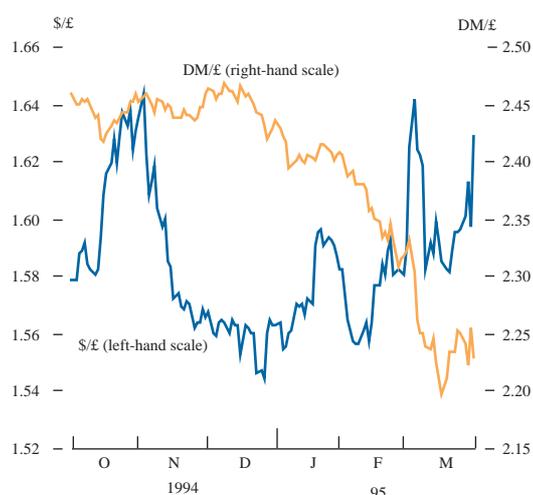
At the very end of February, market turbulence and uncertainty (as measured by implied volatility) increased. The Deutsche Mark and yen strengthened further and the dollar fell sharply. In the ERM, the French franc and Spanish peseta came under severe pressure. In an attempt to relieve some of the tensions, on 3 March central banks engaged in a round of concerted market intervention in support of the dollar, but this had little discernible effect. On 4 March, the Spanish authorities requested a realignment of the peseta within the ERM: its central rate was devalued by 7%, and the Portuguese escudo's by 3½%, with effect from 6 March.

The realignment did little to check the Deutsche Mark's rise against the dollar and the weaker ERM currencies. Outside the ERM, the lira and to a lesser extent the Swedish krona came under heavy pressure at times, both reaching historic lows against the Deutsche Mark. A round of interest rate rises in France, Denmark, Belgium and Ireland on 8/9 March eventually helped to provide steadier conditions. In the following weeks, the Deutsche Mark retreated a little on profit-taking and ERM tensions eased. Countries that followed the surprise cut in the German repo and discount rates on 30 March included Austria, the Netherlands, Switzerland and—alone among those that previously raised rates—Belgium.

The dollar fell sharply following the ERM realignment to hit a new all-time low against the Deutsche Mark of DM 1.3410 on 8 March. It subsequently recovered to trade in a range around DM 1.40 for much of the second half of March. It moved lower on 29 March following the decision at the 28 March FOMC meeting to leave interest rates unchanged, even though this was in line with market expectations. It then rose sharply on 30 March—moving from DM 1.38 to DM 1.42 in less than an hour—following the Bundesbank's ½% cut in its discount rate. The sharp initial reaction was soon reversed, however, and by the close on the following day the dollar was back at DM 1.38.

The yen continued to strengthen throughout March, and the dollar fell to a new low of ¥86.20 on the final day of the quarter. Suggestions in the market that Japanese financial institutions were repatriating funds prior to the Japanese financial year-end at the end of March strengthened the yen, as did signs that Asian central banks were diversifying their reserves away from the dollar.

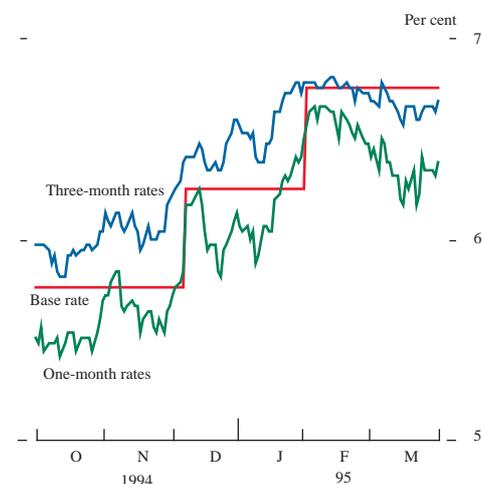
Sterling exchange rates



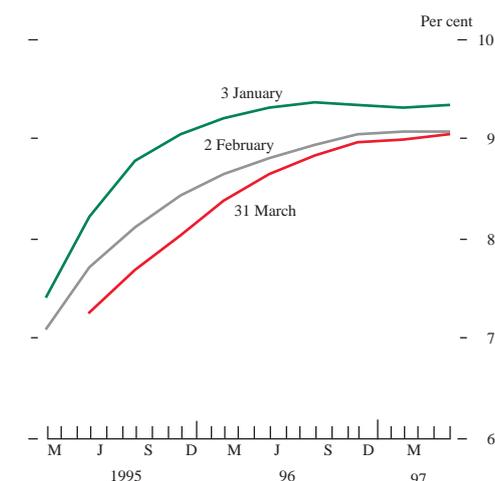
After dipping below its previous low of DM 2.3310—reached in February 1993—sterling initially gained from the ERM turbulence, moving rapidly from around \$1.58 to a two-year high of \$1.6566 against the dollar on 6 March. However, technical resistance and a market feeling that this level was unsustainable on competitive grounds led this to be reversed quickly. Sterling was then unable to make progress against a slightly weaker Deutsche Mark in the wake of the round of European interest rate rises on 8 March, with some short-term funds attracted to the higher yields available in the countries concerned. Market liquidity was often poor, which tended to exaggerate exchange rate movements.

In extremely volatile and disorderly markets, sterling briefly touched a low of DM 2.1875 on 17 March. It recovered quickly to around \$1.60 and DM 2.24 for much of the second half of March, ending the month at 85.3 on the ERI—a depreciation over the quarter of 3.7%. In the sharp movements at the end of the period,

Sterling interest rates

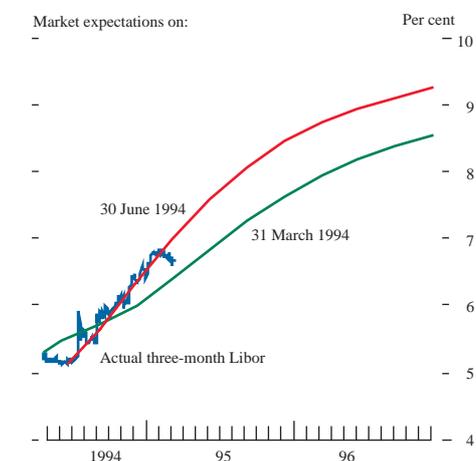


Short-sterling futures rate curves(a)



(a) Short-sterling futures contracts.

Sterling interest rate expectations(a)



(a) Three-month Libor discounted by short-sterling futures contracts.

sterling again moved closely with the dollar against the Deutsche Mark. It initially strengthened sharply following the German interest rate cut, trading briefly at DM 2.28 before returning to its previous levels.

Official money-market operations

The domestic markets showed little reaction to the foreign exchange market turbulence and remained calm throughout the quarter. While some European countries raised short-term interest rates to defend their exchange rates within the ERM, UK domestic markets appeared to recognise that monetary policy continued to be set on the basis of a wide range of indicators relevant to the medium-term outlook for inflation.

Short-term money-market rates were quite soft for most of the quarter, reflecting seasonally low money-market shortages; one-month rates were frequently quoted around $\frac{1}{2}\%$ below base rates and after the February rate rise three-month rates gradually declined to stand below base rate. Twelve-month rates eased over the quarter, from $7\frac{31}{32}\%$ to $7\frac{19}{32}\%$. The average yield paid at the weekly tender for three-month Treasury bills remained below base rate throughout the quarter.

Conditions tightened before the interest rate rise on 2 February, when three-month rates peaked at $6\frac{25}{32}\%$ and the Bank was offered longer-maturity bills in its operations. Short-sterling futures rates also suggested that the rate rise was expected: the three-month rate discounted by March stood at 7.1% on the morning of the 2 February Chancellor/Governor meeting, compared with a three-month cash rate of $6\frac{25}{32}\%$.

Much of the economic data released in January raised expectations of an increase in interest rates in February. A large fall in unemployment was accompanied by a rise in RPI inflation and a CBI survey showing an increase in the balance of firms expecting to raise prices in the months ahead. On the other hand, industrial production figures (for November) showed an unexpected fall. At the monthly monetary meeting on 2 February, it was agreed that interest rates would need to be raised further in either February or March, with the timing essentially a matter of market tactics. The decision to act early was taken in the hope that there would be a greater possibility of lowering expectations about future inflation and interest rates.

The Bank implemented the $\frac{1}{2}\%$ rate rise immediately by setting a Minimum Lending Rate of $6\frac{3}{4}\%$ just before the noon round of operations. The move was smoothly absorbed, with three-month rates ending unchanged on the day at $6\frac{25}{32}\%$.

Interest rate expectations, as implied by short-sterling futures, moderated in the following weeks—the three-month rate discounted at the end of 1995 declined from 8.4% on 2 February to 8.0% on 31 March. Data suggesting a slight moderation in growth probably reinforced perceptions that early action might lead to a lower peak in official interest rates.

Since the spring of 1994, market expectations about the path of three-month interest rates (as measured by short-sterling futures rates) have proved quite accurate. The chart opposite shows the

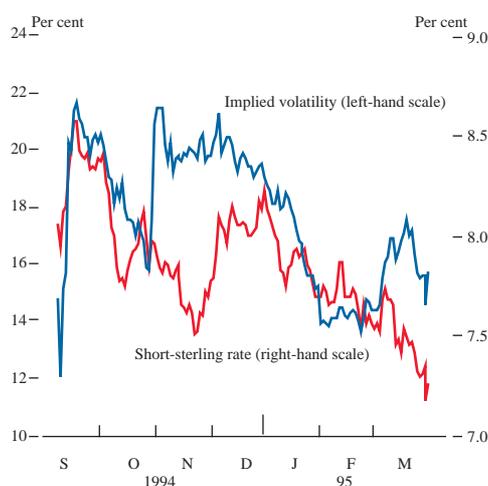
The open gilt repo market

On 21 February, the Chancellor of the Exchequer confirmed that an open gilt repo market is to be established and announced tax reforms to facilitate the market.

On 29 March, the Bank of England published a paper setting out plans for the operation of gilt repo trading, following responses to the consultative paper it issued last November and meetings with a wide range of market participants. The main points are:

- The market will commence on 2 January 1996. Until then, the existing arrangements for gilt lending and borrowing remain in place. The development of an open gilt repo market involves liberalisation in three areas. There will be no official bar on anyone borrowing or lending gilts for any purpose; it will be possible to transact repo business directly or via an intermediary; and intermediaries will be able to act as matched principals or name-passing brokers. These provisions will apply equally to repo activity and stocklending—which are equivalent in economic terms and differ only in the details of their legal structure and documentation, and in the general practice of stocklenders to take collateral in the form of securities rather than cash.
- Gilt-edged market-makers (GEMMs) and discount houses will be free to conduct repo business. The Bank would also be content in principle if they wished to absorb the gilt-lending intermediary functions of a Stock Exchange money broker (SEMB) contained in their group. The Bank will be content to continue to supervise firms as SEMBs, provided their business is directed predominantly at servicing the GEMMs.
- The Bank sought comments by 12 May on drafts of a gilt repo legal agreement and a code of best practice. The legal agreement comprises the Public Securities Association/International Securities Market Association's (PSA/ISMA's) global master repo agreement—which is widely used as the industry standard in existing repo markets in London—plus a specially drawn up annex to adapt it for the gilt market. The code covers a wide range of issues, including the importance of proper legal documentation and margining practices. The Bank will issue final versions of the documents as soon as possible after the market's comments have been considered.
- The Bank has established a third working party to address a variety of settlement issues. It is also discussing with Cedel and Euroclear the possibility of their joining the Central Gilts Office.
- Tax changes have been made to facilitate gilt repo trading. In particular, gross payment of interest on gilts will be available to all likely participants in the repo market, with quarterly accounting for those taxable in the United Kingdom. The distinction between gilts that are and are not free of tax to residents abroad (FOTRA) will no longer have any practical effect for overseas companies that are not trading in the United Kingdom through a branch or agency.

Short-sterling futures^(a) and implied volatility^(b)

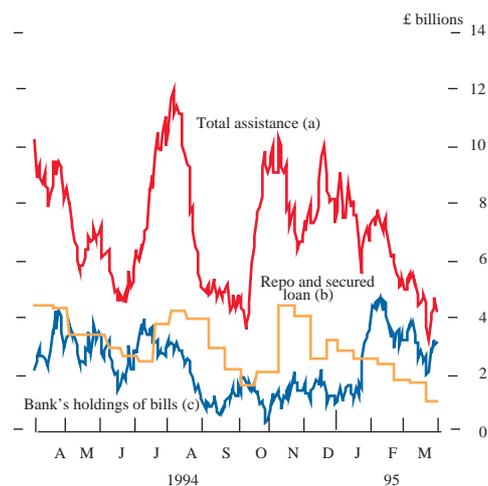


- (a) Rate implied by the September 1995 short-sterling futures contract.
 (b) The expected standard deviation of annualised price movements in the September 1995 short-sterling futures contract.

path of three-month rates discounted by short-sterling contracts of increasing maturity at March and June last year, and the history of three-month cash rates since then. The accuracy of the market's forecasts may have contributed to the fall in implied volatility of short-sterling contracts, and even perhaps to a lower risk premium being embedded in futures rates. The chart opposite shows the June 1995 futures rate and implied volatility derived from options on this contract.

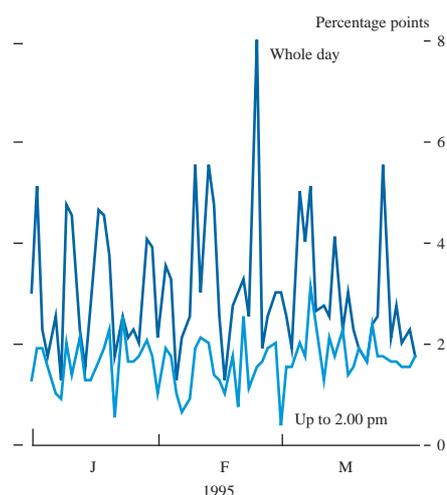
In 1994/95, the stock of assistance (the assets which the Bank acquires in providing liquidity to the money market) fell from a high of £11 billion at the end of July to £8 billion at the end of December and £4 billion at the end of the financial year. This was in part the result of the seasonal pattern of government expenditure (a high proportion of spending takes place towards the end of a financial year). But there were two special factors: 1993/94's £3.4 billion of overfunding and £6.8 billion of gilt purchases by banks and building societies in 1992/93 were both carried forward into 1994/95 for funding purposes. This reduced the total of gilt sales required and so, by the same amount, the drain of liquidity from the money market.

Money-market assistance

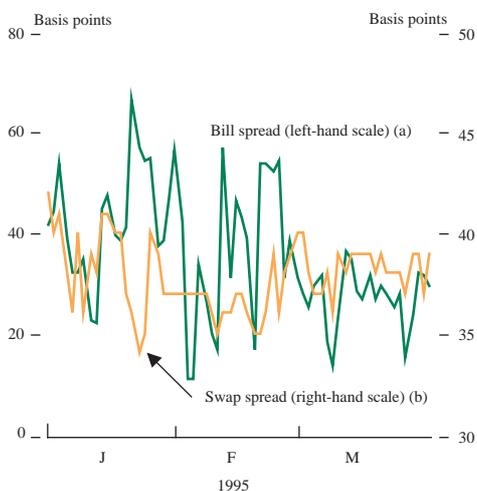


(a) Bank of England's holdings of bills, market advances and—until 19 January 1994—funds supplied under the temporary facilities; since that date, under the repo and secured loan facilities.
 (b) Bank of England's holdings of gilt-edged stocks on a repurchase basis, and loans made against export and shipbuilding credit-related paper under temporary and secured loan facilities.
 (c) Bank of England's holdings of eligible bank and sterling Treasury bills outright and on a repurchase basis.

Width of range of overnight interest rates



Spreads between government and market paper



(a) The spread of three-month eligible bill rates over three-month Treasury bill rates.
 (b) The spread of ten-year sterling swap rates over ten-year gilt yields.

The smaller stock of assistance led in turn to more moderate daily shortages, contributing to the softer market conditions. The average daily shortage was just under £700 million in the first quarter (and £550 million in March), compared with about £900 million in the previous quarter. The amount on offer at the weekly Treasury bill tender was twice raised by £200 million (on 13 January and 31 March—to £900 million—to ease the run-down in the stock of assistance in the final months of the financial year.

On average, the assistance provided via the twice-monthly gilt repo and secured loan facilities was more modest, as short-term interbank offer rates were typically below the repo rate. Nevertheless, the facilities continued to be a useful 'safety valve' and helped sustain the reduced volatility in very short term interest rates. The average maturity of bills offered to the Bank in its daily operations was generally quite short. The only exception was in the week or so before the February rate rise, when £4.3 billion of Band 2 bills (those with a residual maturity of between 15 and 33 days) were purchased. On 1 February, the Bank had three offers of bills at rates higher than the established dealing rate: at noon £135 million of Band 2 bills were purchased at $6\frac{5}{32}\%$ (alongside £415 million bought at the established dealing rate of $6\frac{1}{8}\%$), but in the afternoon sufficient offers of Treasury bills in Band 1 (with a residual maturity of less than 15 days) meant that the two other offers above $6\frac{1}{8}\%$ could be declined.

The chart opposite shows the intraday trading range of the overnight interest rate (the difference between the highest and the lowest observation) both for the whole trading day and also for the period up to 2.00 pm, the time of the Bank's final round of operations. It shows that the additional volatility after 2.00 pm can be considerable, which suggests that if participants were able, or chose, to square their positions by the final round of official operations, they might benefit from a more stable overnight interest rate.

Following the announcement on 26 February that Barings was going into administration, the Bank stated that it would 'stand ready to provide liquidity to the banking system to ensure that it continues to function smoothly'. In the event, there was no ensuing market disturbance and conditions remained calm. Spreads between Treasury and eligible bank bills widened only fractionally for a short time and swap spreads (between sterling swap rates and gilt yields) were unchanged (see the chart), although some tiering was seen in the CD market.

The Bank announced on 20 March that in future it would publish (on its screen pages) at the relevant times of the day details of the bill offers (including any bill repos) being invited. The aim of this technical change was to provide greater transparency in its operations.

The Bank published its plans for an open gilt repo market on 29 March—see the box on page 131; the repo market will commence on 2 January 1996. The Bank believes it should enhance liquidity and efficiency in the gilt market, increase demand and so over time reduce government funding costs. It will also promote greater integration of the gilt and money markets. In its paper setting out plans for the new market, the Bank indicated that while it does not at this stage have plans to change the form of its money-market operations, the development of gilt repo trading

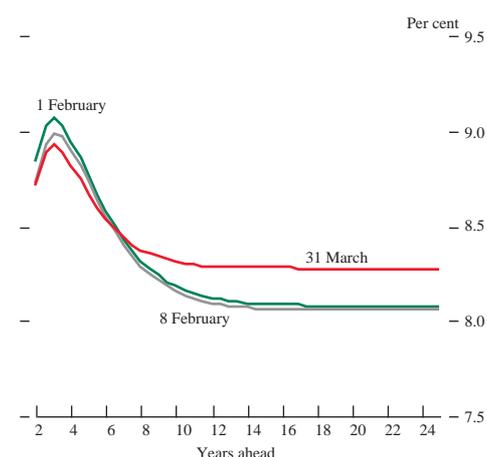
Table B
Influences on the cash position of the money market

£ billions; not seasonally adjusted
Increase in bankers' balances (+)

	1994/95			
	Apr.–Dec.	Jan.	Feb.	Mar.
Factors affecting the market's cash position				
Under/overfunding (+/-) (a)	4.0	-2.9	2.0	7.8
Other public sector net borrowing from banks and building societies (-) (b) of which, local authorities' deposits with banks and building societies (+)	0.6	0.7	0.9	-0.3
Currency circulation (-)	0.2	0.4	0.6	-0.6
Other	-1.9	3.0	-0.1	-1.5
	4.5	-0.6	-0.1	-3.0
Total	7.3	0.2	2.8	3.1
Increase (+) in the stock of assistance	-4.5	-1.0	-2.1	-0.9
Increase (-) in £ Treasury bills outstanding (c)	2.7	-0.8	0.5	2.3
Increase in bankers' balances at the Bank	0.1	—	-0.1	-0.2

- (a) From 1993/94, net purchases of central government debt by banks and building societies are included in funding. Purchases by banks and building societies in 1992/93 are counted as funding in 1994/95.
(b) From 1993/94, banks' and building societies' purchases of local authorities' and public corporations' listed sterling stocks and bonds are included in funding.
(c) Other than those held outright by the Bank and government accounts, but including those purchased by the Bank on a repurchase basis.

Implied forward rates^(a)



- (a) Annualised six-month interest rates derived from the zero-coupon yield curve.

activity could make it sensible for it to contemplate changes to its operations in due course, in which case it would consult market participants well in advance.

Gilt-edged funding

The period of consolidation in the gilt market in the final months of 1994 continued into the new year. Ten-year yields remained in a range of 8¹/₄%–8³/₄% throughout the quarter, and the shape of the yield curve was little changed. However, the average yield spread between gilts and equivalent US and German bonds widened by 35 and 12 basis points respectively (to 112 and 134 basis points) compared with the fourth quarter of 1994. The US bond market benefited from a widening perception that US growth was slowing down and that short-term interest rates were near to a peak. German bonds were also supported by a moderation in expectations about short-term interest rates and by uncertainty in other markets, which encouraged investors to hold Deutsche Mark assets. After some initial hesitation, the Bund market strengthened in response to the cuts in the German repo and discount rates.

The gilt market was largely unaffected by developments in the foreign exchange market. Participants noted that sterling had been caught up on the edges of the turbulence, and the depreciation in March was seen in the context of a very strong Deutsche Mark and yen and a weak dollar. The relative performance of conventional and index-linked gilts suggested no deterioration in medium-term inflation expectations following sterling's fall. Index-linked yields remained steady at around 3.9% during March, while conventional gilts rallied towards the end of the month, sharing in a more confident international environment. The German interest rate cuts on 30 March also helped underpin the market.

The announcement of the interest rate increase on 2 February caused little surprise in the gilt market. The (March) gilt future initially rallied by a quarter of a point on the news and continued to push ahead in the following two weeks. The rise seemed to reinforce the market's belief that the authorities would continue to act prudently on monetary policy, and that by acting in good time the eventual peak in rates could be lower than earlier expected. Implied forward rates—derived from the yield curve—fell after the increase: implied six-month rates in 1998 moderated from 9.1% on 1 February to 8.9% a week later, where they also finished the quarter.

The January auction for £2 billion of 8% Treasury 2015 was successful. Its 20-year benchmark status and long duration were

Table C
Issues of gilt-edged stock

	Amount issued (£ millions)	Date announced	Date issued	Method of issue	Price at issue (per £100 stock)	Details of payment	Yield (a) at issue	Yield (a) when exhausted	Date exhausted
8% Treasury 2015	2,000	17.1.95	26.1.95	Auction	94.4375 (b)	Fully paid	8.58 (c)	8.58	26.1.95
Floating Rate Treasury 1999	500	7.2.95	7.2.95	Tap	99.8700	Fully paid	(d)	(e)	8.2.95
Floating Rate Treasury 1999	100	7.2.95	7.2.95	To CRND	99.8700	Fully paid			
2% Index-Linked 2006	100	7.2.95	7.2.95	Tap	170.2500	Fully paid	3.84 (f)	3.85 (f)	15.3.95
2 1/2% Index-Linked 2024	100	7.2.95	7.2.95	Tap	111.2500	Fully paid	3.85 (f)	3.85 (f)	16.3.95
8 1/2% Treasury 2005	2,000	14.2.95	23.2.95	Auction	98.3750 (g)	Fully paid	8.72 (c)	8.72	23.2.95
8% Treasury 2015	2,000	21.3.95	30.3.95	Auction	95.9375 (h)	Fully paid	8.42 (c)	8.42	30.3.95

- (a) Gross redemption yield, per cent.
(b) Lowest-accepted price for competitive bids and the non-competitive allotment price.
(c) Yield at lowest-accepted price for competitive bids.
(d) Yield equivalent to 8.7 basis points below Libid.
(e) Yield equivalent to 8.9 basis points below Libid.
(f) Real rate of return, assuming 5% inflation.
(g) Lowest-accepted price for competitive bids. The non-competitive allotment price was £98.40625.
(h) Lowest-accepted price for competitive bids. The non-competitive allotment price was £96.09375.

The Government's funding requirement and remit for 1995/96⁽¹⁾

The 1995/96 borrowing requirement

As set out in the November 1994 *Financial Statement and Budget Report*, the Government will continue to operate a full-fund policy.

The PSBR for 1995/96 was forecast in the Budget to be £21.5 billion. Some £4.1 billion of gilts are expected to mature in market hands and need to be refinanced. It is not possible at this stage accurately to forecast net changes over the year in the foreign currency reserves, so these are assumed to remain unchanged on balance. Any overfunding in 1994/95 will reduce the funding requirement in 1995/96, and any underfunding will increase it. The funding outturn for 1994/95 is not yet known.⁽²⁾

The funding requirement for 1995/96 is therefore currently forecast to be around £25.6 billion, subject to any over or underfunding carried forward from 1994/95 and to any changes in the foreign currency reserves (see the table).

The 1995/96 forecast funding requirement

£ billions	
PSBR forecast	21.5
Expected increase in net official reserves	—
Expected gilt redemptions	4.1
<i>Less:</i>	
Over or underfunding from 1994/95	..
Expected funding requirement	25.6 (a)
<i>Funded by:</i>	
Gilts sales required for full funding	23.1 (a)
Assumed net National Savings inflow	2.5
Expected net change in other public sector debt	—
..	not yet known.

(a) Subject to the adjustment for over or underfunding.

National Savings

The net contribution of National Savings to funding (including accrued interest) is assumed to be around £2.5 billion. This is not a target, but an estimate based on experience in previous years and forecasts for 1995/96.

Other debt sales

Net sales of Government debt instruments other than gilts and National Savings are expected to make a negligible contribution to funding.

Quantity of gilt sales

The Bank of England, as the Government's agent, will aim to meet the remainder of the funding requirement by selling gilts to the private sector. On the basis of the Budget forecast, this means selling approximately £23.1 billion of gilts, subject to any over or underfunding carried forward from 1994/95, and any change in the net official foreign currency reserves.

Nature of stocks

The Government will continue to have available the full range of funding instruments. Within conventional stocks, the Government will aim for there to be liquid benchmark issues in the five-year, ten-year and long-dated maturity areas. The conventional stocks may, in appropriate circumstances, include floating-rate or convertible issues.

Pace of funding

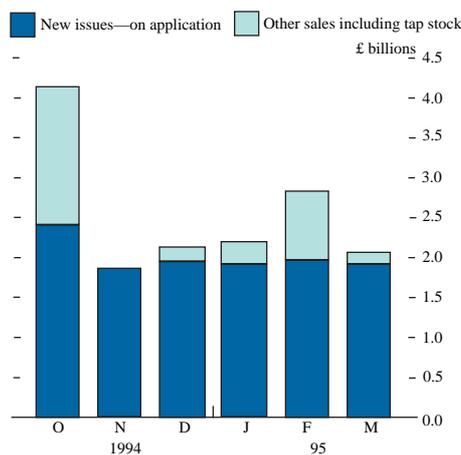
The Government will aim to fund at a broadly even pace through the year.

Maturity pattern of gilt issues

Gilt sales are intended to extend over the full maturity range. Over the year as a whole, the Bank of England, as the Government's agent, will aim to make approximately 15% of its sales in index-linked stocks with the remainder in conventional stocks spread across the maturity ranges, with approximately one third of issuance in each of the short (3–7 years), medium (7–15 years) and long-dated (15 years and over) bands.

(1) This box reproduces the funding requirement and remit published by HM Treasury on 30 March.
 (2) Since the remit was published, total funding in 1994/95 has been estimated at £29.8 billion; the estimated underfunding was £0.6 billion.

Gross official sales of gilt-edged stock



attractive features. There was cover of 1.79 times and tight pricing of the bond; for the first time since December 1993, there was no tail—the yields corresponding to the average and lowest-accepted prices were the same.

The February auction for £2 billion of 8½% Treasury 2005 also went well. Although some had expected a short-dated stock, investors welcomed an addition to the new ten-year benchmark, which was also the cheapest-to-deliver stock into the June gilt future. This encouraged some switching out of the 9½% Treasury 2005, which dropped out of the basket of deliverable stocks in April.

A further £2 billion was added to the 8% Treasury 2015 at the March auction, as the Bank continued the policy of issuing a balance of maturities over the financial year as a whole: during 1994/95,

It is planned that there will be at least two auctions in each of the three conventional maturity bands during the year.

Auctions

Auctions will continue to form the backbone of gilt-edged funding. In view of the lower borrowing requirement, it is planned that eight auctions will be held in 1995/96, on the following dates:

Wednesday 26 April 1995
 Wednesday 28 June 1995
 Wednesday 26 July 1995
 Wednesday 27 September 1995
 Wednesday 25 October 1995
 Late November/December 1995^(a)
 Wednesday 31 January 1996
 Wednesday 27 March 1996

(a) This auction date will depend on the timing of the Budget. It will be published in the relevant quarterly auction announcement (see below).

Each auction is planned to be between £2 billion and £3 billion of stock. An auction may on occasion be split between more than one stock, in which case separate auctions may be held for each stock on successive days.

Before the beginning of each calendar quarter, an announcement will be made giving an indication of the intended maturity of stock to be sold at auctions scheduled to be held in that quarter. The announcement will also give details of progress to date with the funding programme and of any changes to the Government's funding requirement.

The maturity ranges for auctions in the first quarter of 1995/96, to be held on Wednesday 26 April and Wednesday 28 June, will be announced by close of business on Friday 31 March.⁽³⁾

Full details of these, and subsequent, auctions will be announced at 3.30 pm on the Tuesday of the week preceding the auction, as in previous years.

(3) On 31 March, it was announced that the maturity ranges would be 1999–2001 for the April auction and 2004–06 for the June auction.

Reviews of the issuance programme

The issuance programme, and in particular the number and timing of auctions, may be varied during the year in the light of substantial changes to the following:

- the Government's forecast of the PSBR;
- the level of gilt yields;
- market expectations of future interest and inflation rates; and
- market volatility.

Any revisions will be announced.

Tap sales

The programme of auctions will continue to be supplemented by official sales of stock by the Bank of England 'on tap' through its day-to-day operations with the gilt-edged market-makers. 'Tap' sales help maintain the liquidity of existing stocks and are typically issued into stable market conditions in response to demand for stock.

After an auction, the authorities will generally refrain from issuing stock of a similar type or maturity to the auction stock for a reasonable period, and will do so only if there is evident market demand for further such stock.

Coupons

So far as possible, coupons on new issues of gilts will be around gross redemption yields at the relevant maturity at the time of issue.

Conversions

The Government may ask the Bank to hold conversion offers during the year. Details of any such offers will be announced in time for all holders to be able to participate.

Table D
Official transactions in gilt-edged stocks

£ billions: *not seasonally adjusted*

	1994/95			
	Apr.–Dec.	Jan.	Feb.	Mar.
Gross official sales (+) (a)	22.7	2.2	2.8	2.1
Redemptions and net official purchases of stock within a year of maturity (-)	6.0	2.3	—	—
Net official sales (b)	16.7	-0.1	2.8	2.1
<i>of which net purchases by:</i>				
Banks (b)	0.9	-0.5	1.2	-0.9
Building societies (b)	0.4	-1.2	0.5	-0.1
Overseas sector	-2.9	-1.3	-0.5	-0.9
M4 private sector (b)	17.9	2.9	1.6	4.1

(a) Gross official sales of gilt-edged stocks are defined as official sales of stock with over one year to maturity net of official purchases of stock with over one year to maturity apart from transactions under purchase and resale agreements.

(b) Excluding transactions under purchase and resale agreements.

25% of conventional issuance was at the long end of the yield curve, where three auctions were held. The March auction was conducted in more difficult market conditions, the cover was lower at 1.24 times and there was a tail of two basis points.

The yield curve became only slightly less inverted following each announcement of a long stock auction, and had more or less returned to its former shape by the time of the two auctions. The long end of the yield curve has regularly been inverted over the past 15 years. Many domestic institutional investors have a natural demand for long-duration stock to hedge existing liabilities; this feature is perhaps more important than in other major bond markets. Such bonds also exhibit relatively high convexity: compared with lower-convexity bonds, their prices rise by proportionately more in a rally than they fall in a sell-off. This can increase their attractiveness relative to

Table E
Calendar of forthcoming debt issues

June	20	Announcement of stock details and amount(s) on offer at June gilt auction (3.30 pm).
	28	Gilt auction. (a)
	30	Announcement of maturity range for auctions in the following quarter (3.30 pm).
July	11	Confirmation of Ecu note issue and announcement of size (2.30 pm).
	18	Ecu note tender. (b) Announcement of stock details and amount(s) on offer at July gilt auction (3.30 pm).
	26	Gilt auction. (a)
September	19	Announcement of stock details and amount(s) on offer at September gilt auction (3.30 pm).
	27	Gilt auction. (a)
	29	Announcement of maturity range for auctions in the following quarter (3.30 pm).
October	10	Confirmation of Ecu note issue and announcement of size (2.30 pm).
	17	Ecu note tender. (b) Announcement of stock details and amount(s) on offer at October gilt auction (3.30 pm).
	25	Gilt auction. (a)

In addition to the gilt and Ecu note issues detailed above, Ecu Treasury bill issues will be confirmed—and the sizes and maturities of the issues announced—on the first Tuesday of each month, with the tender day the following Tuesday;(c) and sterling Treasury bills will be tendered each Friday, with an announcement on the same day of the size of the following week's tender.(d)

- (a) Bids are submitted by 10.00 am on auction day and the result is normally published by 10.45 am. Value is next day.
 (b) Bids are submitted by 10.30 am and the result is published at 1.00 pm. Value is seven days after the tender.
 (c) Bids are submitted by 10.30 am and the result is published at 1.00 pm. Value is two days after the tender.
 (d) Bids are submitted by 1.00 pm and the result is published by 2.30 pm. Value is on any day of the following week at the buyer's discretion.

medium-maturity stocks and make the slope of the curve sensitive to the level of the market.

The overseas sector was a large net seller of gilts during the quarter, with some investors deterred by what they saw as increased political uncertainty. Substantial purchases continued to be made by the M4 private sector, although a large redemption in January left some institutions with surplus cash. The Bank responded by issuing the first tap (for £500 million) of the floating-rate gilt, which was exhausted at the tender held on 8 February.

Implied volatility in options on the June gilt future moderated from 8½% to 8% over the period, despite some spillover from more turbulent currency markets. This may have been in part because gilt prices have been relatively steady since the autumn and because market uncertainty about UK monetary policy has reduced.

Gilt sales in the first quarter of 1995 were £7.1 billion and sales for the 1994/95 financial year totalled £29.8 billion, allowing a full-fund against the Budget PSBR forecast (but small underfunding compared with the estimate for the PSBR published after the end of the financial year). Issues were spread across the range of maturities, with short and medium-dated stocks each constituting 32%, and long-dated 25%, of conventional stock sales, complemented by sales of index-linked gilts representing 11% of the total. On 30 March, HM Treasury published a debt management report which contained the Government's funding remit to the Bank for 1995/96; the remit is reproduced in the box on pages 134–35. The table opposite gives details of the schedule for sterling gilt auctions and Treasury bill tenders, and for Ecu note issues and Ecu Treasury bill tenders over the next six months.

The international environment

- *In the fourth quarter of 1994, GDP growth was strong in the United States, but slowed in France and western Germany. US growth may have weakened early this year after the sharp rise in interest rates last year. The earthquake in Japan will have affected its growth in the first part of 1995; its impact in the longer term is uncertain, but probably less important than prospects for the real exchange rate.*
- *Non-oil commodity prices, in dollar terms, rose by 3% in Q1. Metal prices fell sharply in February, but the fall was offset by other commodity price rises. Oil prices rose by less than non-oil prices.*
- *Producer price inflation has risen further, reflecting the effect of earlier increases in raw material prices and, in some cases, lower exchange rates. Consumer price inflation has remained low.*
- *The exchange rate movements of recent months have affected the economic background. The effects on growth and inflation will depend largely on why they have occurred and where rates settle.*

Chart 1
GDP in the major economies

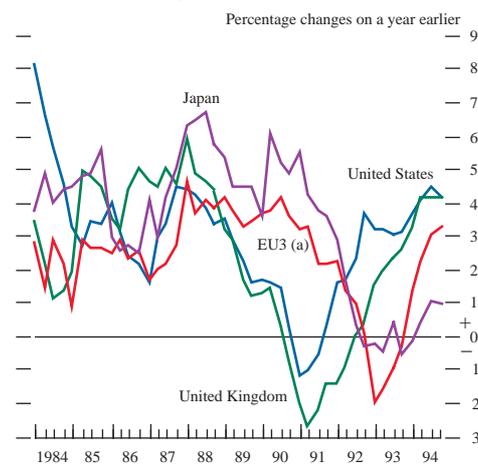
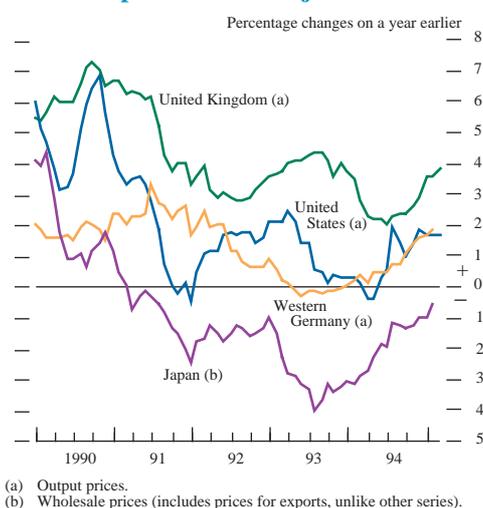


Chart 2
Producer prices in the major economies



Overview

In the major overseas economies, growth continued in the fourth quarter of last year. In the United States it strengthened, but in France and western Germany the rate of growth was lower than earlier in the year. In Japan, where recovery is still at an early stage, output fell in the final quarter.

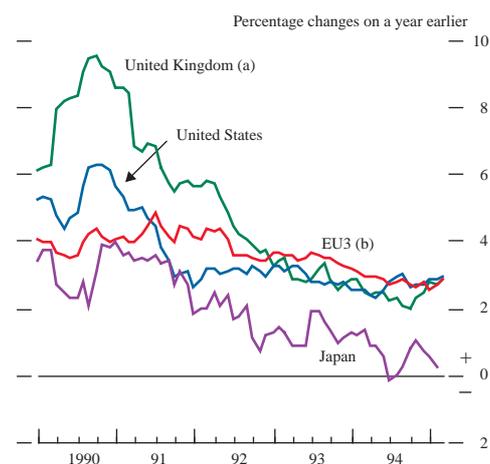
In the fourth quarter, GDP in the Group of Seven (G7) economies as a whole rose by 0.6%, compared with 1% in the third. In the United States, GDP rose by 1.2%, its fastest rate last year. In France and western Germany, it rose by 0.6% and 0.7% respectively. In Japan, output fell by 0.9%, and was 0.9% above its recent trough: this was similar to the position of other G7 countries at the same point in their recoveries, but sluggish by Japanese standards. Chart 1 shows that, by the fourth quarter, all the major economies except Japan were growing at around 3%–4% a year.

In the United States, growth remained broadly based: consumption and investment both rose strongly in the fourth quarter. In France and western Germany, by contrast, personal sector spending has remained weak for this stage of the economic cycle. High unemployment may be preventing a faster recovery in the French personal sector. In western Germany, the tax rises that took effect in January may have curtailed growth in consumer spending.

While growth continued into the first quarter, producer price inflation showed no sign of falling from the rates reached last year (see Chart 2). But consumer price inflation has remained low in most economies (see Chart 3): in the G7, it was 2.3% in the year to February, compared with 2.2% in December. In Italy, annual inflation rose in the first quarter.

As growth continued above its long-run potential rate and producer price pressures remained high, the US Federal Reserve increased its target federal funds rate by 50 basis points in February, taking

Chart 3
Consumer prices in the major economies



(a) RPIX measure.
(b) A GDP-weighted average of France, Italy and western Germany.

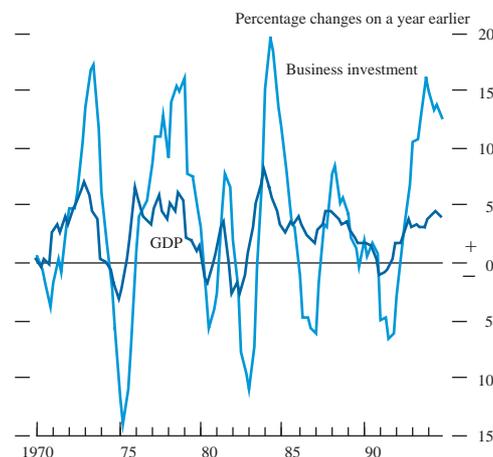
Table A
Contributions to US GDP growth

Percentage points (a)

	1993	1994		
	Year	Year	Q3	Q4
Consumption	2.2	2.4	0.5	0.8
Total investment	1.6	2.0	0.3	0.5
Government expenditure	-0.1	-0.1	0.3	-0.2
Stockbuilding	0.3	0.6	—	-0.1
Domestic demand	4.0	4.8	1.1	1.1
Net external trade	-0.8	-0.7	-0.1	0.2
GDP	3.1	4.1	1.0	1.2

(a) Quarterly contributions are relative to the previous quarter. Components may not sum to total because of rounding.

Chart 4
United States: GDP and business investment



interest rates to a level three percentage points higher than twelve months earlier.

In the early part of the first quarter, interest rates were also increased in Belgium, Canada, Denmark, France, Italy, Spain, Sweden and the United Kingdom. Some of the rises in Europe were in response to exchange rate weakness. In March, the central rates of the Spanish peseta and Portuguese escudo were devalued within the exchange rate mechanism (ERM)—by 7% and 3½% respectively.

In the United States, the yield curve flattened during the first quarter, as market perceptions that US official interest rates might be near to their peak strengthened. This was one factor contributing to the dollar's weakness—and the accompanying strength of the Deutsche Mark and the yen—in the first part of this year.

Later in the quarter, following subdued M3 growth and the strengthening exchange rate (which offset some of the pressure from rising raw material prices), the Bundesbank lowered its discount rate by 50 basis points—the first cut in the rate since June 1994—and its repo rate by 35 basis points. Austria, Belgium, Denmark, France, Greece, the Netherlands and Switzerland subsequently cut official rates.

Early in the second quarter, the Bank of Japan cut its official discount rate by 75 basis points to a new low of 1%. The cut was announced on the same day as an emergency fiscal package and was aimed partly at alleviating some of the effects of the strong yen.

Following the devaluation of the Mexican peso in December, the United States and the IMF announced rescue packages of \$20 billion and \$17.8 billion respectively in the first quarter. The packages, together with a new economic programme in Mexico, helped to support the peso and the Mexican equity market in March. Estimates of the overall impact of the Mexican crisis vary widely, but if there were to be a sustained adverse effect on other emerging markets, world trade growth could be affected significantly.

The United States grew by around 4% last year, but growth probably fell in the first quarter

In the United States, GDP rose by 1.2% in the fourth quarter, compared with 1% in the previous two quarters. As Table A shows, consumption and investment both contributed strongly to the rise. Overall last year, business investment rose by 14%. As Chart 4 shows, this increase in business investment relative to GDP is not out of line with previous cycles.

In the past few months, there has been the first significant evidence that in parts of the US economy growth may be slowing. In the first quarter, employment growth was weaker than in the second half of 1994 and retail sales fell by 0.3%—the first fall for two years. Other indicators of activity have slowed less. Industrial production rose by 1.2% in the first quarter and although capacity utilisation stopped rising, it was still about four percentage points above its 25-year average.

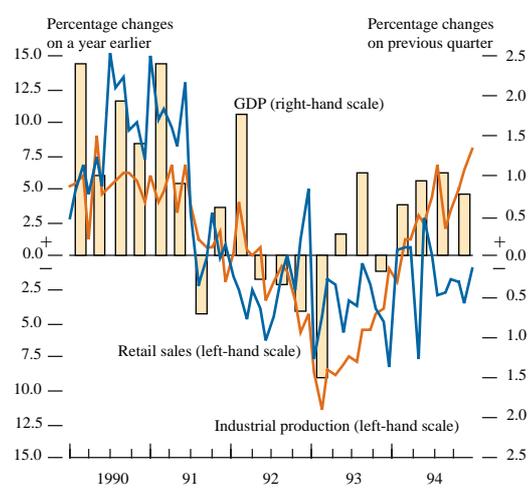
It would be surprising if US economic growth did not slow down this year. Interest rates were increased sharply in 1994, and after

two years in which GDP grew at above the rate of growth of productive capacity, some sectors of the economy are likely to hit capacity constraints. A key question is by how much growth will slow; it is possible that it will remain above the growth rate of productive capacity (estimated to be around 2½% per year) this year.

France, western Germany and Italy each grew by 2%–2½% last year

The major continental European economies grew at similar rates last year. But the composition of their recoveries differed; the box on page 142 looks at the differing pattern of recovery in the major economies.

Chart 5
Western Germany: activity indicators

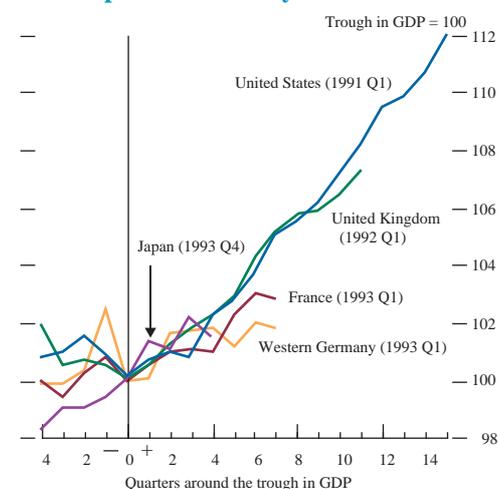


In western Germany, GDP rose by 0.7% in the fourth quarter, compared with 1% in the third. Net external trade accounted for all of the rise in the fourth quarter. Domestic demand was flat: private consumption fell by 0.2%, investment rose, and stockbuilding—which had boosted growth earlier in the year—reduced growth. Despite the sharp rise in net exports in the quarter, the west German recovery has not been export-led: between the first quarter of 1993 (the trough in GDP) and the fourth quarter of 1994, net exports (including to eastern Germany) accounted for only about a fifth of the rise in GDP.

In the year to the fourth quarter, consumption made no contribution to growth, although the rest of the economy grew strongly. Chart 5 shows the divergence in economic activity in western Germany: retail sales growth has been weak but industrial production buoyant.

In eastern Germany, GDP rose by around 9% last year, with construction and manufacturing growing strongly. Unemployment averaged around 16%. Productivity growth continued at high rates, narrowing the differential with western Germany; eastern German productivity rose to around 45% of that in western Germany. Government net transfers to eastern Germany remained more than 50% of its GDP.

Chart 6
Consumption over the cycle^(a)

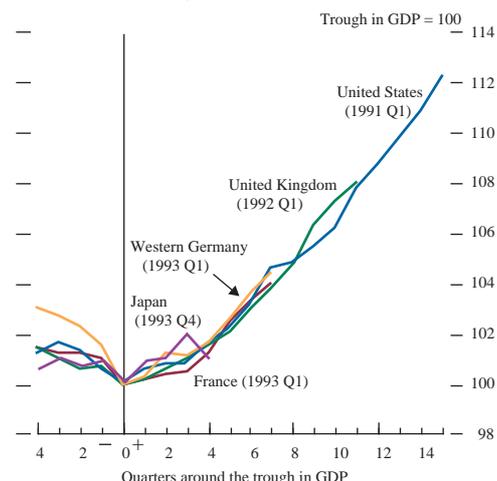


(a) Dates shown in brackets indicate the quarter in which the trough in output was reached.

In France, GDP growth was also weaker in the final quarter than in the middle of the year: output rose by 0.6% in the quarter, with domestic demand and net trade contributing equally. Business investment rose by 1.8%, but household consumption fell. Chart 6 compares French and western German consumption over the cycle with that in the United Kingdom and the United States. Consumption in these two continental European countries has not recovered as quickly. In France, most of the growth in consumption took place in the first half of last year, perhaps suggesting that, as the effect of government stimulus to the car market has faded, ‘underlying’ consumption has remained weak. Two main factors probably lay behind this weakness: high unemployment and slow growth in disposable income. Unemployment in France fell slightly in January to 12.3%, but most of the fall was among those aged under 25 (partly because of government schemes). The unemployment rate for those aged between 25 and 49 has not fallen as quickly—and it is this group which generally has a high propensity to consume.

By contrast, in Spain GDP rose by 0.8% in the fourth quarter—its highest for the year. Private consumption rose by 0.6%, having

Chart 7
GDP over the cycle^(a)



(a) Dates shown in brackets indicate the quarter in which the trough in output was reached.

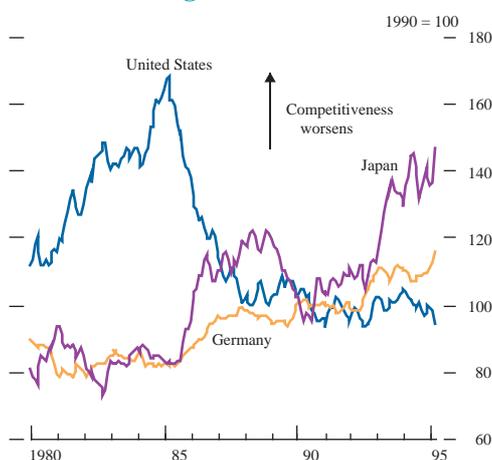
Table B
Contributions to Japanese GDP growth

Percentage points (a)

	1993	1994		
	Year	Year	Q3	Q4
Consumption	0.6	1.3	0.7	-0.4
Total investment	-1.8	-1.2	0.1	-0.2
Government expenditure	1.3	0.6	0.2	—
Stockbuilding	-0.2	0.2	—	0.1
Domestic demand	-0.1	1.0	1.0	-0.6
Net external trade	-0.2	-0.4	-0.1	-0.3
GDP	-0.2	0.5	0.9	-0.9

(a) Quarterly contributions are relative to the previous quarter. Components may not sum to total because of rounding.

Chart 8
G3 real exchange rates^(a)



(a) Nominal effective exchange rates adjusted for changes in relative consumer prices. The figures used for March are derived from changes in the nominal effective exchange rate only.

strengthened throughout last year after export-led growth earlier in the recovery. In the year as a whole, consumption rose by nearly 1%, compared with a fall of 2% in 1993. And the visible trade deficit, which fell by around 2% of GDP in 1993, was broadly unchanged last year. As in Italy, however, the corporate sector has probably been more buoyant than the personal sector; Italian and Spanish industrial production each rose by around 14% in the year to January. The depreciation of both countries' currencies in the first part of this year may further support export industries.

Japan's output fell in the fourth quarter and was adversely affected by the earthquake early in 1995

In Japan, GDP fell by 0.9% in the fourth quarter, offsetting the rise in the third quarter. In 1994 as a whole, Japan's GDP rose by 0.5%, compared with a fall of 0.2% in 1993. The fall in the fourth quarter has led some commentators to question the strength of the Japanese recovery, particularly in view of the high real interest rates, rising real exchange rate, and falling or weak asset prices. But although the fall in GDP was large, the rise in output since the trough has been similar to that in other G7 countries at the same point in their recoveries (see Chart 7). Nevertheless, by Japanese standards, the recovery has been slow.

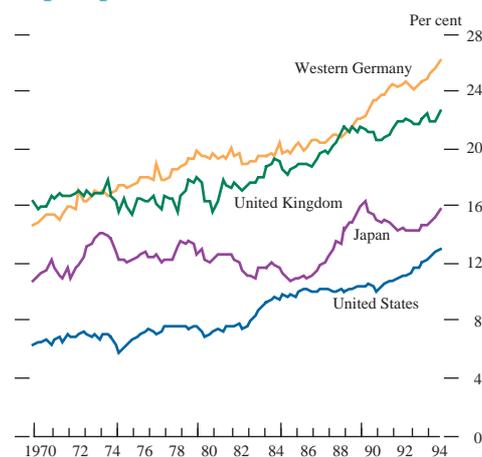
Table B shows the contributions to Japanese GDP growth. In the fourth quarter, consumption fell, having risen strongly in the third quarter following tax rebates in June. Over the year as a whole, it rose by 2.2%. There were further tax rebates in December, but their impact on consumption may have been offset in the first part of this year by the effects of the Kobe earthquake.

Business investment rose in the fourth quarter, as in the third, consistent with the modest recovery in confidence seen in the Tankan survey. It remained below its pre-recession peak, however. Manufacturing firms expected profits to rise sharply in the 1995/96 fiscal year, although investment intentions were, on balance, still negative. Some of the firms worst affected by the Kobe earthquake were excluded from the survey. The Tankan survey was conducted when the exchange rate was ¥99 per dollar, compared with an average rate of ¥96 in the first quarter (and an end-quarter rate of ¥86). Many Japanese firms report that it is very difficult to compete at such a high exchange rate, and in the first quarter there were further anecdotal reports of severely affected profits and sales, and of further production being shifted overseas.

The short-term effects of the earthquake on economic activity are becoming clearer. Industrial production fell in January, though inventories rose (partly because of the difficulties with transportation and distribution networks); according to the Ministry for International Trade and Industry, about half of the fall was due to the earthquake. But production more than fully recovered in February. Kobe is one of Japan's largest ports, and in January whole-economy export and import growth fell. Because of the presence of spare capacity at other ports, however, the earthquake's effect on the trade balance may be short-lived. Consistent with this, export and import growth rose in February.

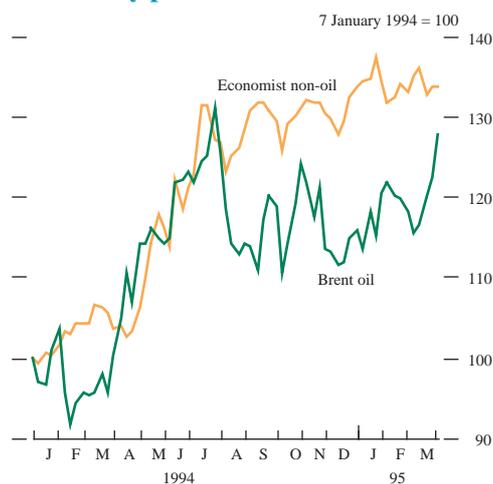
The longer-term economic effects of the earthquake are less clear. Overall, activity in the first part of the year will probably be weaker

Chart 9
Import penetration^(a)



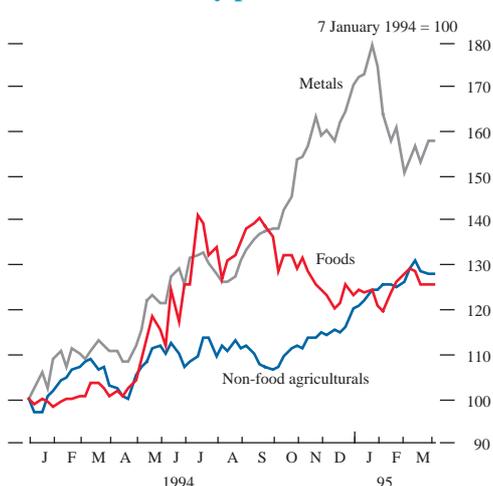
(a) Imports as a percentage of total final expenditure, in constant prices.

Chart 10
Commodity prices^(a)



(a) In dollars.

Chart 11
Non-oil commodity prices^(a)



(a) The Economist's sub indices in dollars.

than it would have been, but this may be reversed later as reconstruction begins. Because of 'multiplier' effects from increased spending, the net long-term effect may be to stimulate economic activity mildly.

In the fourth quarter, Japan's current account surplus fell to 2.5% of GDP, compared with 2.9% a year earlier. The US deficit rose, however, as strong import growth offset export growth. Recent changes in exchange rates have affected the outlook for current accounts. Chart 8 shows that Japan's competitiveness has worsened over a long period. In the past, Japanese exporters may have been able in part to offset this by cutting costs, shifting some production overseas and improving non-price competitiveness (such as the quality of goods and after-sales service). The dollar's real effective exchange rate—in contrast to the widely-held view of dollar weakness—has been broadly stable for seven years.

The volatility of exchange rates in the early part of this year may affect the macroeconomic outlook in some countries; the sharp changes in exchange rates in 1992—and subsequent changes in real exchange rates—had a significant impact on European trade. The box on page 144 looks in more detail at trends in current account balances and competitiveness. If this year's nominal exchange rate changes are followed by persistent changes in real exchange rates, trade volumes might also be affected.

Large exchange rate changes can add to domestic price pressures through the prices of imported goods. The extent of these additional pressures will depend partly on the importance of imported goods in an economy. Chart 9 shows the proportion of total final spending accounted for by imports in a number of countries. Because of relatively low (though rising) import penetration, the Japanese and US economies are more sheltered than European countries from imported good price pressures.

Metal prices fell in the first quarter, but other commodity prices were firm

Non-oil commodity prices, as measured by the Economist's dollar-denominated index, rose by 3% in the first quarter; a sharp fall in metal prices was offset by rising non-food agricultural prices. Oil prices were broadly unchanged in the quarter, but rose sharply in early April. Chart 10 shows the path of oil and non-oil commodity prices since the beginning of last year; since September, non-oil prices have been on a gentle upward trend.

Chart 11 shows the three main components of the Economist's non-oil index. Metal prices rose sharply last year, after a long period of weakness. The price rises were linked to stronger than expected industrial demand and also, perhaps, to an inflow of new money into metal futures markets. The fall in metal prices in February followed evidence that the US economy slowed in January. Some of the new money invested in metal markets last year may have shifted out on this news.

Although metal prices fell sharply, by the end of the first quarter they were still 40% higher than a year earlier. And non-food agricultural prices rose in the first part of the year, supported partly by higher cotton prices following poor harvests and higher demand. So although lower metal prices will help to ease some firms' raw

Output in the major economies during recovery

The composition of the recovery in the major economies by categories of expenditure (consumption, investment etc) was considered in the last *Bulletin*.⁽¹⁾ This box analyses activity in this recovery by sector, making cross-country and cyclical comparisons.

Services account for around 55%–70% of GDP in the major economies, compared with industrial production's share of only 20%–35%. The UK economy lies at about the middle of both ranges. Over the last 20 years, services have become a slightly larger component of GDP in all major economies, at the expense of industrial production.

The table below compares the falls in output in the two sectors during the last recession (and the previous one). As it suggests, the output of services is generally less cyclical than industrial production in the major economies. This may partly reflect the inclusion in services of government activities that are typically countercyclical. The output of services has grown steadily in all the major economies during the recovery, in line with previous cyclical experience.

Cyclical falls in sectoral output^(a)

Per cent

	Industrial production		Services	
France	3.8	2.7	1.0	0.5
Italy	5.0	7.7	—	—
Japan	13.5	2.5	2.0	1.6
United Kingdom	6.4	12.7	2.0	1.6
United States	3.4	8.1	—	3.2
Western Germany	10.7	10.0	0.2	—

(a) Falls in output from sector's peak to trough in the last cycle; sectoral falls in previous cycle given in italics. — indicates no fall.

In the United Kingdom and the United States, the fall in industrial production was less in the recent recession than in the previous one. This probably reflected the significant improvements in the two countries' trade balances—caused by changes in relative demand—during the latest recession. The two countries were the first major economies to enter recession and so external demand helped offset falls in internal demand. By contrast, at the time of the early 1980s recession real exchange rate appreciations of sterling and the dollar may have exacerbated the fall in industrial output.

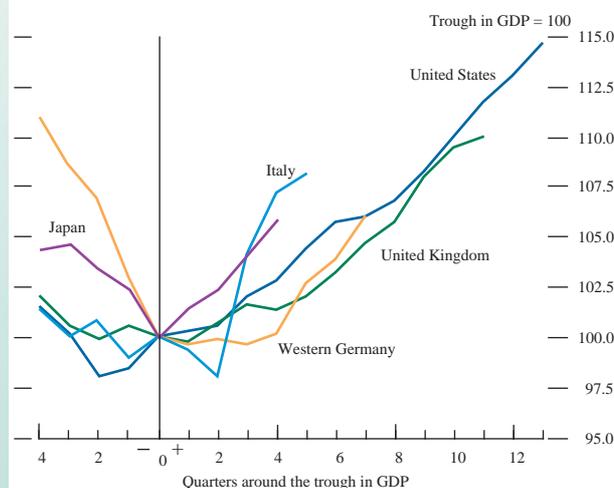
Growth in industrial production in the major economies has risen rapidly in recent quarters, but this is not out of line with previous experience. The chart shows industrial production around the trough in GDP in five of the G7 economies. In Italy, the recovery in production has been particularly quick, reflecting a

significant improvement in competitiveness in 1992. It followed a similar path in its 1970s recovery, which was also preceded by a large exchange rate depreciation. Industrial production in Japan has also been recovering more rapidly than in most other economies, though its recovery began more recently. The speed of recovery may reflect the bigger fall in industrial production during recession than elsewhere.

The construction sector has so far recovered little in all the major economies. In the United Kingdom and United States, the sector's fortunes have contrasted sharply with the early 1980s, probably reflecting the sharp property market falls in the late 1980s. In the United States, construction started to recover more strongly last year, but recently higher interest rates may have reduced growth: private housing starts fell significantly in the first part of this year, after reaching a peak at the end of 1994. The sector remains very subdued in western Germany and France, though this is not out of line with previous cyclical experience. In Japan, construction has also been affected by the end of the speculative bubble in the late 1980s; reconstruction after the Kobe earthquake may mask a continuing underlying weakness in the sector in the next couple of years.

Given the likelihood of continued steady growth in services this year and next, any changes in GDP growth will be largely determined by the outlook for construction and industrial production. Higher interest rates and capacity constraints are likely to slow growth in these two sectors in the United States. A recovery in continental European construction may contribute to a strengthening recovery there in the next two years.

Industrial production in recovery



(1) See the box on page 17 of the February *Quarterly Bulletin*.

Chart 12
United States: producer prices

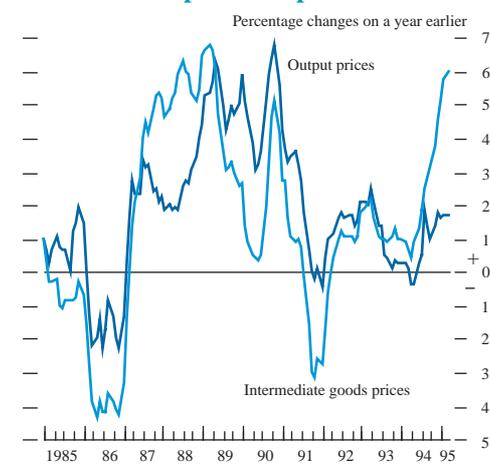


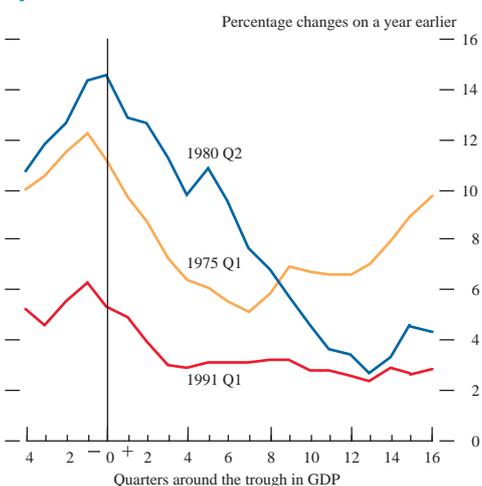
Table C
Unit wage costs in manufacturing^(a)

Percentage changes on a year earlier

	1993 Year	1994 Year	Q3	Q4
Canada	-2.8	-2.4	-3.4	-3.2
France	3.5	-0.9	-2.0	-1.7
Italy	3.0	-3.6	-5.2	-6.5
Japan	4.5	-0.8	-4.0	-4.6
United States	-1.2	-0.9	-1.1	-1.0
Western Germany	2.0	-7.1	-7.8	-7.4
Major six	0.5	-2.6	-3.6	-3.6
<i>Memo:</i>				
United Kingdom	0.6	-0.2	-1.5	-0.7

(a) Bank estimates for major six countries.

Chart 13
United States: consumer prices over recent cycles^(a)



(a) Dates shown indicate the quarter in which the trough in output was reached.

material price pressures, by mid April there was no evidence of an easing in overall commodity price pressures.

Producer price inflation has risen further in some countries

Firm raw material prices and, in some cases, upward pressure on unit wage costs have put further pressure on producer prices. Pressures have been strong at intermediate stages of production, but producer output price inflation has not risen as sharply. As Chart 12 shows, in the past there has been a strong link between intermediate goods price inflation and output price inflation in the United States. The relationship has been less strong in recent months, suggesting that there may have been a fall in profit margins.

Because nominal earnings growth has been weak throughout the G7, cyclical improvements in labour productivity have helped to keep unit wage cost pressures weak (see Table C). In the fourth quarter, the smallest falls in unit wage costs were in the United Kingdom and the United States; these two countries were among the first to recover, so cyclical productivity improvements might be expected to fade there first.

Consumer price inflation was generally subdued in the first quarter

Consumer price inflation generally remained low in the G7 economies in the first quarter of the year. The annual rate of consumer price inflation averaged 2.3% in February, compared with 2.2% in December. But rates of inflation have begun to rise in some countries (including some outside the G7).

In the United States, consumer price inflation remained low in the first quarter. The US economy has now been growing for four years. At the same point in the last two recoveries, consumer price inflation was higher—as Chart 13 shows. Probably one reason why US inflation has not risen as much during this recovery is that global growth was initially lower this time, putting less upward pressure on import and raw material prices. Increased competition, particularly in the retail sector, may also be a factor keeping inflation lower in this recovery.

In western Germany, the annual rate of consumer price inflation fell sharply in January, as indirect tax increases last year fell out of the year-on-year comparison. Underlying consumer demand pressures seemed to remain weak, following further tax increases in January. But the wage settlement agreed with IG Metall—usually a benchmark for subsequent agreements—was at the upper end of expectations.

The IG Metall deal was worth around 4% in 1995, compared with 1% last year. But manufacturing labour productivity may have risen by 10% or so in western Germany last year, and real personal disposable incomes fell in 1993 and 1994. The agreement also fixed wage growth for 1996 at 3%, which may reduce uncertainty in the run-up to next year's wage round. The risks of rising inflation in Germany have been partly offset by the strength of the Deutsche Mark (though the short-term effects of its appreciation may be reduced by invoicing in Deutsche Marks, which covers perhaps a half of all imports).

French inflation was unchanged at around 1.7% in the first quarter, broadly the same as in the second half of last year. And because

Recent current account trends

Current account imbalances in the major economies have changed quite sharply in the past few years—as the table shows. This box analyses the recent trends. Changes in both relative demand and competitiveness help to explain current account trends. But in view of the volatility of currencies in the first part of this year, the box focuses mainly on the role of exchange rates and competitiveness.

Current account balances

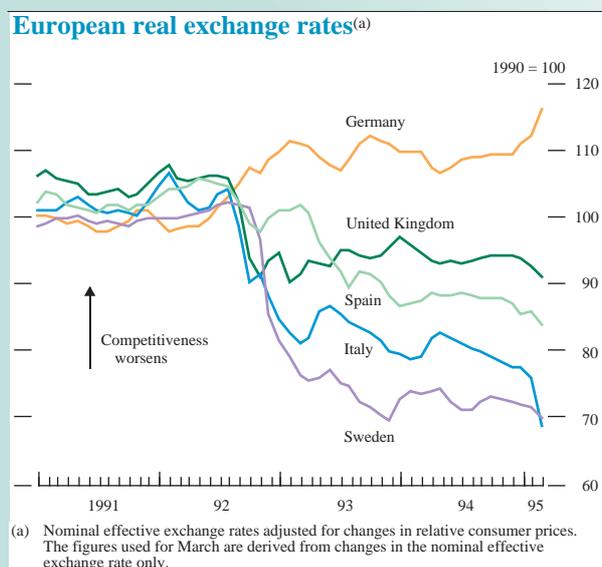
As a percentage of GDP

	1992	1993	1994 (a)
Canada	-3.9	-4.3	-3.3
France	0.3	0.8	0.7
Germany	-1.2	-1.2	-1.9
Italy	-2.3	1.1	1.4
Japan	3.2	3.1	2.8
Spain	-3.0	-0.5	-0.9
Sweden	-3.5	-2.1	0.4
United Kingdom	-1.6	-1.9	—
United States	-1.1	-1.6	-2.3

(a) First three quarters for France, Italy and Spain.

Changes in US, Japanese and German real exchange rates, measured using nominal effective rates adjusted for relative changes in consumer prices, are shown in Chart 8 on page 140. The most significant recent change has been for Japan, where the real exchange rate appreciated by around 30% in the two years to March. Germany's real exchange rate rose by less and the US real rate has fallen, but only gently. The relative stability of the dollar's real exchange rate, despite the currency's weakness against the Deutsche Mark and the yen, reflects both its appreciation against the Canadian dollar and a higher rate of consumer price inflation than in some of its major competitors, particularly Canada and Japan (which account for 55% of the weight in the US effective exchange rate).

Within Europe, some countries' real exchange rates fell sharply after the ERM crisis in 1992, as the chart shows. In the 2½ years after September 1992, Italian, Spanish



and Swedish rates fell by at least 20%. Sterling's real exchange rate fell by around 10% over the same period, while French and German real exchange rates appreciated. These changes in competitiveness have contributed to changes in current account balances, and within Europe those countries whose real exchange rates fell most have experienced the greatest improvement in the last few years. Between 1992 and 1994, for instance, Italian and Swedish current accounts improved by around 4% of GDP, compared with 2% in Spain and around 1% in the United Kingdom.

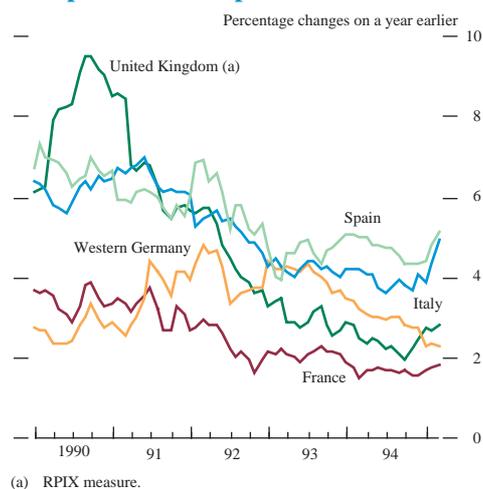
Germany's current account deficit rose in 1994, largely because of a sharp fall in its balance on interest, profits and dividends, which may have reflected its currency appreciation. In France, the current account moved into surplus in 1992 and, by the third quarter of last year, this was around 0.8% of GDP. This partly reflected the weakness of French demand relative to its major competitors, but also an improvement in the terms of trade following the franc's appreciation.

The US current account deficit rose from 2% of GDP in the first quarter of 1994 to 2.6% by the fourth. The rise was mainly the result of a rising visible trade deficit stemming largely from the strength of US relative demand. US domestic demand rose by 4½% in 1994, compared with 2%–2½% in the rest of the G7; US import volumes rose strongly, by 13%. Export volumes also rose—partly in response to improved competitiveness—but by less than import volumes. If domestic demand grows by less in the United States than in its competitors this year, the US current account deficit may stop rising. But the dollar's appreciation against the Canadian dollar and Mexican peso over the last year may partly offset the effects of any changes in relative demand.

Japan's current account surplus fell by 10% in yen terms last year. The yen's strength over the last few years has affected trade volumes. But the fall in the surplus to date has been less than after the currency's sharp appreciation between 1985 and 1987. A rise in Japanese relative demand would reinforce the effects of the rising real exchange rate.

In recent years, Canada has had the largest current account deficit in the G7: over the last ten years or so, it has averaged more than 3% a year. Its visible balance has, however, been in surplus for most of the last 20 years (and this is likely to be reinforced by recent improvements in competitiveness). The main counterpart to its current account deficit has been a high public sector deficit and consequently there has been a large net outflow of interest, profits and dividends, reflecting the high level of foreign-held debt.

Chart 14
Europe: consumer prices



unemployment remains high, there may be few wage pressures in France this year. In Italy, inflation increased in the first quarter. Consumer prices rose by 4.9% in the year to March, compared with a low of 3.6% last year; indirect tax increases explained part of the rise this year. Chart 14 suggests the beginnings of a divergence in the inflation rates of the major continental European countries.

Broad money growth remained weak in a number of major countries

In the United States, annual growth of M2 was 1% in the first two months of the year, weaker than in the early part of last year. Bank lending growth has continued to be much stronger than broad money growth and eased little in the first part of the year, suggesting that the economic slowdown was modest.

In Germany, broad money growth slowed in the early part of this year. In February, annualised growth in M3 since the fourth quarter of 1993 was 3.7%; this compared with a target range of 4%–6% for growth between the fourth quarters of 1994 and 1995. The slowdown in M3 was partly the result of a switching out of M3 deposits into longer-maturity assets. The Bundesbank also monitors an extended M3 aggregate, which includes, among other things, money-market funds. Extended M3 growth also fell in the first months of the year.

In Japan, annual growth of M2 plus CDs was higher in the first quarter than last year. Part of the rise may have been the result of an increased demand for cash after the Kobe earthquake. Bank lending was broadly unchanged in the year to February, although there was some increase in the level of corporate bonds and commercial paper outstanding in the final months of last year.

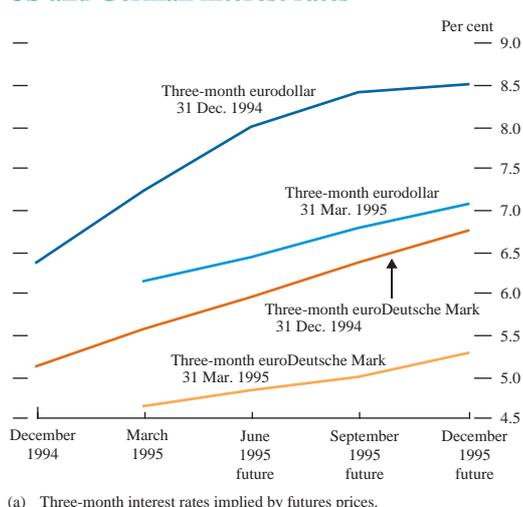
US interest rates were increased further, but German and Japanese rates were cut

In response to high growth towards the end of last year and further intermediate goods price pressures this year, the Federal Reserve raised its target federal funds rate to 6% in February. Subsequent statements by Federal Reserve officials, and evidence that growth was slowing in the first quarter, led market expectations of future US interest rate rises to be revised downwards. Chart 15 shows the change in the three-month interest rates implied by eurodollar and euroDeutsche Mark futures contracts between 31 December and 31 March.

The change in interest rate expectations during the first quarter was probably only a partial explanation of the subsequent weakening of the dollar. The rise in the US visible trade deficit in January and the failure to pass the 'balanced budget amendment' in March may also have affected market confidence, by focusing attention on two key structural factors (the current account and fiscal deficit) affecting the supply of dollars on world markets.

The strength of the Deutsche Mark in the early part of the quarter led to strains within the ERM. In Belgium, Denmark, France, Ireland, Italy, Portugal and Spain, official interest rates were increased, partly to support currencies. And in March, the Spanish peseta and Portuguese escudo were both devalued. Towards the end of March, the Bundesbank cut its discount rate by 50 basis points to 4% and its repurchase rate by 35 basis points, citing low M3 growth

Chart 15
US and German interest rates^(a)



and the strength of the Deutsche Mark—which had reduced some of the threat from higher commodity prices—as justifications for the cut. Austria, Belgium, Denmark, France, the Netherlands and Switzerland subsequently cut official rates. (The exchange rate developments in the first quarter are discussed in detail in the review of the operation of monetary policy on pages 125–36.)

Early in the second quarter, the Bank of Japan cut its official discount rate by 75 basis points, the first cut since September 1993. Japanese inflation was 0.2% in the year to February, but some analysts suggested that prices were falling by 2% a year because of widespread and unrecorded discounting. Adjusted for current inflation, therefore, Japanese interest rates were still high by international standards and for this stage of the recovery. (They were around the same level as US official interest rates adjusted for US inflation.) And because of the yen's real appreciation of around 30% over the past two years (including the sustained upward pressure in recent months), Japan's overall monetary policy stance has been tighter than the level of real interest rates suggests.

Fiscal deficits remained high in some countries

After the devaluation of the Mexican peso in December, and subsequent currency tensions elsewhere this year, the prospects for fiscal policy may have become a more important influence on market behaviour. Stronger growth in most European countries should help to cut the cyclical part of fiscal deficits this year, but structural imbalances are still large. Higher interest rates would add to funding costs and countries with high debt, short average debt maturities (such as Italy) or a high proportion of floating-rate debt (such as Canada) would be affected most.

In Italy, this year's fiscal plans were supplemented with a mini-budget of Lit 20 trillion (1.2% of GDP), introduced partly because of higher funding costs following interest rate increases. The OECD estimates that a one percentage point rise in interest rates at all maturities increases the government deficit by 0.4% of GDP in Italy and 0.3% in Canada, the highest in the G7 (see Table D). It also estimates that budget deficits in Belgium, Greece, Portugal and Sweden would increase by at least 0.3% of GDP.

In Canada, the budget announced in February included large spending cuts (including cuts in federal transfers to the provinces), higher business taxes and privatisations. The budget was based on higher long-term interest rate projections than those of many outside forecasters.

Table D
Effect of an interest rate rise on government deficits^(a)

Increase as a percentage of GDP

Canada	0.3
France	0.1
Germany	0.1
Italy	0.4
Japan	0.1
United States	0.1

Memo:
United Kingdom 0.1

Source: OECD December 1994 *Economic Outlook*.

(a) The estimated effect of a one percentage point increase in interest rates at all maturities on government deficits in 1995.

Financial market developments

- *Yield curves flattened in most major government bond markets during the first quarter, reflecting greater investor confidence about inflationary prospects.*
- *The Mexican financial crisis led to a reassessment of emerging-market risk by investors and a greater appreciation of the interdependence of capital markets worldwide.*
- *Recent trends in international issuing continued: in particular, the average maturity of international fixed-rate bonds shortened, MTN issues and syndicated credits increased, and privatisations continued to favour international equity issues.*

Overview

During the first quarter of 1995, yield curves flattened in most major government debt markets. This reflected reduced investor concern about inflationary pressures, which also led to a sell-off in base metal commodity markets during February. In contrast to the Japanese earthquake and the Barings crisis, which had only transient effects on markets, the Mexican financial crisis led investors to reassess the risk in assets from emerging markets and developed countries with high levels of public debt.

Although there was some strengthening in the US equity market, there was no consistent trend in prices in the major European equity markets during the quarter. The Japanese equity market fell as a result of the strength of the yen against the dollar, because of concerns about its adverse effect on exporters. Equity turnover worldwide was fairly stable, with trading volumes in Tokyo remaining low.

In the international markets, the recent shift in borrowing away from straight, fixed-rate bonds towards medium-term notes (MTNs) and syndicated credits continued. 1994 was a record year for international equity issues, with privatisations and offerings from companies in developing countries particularly significant. Further privatisations are expected to maintain the high levels in 1995. Last year, there were also a record number of issues by newly listed companies on the London Stock Exchange; market predictions for 1995 are that such issues will be fewer, but of larger average size.

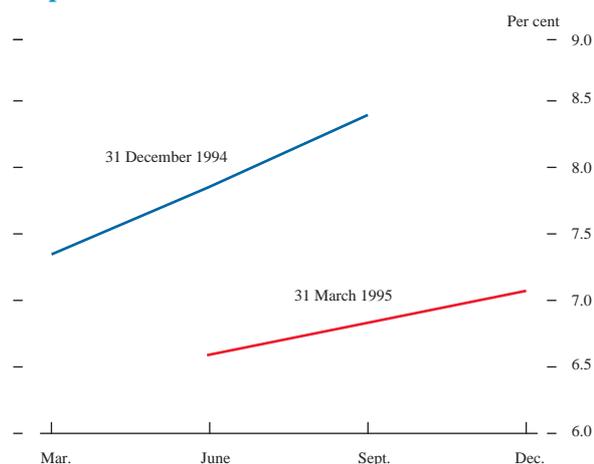
Turnover on derivatives exchanges worldwide rose during the first quarter, although volumes were still generally down on the exceptional levels seen in the first half of 1994. Competition between exchanges continued to intensify, but there was also a willingness to establish mutually-beneficial trading agreements.

Bond and other debt markets

In the US Treasury market, the differential between three-month rates and the ten-year yield fell by 82 basis

points to 132 basis points. The yield curve flattened for the second successive quarter; but whereas in the fourth quarter of 1994 the flattening reflected rises in short-term rates, in the first quarter it was the result of falling long-term bond yields. Strong investor demand at the long end of the yield curve, despite the weakness of the dollar, reflected a growing view that the Federal Reserve was near the end of its tightening of monetary policy and greater confidence about inflationary prospects; long-bond yields ended the quarter down almost 50 basis points at 7.43%. The change in perception concerning future interest rates can be seen in Chart 1. By the end of the quarter, however, interest rate futures still suggested that market participants expected further increases in short-term interest rates—of around 50 basis points—by the end of June.

Chart 1
Implied US three-month forward rates

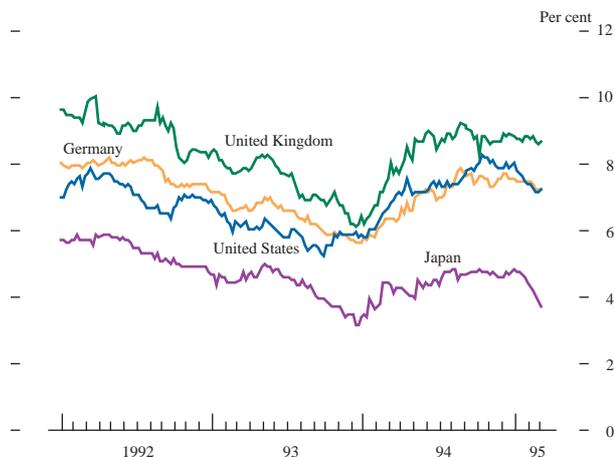


Source: Bloomberg.

The prices of Japanese government bonds also rose during the quarter, with the yield on the ten-year bond falling almost 100 basis points to 3.68%, its lowest level for over a year (see Chart 2). Several factors—including the weakness of the equity market and the appreciation of the yen—led to speculation that official short-term interest rates might be

eased. In addition, bond prices rose as a result of the continued repatriation of funds by domestic investors.

Chart 2
Ten-year government bond yields



Source: Bloomberg.

Yield curves also flattened sharply in the major continental European markets. Yields on German government bonds (Bunds) fell; the yield on the ten-year Bund ended the quarter down almost 50 basis points at 7.19%. The strength of the Deutsche Mark, which was viewed as a 'safe haven' after the financial crisis in Mexico, and subdued M3 growth figures outweighed market concerns about inflationary pressures arising from the annual wage round. The spread between ten-year French government bonds and Bunds, which had widened during 1994, fluctuated in a range of about 60 to 90 basis points for most of the quarter, with movements largely reflecting political uncertainties prior to the French presidential election.

International issues

Gross borrowing in the international bond markets during the first quarter totalled \$98 billion, 28% down on the same quarter of 1994. Fixed-rate issues increased marginally compared with the same quarter, to \$82 billion, reflecting greater investor confidence about inflationary prospects in most major economies. Floating-rate note (FRN) issues fell by 37%, as the concerns witnessed last year about oversupply and the liquidity of structured products continued. FRN issues totalled \$14 billion, compared with \$39 billion in the same quarter of 1994. Equity-related issues also declined, to only \$2 billion, compared with over \$20 billion a year earlier.

The shift in borrowing in recent quarters away from straight, fixed-rate bonds and towards MTNs and syndicated credits continued. Issues of euromedium-term notes (EMTNs) were \$53 billion, a rise of over 70% on a year earlier. The tendency of shorter-maturity assets to be less price sensitive to interest rate changes was a significant reason for this growth; although the maturity range of EMTNs has widened, they are still generally of shorter maturity than bonds. Investor preference for shorter-maturity assets has also been illustrated by the fall since the first quarter of last year in the

average maturity of dollar and Deutsche Mark denominated fixed-rate international bonds.

Table A
Total financing activity:^(a) international markets by sector

\$ billions; by announcement date

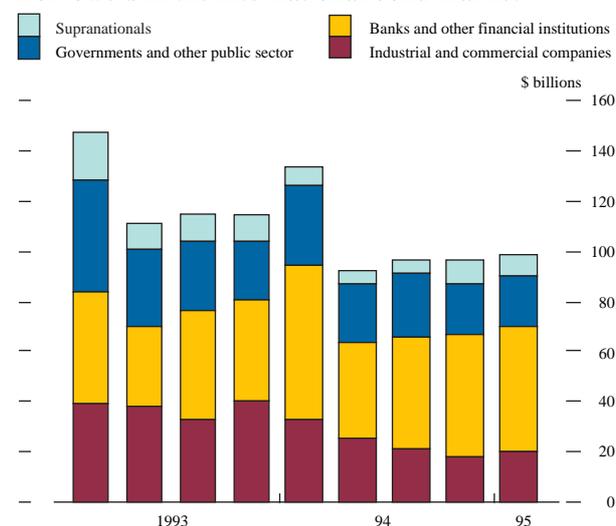
	1994	1995			
	Year	Q2	Q3	Q4	Q1
International bond issues					
Straights	296.1	68.6	75.0	75.4	81.7
Equity-related	33.2	5.7	4.0	2.8	2.3
of which:					
Warrants	10.8	0.8	0.7	1.1	0.9
Convertibles	22.3	4.8	3.3	1.7	1.4
Floating-rate notes	92.7	17.8	17.9	18.3	14.2
Bonds with non-equity warrants (currency, gold, debt)	0.1	—	—	—	—
Total	422.1	92.1	96.9	96.5	98.2
Credit facilities (announcements)					
Euronote facilities	193.3	46.0	40.2	71.4	54.9
of which:					
CP	36.4	15.4	10.9	6.2	6.8
MTNs	157.0	30.6	29.3	65.2	48.1
NIFs/RUFs	—	—	—	—	—
Syndicated credits	248.6	64.5	59.3	72.8	99.4
Total	441.9	110.5	99.5	144.2	154.3
<i>Memo: amounts outstanding</i>					
All international					
Bonds (b)	2,061.9	2,060.1	2,049.3	2,061.9	2,211.0
Euronotes (c)	406.1	330.3	378.7	406.1	461.6
of which, EMTNs	292.0	216.5	259.4	292.0	347.1

(a) Maturities of one year and over. The table includes euro and foreign issues and publicised placements. Issues which repackage existing bond issues are not included. Figures may not add to totals because of rounding. Bond total includes issues from MTN programmes.

(b) BIS-adjusted figures, including currency adjustment. Includes issues of fixed-rate bonds and floating-rate notes.

(c) Euroclear figures.

Chart 3
Borrowers in the international bond market



Source: Bank of England ICMS database.

In addition, there was a large increase in international syndicated lending; announcements in the quarter totalled \$99 billion, an increase of 85% on the first quarter of 1994. The very low spreads that have become common in this market (in part reflecting increased competition among banks) contributed to the rise. The shift to shorter-maturity assets was also seen in eurocommercial paper (ECP) issues, which totalled over \$100 billion.

Dollar issues

The dollar's share of international issues declined during the first quarter. A move towards shorter-maturity instruments in international dollar debt markets reflected the general trend: the average maturity of international dollar fixed-rate bonds fell to 5.9 years from 6.5 years a year earlier. As Table B shows, gross bond issues in dollars constituted 31% of total international issues, compared with 39% a year earlier—a fall of 43% by value. Dollar FRNs' share of total international FRN issues also fell over the same period, from 66% to 42% (a fall of 76% by value). And corporate international issues in dollars in the quarter were half those a year earlier. By contrast, dollar-denominated syndicated credit announcements were up 31% on a year earlier.

Table B
Currency composition of international bond issues

Currency denomination	1993	1994				1995
	Year	Year	Q2	Q3	Q4	Q1
US dollar	175.6	147.3	26.2	30.6	37.3	30.6
Yen	58.7	77.8	20.7	23.9	22.1	13.6
Deutsche Mark	56.4	39.8	8.4	8.5	9.2	14.3
Sterling	42.6	29.5	6.6	5.3	4.1	6.5
French franc	42.3	28.7	8.5	3.1	3.5	4.8
Swiss franc	27.5	20.8	3.2	6.2	4.3	5.7
Italian lira	12.3	17.1	5.0	4.6	2.7	5.9
Ecu	11.4	7.6	1.8	1.5	0.9	2.9
Other	58.2	53.3	11.6	13.2	12.3	14.0
Total	485.0	421.9	92.0	96.9	96.4	98.2

Source: Bank of England ICMS database.

In the US domestic market, gross bond issues by companies during 1994 totalled \$141 billion—58% of the 1993 figure—and equity issues by US companies fell sharply. Gross corporate borrowing in the US domestic MTN market also fell in 1994, to \$18 billion—37% lower than in 1993—contrasting with the growth in the international market. But in bank lending, where there had been net repayments by companies of \$14 billion in 1993, there was corporate net borrowing of \$61 billion in 1994. Total gross government borrowing of \$568 billion was 11% down on the previous year, ending an upward trend of several years.

Yen issues

International issues in yen fell to \$13.6 billion in the first quarter, but were still up on the level a year earlier. Yen-denominated corporate international borrowing was \$1.8 billion, continuing its downward trend of four quarters. The average maturity of yen-denominated international bonds rose to 6.0 years from 5.7 years a year earlier, in contrast to the shortening in dollar and Deutsche Mark denominated bonds. Gross domestic bond issuing by Japanese companies rose to ¥6.2 billion in 1994, 5% up on 1993 levels. Gross central government borrowing was almost ¥56 trillion in 1994, a 9% increase on 1993 and continuing an upward trend of several years.

The Japanese Ministry of Finance was reported to be considering lifting, by the end of March 1996, the 90-day

'lock-up period' for euroyen bonds issued by non-Japanese corporations, to enable Japanese investors to diversify. Under the so-called *seasoning* rule, euroyen bonds cannot be sold to Japanese investors for a period of 90 days after issue. After a similar deregulation of the euroyen issues made by non-Japanese public-sector borrowers in January 1994, issues by non-Japanese entities increased to \$52.3 billion in 1994, almost three times the level in 1993. Although this growth may also have reflected other factors—such as low coupons and the strength of the yen—similar growth is expected if euroyen issues by foreign companies are deregulated.

The proposed deregulation could adversely affect the Samurai market.⁽¹⁾ Borrowing in this market fell in 1994, partly because of the reform of the euroyen market, which issuers preferred on grounds of liquidity as well as cost. The Samurai market has also suffered a decline in credit quality: there have been no AAA-rated issues since 1993. There is a separate issue about the increasing dependence of the Samurai market on one group of investors—regional institutions—which are prohibited from buying euroyen issues.

Deutsche Mark issues

The Deutsche Mark sector's share of gross international bond issues increased to 15% during the first quarter, helped by the currency's perceived stability. Compared with the first quarter of 1994, the average maturity of Deutsche Mark denominated international bonds fell by 2.7 years to 5.4 years, reflecting the general move to shorter-maturity assets. In the German domestic markets, however, it has been difficult to identify a switching away from bonds, because gross domestic corporate bond borrowing has been very low (only 0.1% of total gross domestic bond borrowing in 1994). But net bank lending to companies fell by 6% to DM 320 billion in 1994, with new loans mainly of longer maturity.

In recent years, German domestic bond markets have been driven by the need for capital to fund German unification. Over 1994, total domestic gross bond issues fell by 14% to DM 627 billion, mainly because of a fall in government (central, state and local) gross borrowing. This totalled DM 112 billion in 1994, 43% lower than in 1993 (but still much higher than 1989's pre-unification borrowing of DM 66 billion). The fall coincided with the winding-down of the Treuhandanstalt,⁽²⁾ a major borrower in recent years (it raised DM 59 billion during 1994). By contrast, German equity market issues have been rising since 1991.

Sterling issues

Gross sterling bond issues totalled £4.3 billion during the first quarter, compared with £2.9 billion in the previous quarter. Both UK and overseas issues increased, but overseas public-sector issues rose particularly strongly: the EIB's £500 million eurobond was the largest sterling issue

(1) A Samurai bond is a yen-denominated bond issued in the Japanese domestic market by a foreign issuer.

(2) The state holding company created to take over the industries owned by the former East German state and to oversee their privatisation.

for more than a year. A number of eurosterling issues included an option to convert to registered form, in anticipation of an announcement by the Inland Revenue on the paper eligible to be held in corporate-bond PEPs. In March, the domestic sterling market was boosted by two new issues, by the University of Lancaster and Newport Borough Council. Total sterling commercial paper outstanding fell marginally over the quarter to £5.9 billion, while sterling MTNs outstanding rose by 11% to £12.7 billion.

Ecu markets

In the United Kingdom, there were regular monthly auctions of ECU 1,000 million of Treasury bills during the first quarter, comprising ECU 200 million of one-month, ECU 500 million of three-month and ECU 300 million of six-month bills. The auctions continued to be oversubscribed, with issues being about twice covered. Bids were accepted at yields up to 20 basis points below the Ecu Libid rate of the appropriate maturity, in line with previous spreads achieved since the Ecu market disturbance in 1992. There are currently ECU 3.5 billion of Treasury bills outstanding; secondary market turnover has continued to average ECU 2–3 billion a month.

ECU 1,000 million of the fourth three-year Ecu Treasury note was auctioned on 17 January. It is expected that the issue will be reopened in April, July and October. Cover at the auction was 2.9 times the amount on offer and accepted bids were in a tight range of 8.05%–8.07%. The first issue of Ecu notes matured in January and the total value of notes outstanding fell to ECU 5.5 billion (though outstandings will increase during the year as the fourth note is reopened). Secondary market turnover was particularly strong, continuing the increasing trend since 1992. The UK government's total outstanding Ecu debt was ECU 11.5 billion at the end of the quarter.

The French government issued a total of ECU 1,930 million in bonds and notes during the quarter, taking its outstanding Ecu debt to ECU 23.2 billion. The Italian government issued ECU 744 million of notes in January; the total outstanding at the end of March was ECU 25.6 billion. There were also ECU 5.9 billion of Italian government eurobonds outstanding. The ECU 2.3 billion (\$2.9 billion) of international Ecu bond issues in the quarter comprised issues by Denmark and Austria, as well as corporate issues from a number of countries and issues by supranationals.

Emerging markets

The devaluation of the Mexican peso on 20 December led to a sharp fall in other emerging bond and equity markets. The prices of Brady bonds,⁽¹⁾ as measured by the Salomon Brothers' index, fell 11% over the first quarter and emerging equity markets fell 15%.⁽²⁾ There were widespread effects on investor confidence in other markets, particularly in Latin American assets. Argentinian and Brazilian Brady bonds fell more than Mexican during January and February, as

market concerns spread to other highly indebted countries. Equity markets as diverse as Hungary, Poland, South Africa and India were also adversely affected.

Markets in Asia started to recover as the quarter progressed. In February, there was a clear difference in the performance of Latin American (-14.5%) and Asian (+8.7%) emerging equity markets, but this difference faded in March as most Latin American markets surged. The effect of the Mexican crisis was only one influence on Asian markets: the weakness of the Japanese equity market and concerns about Chinese political developments also had an impact.

Latin American borrowers were almost entirely absent from international bond markets during the quarter: total issues fell from \$5.8 billion in the last quarter of 1994 to \$196 million (and \$300 million in international syndicated credits). Issue levels were even lower than during the global bond market turbulence in the second quarter of 1994. By contrast, Asian borrowers seemed to switch to syndicated credits—borrowing \$12.8 billion, compared with \$9.8 billion in the fourth quarter of last year. The total of Asian bonds issued fell from \$3.9 billion to \$2.6 billion.

The Mexican crisis added to earlier problems in emerging markets, which had a difficult year in 1994 after booming in 1993. After reaching historic highs at the beginning of 1994, the markets fell heavily as major bond markets weakened. A number of analysts predicted that emerging markets would be depressed for many years, but they recovered to their former highs by late September. They then again drifted lower, however. Over 1994 as a whole, Mexican Brady bonds fell 25% and Mexican equities 38%; emerging Asian equities fell 13%; and Latin American equities were down 9.5%. By the end of the first quarter, emerging equity markets had fallen back to their mid-1993 levels and Brady bonds were about 8% lower than a year earlier. Concerns arising from the Mexican crisis also led to a resurgence of investor concern over countries with high levels of public debt.

It is too early to draw conclusions about long-term shifts in the pattern of capital flows to emerging markets, but the events of the first quarter have led both to renewed discussion of the most suitable form for flows to developing countries and to a greater appreciation of the interdependence of capital markets worldwide.

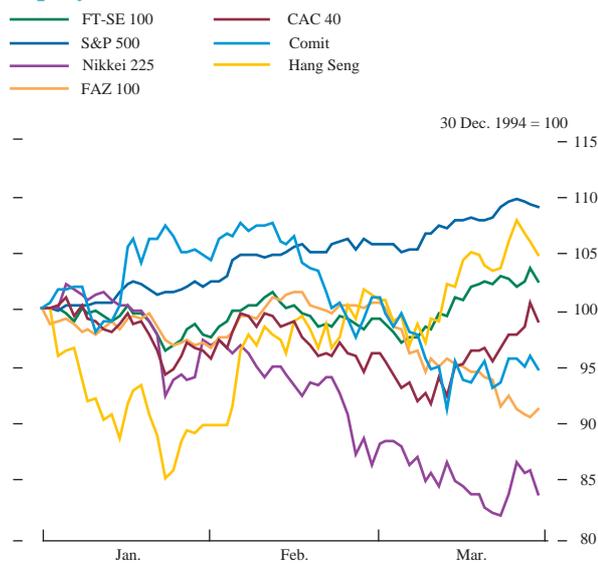
Equity markets

Over the first quarter, the strongest rise in the major equity markets was in the United States: the Standard and Poor's 500 index rose 9%. Confidence that interest rates would not rise further in the short term overrode concerns that US-listed companies with exposure to Mexico would be adversely affected by the Mexican crisis.

The Japanese Nikkei 225 index fell by 16.3%. The main reason for this was the strength of the yen against the dollar,

(1) Bonds issued by the government of a developing country to refinance its debt to foreign commercial banks, under a Brady-type agreement.
 (2) The equity indices referred to are the International Finance Corporation Total Return Investible indices, expressed in US dollar terms.

Chart 4
Equity indices



which led to concerns that exporters would be adversely affected. The earthquake in January resulted in portfolio-switching out of export-orientated and technology stocks, and into construction-related stocks, but the net effect on the Nikkei index was limited. The Hong Kong equity market was very volatile during the quarter, with the Hang Seng index ranging from a low of 6,968 in the middle of January to a high of 8,828 in the latter part of March. Sharp falls in January were partly the result of foreign investors withdrawing funds, as concerns from the Mexican crisis spread to Asia.

The UK equity market—as measured by the FT-SE 100 index—rose by 2.4% over the quarter. Take-over speculation fuelled activity early in the quarter, with the prospect of a large cash injection to the market resulting from Glaxo's successful take-over of Wellcome. The Barings crisis led prices to be marked down when markets opened on 27 February, but there was less selling than many commentators had expected, and the FT-SE 100 index fell only 12 points (0.4%) on the day. Equities rallied towards the end of the quarter, as confidence grew that there would be no further rises in domestic interest rates in the near future.

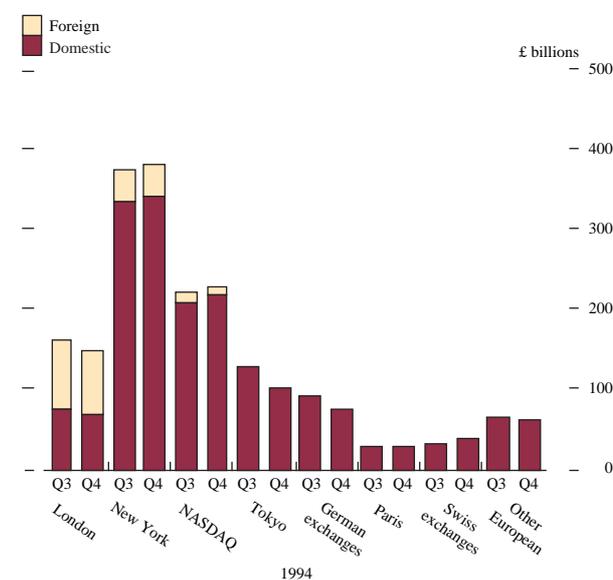
There was no consistent pattern to price movements on other major European exchanges during the quarter. In Germany, the FAZ 100 index fell by nearly 9%, mainly because of concerns that exporters' profits would be reduced by the sustained strength of the Deutsche Mark. The unexpected discount rate cut on 30 March led equity prices to recover slightly. The French market was weak for most of the quarter, affected by uncertainty in the run-up to the French presidential elections. But good corporate news and an easing of political concerns resulted in a rapid recovery; and the CAC 40 index ended the quarter only 1% below its level at the start of the year. The Italian equity market, as measured by the Comit index, fell 5.2% during the quarter. Early optimism, following the formation of an interim

government, was reflected in a strong rise in equity prices in January, but concerns resurfaced over fiscal prospects and wide-reaching pension reforms.

Turnover

Turnover on the London and New York stock exchanges has been stable in recent quarters. Suggestions that reforms of other European exchanges might lead business to be repatriated from London have not been confirmed by published data. But prospective privatisations across Europe and moves to private pension funding are expected to increase volumes on European exchanges in the longer term.

Chart 5
Turnover of domestic and foreign equities on major stock exchanges



Despite a temporary boost resulting from portfolio-switching in the aftermath of the Kobe earthquake, trading on the Tokyo Stock Exchange remained low by historical standards. Since 1992, annual turnover has been well under ¥100 trillion, compared with over ¥300 trillion in 1989. Some commentators expect securities houses in Japan to suffer heavy losses in the current financial year, because of the lower revenues resulting from reduced turnover. Four US firms delisted from the foreign section of the Tokyo Stock Exchange during the quarter.

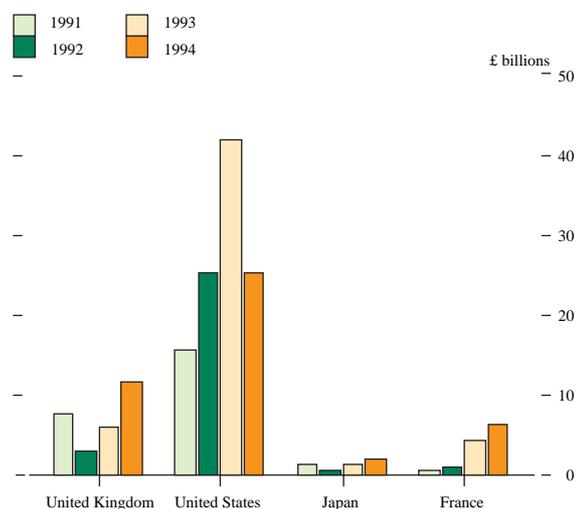
Equity issues

Issues of international equities—offers of equities with an international tranche—almost doubled in the two years from 1992, reaching \$45 billion in 1994. Large-scale privatisations accounted for an unprecedented \$9.3 billion of international equity offerings in 1993 (22% of the total) and \$13.6 billion (30% of the total) in 1994. Offerings from companies in developing countries also increased, from \$8.2 billion in 1993 to \$15.6 billion in 1994. In the first quarter of 1995, around \$5.4 billion of international equities were issued. These included the international tranches of the UK government's remaining £4 billion stake in National Power and PowerGen, and the FFf 5.8 billion privatisation

of the French tobacco company, Seita. The OECD estimates that European governments will privatise \$41 billion of state assets in 1995, having sold \$51 billion in 1994; the French, Italian and UK governments are expected to be the largest sellers.

In the UK equity market, £1.4 billion was raised from rights issues by UK and Irish companies during the first quarter, of which £400 million was raised by Cadbury Schweppes. This compared with total rights issues of £7.1 billion last year. In 1994, there were a record number of issues by companies newly listed on the London Stock Exchange: 256 UK and Irish companies joined the Official List, raising £11.5 billion between them. (This compared with 101 companies in 1991, 82 in 1992 and 180 in 1993.) Towards the end of last year, however, several newly floated companies issued profit warnings, and others postponed issues or accepted lower offer prices.

Chart 6
Equity capital raised by newly listed companies



The market is expecting this year that issues by newly listed companies will be fewer, but of larger average size. In the first quarter, 43 companies joined the Official List, of which 24 raised capital totalling £905 million and 14 transferred from the Unlisted Securities Market (USM). USM companies can take advantage of an amendment to the Listing Particulars Directive, which enables a company that has been traded on the USM for at least two years to move to the Official List without producing full listing particulars.

New equity markets

The London Stock Exchange published the rules of the Alternative Investment Market (AIM) which is to begin operations on 19 June. AIM is targeted at small, young companies with growth potential and companies whose shares are currently traded under Rule 4.2 (the Stock Exchange's occasional dealing facility). Companies currently traded on the USM will be able either to move to the Official List or to apply to join AIM.

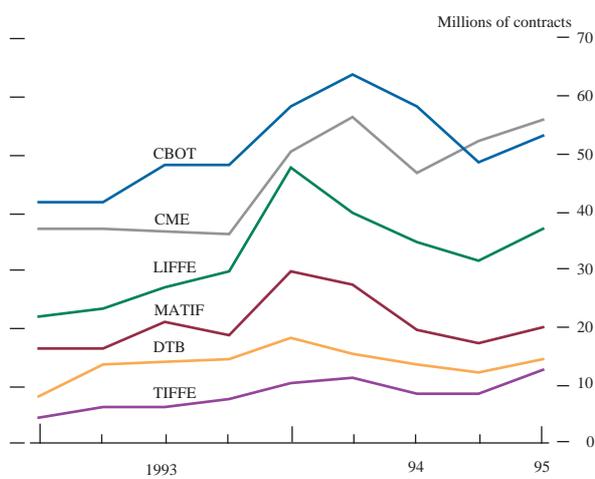
The Paris Bourse announced details of its plan for a new market (the *Nouveau Marché*), which will also be aimed at

small, high-growth companies. The Paris Bourse was one of the original supporters of EASDAQ (the proposed pan-European small companies market) and intends the new market to be a first step towards a pan-European association of similar markets.

Derivatives markets

Turnover on derivatives exchanges worldwide rose during the first quarter. The turbulence in foreign exchange markets during March, and the reduction in German interest rates, led to increased activity in currency, interest rate and bond contracts after a quiet start. However, turnover was generally below the exceptional levels seen in the first half

Chart 7
Quarterly turnover on major derivatives exchanges



of 1994. The notable exception was the Chicago Mercantile Exchange (CME), largely because of strong growth in its eurodollar futures contract. The lower volumes worldwide compared with the first quarter of last year reflected a return to the underlying upward trend in exchange-traded derivatives markets, rather than a downturn (see Chart 7).

Volumes on the London International Financial Futures Exchange (LIFFE) increased by 19% during the first quarter—with all LIFFE's major contracts posting increases—but total open interest ended the quarter down 11%. Turnover on the LME was 4% down on the record levels seen at the end of last year, but turnover on the LCE was up 32%.

In the United States, volumes on the CME were up 7% during the first quarter. Turnover in its eurodollar futures contract rose 10% quarter on quarter and 25% year on year, consolidating its position as the world's most actively traded contract. Short-dated interest rate contracts continued to challenge longer-term government bond contracts as the world's most actively traded on-exchange sector. Turnover on the Chicago Board of Trade (CBOT) rose 10% during the quarter, with turnover in the US Treasury bond future—the world's most actively traded bond futures contract—up 15%. Over the first quarter, turnover on the DTB and MATIF—the main German and French derivative exchanges—was up

Chart 8
Turnover on London derivatives exchanges

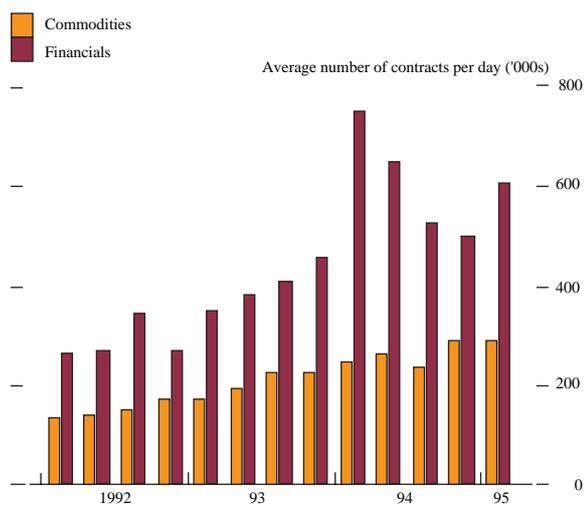
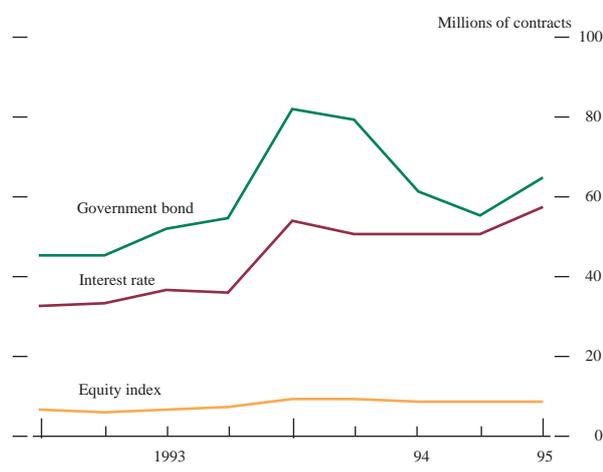


Chart 9
Quarterly turnover of futures by type^(a)



(a) Turnover in the major futures contracts listed on the CME, CBOT, LIFFE, DTB, MATIF and TIFFE.

19% and 16% respectively, and turnover on TIFFE, Japan's largest derivatives exchange, was up 48%.

In contrast to the exchange-traded derivatives markets, data on over-the-counter (OTC) derivatives are less comprehensive and available only after a lengthy delay.⁽¹⁾ In its latest biannual survey of activity, the International Swaps and Derivatives Association (ISDA) reported that swaps and related derivative transactions represented a notional principal value of \$4,200 billion for the first half of 1994, more than double that a year earlier. This increase was in line with the high turnover recorded in on-exchange and underlying cash markets in the period. Data on OTC activity for the second half of 1994 are expected to show a fall in turnover, partly because of the adverse publicity surrounding large derivative-related losses by a number of corporate end-users, and partly apparently because some dealers are

becoming reluctant to commit increased capital to these markets.

Exchange developments

The range of products offered by exchanges widened further in the first quarter. Some of the new products mimic the risk characteristics of OTC products. The CME extended its range of rolling spot and forward contracts to cover the Japanese yen. The CBOT announced plans to launch futures and options contracts on US yield curve spreads. OMLX—the London Securities and Derivatives Exchange—launched flex⁽²⁾ futures and options on a range of FT-SE indices. And LIFFE introduced serial options⁽³⁾ on its long-gilt futures contract, and is planning to introduce equity flex products as well as futures on individual stocks.

In addition, the CME announced plans to create a swap collateral depository. The depository, which is planned to open in the second half of this year, will receive and accept swap transactions from commercial and investment banks, mark them to market and report positions on collateral held for member banks. It will not, however, guarantee swap transactions.

The LME's decision to open copper delivery warehouses in the United States has brought the exchange into more direct competition with the New York Mercantile Exchange (NYMEX). In an attempt to boost volumes, NYMEX announced a range of new measures for its copper contracts, including extending floor trading hours and listing the futures contract on ACCESS, the exchange's electronic afterhours system. NYMEX has also announced plans to launch an aluminium contract; aluminium is currently the LME's second most liquid contract. In March, the US Commodity Futures Trading Commission asked the LME to prepare an analysis of the impact that its decision will have on the US market.

In March, LIFFE and the CBOT announced plans for a trading link, enabling each to trade the other's most liquid bond futures and options contracts in open outcry on its own trading floor. LIFFE will trade the CBOT's US Treasury bond contracts, and its five and ten-year US Treasury note contracts, in morning trading in London. CBOT will trade LIFFE's Bund, BTP (Italian government bond) and long-gilt contracts in afternoon trading in Chicago. These plans require member and regulatory approval, and will not be implemented for at least a year. They would further LIFFE's aim of forging links with exchanges outside the European time zone: in January, LIFFE signed a letter of intent with TIFFE to trade its euroyen futures contract in London. In addition, LIFFE was granted recognition by the French authorities as an overseas investment exchange and, in a reciprocal agreement, MATIF was approved as a recognised overseas investment exchange by the Treasury.

(1) See the article on statistical information on derivatives on pages 185–91.

(2) Flex contracts are characterised by the ability of participants to customise the terms of each contract.

(3) Shorter-dated options which expire on months other than the usual quarterly months.

Bond yield changes in 1993 and 1994: an interpretation

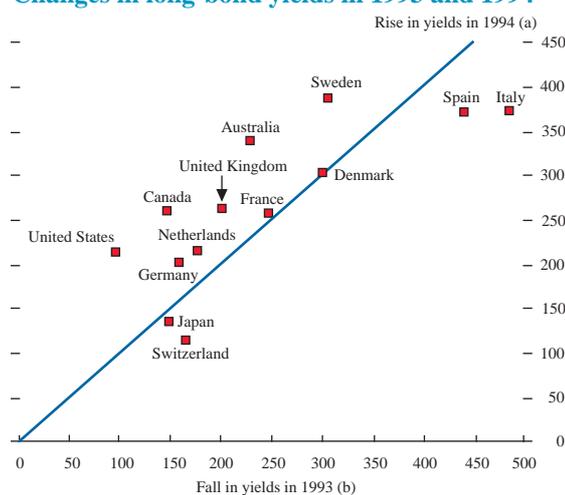
By Joe Ganley and Gilles Noblet of the Bank's Monetary Assessment and Strategy Division.⁽¹⁾

Government bond markets experienced a prolonged rally in 1993. This reflected subdued inflationary pressure—the result of, among other influences, weak commodity prices, and declining output and rising unemployment in some countries. Last year, bond markets entered a protracted period of turbulence and reassessment following the monetary tightening by the US Federal Reserve that began on 4 February 1994. A number of explanations for this turnaround have been put forward, including the changing cyclical conjuncture and technical factors, such as the behaviour of hedge funds. This article gives the results of research exploring the role of monetary policy credibility in the yield changes over the two years.

Introduction

The fall in government bond prices in 1994 followed a long rally during most of 1993. Ten-year UK government bond yields fell by 210 basis points in 1993, but rose by more than 275 basis points in 1994. In the United States, ten-year yields fell 151 basis points between the end of 1992 and their low-point in mid-October 1993. During 1994, they rose by 200 basis points. The pattern of sharp declines in yields in 1993 followed by more than offsetting rises in yields in 1994 was seen in most major countries—as shown in Chart 1, which compares the falls in yields in 1993 with the rises in 1994.⁽²⁾

Chart 1
Changes in long-bond yields in 1993 and 1994



Sources: Datastream, Bloomberg. The line shown is a 45° line.

- (a) Basis-point change in long-bond yields between 31 December 1993 and 31 December 1994.
 (b) Basis-point change in long-bond yields between 31 December 1992 and 31 December 1993.

Another interesting aspect of the market rally in 1993 was the convergence of government bond yields. As Chart 2

Chart 2
Yields on long-dated bonds in 1993 and 1994^(a)



Sources: BIS and Datastream.

(a) Ten-year benchmark bonds, redemption yields.

shows for a selection of countries, the range of yields was far larger at the beginning of 1993 than at the end of the rally a year later. For a representative sample of countries, the range in yields fell from 890 basis points at 31 December 1992 to 495 basis points by 3 February 1994; the standard deviation of yields halved during the period. During 1994, yield levels began to diverge—with the range rising to 749 basis points by the end of December. Both the rally and the convergence of yields in 1993, therefore, were largely reversed in 1994. This suggests that bond market developments over the two years were closely connected and that a full explanation of the turnaround in yields in 1994 requires an examination of the preceding rally in 1993.

Developments in 1993

The decline in yields in 1993 was widely attributed to a number of influences, several of them cyclical and affecting

(1) Gilles Noblet worked in the Division during a secondment to the Bank from the Bank of France.
 (2) The bonds shown are chosen on the basis of their actual maturity so as to provide representative yields on long-dated government debt. It is likely that there are differences in the duration of these stocks—the average maturity of all their future payments, weighted according to the discounted present value of each payment; however, these differences are likely to be small.

market perceptions of the inflation outlook. Although recovery was well under way in the United States and the United Kingdom, output continued to fall in most of continental Europe during 1993. For example, GDP (at constant prices) fell by 1.7% in Germany, 0.9% in France, 0.7% in Italy and 1.0% in Spain. At the same time, unemployment was rising, indicating a slackening of labour markets in these countries. Non-oil commodity prices rose little during the first three quarters of 1993, before picking up fairly sharply in November and December. The twelve-month growth rate in Brent oil prices fell for most of the year. The decision to widen the fluctuation bands in the European exchange rate mechanism to 15% following the market turbulence in July 1993 reinforced the view that short-term interest rates might fall sharply in the following months to stimulate depressed activity. Together, these influences appeared to create a favourable environment for government bonds. Market participants increasingly felt that inflation was unlikely to be a policy problem in the foreseeable future.

Towards the end of 1993, however, there were indications that the outlook was beginning to change. As mentioned, non-oil commodity prices began to pick up sharply in November and December in response to growing evidence of stronger economic activity in the United States. The yields on long-dated debt in the United States began to rise as early as mid-October. But it was not until the decision by the US authorities to increase the target federal funds rate on 4 February 1994 that yields worldwide began to rise. Following the tightening in US monetary policy, data releases in a number of countries began to revive market concerns about possible future inflationary pressure. In the final quarter of 1993, for example, US GDP (at constant prices) grew by over 6% on an annualised basis. On an annualised basis compared with the previous quarter, German broad money grew by 21.3% in January 1994, compared with a target range of 4%–6%—though the increase was partly attributable to special factors. As Chart 1 shows, in most countries the increase in yields prompted by these developments was substantial and, taking 1994 as a whole, broadly offset the falls seen in 1993.

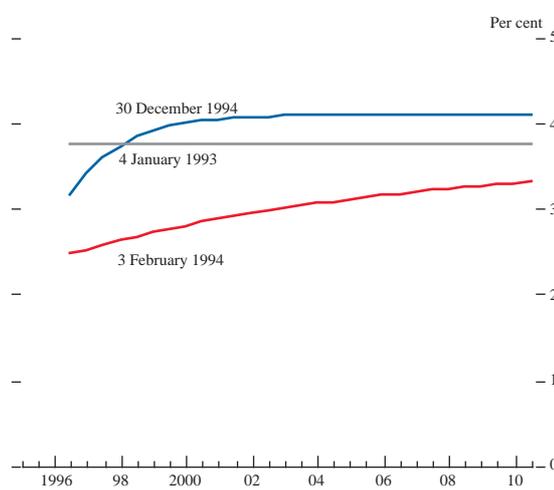
Interpreting the turnaround in yields

Many explanations have been put forward for the turnaround in yields which began in most countries in February 1994. Nominal yields can be decomposed into four components: the expected real rate of return, the real rate risk premium, the expected inflation rate and the inflation risk premium.⁽¹⁾ Explanations of the changes in yields in 1993 and 1994 must account for a change in one or more of these components.

For example, unexpectedly strong economic growth in 1994 led to fears of a shortage of capital and so to an increase in expected real interest rates. It is possible to estimate changes in the real rate for the United Kingdom from the yields on index-linked gilts. Between 4 January 1993 and

3 February 1994, real rates at most maturities fell by around a quarter, or approaching 100 basis points (see Chart 3). This formed about 40% of the change in nominal yields over that period. During 1994, the reduction in real rates in 1993 was reversed—and rates returned to levels close to those prevailing at the beginning of 1993.

Chart 3
Real forward interest rates



There was a different pattern to changes in the expected inflation rate, particularly at longer maturities where the reduction in inflation expectations seen in 1993 was broadly maintained in 1994. At shorter maturities, inflation expectations rose by around 200 basis points between 3 February and 30 December 1994, more than offsetting the decline in 1993. By contrast, ten-year inflation expectations were little changed over the period (Chart 4).

Chart 4
Implied forward inflation rates

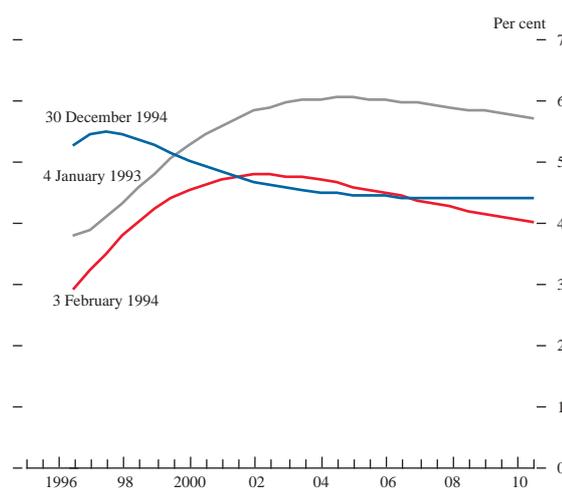
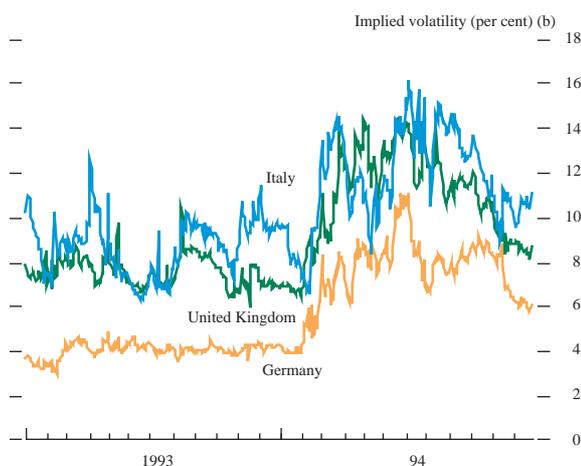


Chart 4 does not separate the expected level of inflation and the inflation risk premium. Part of the increase in implied forward inflation rates may have reflected an increased inflation risk premium. Inflation risk is difficult to measure. Assuming, however, that changes in the real interest rate risk

(1) The components were discussed in Mr King's speech to the Scottish Economic Association on 'Credibility and monetary policy', reproduced in the February 1995 *Quarterly Bulletin*, pages 84–91.

premium are relatively small, a reasonable proxy for the risk is given by the implied volatility of government bond futures contracts. As Chart 5 illustrates, volatility in major bond markets was much higher in 1994 than in 1993. The increase appears to have happened around the time of the change in the target federal funds rate on 4 February. Volatility in markets outside the United States may have reflected domestic developments and uncertainty about the response of the authorities to them, as well as some 'spill-over' effects from the US Treasury market (see below). If so, the developments would offer an important insight into market perceptions of the authorities' policies and their credibility.

Chart 5
Implied bond market volatility^(a)



(a) Derived from the options on LIFFE's long gilt, Bund and BTP futures.
(b) The annualised daily standard deviation of continuously compounded returns.

A technical explanation advanced for the turnaround in yields in the United States is a link between the mortgage-backed securities (MBSs) and US Treasury markets.⁽¹⁾ A common hedging strategy for those with a long position in MBSs is to take a short position in US Treasuries of a similar maturity (most mortgages are fixed-rate). When interest rates rise, the likelihood of early mortgage repayment is reduced and the effective maturity of MBSs lengthens. This possibility is called extension risk, and necessitates further sales of Treasuries of an appropriate maturity in order to match the new effective maturity of the MBS. After the interest rate increase by the Federal Reserve in February 1994, such sales of Treasuries may have contributed to the sharp rise in yields. Given the limited extent of securitisation in many other countries, however, it is difficult to see how this explanation can account for the turnaround in bond yields internationally.

Technical factors may either have had an independent influence on yields or have arisen as a result of more fundamental causes. International capital markets are now highly integrated and movement in one major market is likely to have a rapid impact on others. Because of the increased internationalisation of portfolios, a loss in one market may have to be offset by liquidating positions in

others. In 1994, for example, investors may have liquidated long positions in European and emerging markets to cover losses in the US bond market. In addition to such spill-over effects, bond price movements were probably influenced by the unwinding of highly geared long positions and by market practices such as stop-loss trading.

Some commentators have emphasised the role of hedge funds and other leveraged funds, which rapidly liquidated such positions. Their importance, and the duration of their effect on bond yields, is difficult to estimate, however; all market participants—not merely leveraged funds—may have reassessed their portfolio strategy in the light of their changing perceptions of monetary and economic developments. These developments suggest that 1994 can be interpreted as a period in which market participants generally reassessed the expectations they had formed in 1993. The fact that the increase in yields during 1994 was sustained and large suggests that this reassessment took time.

Other explanations of the yield changes in 1994 have referred to the high levels of fiscal deficits and public debt in many countries, although these had been present in 1993 during the bond market rally. Indeed, some governments—particularly in Europe, and partly in response to the convergence criteria included in the Maastricht Treaty—had already begun to consolidate their fiscal positions in 1994.

A role for monetary policy credibility

This section explores the extent to which the movements in bond yields during 1993 and 1994 were correlated with monetary policy credibility. In late 1994, nominal yields in many countries were only slightly higher than in early 1993. This may suggest that monetary policy credibility was in fact little changed overall over the two-year period, but that it increased in 1993 and fell back in 1994. Before pursuing this interpretation further, it is necessary to explain what is meant by credibility and to examine some of the means used to measure it.

A monetary policy strategy is credible if the public believes that the authorities will actually carry out their plans. The actions of the authorities will depend on their preferences; but those preferences, and so credibility, are not directly observable. If the public believes that the authorities are genuinely committed to low inflation and will deliver it, then private-sector expectations will closely reflect the authorities' forecasts (or targets) for inflation. The private sector's expectations will affect the response of the economy to changes in monetary policy. With a credible policy, a tightening in monetary policy will influence expectations rapidly, inflation will fall in line with expectations and there should be relatively low short-term output costs associated with the adjustment. Low policy credibility, by contrast, will mean that a monetary tightening may have high short-term output costs and a slower effect on inflation,

(1) The explanation is advanced in Fernald, J, Keane, F and Mosser, P, 'Mortgage security hedging and the yield curve', *Federal Reserve Bank of New York Research Paper No 9,411*, 1994.

because it will have little impact on expectations. These considerations emphasise the desirability of policy credibility.⁽¹⁾

In practice, it is likely there will be some divergence, at least initially, between the authorities' announced inflation forecasts (or targets) and private-sector expectations. The public cannot be certain about the strength of the authorities' commitment to low inflation and its feasibility; they are therefore likely to form expectations based on the authorities' track record and inflation outturns following a policy change. So at the start of a new monetary regime—for example, of inflation targeting—the public is likely to be sceptical, particularly where there is a history of high inflation. If, however, the authorities' subsequent performance is satisfactory and actual inflation is maintained within the target range, expectations are likely to begin to converge on the authorities' announced target.

The inflation history of an economy may therefore be an important determinant of expectations, with the result that there may be a tendency for inflation to persist. A number of studies have attempted to approximate this persistence in inflation by using averages of past inflation.⁽²⁾ The appropriate length of inflation history is unclear, but it should be long enough to provide a representative summary of past experience.

Proxies for monetary policy credibility

Any variable that may offer information on the authorities' attitude to inflation can potentially be used as a proxy for credibility; the persistence of inflation, by indicating the authorities' willingness to tolerate inflation, is therefore one possible proxy. In the results discussed below, proxies for credibility have usually been expressed as averages over the previous ten years.⁽³⁾

In a study of credibility in the European Monetary System, Grilli *et al* used measures of central bank independence, given the evidence of a link between independence and low inflation, and thus indirectly with credibility.⁽⁴⁾

Since inflation is ultimately a monetary phenomenon, a number of studies have examined the growth rates of monetary aggregates as proxies for credibility.⁽⁵⁾ Again it is likely that agents will form expectations based on past histories or averages of money supply growth over several years.

Fiscal measures—measured by either the stock of government debt or the fiscal deficit—may also have

implications for the credibility of monetary policy. In particular, to maintain (or enhance) credibility the fiscal deficit should be financed in a non-inflationary way.⁽⁶⁾ Similarly, a number of studies⁽⁷⁾ have highlighted the relevance of the exchange rate and the foreign exchange market in assessing credibility; Baxter found that the level of foreign exchange reserves was a statistically-significant determinant of credibility.

Information on credibility can also be extracted from the difference between nominal and real implied forward interest rates derived from the yields on conventional and index-linked bonds,⁽⁸⁾ though the absence of index-linked bonds in most major bond markets restricts the use of this source. And the average level of nominal bond yields may itself contain information on credibility.⁽⁹⁾

In recent research, the variables mentioned above—central bank independence, averages of past inflation, money supply growth, the fiscal deficit, the stock of government debt, the level of foreign exchange reserves and ten-year nominal bond yields—were used in a simple bivariate analysis of changes in bond yields in 1993 and in 1994. Although the approach was clearly crude and there was inevitably a degree of arbitrariness in the final choice of variables used, it nevertheless produced results consistent with more sophisticated methods, and suggested that monetary policy credibility may have at least a partial role in explaining the bond-market developments in 1993 and 1994.

The correlates of bond yield changes in 1993 and 1994

A cross-sectional analysis covering 13 countries was used to find relationships between proxies for monetary credibility and yield changes in 1993 and 1994. The proxies for credibility—usually expressed as ten-year averages—were defined as variables from which agents might learn (indirectly) about the preferences of the monetary authorities. The analysis was based on simple bivariate regressions of the changes in long-dated bond yields and in the proxies for credibility. The dependent variable was defined over two sample periods, looking first at the change in yields during the bond market rally in 1993, and then at yield changes during the correction in yields in 1994.

The results indicated statistically-significant correlations in both sample periods for three proxies for credibility: averages of past inflation, the level of nominal bond yields in the previous ten years, and the Alesina and Summers' index of central bank independence.⁽¹⁰⁾ The significance of these three variables appeared to be robust to changes in the precise choice of sample period. Regressions using two

(1) On this point, see the article on the costs of inflation in the February 1995 *Quarterly Bulletin*, pages 33–45.

(2) See Alogoskoufis, G. 'Monetary accommodation, exchange rate regimes and inflation persistence', 1992, *Economic Journal*, 102, pages 461–80.

(3) In some cases where full data were unavailable, however, shorter averages have been used.

(4) See Grilli, V. Masciandaro, D and Tabellini, G. 'Political and monetary institutions and public financial policies in the industrial countries',

Economic Policy, 1991.

(5) See Baxter, M. 'The role of expectations in stabilisation policy', *Journal of Monetary Economics*, 15, pages 343–62, 1985.

(6) The possibility of a link between deficits and inflation is explored in Sargent, T and Wallace, N. 'Some unpleasant monetarist arithmetic', *Federal Reserve Bank of Minneapolis Review*, 5, 1–17, 1981.

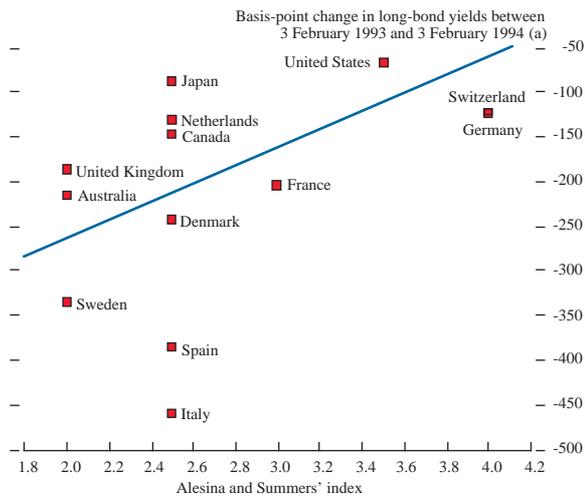
(7) See for example Christensen, M. 'On interest rate determination, testing for policy credibility, and the relevance of the Lucas Critique', *European Journal of Political Economy*, 3, pages 369–88, 1987.

(8) See Mr King's lecture to the Scottish Economic Association, reproduced in the February 1995 *Quarterly Bulletin*, pages 84–91.

(9) See Table A in Mr King's lecture, *ibid*, page 89.

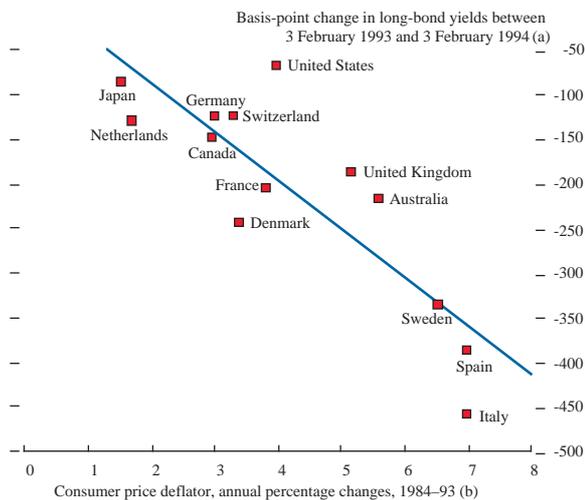
(10) The index is taken from Alesina, A and Summers, L. 'Central bank independence and macroeconomic performance', *Journal of Money, Credit and Banking*, 24, 151–62.

Chart 6
Yield changes and central bank independence: the rally



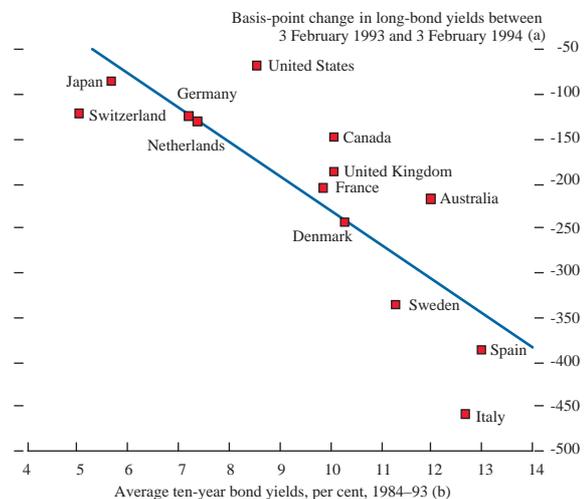
(a) Ten-year benchmark redemption yields. (Source: Datastream.)

Chart 7
Yield changes and past inflation: the rally



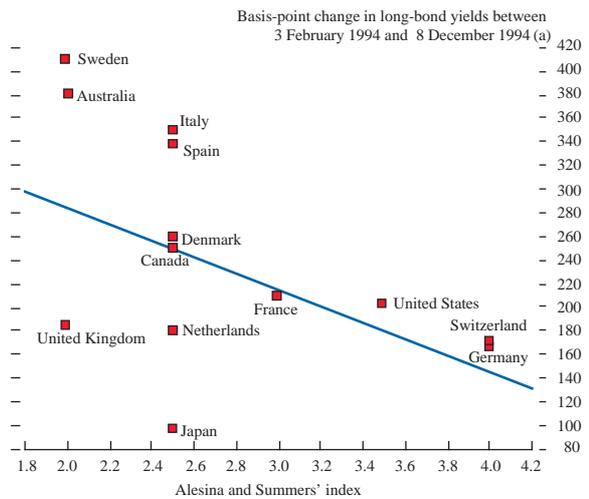
(a) Ten-year benchmark redemption yields. (Source: Datastream.)
(b) Source: *OECD Economic Outlook*, December 1993.

Chart 8
Yield changes and nominal yields: the rally



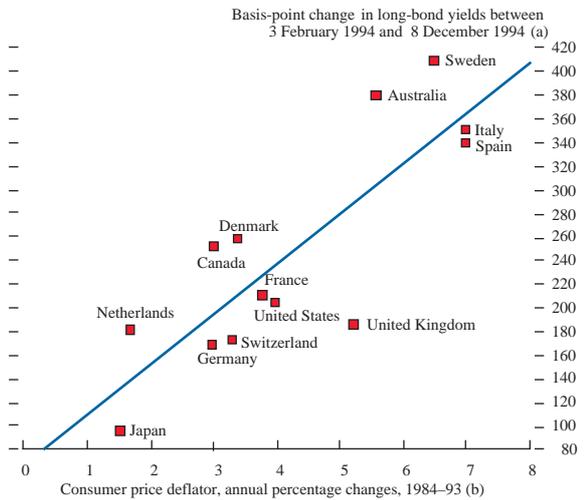
(a) Ten-year benchmark redemption yields. (Source: Datastream.)
(b) Source: *OECD Economic Outlook*, December 1993.

Chart 9
Yield changes and central bank independence: the correction



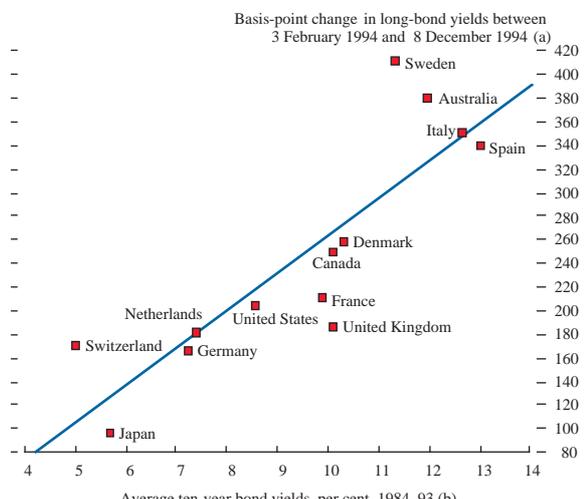
(a) Ten-year benchmark redemption yields. (Source: Datastream.)

Chart 10
Yield changes and past inflation: the correction



(a) Ten-year benchmark redemption yields. (Source: Datastream.)
(b) Source: *OECD Economic Outlook*, December 1993.

Chart 11
Yield changes and nominal yields: the correction



(a) Ten-year benchmark redemption yields. (Source: Datastream.)
(b) Source: *OECD Economic Outlook*, December 1993.

shorter sample periods showed the same three variables to be statistically significant.⁽¹⁾ The relationships are summarised, separately for the rally and the correction, in Charts 6 to 11. In each chart, the line shown represents the best fit from the regression analysis. The regressions are of course suggestive and do not imply causal links with the yield changes.

Perhaps the most striking aspect of the results is that in each case the direction of the relationship with the proxy for credibility was reversed during the correction. In particular, during the rally in 1993 the relationships showed that countries with relatively low central bank independence experienced the largest reductions in yields (Chart 6). Charts 7 and 8 show that the same countries had had a history of relatively high inflation and high nominal bond yields. During the correction in bond yields in 1994, however, those countries with the lowest measured monetary policy credibility experienced the largest increases in yields (see Charts 9, 10 and 11). Taking the two years together, it is noticeable that the smallest reductions in yields in 1993 and the smallest increases in 1994 were seen in those countries with higher measured credibility.

Interpretation of the results

The fall in yields in 1993 was related to the economic conditions shared by many countries at that time. Market participants increasingly felt that inflation was unlikely to constitute a major policy problem for the foreseeable future. This view allowed yields to fall—particularly in countries with low measured credibility, since it was those that had the most to gain, in terms of the yields payable on their debt, from this change in market perceptions. In the

circumstances, central bank independence and other aspects of credibility appeared to be less important for the achievement of price stability.

In 1994, the latest economic data—showing stronger output growth—and the monetary tightening by the Federal Reserve on 4 February prompted a revival of market concerns about possible future inflation, particularly after primary product prices rose sharply towards the middle of the year. Some tightening of policy had been expected by the markets—as evidenced, for example, in futures prices on US Treasuries in 1993; however, developments in 1994 suggested that the extent of this tightening might have been underestimated.

In this light, it was perhaps not surprising that yields should readjust in 1994, and that the extent of the readjustment should reflect the credibility of national monetary policies. This may partly explain the increasing divergence in yields last year. A comparison of the sets of charts on the rally and the correction shows that the readjustment of yields was greatest in countries with low credibility and smallest in high-credibility countries.

Summary

In 1993, the fall in bond yields was related to the falling inflation expectations at the time. Yields converged on the levels in those countries with higher monetary policy credibility. During 1994, cyclical changes led to a revival of inflation expectations. Yields began to rise to reflect this—particularly in those countries with less established monetary policy credibility—and the reduction and convergence in yields observed in 1993 were reversed.

(1) An additional analysis showed that these variables also had a statistically-significant relationship with the *level* of bond yields on 3 February 1994 and 8 December 1994.

Bond prices and market expectations of inflation

By Francis Breedon.⁽¹⁾

Last November, a new method was introduced for deriving the inflation expectations that appear regularly in the Inflation Report from UK government bond prices. This article gives a description of the new method and assesses how well the expectations derived using it would have predicted inflation in the past. The data used are now available to researchers—details of how to obtain them are given in a box on page 164.

Market expectations of future inflation are important indicators for monetary policy. Not only can they give useful forecasts of inflation, but they provide a measure of financial markets' perceptions of the current monetary stance.

The expectations derived from financial asset prices have a number of advantages over other measures of private-sector expectations, such as surveys. They are available almost continuously, whereas surveys are produced intermittently and take some time to compile. The prices from which they are derived combine the information of a large number of sophisticated investors. The fact that the expectations are derived from prices in financial markets where actual investments are made means that they are likely to reflect more careful consideration than survey responses. And asset prices allow expectations to be derived over a much longer time-horizon than can be provided by surveys.

An article in last August's 1994 *Quarterly Bulletin* gave an assessment of a number of methods used to derive market expectations.⁽²⁾ This article describes in more detail the method the Bank has chosen to adopt, gives the reasons for that choice and assesses the forecasting power of the derived expectations.

Deriving inflation expectations from government bond yields

To derive market expectations of inflation from government bond yields, two economic relationships are used—the expectations theory of the yield curve and the Fisher equation.

The expectations theory of the yield curve suggests that the yield on a long-term bond contains expectations of future short-term interest rates. The theory is based on the idea that an investor choosing between investing in a long or short-term bond will base the choice on an expectation of future interest rates. If, for example, he or she expects

interest rates to rise next year, the investor will demand a higher yield on a two-year bond than on a one-year one, because of the expectation that in a year's time the return on a one-year bond will be higher. As a result, expectations become embodied in the relative prices of the two bonds.

In practice, for a number of reasons (described below), it is unlikely that the expectations theory holds exactly: long-term interest rates are unlikely to be *simply* the average of actual and expected future short-term rates. But expectations are probably the most important single factor affecting the relationship between short and long-term rates.

The second relationship used to derive market expectations of inflation is the Fisher equation: this states in essence that the nominal interest rate is the sum of expected inflation and real interest rates.

Since index-linked bonds compensate investors for inflation, the return on an index-linked bond is related to current and expected future short-term real interest rates. So using the Fisher equation, market expectations of inflation can be calculated by subtracting the real interest rates derived from the yields on index-linked bonds from the nominal yields on conventional bonds.⁽³⁾ But since different bonds carry different coupons, it is not correct simply to use the yields on bonds trading in the market in this calculation; the yields must be converted so that they are on a comparable basis. This is done by creating a *zero-coupon yield*—the yield on a hypothetical bond that bears no coupon. By looking at zero-coupon yields at various maturities, a series of average inflation expectations over a number of years ahead can be built up. These expectations (for example, of average inflation *over* the next 20 years) can then be converted to implied forward rates (for example, the annual rate of inflation *in* 20 years' time) to give a profile of expected inflation.

The critical step in deriving the implied forward inflation rates is arriving at market expectations of average nominal

(1) The article was prepared while the author was working in the Bank's Monetary Instruments and Markets Division.

(2) 'Estimating market interest rate and inflation expectations from the prices of UK government bonds', August 1994 *Quarterly Bulletin*; see also Deacon, M and Derry, A, 'Deriving estimates of Inflation Expectations from the Prices of UK Government Bonds', *Bank of England Working Paper No 23*, and 'Estimating the Term Structure of Interest Rates', *Bank of England Working Paper No 24*.

(3) In practice, the Bank uses a non-linear form of the Fisher equation that allows for compounding.

and real interest rates at all maturities. This is done by fitting nominal and real (zero-coupon) yield curves. By fitting a yield curve through observed bond yields, it is possible to derive a market expectation for every possible maturity (since the curve interpolates between the maturities for which bonds exist). The choice of the technique used to estimate the yield curve can, however, have a marked effect on the implied forward inflation rates, so the choice of fitting technique is an important one.⁽¹⁾

Estimating the nominal yield curve

There is no one ‘correct’ method for fitting a yield curve; different methods have different advantages and disadvantages. The choice of method depends on the purpose for which the curve is being fitted.

To fit curves to be used to derive inflation expectations, the Bank judged that the following criteria were the most important:

- the technique should aim to fit implied forward rates (rather than, for example, yields), since the final objective is to derive implied forward inflation rates;
- it should give relatively smooth forward curves, rather than trying to fit every data point, since the aim is to supply a market expectation for monetary policy purposes, rather than a precise pricing of all bonds in the market; and
- it should allow as many economic restrictions as possible to be imposed.

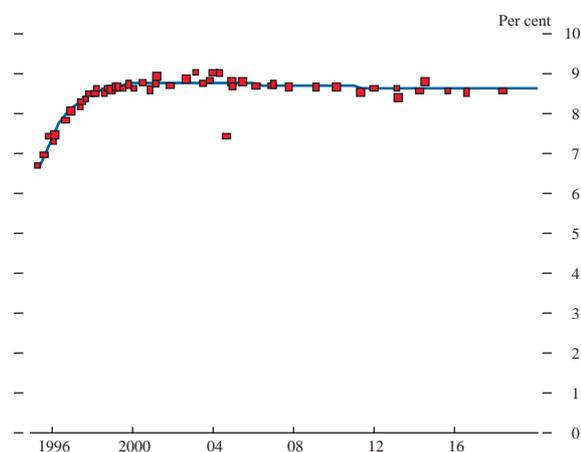
In practice, the last criterion favoured a method based on the discount function which imposes the desirable condition that cash flows received on the same date are discounted at the same rate. A further restriction imposed was that expectations of short-term interest rates a long time in the future should not vary; that is, an investor’s expectation of the one-year interest rate likely to prevail in, say, 50 years’ time should be the same as the expectation of rates in 51 years’ time (the implied forward curve should be flat at the long end).

On the basis of the three criteria, the Bank decided to adopt the estimation method proposed by Svensson,⁽²⁾ which is itself an extension of a method developed by Nelson and Siegel.⁽³⁾ The Svensson method is based on the discount function and explicitly fits the implied forward curve with a relatively small number of parameters; details are given in the annex on page 165.

The estimation of the curve then involves finding values for the parameters to minimise the deviations of observed bond yields from the fitted curve. In practice, the equation used has to be extended to include additional parameters to allow

for tax effects.⁽⁴⁾ Chart 1 illustrates the nominal par yield curve on 10 March estimated using the Svensson method and its relationship with bond yields on that day.⁽⁵⁾ As it shows, some bond yields may lie a long way from the fitted curve. This is mainly because the different coupons paid by bonds in the market change their payment profile and tax properties.

Chart 1
Par yield curve



(a) Estimated using the Svensson method based on prices on 10 March.

Estimating the real yield curve

The same criteria used to choose an estimation method for the nominal curve were also applied to the real curve. There are, however, two additional complications when fitting the real curve:

- the limited number of index-linked bonds: there are currently 14 index-linked bonds in issue (compared with 58 nominal bonds); in 1982, there were only four; and
- the lag in indexation: to allow investors to know in advance the value of the next coupon, index-linked bonds are up-rated using the level of the retail prices index eight months before the coupon date. Because of this lag in indexation, there is still a small element of inflation risk in index-linked bonds, which needs to be removed if a real yield curve is to be estimated.

Given that the number of index-linked bonds sets a limit on the number of parameters that can be estimated, if real yield curves are to be estimated from 1982 no more than three parameters can be used. This restriction—and the fact that, on examination, the real yield curve proved to be very stable—led the Bank to adopt a simple, three-parameter estimation method for the real curve (see the annex for further details).

To overcome the problem of the indexation lag, an assumption has to be made about investors’ expectations of inflation over the eight months for which they are not

(1) A description of different fitting techniques was given in the August 1994 *Quarterly Bulletin* article.

(2) See Svensson, L E O, ‘Estimating and interpreting forward interest rates: Sweden 1992–4’, *CEPR Discussion Paper*, 1,051.

(3) Nelson, C R and Siegel, A F, ‘Parsimonious modelling of yield curves’, *Journal of Business*, 1987.

(4) The additional parameters are described in Deacon, M and Derry, A, ‘Estimating the term structure of interest rates’, *Bank of England Working Paper No 24*. Parameters to reflect ex-dividend and FOTRA (free of tax to residents abroad) effects are also included.

(5) The par yield curve is constructed by assuming all bonds in the market pay a coupon equal to their yield.

covered by the bond. Since market expectations of inflation can be derived using the real and nominal forward curve, it is possible to ensure internal consistency in the estimation process by iterating so as to equate the assumed level of inflation and the level derived from the fitted curves.

Another problem resulting from the limited number of index-linked bonds is that it is not possible to fit the extra tax parameters into the real curve estimation. For most index-linked bonds this is not a problem, since the assumption that they are held by zero-rate taxpayers—such as pension funds—seems realistic. However, for the shortest-maturity index-linked bonds, anecdotal evidence suggests that there is some tax effect (because short-maturity index-linked bonds appear to be particularly attractive to high-rate taxpayers); the Bank has yet to find an estimation method that can allow for this effect. Because of this and the eight-month indexation lag, the real yield curve may not be very reliable at maturities shorter than two years.

Chart 2 traces the changes in ten-year zero-coupon real rates since 1982; it shows that, like nominal rates, real rates have risen over the last year or so. But it is notable also that real interest rates are not significantly higher currently than the average over the period.

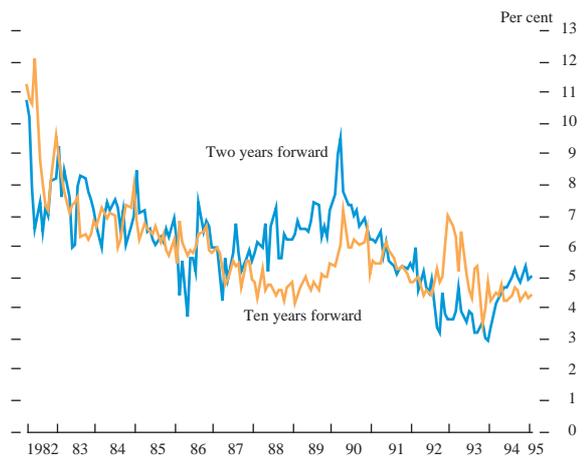
Chart 2
Ten-year zero-coupon real rates



The derived inflation expectations

Chart 3 shows the paths of the implied forward inflation rates two and ten years ahead derived using the new Bank method—that is, it gives for each date the rate of inflation expected to prevail in two and ten years' time. It shows how these rates generally fell during the 1980s, apart from in the last year or so. The brief increase in ten-year rates in 1992, following the suspension of sterling's membership of the ERM, is also evident. And it is also notable that, although two-year implied forward inflation rates have risen since the end of 1993, longer-term forward inflation rates have remained relatively low.

Chart 3
Implied forward inflation rates



As noted above, however, the implied forward curves fitted to bond yields may not represent true market expectations. There are two main factors that may cause the implied forward rates to differ from pure expectations.

The first is the existence of risk or liquidity premia. Some bonds may have particular characteristics, such as price volatility or a lack of liquidity, that may make them unattractive to investors. The Svensson estimation method reduces the sensitivity of the estimated yield curves to bond-specific effects; but if there are some premia applying to a class of bonds (for example, long bonds generally exhibit greater price volatility), this may cause the fitted curves to deviate from the true expectations.

The second is the result of *Jensen's inequality* (also called convexity). This mathematical result applies to any non-linear function; for a convex function, such as that between bond prices and implied forward rates, it means that the implied forward rates may be a downward biased estimate of the true market expectation.⁽¹⁾ The extent of the bias is related to the expected volatility of bond yields and the particular properties of each bond. The reason for it is that certain bonds give better insurance against unexpected outcomes than others, so that investors will be prepared to pay something for that insurance over and above the expected value of the bond.

There is no simple way of establishing either the direction or the magnitude of the combined impact of these two effects. But to the extent that the impact is relatively constant over time, it is reasonable to interpret changes in implied forward rates as being primarily the result of changes in expectations.

The accuracy of implied forward rates in predicting future inflation

So far, this article has explained how implied forward inflations can be derived as a measure of market expectations of inflation. A separate—though related—issue is that of the predictive power of the derived rates. The

(1) Jensen's inequality states that for a strictly convex function, the expectation of the function of a random variable will be greater than the function of the expectation of that variable (ie $E[f(x)] > f[E(x)]$).

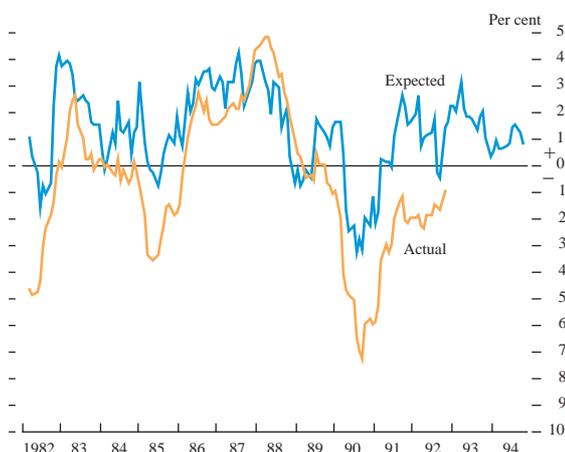
issues are related because one reason why implied forward rates may give poor predictions—if they do—is that they do not measure expectations correctly. The other main reason is that the market’s expectations may themselves actually predict future inflation poorly. However, as noted in the introduction, financial markets aggregate the information of a large number of people, and predictions made in financial markets are backed by investment; because of this, they might be expected to predict inflation better than most other forecasts.

Since index-linked bonds have been issued for a relatively short time, it is not yet possible to construct a very rigorous test of the forecasting power of implied forward inflation rates; any test over such a small sample can only be indicative. Bearing this in mind, the Bank has looked in recent research at the predictive power of changes in average inflation expectations over various periods, to evaluate the extent to which the slope of the *inflation curve* (the zero-coupon yield curve derived by subtracting the real from the nominal curves) predicts future changes in inflation.

As well as overcoming some statistical problems, this approach has two advantages. First, since changes in implied forward inflation rates are likely to be more reliable than the level (for the reasons discussed above), a test based on changes in expectations is more appropriate. And second, although the implied forward inflation curve is less reliable at maturities below two years (because of the problems with the real curve), the average inflation curve over two or more years should be more reliable and contains an expectation of average inflation over the first two years.

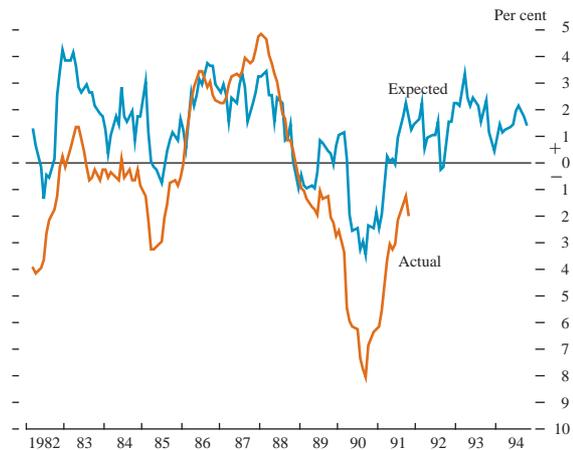
Charts 4–6 show the paths of the expected change in inflation over the following two, three and four years respectively, and compares them with what actually occurred. In general, the inflation curve appears to predict future changes in inflation quite well, with changes in expected inflation being associated with changes in actual

Chart 4
Expected and actual changes in inflation: over two years^(a)



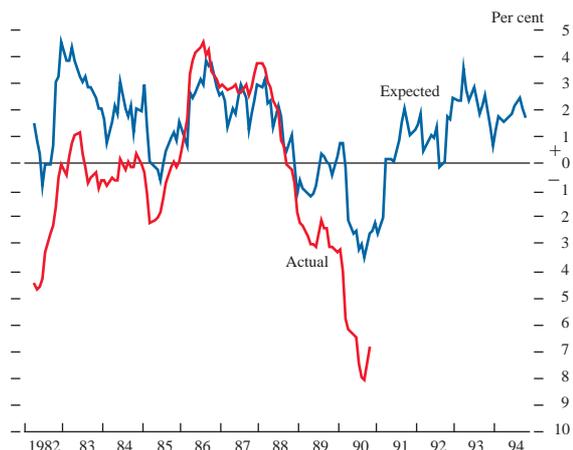
(a) The change in inflation is defined as the difference between the prevailing level and average inflation over the following two years.

Chart 5
Expected and actual changes in inflation: over three years^(a)



(a) The change in inflation is defined as the difference between the prevailing level and average inflation over the following three years.

Chart 6
Expected and actual changes in inflation: over four years^(a)



(a) The change in inflation is defined as the difference between the prevailing level and average inflation over the following four years.

inflation over the following years. There seems, however, to be some bias in the prediction over the period, with the inflation curve consistently overpredicting future inflation. Tests confirm that there is a statistically-significant tendency for the slope of the inflation curve to overpredict future inflation, with the average overprediction being about 1.7% for forecasts two, three and four years ahead.

Why does the inflation curve overpredict future levels of inflation? There are three possible explanations:

- The overpredictions are an effect of the small sample period. It is conceivable that, over the relatively short sample of data available, the market persistently overpredicted inflation. After the experience of the 1970s when, for example, inflation rose from 9.4% to 17.2% between January and December 1979, it is plausible that the market might have allowed for the possibility of a similar event in the 1980s.

- The inflation curve overestimates true expectations. It is possible that the difference in returns between conventional and index-linked bonds overestimates

Data available for researchers

A full set of the curves fitted using the approach outlined in this article are now available to outside researchers. These comprise:

- Zero-coupon nominal curves.
- Implied forward nominal rates.
- Zero-coupon real curves.
- Implied forward real rates.
- Zero-coupon inflation curves.
- Implied forward inflation rates.

The data are available as compressed tab-delimited ASCII files on 3.5" high-density diskettes. They are in the form of fitted values at semi-annual maturities from half a year to 25 years. The curves are available at monthly (end-month) and daily frequencies between end-March 1982 and April 1995. There is a charge of £50 for daily data; the monthly data are available free of charge. Those wishing to obtain the data should mark their request 'yield curve data' and send a cheque payable to the Bank of England to the Bank's Monetary Instruments and Markets Division.

inflation expectations. The most likely cause of such an overestimate is an inflation risk premium, which makes index-linked bonds more attractive to investors than conventional bonds (because index-linked bonds protect investors against inflation). In such circumstances, the yields on conventional bonds would have to be persistently higher (or those on index-linked bonds persistently lower) than true market expectations to compensate investors for inflation risk.

- There are problems with the technique for fitting the curve. Because of factors such as tax, the estimated yield curve may not be a good measure of the actual returns that investors derive from bonds. This is particularly likely to be the case over fairly short forecasting horizons.

Conclusions

Although there are a number of relatively minor improvements that could be made, the approach to estimating implied forward inflation rates described in this article gives a fair summary measure of the information contained in government bond prices. Analysis of the inflation predictions contained in these prices indicates that implied forward inflation rates do have predictive power, but that they have a tendency to overpredict future inflation. But since that overprediction has remained relatively stable over time, changes in implied forward inflation rates have contained information about future changes in inflation.

Estimation of yield curves

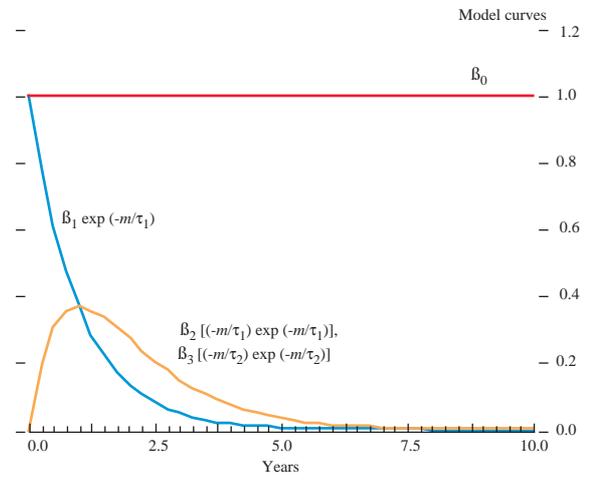
The Bank has adopted a method for estimating yield curves proposed by Svensson; the method involves estimating the following equation:

$$f(m) = \beta_0 + \beta_1 \exp(-m/\tau_1) + \beta_2 [(m/\tau_1) \exp(-m/\tau_1)] + \beta_3 [(m/\tau_2) \exp(-m/\tau_2)]$$

where $f(m)$ is the forward rate at a given maturity m , and the β s and the τ s are the parameters to be estimated.

One of the advantages of the Svensson approach is that it is relatively easy to understand. Each parameter has a simple interpretation; and they determine how smooth the slope of the curve is and the points at which humps appear. β_0 represents the long-run level of interest rates, the β_1 term represents the slope of the curve, and the β_2 and β_3 terms represent humps in the fitted curve. By combining the elements, it is possible to create a large range of possible curves, as suggested in the chart.

Components of the forward rate curve



To estimate the real yield curve, the Bank uses a simplified version of the Svensson curve, in which only β_0 , β_1 and τ_1 are estimated.

Inflation and economic growth

By Professor Robert J Barro.⁽¹⁾

In this article, Robert Barro uses data for around 100 countries from 1960 to 1990 to assess the effect of inflation on economic performance. If a number of country characteristics are held constant, then regression results indicate that an increase in average inflation of ten percentage points per year reduces the growth rate of real per capita GDP by 0.2–0.3 percentage points per year and lowers the ratio of investment to GDP by 0.4–0.6 percentage points. Since the statistical procedures use plausible instruments for inflation, there is some reason to believe that these relations reflect causal influences from inflation to growth and investment.

Although the adverse influence of inflation on growth looks small, the long-term effects on standards of living are substantial. For example, a shift in monetary policy that raises the long-term average inflation rate by ten percentage points per year is estimated to lower the level of real GDP after 30 years by 4%–7%, more than enough to justify a strong interest in price stability.

Professor Barro is at present a Houblon-Norman fellow at the Bank.⁽²⁾ The views expressed in this article are his, rather than those of the Bank.

In recent years, many central banks, including the Bank of England, have placed increased emphasis on price stability. Monetary policy—whether expressed in terms of interest rates or growth of monetary aggregates—has been increasingly geared toward the achievement of low and stable inflation. As one indicator of this concern, the Bank of England began in February 1993 to issue the *Inflation Report*.

Central bankers and most other observers view price stability as a worthy objective because they think that inflation is costly. Some of these costs involve the average rate of inflation, and others relate to the variability and uncertainty of inflation. But the general idea is that businesses and households are thought to perform poorly when inflation is high and unpredictable.

The academic literature contains a lot of theoretical work on the costs of inflation; a thorough review by Briault (1995) appeared in the February issue of the *Bulletin*. This analysis provides a presumption that inflation is a bad idea, but the case is not decisive without supporting empirical findings. Although some empirical results (also surveyed by Briault) suggest that inflation is harmful, the evidence is not overwhelming. It is therefore important to carry out additional empirical research on the relation between

inflation and economic performance. This article explores this relation in a large sample of countries over the last 30 years.

1 Data

The data set covers over 100 countries from 1960 to 1990. Table A provides information about the behaviour of inflation in this sample. Annual inflation rates were computed in most cases from consumer price indices. (The deflator for the gross domestic product was used in a few instances, when the data on consumer prices were unavailable.) The table shows the mean and median across the countries of the inflation rates in three decades: 1960–70, 1970–80 and 1980–90. The median inflation rate was 3.3% per year in the 1960s (117 countries), 10.1% in the 1970s (122 countries) and 8.9% in the 1980s (119 countries).⁽³⁾

The annual data were used for each country over each decade to compute a measure of inflation variability, the standard deviation of the inflation rate around its decadal mean. Table A shows the mean and median of these standard deviations for the three decades. The median was 2.4% per year in the 1960s, 5.4% in the 1970s and 4.9% in the 1980s. Thus, a rise in inflation variability accompanied the increase in the average inflation rate since the 1960s.

(1) Robert Barro is Robert C Waggoner Professor of Economics at Harvard University and a Senior Fellow of the Hoover Institute at Stanford University.

(2) The Houblon-Norman Fund, established by the Bank in 1944, finances academic research into subjects relevant to central banking. More details of the Fund were given in an article in the August 1993 *Quarterly Bulletin*. The author acknowledges useful comments from Clive Briault and Tony Garratt, and help with the inflation data from Simon Frew, of the Bank's Monetary Assessment and Strategy Division.

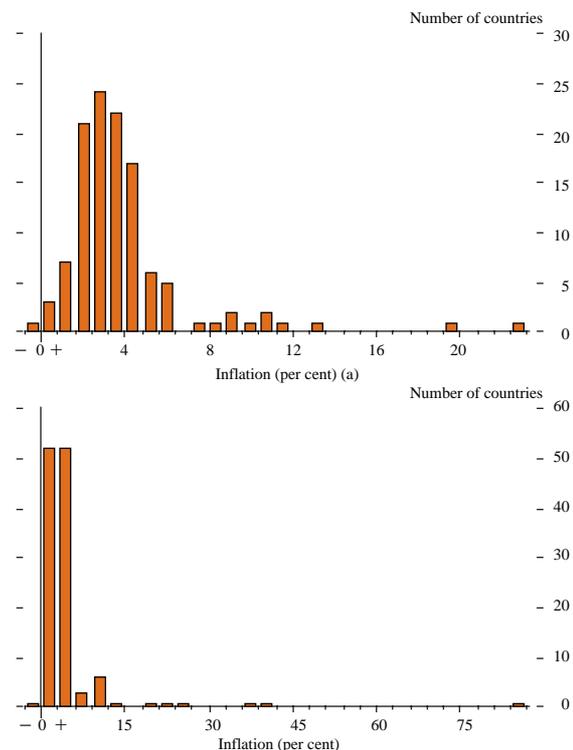
(3) The cross-country mean of inflation exceeds the median for each decade because the distribution of inflation rates is highly skewed to the right, as shown in Charts 1–3; that is, there are a number of outliers with positive inflation rates of large magnitude, but none with negative inflation rates of high magnitude. Because this skewness increased in the 1980s (there were more countries with very high inflation rates), the mean inflation rate rose from the 1970s to the 1980s, although the median rate declined.

Table A
Descriptive statistics on inflation, growth and investment^(a)

Variable	Mean	Median	Number of countries
1960–70:			
Inflation rate	5.4	3.3	117
Standard deviation of inflation rate	3.9	2.4	117
Growth rate of real per capita GDP	2.8	3.1	118
Ratio of investment to GDP	16.8	15.6	119
1970–80:			
Inflation rate	13.3	10.1	122
Standard deviation of inflation rate	7.5	5.4	122
Growth rate of real per capita GDP	2.3	2.5	123
Ratio of investment to GDP	19.1	19.3	123
1980–90:			
Inflation rate	19.1	8.9	119
Standard deviation of inflation rate	13.4	4.9	119
Growth rate of real per capita GDP	0.3	0.4	121
Ratio of investment to GDP	17.4	17.3	128

(a) The inflation rate is computed on an annual basis for each country from data on consumer price indices (from the World Bank, STARS databank and issues of *World Tables*; International Monetary Fund, *International Financial Statistics*, yearbook issues; and individual country sources). In a few cases, figures on the GDP deflator were used. The average inflation rate for each country in each decade is the mean of the annual rates. The standard deviation for each country in each decade is the square root of the average squared difference of the annual inflation rate from the decadal mean. The values shown for inflation in this table are the mean or median across the countries of the decade-average inflation rates. Similarly, the figures for standard deviations are the mean or median across the countries of the standard deviations for each decade. The growth rates of real per capita GDP are based on the purchasing power adjusted GDP values compiled by Summers and Heston (1993). For the 1985–90 period, some of the figures come from the World Bank (and are based on market exchange rates rather than purchasing-power comparisons). The ratios of real investment (private plus public) to real GDP come from Summers and Heston (1993). These values are averages for 1960–69, 1970–79 and 1980–89.

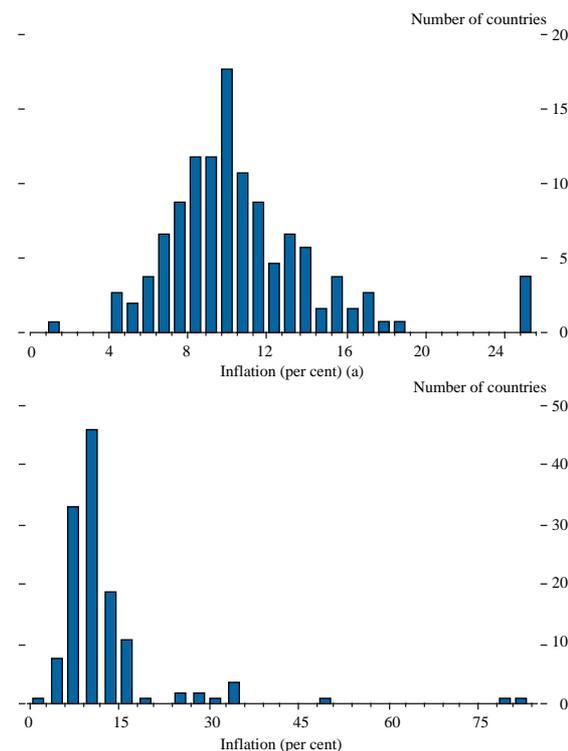
Chart 1
Distribution of inflation rates across countries: 1960–70



(a) For those countries whose average inflation rate was less than 25% per year.

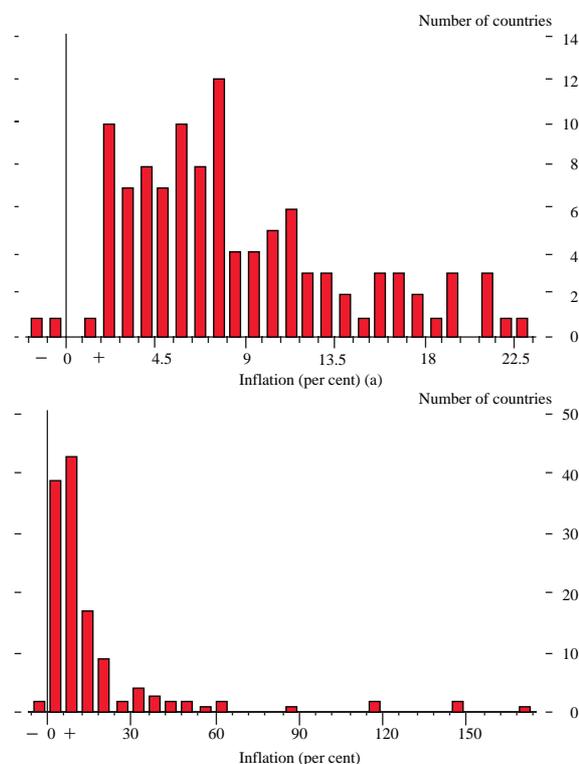
Charts 1–3 provide information about the distribution of inflation rates across the countries in the three decades. To ease the presentation, the upper panel considers inflation rates below 25% per year, whereas the lower panel looks at the entire range. Aside from the clustering of inflation rates around the median for each decade, the charts show the

Chart 2
Distribution of inflation rates across countries: 1970–80



(a) For those countries whose average inflation rate was less than 25% per year.

Chart 3
Distribution of inflation rates across countries: 1980–90

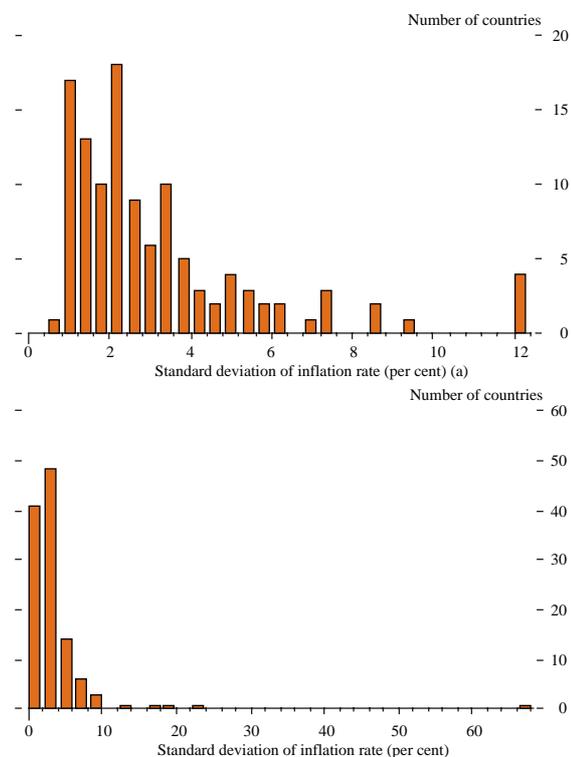


(a) For those countries whose average inflation rate was less than 25% per year.

outlier countries with extremely high inflation rates (see footnote 3). Charts 4–6 provide the parallel information

about the cross-country distribution of the decadal standard deviations of inflation. In these cases, the upper panels

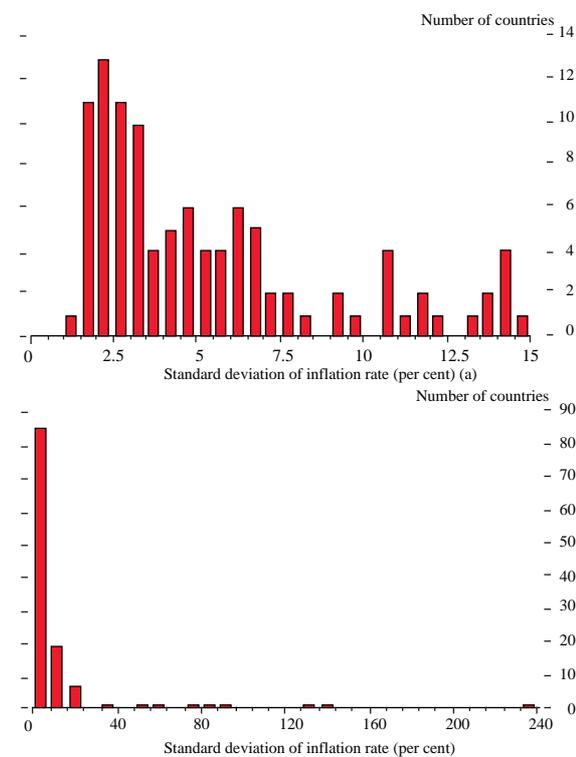
Chart 4
Distribution of standard deviations of inflation rates: 1960–70



(a) For those countries whose average standard deviation of inflation rate was less than 15% per year.

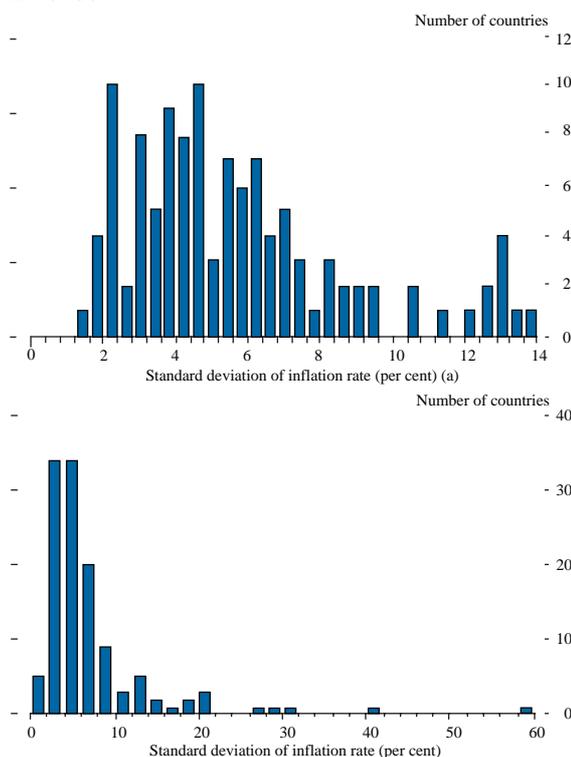
consider only standard deviations below 15% per year, whereas the lower panels examine the full range.

Chart 6
Distribution of standard deviations of inflation rates: 1980–90



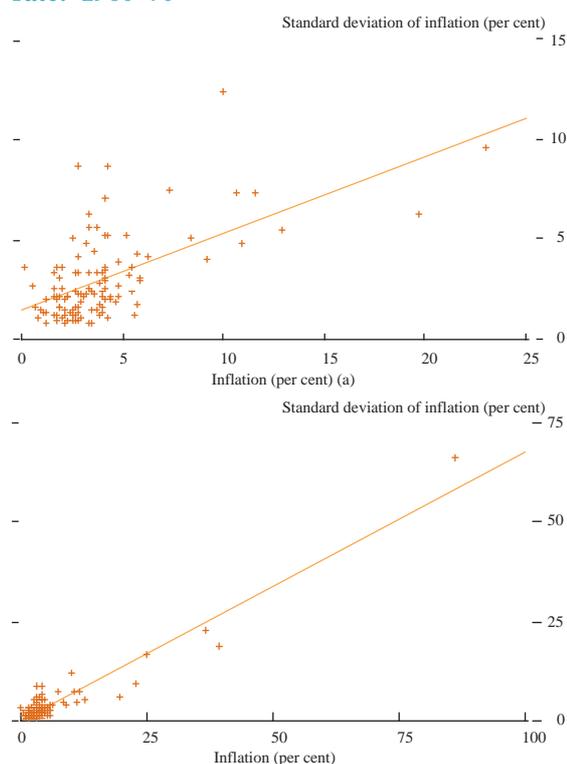
(a) For those countries whose average standard deviation of inflation rate was less than 15% per year.

Chart 5
Distribution of standard deviations of inflation rates: 1970–80



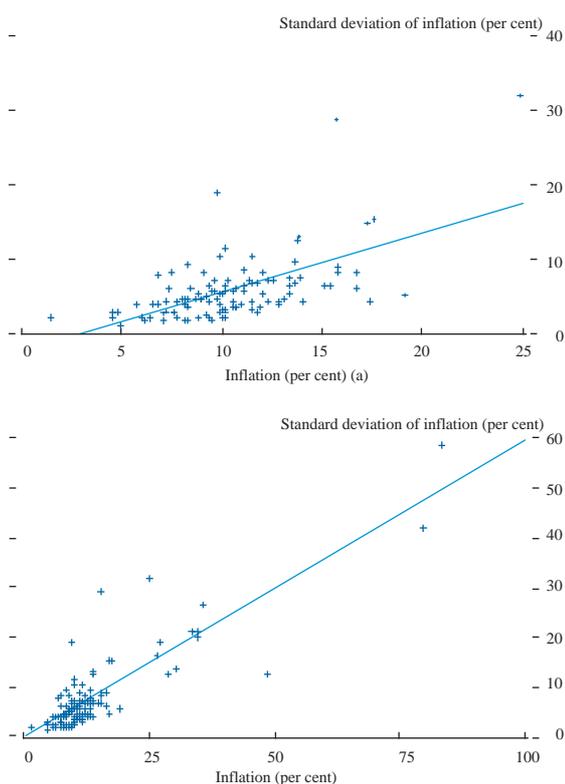
(a) For those countries whose average standard deviation of inflation rate was less than 15% per year.

Chart 7
Standard deviation of inflation versus inflation rate: 1960–70



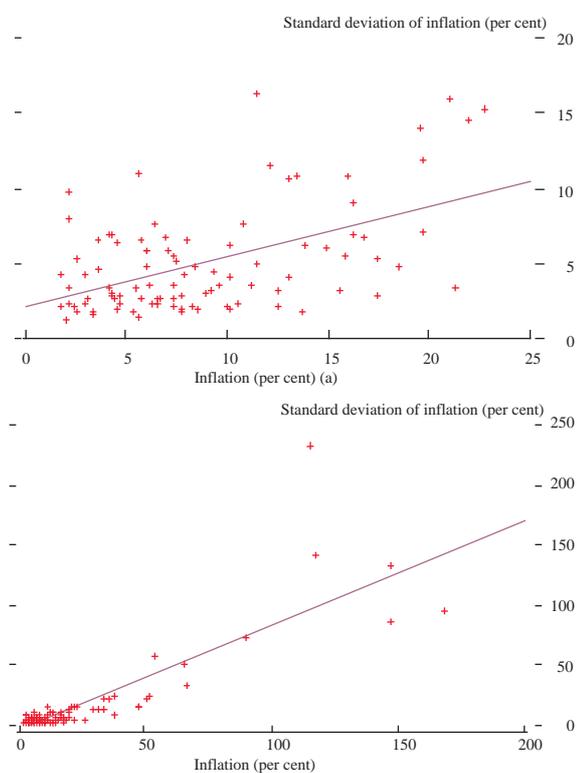
(a) For those countries whose average inflation rate was less than 25% per year.

Chart 8
Standard deviation of inflation versus inflation rate: 1970–80



(a) For those countries whose average inflation rate was less than 25% per year.

Chart 9
Standard deviation of inflation versus inflation rate: 1980–90



(a) For those countries whose average inflation rate was less than 25% per year.

Charts 7–9 confirm the well-known view that a higher variability of inflation tends to accompany a higher average rate of inflation [see, for example, Okun (1971) and Logue and Willett (1976)]. These charts provide scatter plots for each decade of the standard deviation of inflation (measured for each country around its own decadal mean) against the average inflation rate (the mean of each country's inflation rate over the decade). The upper panels of each chart consider only inflation rates below 25% per year, whereas the lower panels look at the entire range. The positive relation between variability and mean is apparent throughout, but is stronger in the plots that include the full range of inflation rates.

Table A also gives the means and medians of the growth rate of real per capita GDP and the ratio of investment to GDP for the three decades. The median growth rate fell from 3.1% in the 1960s (118 countries) to 2.5% in the 1970s (123 countries) and 0.4% in the 1980s (121 countries). The median investment ratio went from 16% in the 1960s to 19% in the 1970s and 17% in the 1980s. In contrast to inflation rates, the growth rates and investment ratios tend to be symmetrically distributed around the median.

2 Framework for the analysis of growth

To assess the effect of inflation on economic growth, I use a system of regression equations in which many other determinants of growth are held constant. The framework is one that I have developed and applied previously.⁽¹⁾

A general notion in the framework is that an array of government policies and private-sector choices determine where an economy will go in the long run. For example, favourable public policies—including better maintenance of the rule of law and property rights, fewer distortions of private markets, less non-productive government consumption and greater public investment in high-return areas—lead in the long run to higher levels of real per capita GDP. (Henceforth, the term GDP will be used as a shorthand to denote real per capita GDP.) Similarly, a greater willingness of the private sector to save and a reduced tendency to expend resources on child-rearing (lower fertility and population growth) tend to raise standards of living in the long run.

Given the determinants of the long-run position, an economy tends currently to grow faster the *lower* its GDP. In other words, an economy's per capita growth rate is increasing in the gap between its long-term prospective GDP and its current GDP. This force generates a *convergence* tendency, in which poor countries grow faster than rich countries and tend thereby to catch up in a proportional sense to the rich places. However, poor countries grow quickly only if they have favourable settings for government policies and private-sector choices. If a poor country selects unfavourable policies—a choice that likely explains why the country is currently observed to be poor—then its growth rate will not be high and it will not tend to catch up to the richer places.

(1) See Barro (1991, 1994), Barro and Sala-i-Martin (1995, Chapter 12).

Another important element is a country's human capital in the forms of education and health. For given values of prospective and actual GDP, a country grows faster—that is, approaches its long-run position more rapidly—the greater its current level of human capital. This effect arises because *first* physical capital tends to expand rapidly to match a high endowment of human capital, and *second* a country with more human capital is better equipped to acquire and adapt the efficient technologies that have been developed in the leading countries.

Table B provides a qualitative summary of the estimated growth effects of the various determinants other than inflation. The quantitative results that underlie these patterns come from information about growth rates and the indicated explanatory variables for 78 countries from 1965 to 1975, 89 countries for 1975 to 1985 and 84 countries from 1985 to 1990.⁽¹⁾ (This sample reflects the availability of the necessary data.) The details for a similar set-up appear in Barro (1994).

Table B
Framework for the determination of growth rates across countries^(a)

Determinant	Estimated effect on growth
Variables related to an economy's position at the start of each period:	
Initial real per capita GDP	Negative
Initial school attainment	Positive
Initial life expectancy (health status)	Positive
Variables related to government policy:	
Government consumption (relative to GDP)	Negative
Government spending on education (relative to GDP)	Positive, not significant
Distortions of markets (black-market premium on foreign exchange)	Negative
Subjective index for maintenance of the rule of law	Positive
Subjective index of democracy (political rights)	Positive at low levels, negative at high levels
Variables related to private-sector choices:	
Investment ratio	Positive, not significant
Fertility rate	Negative

(a) The table indicates the qualitative effect of each explanatory variable on the growth rate of real per capita GDP. The underlying estimates use 251 observations on growth rates, broken down among 78 countries for 1965–75, 89 countries for 1975–85 and 84 countries for 1985–90. Lagged values of the explanatory variables (except for initial schooling and life expectancy and the rule-of-law index) are used as instruments in the estimation. For details of the variables and statistical procedure, see Barro (1994).

3 Estimated effects of inflation on economic growth

Preliminary results

To get a first-pass estimate of the effect of inflation on economic growth, I included the inflation rate over each period as an explanatory variable along with the growth determinants described in Table B. Section A of Table C indicates that the estimated coefficient of inflation is -0.024 (standard error = 0.005). Thus, an increase of ten percentage points in the annual inflation rate is associated with a decline of 0.24 percentage points in the annual growth rate of GDP. Since the *t*-statistic for the estimated coefficient is 4.9, this result is statistically significant.⁽²⁾

Table C
Estimated effects of inflation on economic growth

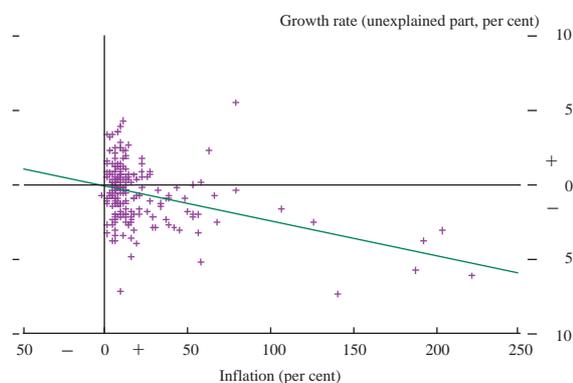
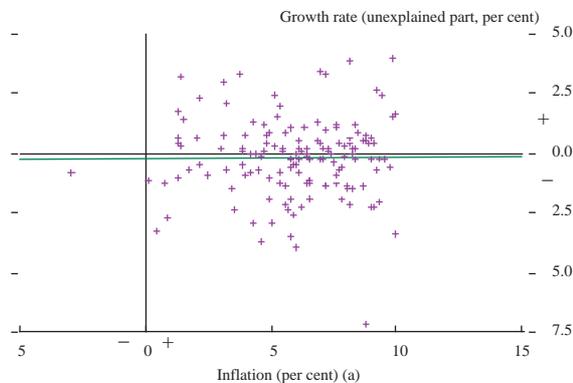
Estimation procedure	Estimated effect of an increase in the annual inflation rate of one percentage point on the growth rate of real per capita GDP (in percentage points per year) (a)	
A. Using actual inflation	-0.024	<i>0.005</i>
B. Using prior inflation as instrument	-0.020	<i>0.007</i>
C. Using prior colonial status as instruments	-0.031	<i>0.008</i>

(a) The numbers in italics are standard errors for the estimated effects of inflation on the growth rate of real per capita GDP. The estimates come from the systems described in Table B.

Chart 10 depicts graphically the relation between growth and inflation. The horizontal axis shows the inflation rate; each observation corresponds to the average rate for a particular country over one of the time periods considered (1965–75, 1975–85 and 1985–90). The top panel in the chart considers inflation rates below 10% per year, whereas the bottom panel includes the full range of inflation. The vertical axis shows the growth rate of GDP *net of the part of the growth rate that is explained by all of the explanatory variables aside from the inflation rate.*⁽³⁾ Thus, the panels illustrate the relation between growth and inflation after all of the other growth determinants have been held constant.

The bottom panel of Chart 10 fits a downward-sloping regression line (least-squares line) through the scatter plot; the slope of this line corresponds to the significantly

Chart 10
Growth rate of real per capita GDP (part unexplained by other variables) and inflation rate



(a) For those countries whose average inflation rate was less than 10% per year.

(1) The first period starts in 1965, rather than 1960, so that the estimation procedure can use lagged values of the various explanatory variables.

(2) This estimate is similar to that reported by Fischer (1993, Table 9). For earlier estimates of inflation variables in cross-country regressions, see Kormendi and Meguire (1985) and Grier and Tullock (1989).

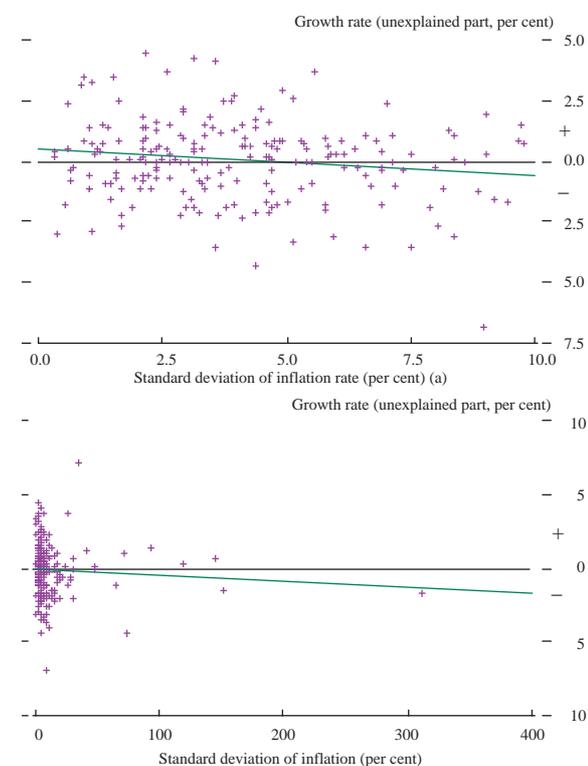
(3) The residual is computed from the regression system that includes all of the variables, including the inflation rate. But the contribution from the inflation rate is left out to compute the variable on the vertical axis in the scatter diagram.

negative coefficient shown in Section A of Table C. The panel shows, however, that the fit is dominated by the inverse relation between growth and inflation at high rates of inflation, say at rates above 10%–20% per year. For lower inflation rates, as shown in the upper panel, the relation between growth and inflation is not statistically significant.

To check for linearity of the relation between growth and inflation, I estimated the system with separate coefficients for inflation in three ranges: up to 15%, between 15% and 40%, and over 40%. The estimated coefficients on inflation in this form are -0.016 (standard error = 0.035) in the low range, -0.037 (0.017) in the middle range, and -0.023 (0.005) in the upper range. Thus the clear evidence for the negative relation between growth and inflation comes from the middle and upper intervals. However, since the three estimated coefficients do not differ significantly from each other,⁽¹⁾ the data conform to a linear relationship. In particular, even at low rates of inflation, the data would not reject the hypothesis that growth is negatively related to inflation.

The estimates are also reasonably stable over time. If different coefficients for inflation are allowed for each period, then the resulting values are -0.019 (0.015) for 1965–75, -0.029 (0.010) for 1975–85, and -0.023 (0.005) for 1985–90. These values do not differ significantly from one another.

Chart 11
Growth rate of real per capita GDP (part unexplained by other variables) and standard deviation of inflation



(a) For those countries whose average standard deviation of inflation rate was less than 10% per year.

(1) The *p*-value for the hypothesis of equal coefficients is 0.65.

The standard deviation of inflation can be added to the system to see whether inflation variability has a relation with growth when the average inflation rate is held constant. The strong positive correlation between the mean and variability of inflation (Charts 7–9) suggests that it would be difficult to distinguish the influences of these two aspects of inflation. However, when the two variables are entered jointly into the regression system, the estimated coefficient on inflation remains similar to that found before [-0.021 (standard error = 0.008)], and the estimated coefficient on the standard deviation of inflation is virtually zero [-0.004 (0.009)]. Thus, for a given average rate of inflation, the variability of inflation has no significant relation with growth.

The nature of the relationship between the growth rate and the standard deviation of inflation is depicted in Chart 11. In this construction, the vertical axis plots the growth rate of GDP after allowing for the contributions of the other explanatory variables, including the average rate of inflation. The two panels in the chart show that the lack of relationship applies over the full range of experience. One possible interpretation of this surprising result is that the variability of inflation does not adequately measure the uncertainty of inflation, the variable that one would have expected to be negatively related to growth.

Instrumental variables for inflation

A key problem in the interpretation of the results is that they need not reflect causation from inflation to growth. Inflation is an endogenous variable, which may respond to growth or to other variables that are related to growth. For example, an inverse relation between growth and inflation would arise if an exogenous slowing of the growth rate tended to generate higher inflation. This increase in inflation could result if monetary authorities reacted to economic slowdowns with expansionary policies. Moreover, if the path of monetary aggregates did not change, then a reduction in the growth rate of output would tend automatically to raise the inflation rate (to be consistent with the equality between money supply and demand at each point in time).

It is also possible that the endogeneity of inflation would produce a positive relation between inflation and growth. This pattern tends to emerge if output fluctuations are driven primarily by shocks to money or to the aggregate demand for goods.

Another possibility is that some omitted third variable is correlated with growth and inflation. For example, better enforcement of property rights is likely to spur investment and growth, and is also likely to accompany a rules-based set-up in which the monetary authority generates a lower average rate of inflation. The idea is that a committed monetary policy represents the application of the rule of law to the behaviour of the monetary authority. Some of the explanatory variables in the system attempt to capture the degree of maintenance of the rule of law. However, to the extent that these measures are imperfect, the inflation rate

may proxy inversely for the rule of law and thereby show up as a negative influence on growth. The estimated coefficient on the inflation rate could therefore reflect an effect on growth that has nothing to do with inflation *per se*.

In general, the way to avoid these difficulties is to isolate relatively exogenous variations in inflation; that is, to use the data to try to mimic the results from experiments in which inflation is set arbitrarily at different values. The implementation of this idea requires satisfactory *instrumental* variables—reasonably exogenous variables that are themselves significantly related to inflation. If these instrumental variables can be found, then one can investigate whether the changes in inflation that are related to the instruments (and are, accordingly, exogenous) still have the kind of negative relation with growth that appears in Chart 10.

Central bank independence

One promising source of instruments for inflation involves legal provisions that guarantee more or less central bank independence. A recent literature⁽¹⁾ argues that a greater degree of independence leads to lower average rates of money growth and inflation, and to greater monetary stability. The idea is that independence enhances the ability of the central bank to commit to price stability and, hence, to deliver low and stable inflation. Alesina and Summers (1993, Figures 1a, 1b) find striking negative relationships among 16 developed countries from 1955 to 1988 between an index of the degree of central bank independence and the mean and variance of inflation. Thus, in this sample, the measure of central bank independence satisfies one condition needed for a good inflation instrument; it has substantial explanatory power for inflation.

Because of the difficulty of enacting changes in laws, it is plausible that a good deal of the cross-country differences in legal provisions that influence central bank independence can be treated as exogenous. Problems arise, however, if the legal framework changes in response to inflation (although the sign of this interaction is unclear). In addition, exogeneity would be violated if alterations in a country's legal environment for monetary policy are correlated with changes in unmeasured institutional features—such as structures that maintain property rights—that influence growth rates. This problem is, however, mitigated by the inclusion of other explanatory variables, notably the index of the rule of law, in the regression framework.

Cukierman (1992, Chapter 19) argues that the legal provisions that govern central bank action differ substantially from the way that the banks actually operate. In particular, he distinguishes the legal term of office of the central bank governor from the actually observed turnover. The latter variable would be more closely related to bank performance (and hence to inflation), but cannot be treated as exogenous to growth or omitted third variables. Thus, for the purpose of constructing instruments for inflation, the

preferred strategy is to focus on the extent to which inflation can be explained by differences in legal provisions for the central bank.

Table D shows an index of central bank independence for 67 countries, based on the information compiled by Cukierman (1992, Chapter 19, Appendix A) over time periods that correspond roughly to the four decades from the 1950s to the 1980s. The index is an average over the time periods and for numerous categories of legal provisions contained in the charters of the central banks; see the notes to Table D. The details of construction differ somewhat from those used by Cukierman, but the values shown in the table are similar to those reported in his Table 19.3 for the 1980s.

Table D shows the average inflation rate from 1960 to 1990 for the 67 countries in my sample that have data on the index of central bank independence. A comparison between the index and the inflation rate reveals a crucial problem; the

Table D
Inflation rates and central bank independence^(a)

Country	Index of independence	Inflation rate, 1960–90	Country	Index of independence	Inflation rate, 1960–90
West Germany	0.71	0.037	South Africa	0.33	0.099
Switzerland	0.65	0.038	Nigeria	0.33	0.125
Austria	0.65	0.043	Malaysia	0.32	0.034
Egypt	0.57	0.094	Uganda	0.32	0.353
Denmark	0.53	0.069	Italy	0.31	0.088
Costa Rica	0.52	0.117	Finland	0.30	0.073
Greece	0.52	0.109	Sweden	0.30	0.067
United States	0.51	0.049	Singapore	0.30	0.034
Ethiopia	0.50	0.058	India	0.30	0.074
Ireland	0.50	0.083	United Kingdom	0.30	0.077
Philippines	0.49	0.107	South Korea	0.29	0.113
Bahamas	0.48	0.063 (b)	China	0.29	0.039
Tanzania	0.48	0.133	Bolivia	0.29	0.466
Nicaragua	0.47	0.436	Uruguay	0.29	0.441
Israel	0.47	0.350	Brazil	0.28	0.723
Netherlands	0.47	0.045	Australia	0.27	0.067
Canada	0.47	0.054	Thailand	0.27	0.052
Venezuela	0.45	0.100	Western Samoa	0.26	0.112 (c)
Barbados	0.44	0.075	New Zealand	0.25	0.085
Argentina	0.44	0.891	Nepal	0.23	0.084
Honduras	0.44	0.058	Panama	0.23	0.033
Peru	0.44	0.606	Zimbabwe	0.22	0.074
Chile	0.43	0.416	Hungary	0.21	0.047
Turkey	0.42	0.235	Japan	0.20	0.054
Malta	0.42	0.035	Pakistan	0.19	0.072
Iceland	0.42	0.229	Colombia	0.19	0.170
Kenya	0.40	0.082	Spain	0.16	0.096
Luxembourg	0.40	0.044	Morocco	0.15	0.055
Zaire	0.39	0.357	Belgium	0.13	0.048
Mexico	0.37	0.227	Yugoslavia	0.12	0.395
Indonesia	0.36	0.366	Poland	0.12	0.293 (b)
Botswana	0.36	0.076	Norway	0.12	0.066
Ghana	0.35	0.256			
France	0.34	0.064			
Zambia	0.34	0.174			

(a) The index of central bank independence is computed from data in Cukierman (1992, Chapter 19, Appendix A). The index is a weighted average of the available data from 1950 to 1989 of legal provisions regarding: (1) appointment and dismissal of the governor (weight 1/6); (2) procedures for the formulation of monetary policy (weight 1/6); (3) objectives of central bank policy (weight 1/6); and (4) limitations on lending by the central bank (weight 1/6). The first category is an unweighted average of three underlying variables that involve the governor's term of office and the procedures for appointment and dismissal. The second category is an unweighted average of two variables, one indicating the location of the authority for setting monetary policy and the other specifying methods for resolving conflicts about policy. The third category relates to the prominence attached to price stability in the bank's charter. The fourth category is an unweighted average of four variables: limitations on advances, limitations on securitised lending, an indicator for the location of the authority that prescribes lending terms, and the circle of potential borrowers from the central bank. For each underlying variable, Cukierman defines a scale from 0 to 1, where 0 indicates least favourable to central bank independence and 1 indicates most favourable. The overall index shown in Table D runs correspondingly from 0 to 1. See Table A for a discussion of the inflation data.

(b) 1970–90.
(c) 1975–90.

(1) See Bade and Parkin (1982), Grilli, Masciandaro and Tabellini (1991), Cukierman (1992), Alesina and Summers (1993), Eijffinger and de Haan (1995).

correlation between the two variables is essentially zero. This verdict is also maintained if one looks separately over the three decades from the 1960s to the 1980s and if one holds constant other possible determinants of inflation. In this broad sample of countries, differences in legal provisions that ought to affect central bank independence have no explanatory power for inflation.⁽¹⁾ This negative finding is of considerable interest—it suggests that low inflation cannot be attained merely by instituting legal changes that appear to promote a more independent central bank. However, the result also means that we have to search further for instruments to clarify the relation between growth and inflation.⁽²⁾

Lagged inflation

Earlier values of a country's inflation rate have substantial explanatory power for inflation. Lagged inflation would also be exogenous with respect to innovations in subsequent growth rates. Hence, if lagged inflation is used as an instrument, then the estimated relation between growth and inflation would not tend to reflect the short-run reverse effect of growth on inflation.

One problem, however, is that lagged inflation would reflect persistent characteristics of a country's monetary institutions (such as the extent to which policy-makers have credibility), and these characteristics could be correlated with omitted variables that are relevant to growth (such as the extent to which political institutions support the maintenance of property rights). The use of lagged inflation as an instrument would therefore not rule out the problems of interpretation that derive from omitted third variables. However, the inclusion of the other explanatory variables in the regression framework lessens this problem.⁽³⁾

Section B of Table C shows the estimated effect of inflation on the growth rate when lagged inflation (over the five years prior to each sample period) is used as an instrument. The estimated coefficient is -0.020, similar to that found in Section A when actual inflation is used in the estimation. Thus, it seems that most of the estimated negative relation between growth and inflation does not represent reverse short-term effects of growth on inflation. It remains true, however, that the significant negative influence of inflation on growth shows up only for high inflation rates; the relation is insignificant if the sample is limited to rates below 10% per year.⁽⁴⁾

Results about the variability of inflation are also similar to those found before. If the standard deviation of inflation is included in the regressions (and a lag of this standard

deviation is used as an instrument), then the estimated coefficient on average inflation changes little, and the estimated effect of the standard deviation of inflation is still around zero.

Prior colonial status

Another possible instrument for inflation comes from the observation that prior colonial status has substantial explanatory power for inflation. Table E breaks down averages of inflation rates from 1960 to 1990 by groups of countries classified as non-colonies (defined as those that were independent prior to US independence in 1776) and former colonies of Britain, France, Spain or Portugal, and other countries (in this sample, Australia, Belgium, the Netherlands, New Zealand and the United States).

Table E
Inflation rates and prior colonial status^(a)

Period	All countries	Non-colonies	British colonies	French colonies	Spanish or Portuguese colonies	Other colonies	Latin American other than Spanish or Portuguese colonies
1960–70	5.4 <i>121</i>	4.5 <i>31</i>	3.3 <i>43</i>	3.0 <i>21</i>	8.9 <i>19</i>	19.4 <i>7</i>	3.1 <i>7</i>
1970–80	13.1 <i>131</i>	11.0 <i>32</i>	12.0 <i>50</i>	9.3 <i>20</i>	21.8 <i>21</i>	14.7 <i>8</i>	10.9 <i>11</i>
1980–90	18.2 <i>132</i>	12.4 <i>31</i>	13.9 <i>51</i>	7.4 <i>22</i>	52.3 <i>20</i>	13.6 <i>8</i>	9.7 <i>11</i>
1960–90	12.6 <i>117</i>	8.9 <i>30</i>	10.4 <i>42</i>	6.6 <i>20</i>	29.4 <i>18</i>	16.1 <i>7</i>	9.0 <i>7</i>

(a) The numbers in italics are the numbers of countries with available data that fall into each category. See Table A for a discussion of the inflation data. Countries that were independent before 1776 are treated as non-colonies. Otherwise, the colonial status refers to the most recent outside power; for example, the Philippines is attributed to the United States, rather than Spain; Rwanda and Burundi are attributed to Belgium, rather than Germany; and the Dominican Republic is attributed to France, rather than Spain. Some countries that were dominated by other countries for some periods are treated as non-colonies; examples are Hungary, Poland, South Korea and Taiwan. The only present colony in the sample is Hong Kong. The last column refers to countries that are located in Latin America but are not former Spanish or Portuguese colonies.

Table E indicates that the average inflation rate for all 117 countries from 1960 to 1990 is 12.6% per year. The average for the 30 non-colonies of 8.9% is similar to that of 10.4% for the 42 British colonies and 6.6% for the 20 French colonies. However, the rates are strikingly higher for the 18 Spanish or Portuguese colonies—29.4%—and somewhat higher for the seven other colonies—16.1%.

A key reason for the low average inflation rate for the former French colonies is the participation of most of the sub-Saharan African states in the fixed-exchange rate regime of the CFA franc.⁽⁵⁾ This type of reasonably exogenous commitment to relatively low inflation is exactly the kind of experiment that provides for a good instrument for inflation.

(1) Cukierman's (1992, Chapter 20) results concur with this finding, especially for samples that go beyond a small number of developed countries, the kind of sample used in most of the literature on central bank independence.

(2) Cukierman *et al* (1993) use as instruments the turnover rate of bank governors and the average number of changes in bank leadership that occur within six months of a change in government. These measures of actual bank independence have substantial explanatory power for inflation but need not be exogenous with respect to growth.

(3) Another favourable factor is that the residuals from the growth equations turn out not to be significantly correlated over time within countries.

(4) The estimated coefficients of inflation are again stable over the three time periods. A scatter plot of the unexplained part of the growth rate against the inflation rate is virtually the same as that shown in Chart 10. However, the line drawn through the points differs somewhat from that shown in the chart (the least-squares line) when lagged inflation is used as an instrument.

(5) For discussions of the CFA franc zone, see Boughton (1991) and Clement (1994). The zone maintained a fixed exchange rate with the French franc for 45 years until the devaluation from 50 to 100 CFA francs per French franc in January 1994. At the time of the devaluation, the zone covered 14 African countries grouped around three central banks: the West African Monetary Union of Benin, Burkina Faso, Ivory Coast, Mali, Niger, Senegal and Togo; a group of central African countries consisting of Cameroon, Central African Republic, Chad, Congo, Equatorial Guinea and Gabon; and the Comoros. Some original members of the zone left to establish independent currencies—Djibouti in 1949, Guinea in 1958, Mali in 1962 (until it rejoined in 1984), Madagascar in 1963, Mauritania in 1973 and the Comoros in 1981 (to set up its own form of CFA franc). Equatorial Guinea, which joined in 1985, is the only member that is not a former colony of France (and not French-speaking).

For many of the former British colonies, a significant element may be their prior experience with British-organised currency boards, another system that tends to generate low inflation [see Schwartz (1993)]. These boards involved, at one time or another before independence, most of the British colonies in Africa, the Caribbean, south east Asia and the Middle East.

The high average inflation rate for the 16 former Spanish colonies in the sample does not reflect *per se* their presence in Latin America. For seven Latin American countries that are not former Spanish or Portuguese colonies,⁽¹⁾ the average inflation rate for 1960–90 is only 9.0%, virtually the same as that for the non-colonies (see Table E). Also, four former Portuguese colonies in Africa experienced the relatively high average inflation rate of around 20%.⁽²⁾ For Portugal and Spain themselves, the average inflation rate of 10.9% for 1960–90 is well below the rate of 29.4% experienced by their former colonies. However, 10.9% inflation is substantially higher than that experienced by France (6.4%) and the United Kingdom (7.7%).

Section C of Table E shows the estimated effect of inflation on the growth rate of GDP when prior colonial status is used as an instrument.⁽³⁾ The estimated coefficient is now -0.031, somewhat higher in magnitude than that found when actual inflation is used in the estimation. The significant negative relation again arises only for high inflation rates; the relation is insignificant if the sample is limited to rates below 10% per year.⁽⁴⁾

One question about the procedure is whether prior colonial status works in the growth regressions because it serves as an imperfect proxy for Latin America, a region that is known to have experienced surprisingly weak economic growth [see, for example, the results in Barro (1991)]. However, if a dummy variable for Latin America is included in the system (and prior colonial status is retained as an instrument), then the estimated coefficient of inflation remains negative and significant: it becomes -0.025, essentially the same as that found when actual inflation is used in the estimation (Section A of Table C).⁽⁵⁾ Thus, the negative effect of inflation on growth does not reflect the tendency for many high-inflation countries to be in Latin America.

4 Estimated effects of inflation on investment

A likely channel by which inflation decreases growth is through a reduction in the propensity to invest. I have investigated the determination of the ratio of investment to GDP within a framework that parallels the one set out in

Table B. The results for the effects of inflation are in Table F (see the notes to the table for a discussion of the other determinants of investment).

In the case of the investment ratio, the use of instruments turns out to be crucial for isolating a negative effect of inflation. Specifically, the procedures that use lagged inflation or prior colonial status as instruments (Sections B and C of Table F) reveal these significantly negative effects. An increase in average inflation by ten percentage points per year is estimated to lower the investment ratio by 0.4–0.6 percentage points. In contrast, when actual inflation is used, the estimated coefficient is close to zero (Section A of the table). These results suggest that the reverse relation between investment and inflation is positive and that the instrumental procedures isolate the negative effect of inflation on investment.

Table F
Estimated effects of inflation on investment

Estimation procedure	Estimated effect of an increase in the annual inflation rate by one percentage point on the ratio of investment to GDP (in percentage points) (a)	
A. Using actual inflation	-0.001	<i>0.011</i>
B. Using prior inflation as instrument	-0.059	<i>0.017</i>
C. Using prior colonial status as instruments	-0.044	<i>0.022</i>

(a) The numbers in italics are standard errors for the estimated effects of inflation on the ratio of investment to GDP. The estimates come from systems that include the explanatory variables described in Table B, other than the investment ratio itself. The main findings for these explanatory variables are that the investment ratio is positively related to initial human capital and to the rule-of-law index, negatively related to government consumption, positively related to democracy at low levels of democracy and negatively related to democracy at high levels of democracy.

Even when the instruments are used, the adverse effect on investment shows up clearly only for inflation rates above 10%–20% per year. For lower inflation rates, the estimated effect of inflation on the investment ratio tends to be negative, but not significantly different from zero. This finding accords with the results for growth rates.

5 Concluding observations

The bottom line from the empirical analysis is that the estimated effects of inflation on growth and investment are significantly negative when some plausible instruments are used in the statistical procedures. Thus, there is some reason to believe that the relations reflect causation from higher long-term inflation to reduced growth and investment.

It should be stressed that the clear evidence for adverse effects of inflation comes from the experiences of countries in which inflation exceeded 10%–20% per year in some

(1) The seven in the sample are Barbados, Dominican Republic (attributed to France rather than Spain; see the notes to Table E), Guyana, Haiti, Jamaica, Surinam, and Trinidad and Tobago. Five other former British colonies in Latin America that are not in this sample—Bahamas, Belize, Grenada, St. Lucia and St. Vincent—experienced the relatively low average inflation rate of 6.9% from 1970 to 1990.

(2) These four are Angola, Cape Verde, Guinea-Bissau and Mozambique. Data are unavailable for Cape Verde and Guinea-Bissau in the 1960s (prior to independence). The figures for Angola in the 1980s are rough estimates.

(3) The inclusion of years since independence does not materially alter the results. Also, the number of years since independence has no explanatory power for inflation. This result may arise because the former colonies of Spain and Portugal in Latin America all attained independence at roughly the same time. Moreover, the tendency toward high inflation predates the experiences since the end of the Second World War. See Bordo and Schwartz (1994) for a discussion of inflationary propensities during the nineteenth century in Argentina, Brazil and Chile.

(4) The estimated coefficients on inflation are still stable over the three time periods. A scatter plot of the unexplained part of the growth rate against the inflation rate is again virtually the same as that shown in Chart 10. The line drawn through the points differs from that shown in the chart (the least-squares line) because prior colonial status is used as an instrument.

(5) This system includes the inflation rate and the Latin America dummy as explanatory variables, and includes as instruments prior colonial status and the Latin America dummy. The estimated coefficient on the dummy variable is -0.0060 with a standard error of 0.0034. Thus, the effect is negative, but now only marginally significant. The results are basically the same if the Latin America dummy is added to the system in which actual inflation is used. It therefore appears that much of the estimated effect of the Latin America dummy on growth rates in previous research reflected a proxying of this dummy for high inflation.

periods. The magnitudes of effects are also not that large; for example, an increase in the average inflation rate by ten percentage points per year is estimated to lower the growth rate of real per capita GDP by 0.2–0.3 percentage points per year.

Over long periods, however, an apparently small change in the average growth rate has dramatic effects on standards of living. For example, if the growth rate of UK GDP from 1960 to 1990 had been higher by 1.1 percentage points per

year, then UK GDP in 1990 would have been the highest in the world, instead of the 15th highest. More specifically, a reduction in the growth rate by 0.2–0.3 percentage points per year (produced by ten percentage points more of average inflation) means that the level of real gross domestic product would be lowered after 30 years by 4%–7%.⁽¹⁾ In 1994, the UK gross domestic product was £670 billion; 4%–7% of this amount equals the substantial sum of £27–47 billion, more than enough to justify the Bank of England's keen interest in price stability.

(1) In the model, the fall in the growth rate by 0.2%–0.3% per year applies on impact in response to a permanent increase in the inflation rate. The growth rate would also decrease for a long time thereafter, but the magnitude of this decrease diminishes toward zero as the economy converges back to its (unchanged) long-run growth rate. Hence, in the very long run, the effect of higher inflation is a permanently lower level of output, not a reduced growth rate. The numerical estimates for the reduced level of output after 30 years take account of these dynamic effects. The calculation depends on the economy's rate of convergence to its long-term growth rate (assumed, based on the cross-country evidence, to be 2%–3% per year).

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Risk measurement and capital requirements for banks

By Patricia Jackson of the Bank's Regulatory Policy Division.

As part of their efforts to improve their risk control, the major banks are developing new statistically based tests to measure some of the risks they face. Although they are re-examining the risks in traditional lending and borrowing activities, progress has so far been greatest in the measurement of the position risk in securities and derivatives trading books. This article reviews developments in both areas, and compares the two main types of test being developed for trading books—value at risk models and 'stress tests'. It also looks at the way that the value at risk models are influencing the development of international capital standards.

The main recent developments have been:

- *Banks have used statistical techniques to look at the risks in different parts of their trading books for some time, but a number are now using more sophisticated, value at risk (VAR) models and 'stress tests' to look at the risks in the whole trading book. Large securities houses are developing these approaches in a similar way.*
- *In 'traditional banking business' (mainly lending and its deposit funding), the most significant change has been in the management of the embedded interest rate risk. Most large banks now manage this in their trading books, enabling it to be hedged actively.*
- *The growing sophistication of some banks' measurement of their overall trading risks has led the Basle Committee on Banking Supervision to consider allowing them to use their internal VAR models to determine the capital required to back their trading positions.*

Background

The nature and scale of the risks that banks face vary across the range of their activities. In their 'traditional banking business'—lending financed by deposits from customers or the wholesale markets—the main risks are: the *credit risk* on loans (the risk that the borrower will default); *liquidity risk* (which arises when the maturity profiles of assets and liabilities differ); the *interest rate risk*, if there is a difference between the interest rate structure of loans and deposits; and *operational risk* (for instance the risk of fraud or error). Almost all banks account for this part of their business on a cost basis, less provisions if an asset is impaired.

In recent years, banks have, in addition, become increasingly involved in the trading of securities and derivatives. These trading activities give rise primarily to *position, or market, risk*—the risk that a change in the prices of the securities or derivatives in which a bank has a position will cause a loss. Because trading-book exposures are taken with a view to

resale or short-term profit, rather than to holding the securities until maturity, the assets are treated as short-term and valued on a mark-to-market basis, ie at the current price at which they could be sold in the market, which enables the risks to be managed.

Because the risks that banks face in their traditional business mainly arise from their loanbooks, these were the focus of the first international initiatives to agree minimum capital requirements, which led to the 1988 Basle Capital Accord. The approach in the Accord provided the basis for the European Union's Solvency Ratio and Own Funds Directives. Under it, all private-sector assets carry a set capital charge related to credit risk—8% in general, but less for interbank and mortgage lending—to give a capital requirement for a diversified loanbook.⁽¹⁾ Within trading books, only on balance sheet positions bear this credit risk charge for their full amount; short positions in private-sector securities (which are treated as liabilities), and all positions in government securities (which are assumed to have minimal credit risk), are excluded.⁽²⁾ Positions in some

(1) For UK banks, the capital requirement may be above the minimum set in the Accord, because required capital ratios are not set automatically at 8%, but depend on the strength of a bank's systems, its assets and management.

(2) The United Kingdom, however, sets capital requirements for long and short government bond positions, because it is considered essential to take the position risk into account.

off balance sheet items are covered by requirements for counterparty risk (which cover the replacement cost if a counterparty reneges). But there is no allowance for the hedging of securities positions, which would not have fitted within the credit risk structure of the requirements.

The building-block approach for trading books

It was always envisaged that the Basle standard would need to be adjusted to provide a more appropriate treatment for the risks in banks' trading books, and for some time the Basle Committee has been considering this.⁽¹⁾ In addition, in the European Union the Commission was seeking a common approach to the treatment of banks and securities houses' trading books, driven by the need for an agreed capital standard for securities firms, which will—under the terms of the Investment Services Directive—for the first time be able to set up branches throughout the European Union on the basis of a 'passport' given by authorisation in one member state.

For a number of years, the Basle Committee and the European Union worked in parallel on a treatment similar to the risk-based approach of securities supervisors such as the Securities and Futures Authority. The Capital Adequacy Directive, finally agreed in 1993, set out the EU approach for the trading books of banks and securities firms;⁽²⁾ and at roughly the same time, the Basle Committee published proposals to apply to international banks in the Group of Ten countries, Luxembourg and Switzerland. The approach allows for hedging within markets (for example of UK interest rate risk), but not for hedging or diversification between markets (for example between UK and US interest rate risk).

This approach was based on what was then regarded as the most appropriate way of setting capital standards for trading positions. It uses historical data on price movements to calculate the capital needed to cover, say, 95% of movements over a two-week period; this is then set down as a percentage capital requirement for a particular position. Such calculations had previously been carried out by several securities regulators, and their requirements informed the decisions taken in the European Union and in Basle.

The fundamental structure is, therefore, additive and is known as the *building-block approach*. The capital requirement for pure interest rate risk on exposures in a particular bond market is calculated taking into account the maturity of the bonds and hedging allowances. To this is added a specific risk charge for the non-government instruments in the book. The total requirement for that book is then added to the requirements for the positions in every other bond market in which a firm has an exposure, to those for each equity and foreign exchange book, and to the total counterparty risk requirement.

Although the underlying figures for the risks in a market are broadly based on a two-week holding period and a 95% *confidence interval*, the overall result for a well-diversified book is a much greater margin of comfort. This is because it is very unlikely that a firm would simultaneously suffer an equally adverse movement affecting all the elements of its trading book—each individual bond, equity, and foreign exchange market, and its counterparty exposures. The requirements had, however, to be sufficient to cover specialist players operating in only one market, as well as diversified firms.

The treatment allowed a more sophisticated approach in one area: in-house 'pre-processing models' may be used to convert derivative positions into positions in their underlying bonds or equities, which can be slotted into the basic approach. In addition, a models approach was permitted for foreign exchange positions, enabling firms to use past data to estimate likely losses.

Overall, the building-block approach to trading-book risks represents a substantial advance on the Basle Accord, because it produces a capital requirement which is broadly risk-based—at least for the individual parts of the book—and takes into account hedges within markets.

But banks have developed their own systems for measuring market risk considerably in recent years. This has led the Basle Committee to consider going beyond this proposed treatment to offer an alternative approach. Rather than laying down detailed capital requirements for trading-book positions, the approach would allow banks to use their own models to estimate the likely losses on positions and calculate their capital requirements. This would enable the capital requirements to reflect portfolio effects (for example, from hedging or diversifying between the UK and US bond markets). The use of banks' own models in this way would, however, be subject to safeguards concerning the nature of the models themselves and the controls applied to their use.

Banking-book risks

Interest rate risk

There has been a marked change over the last ten years or so in the way banks manage the interest rate risk within their 'traditional' banking books. Interest rate risk arises here where there is a difference between the interest rate structure of a loan and of the funds being used to finance it. Where such a difference exists, the interest cost of the funding will not necessarily move in tandem with the interest earned. If a five-year fixed-rate loan is funded using three-month deposits,⁽³⁾ for example, there is a substantial interest rate risk because the rate on the deposits could vary over the life of the loan. There is a similar—though smaller—risk if a

(1) The Basle Committee on Banking Supervision is a committee of banking supervisory authorities established in 1975 by the central bank governors of the Group of Ten countries.

(2) The Capital Adequacy Directive contains an explicit definition of the *trading book*, which does not necessarily correspond exactly to individual banks' own definitions.

(3) Most lending in the United Kingdom is floating-rate, but in the past five years a substantial market in fixed-rate mortgages and loans to small companies has developed.

five-year loan carrying a floating rate of interest that is re-fixed every six months is funded using three-month deposits. And even if the term and interest-reset dates of the liabilities and assets are the same, interest rate risk still arises where the *bases* of the interest rate are not the same—where, for instance, a loan with a variable interest rate set by reference to the base lending rate is funded using deposits carrying a Libor rate.⁽¹⁾

Because banking books are valued at cost and not current market value, it is difficult to monitor and hedge their overall interest rate exposure from day to day. One possible answer to this would be for a bank to value them, at least in its management accounts, on a net present value basis;⁽²⁾ this would allow the total risk to be hedged using market-value items. If such an approach were used in published accounts, however, it would—among other problems—not conform to the accounting convention that assets not held for trading should be valued at historic cost.

Banks have developed other approaches to the problem. One approach, in principle at least, is to match the interest term of each loan exactly with that of the funds used to finance it (match funding), so ensuring that a bank's interest rate exposure arises to a large extent in its trading book, where it can be accounted for on a mark-to-market basis. But this is rather cumbersome in practice.

An alternative, now used by many banks, is to manage the interest rate risk in the trading book rather than the banking book. To achieve this, the trading arm of the bank provides hedging instruments for the banking book which exactly fill the interest rate gaps in that book. For example, if a banking book contains loans carrying interest rates reset every six months funded using three-month deposits, the exposure to a change in rates in three months' time can be removed from it by the banking arm 'purchasing' a forward rate agreement (FRA) from the trading arm, which assumes the risk.⁽³⁾ The FRA is accounted for on an accruals basis in the banking book (consistent with the historic cost treatment) and on a market-value basis in the trading book. This allows the risk to be hedged in the trading book using market-value derivatives (or other instruments), in the same way as any other trading exposure. A clear advantage of this approach is that it enables a bank's total interest rate exposure (from both trading and lending activities) to be measured and managed centrally.

Credit and operational risks

A number of banks are also working on more sophisticated methods for measuring credit risk. The objective is to gain a better understanding of the likely (ie expected mean) losses on particular categories of loan over their life, and also of

the likely variation in these—the magnitude of unexpected losses. The aim would then be for the likely losses to be more than covered by the spread over the cost of funding charged by the bank; unexpected losses would be met from capital. An essential element in the approach is that loan officers should grade loan requests using a scoring system that is calibrated according to the likely percentage loss on that class of business, and that this is reflected in the interest rate set. The system would also be used to update the grading of outstanding loans; the calibration of loan-grading systems in this way is relatively new.

The likely default rates of large companies can be estimated using data on the likely default of companies with particular credit ratings. A scoring system is used to impute a bond rating for those companies that are not rated. For other credits, banks are obliged to use their own internal data. A number are at present working to extract from the available data information on losses from homogeneous categories of loan; the extent of progress with this varies.

Some banks are developing similar methods to measure *operational risks*—such as the risk of errors in transactions with customers, or of fraud. At present, many use a rule of thumb to determine their capital allocation for operational risks—for example a percentage of the volume of transactions. Others use 'scenario analysis', looking at events which could lead to large operational risks and the size of the possible losses.

Trading risks

VAR models

The area where there has been the greatest change in the measurement of risk in recent years is securities and derivatives trading. The development of liquid derivatives markets has given banks the tools to control their risk profile more closely; and this has been paralleled by the development of more sophisticated in-house systems to measure the risk inherent in a particular book.

In the past, banks have usually measured the risks in individual parts of their trading books separately. But now they are increasingly moving towards a whole trading book approach—using a *value at risk* (VAR) model. The aim of a VAR model is to calculate on a consistent basis the *likely* loss that a bank might experience on its whole trading book, allowing for the hedges that exist between—as well as within—different markets. VAR models assess likely price changes of instruments within individual markets and at the extent to which prices in one market vary with those in others; some are more comprehensive than others in attempting this assessment.

(1) Libor is the interest rate at which wholesale deposits are offered to banks in the London money market, as measured by samples of the rates at which deposits are offered to representative major banks. Base lending rate is an administered reference rate, which determines the interest rate on some loans, set by clearing banks in relation to the cost of their wholesale funding (eg Libor). Changes in base lending rate are less frequent than moves in wholesale market rates.

(2) The net present value (NPV) of a loan (or deposit) is the value of the future cash flows discounted using current interest rates for loans (or deposits) of that maturity. The current market value of an interest rate related security reflects this NPV, any specific risk related to the issuer and risks related to the market, for example liquidity risk.

(3) A forward rate agreement is a contract in which two parties agree on the interest rate to be paid on a notional deposit of specified maturity at a specific future time. It enables the buyer to protect itself against a rise in interest rates and the seller against an interest rate fall.

Value at risk models

This box describes in more detail the two value at risk (VAR) modelling techniques discussed in the main article.

Variance/covariance analysis uses summary statistics, calculated from historic data on price volatilities and correlations within and between markets, to estimate likely potential losses. Price changes are assumed to be normally distributed; this enables a bank to calculate a confidence level—a figure for the value at risk over the next 24 hours that it can be, say, 95% or 99% confident will not be exceeded. The confidence level is calculated by reference to the standard deviation of past percentage price changes multiplied by a scaling factor.

To give an example, if a bank has positions in interest rate related instruments—bonds, swaps, forward rate agreements etc—in three markets (the United Kingdom, the United States and Germany), the following statistics will be calculated for each market; they might run to many thousands if a full variance/covariance approach were being used:

- the volatilities of government bond prices in a large number of maturity bands—for example, the standard deviation of daily percentage price changes—converted to a 99% confidence interval by multiplying by 2.3;⁽¹⁾
- correlations in price movements between the maturity bands (ie along the yield curve) in each market;
- the relationship between price changes in corporate and government securities (in essence, the risk on corporate exposures is separated into the pure interest rate risk on government bonds, and the spread between government and corporate bonds); and
- correlations in price movements between markets.

In order to use these summary statistics to calculate the value at risk from interest rate exposures in a particular market, the portfolio will be broken down into a number of maturity bands. A bank will have a rule enabling nearly identical risks to be netted off against one another. Using sensitivity models, other exposures (for example, large swap books) are reduced to a small number of bond positions with sensitivity to interest rates very similar to the cash flows from the swaps. The bond positions can then be used as a proxy for the swap positions, and are placed in the maturity bands.

To look at the exposure of the total bond book (across all the bond markets), the correlations between price changes at each point in the yield curve in the different markets are calculated. This technique is applied to equity books in a similar way: for a bank's equity positions in each market, the likely volatility (given a 99% confidence interval) of the index is calculated, as is the likely correlation between

movements in the indices in different markets. The VAR approach can also be used to capture the *beta* risk—the risk that prices of individual equities will not move exactly in line with the index. Similarly, the currency position risk arising from the securities positions is captured by calculating the volatility of each currency and the correlations between them. And, depending on how comprehensive the VAR model is, the interest rate, equity and foreign exchange exposures may all be considered together to give an overall picture of likely losses, by calculating the correlations between price movements in the separate risk groups.

It is difficult to allow fully for the non-linear risks arising in option portfolios—exposures in gamma⁽²⁾—using this technique. The approach implicitly assumes that a portfolio's value varies linearly with changes in market level. This is clearly not the case with options, and the problem is particularly significant when there are large market movements.

The other method of VAR modelling is *historical simulation*. Here, the trading book is reduced to its essential elements (using maturity bands for the interest rate exposures, as in the first approach). Historical data covering two years or so is then used to calculate the changes in the value of the book that *would* have been experienced had it been held throughout the period. (It is not possible simply to revalue the current book over the past, without reducing it to its essential elements, because data on all individual bonds and equities is usually not stored over long periods by the banks; in any case, in earlier periods some bonds would not have been in existence. Even if the bond *had* been in existence, its residual maturity would have been different in earlier periods, leading to different price volatilities.) Using this technique, it is possible to calculate the 99% confidence interval *without* assuming that the price changes are normally distributed, by computing the loss which was not exceeded on 99% of occasions.

Clearly, a main difference between the two approaches is that with the first the confidence interval is calculated statistically, whereas with historical simulation it is observed. The variance/covariance method uses the assumption that the price changes are normally distributed to derive the confidence level; that assumption is not, however, entirely realistic, since prices tend to exhibit more extreme movements than is consistent with a normal distribution (the observed distribution has fatter tails than a true normal distribution). By assuming normality, therefore, the approach may understate the likely volatility.

Another difference is that the simulation method can encompass the spread and basis risk between instruments, and can also be expanded to encompass the non-linear gamma risks in option portfolios.⁽³⁾

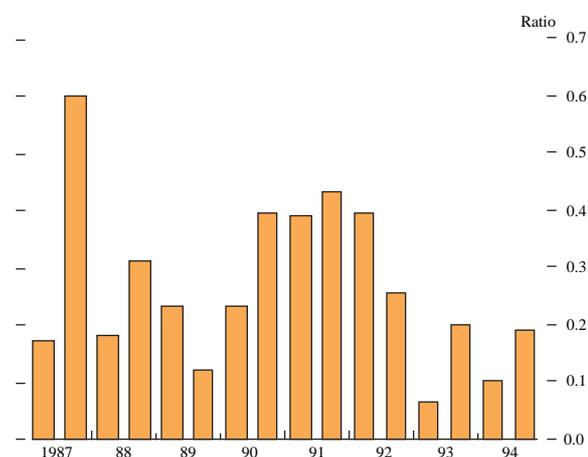
(1) Since the returns are assumed to be normally distributed, there is a 1% probability that the return will be greater than 2.326 standard deviations from its mean.
 (2) The *delta* of an option is the rate of change of its price with respect to changes in the price of the underlying asset. Its *gamma* is the rate of change of the value of the option with respect to its delta.
 (3) The *spread risk* is the risk of a change in the spread between corporate and government bond prices; the *basis risk* is the risk that, where a position is hedged using a position in a non-identical instrument, the prices of the two positions will move differently.

There are two main VAR approaches: variance/covariance and simulation. Under the variance/covariance approach, a bank uses summary statistics on the magnitude of past price movements and correlations between price movements to estimate likely potential losses in its portfolio of trading-book positions. Under the simulation approach, a bank bases its expectation of potential future losses on calculations—using data on past price movements—of the losses that would have been sustained on that book in the past. Banks can use either approach to allocate the capital between their various operations. They can also use them to see how particular exposures change their value at risk. The box on page 180 describes VAR models in more detail.

One issue with VAR models is how they treat correlations. The variance/covariance approach cannot reflect the substantial variation in correlations between markets seen in different periods; instead it is based on average correlations calculated for the whole data period. The simulation approach reflects the actual correlations seen on particular days, but where extreme changes in correlation coincide with periods of extreme volatility, they are likely to fall outside the 99% confidence interval used and so outside the VAR test itself—although they can still be observed.

In some extreme periods, such as during the October 1987 crash in equity markets, the correlation between major markets has been close to 1: all the markets moved together. There is little benefit at such times from diversification between markets, but considerable benefit from having long and short positions in different markets. At other times—for example after the 1987 crash, when the Nikkei equity index fell alone—the correlation between some markets has been closer to 0, or even -1. The benefits from diversification are then greater, but those from hedging are considerably reduced. In the past seven years, the average correlation between the Nikkei and FT-SE 100 indices has been 0.32, but the correlations calculated over six-month periods have varied between 0.07 and 0.6—as Chart 1 shows.

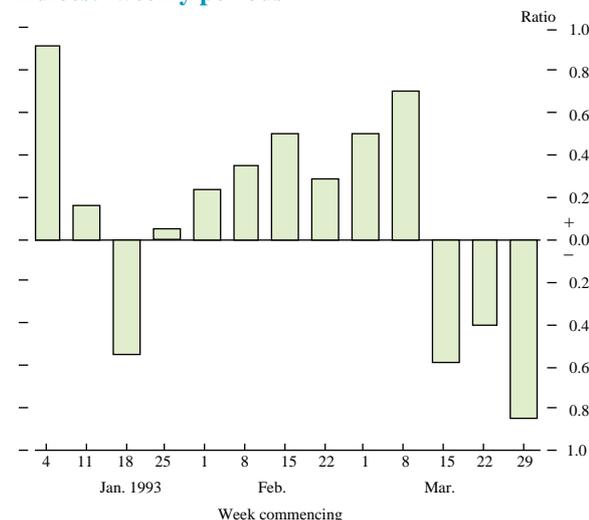
Chart 1
Correlations between Japanese and UK equity indices: six-month periods^(a)



(a) Average correlations between percentage daily changes in the Nikkei 225 and FT-SE 100 stock market indices calculated over six-monthly periods.

The variation in the correlation between the two markets was even greater over shorter periods. In the first quarter of 1993, for example, the weekly correlations varied from +0.9 to -0.9 (see Chart 2); there was a similar pattern in the first quarter of 1994.

Chart 2
Correlations between Japanese and UK equity indices: weekly periods^(a)



(a) Average correlations between percentage daily changes in the Nikkei 225 and FT-SE 100 stock market indices calculated over weekly periods.

For the risk profile of a trading book, it is short-term rather than longer-term correlations that are important; with daily marking to market of positions, hedges must be effective over weeks rather than quarters.

Stress tests

VAR models are only part of the risk measurement armoury, however. The other main part are ‘stress tests’, used to look at the effects on a trading book of extreme market movements. Stress tests calculate the *possible* extent of exposures under extreme assumptions (rather than the *likely* loss). The trading book is revalued according to imposed parameters, rather than according to summary statistics calculated from past data as in the VAR variance/covariance approach. The differences with the VAR approach are highlighted in the table below.

VAR variance/covariance models and stress tests

Feature	VAR variance/covariance model	Stress test
Volatility (intra-market by maturity band)	Calculated statistically	Volatility imposed
Correlations between maturity bands	Calculated statistically	Twists in the yield curve imposed
Spread risk between governments and companies	Calculated statistically	May or may not be calculated statistically
Correlations between markets	Calculated statistically	Imposed

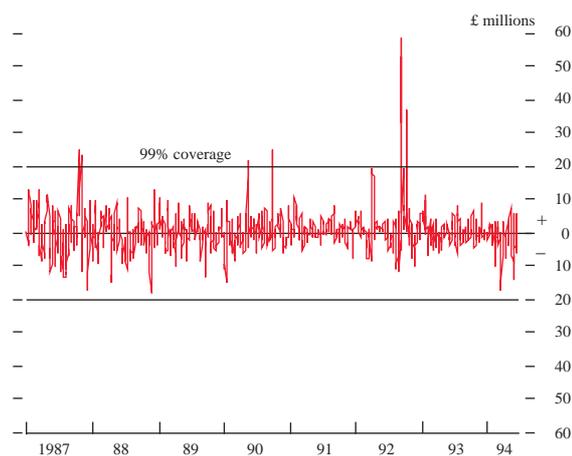
Stress tests look explicitly at the effects of extreme movements in markets. Firms decide on several scenarios which, though unlikely, are possible—a *spike* period—and calculate the hypothetical loss on their trading books in these

circumstances. Some banks use the most risky plausible scenario for their current book. Others use standard tests—for example a 1% shift in interest rates along the yield curve, combined with particular assumptions about shifts in the yield curve (eg short rates moving more than long rates) in all markets and a 10% fall in equity markets. Some also use as stress tests a move of four standard deviations for each variable in the VAR model. Parameters in option-pricing models are usually moved in line, although some firms are starting to model volatility changes (for input to these models) separately.

Those banks that have adopted the VAR simulation approach can use their data on the daily profits and losses which would have been made had the book been held over the past two or three years to look at all the spike periods. They can then consider how likely movements of that scale are over the next 24 hours, and hedge if it is thought appropriate.

Chart 3 shows, as an example, the profits and losses which would have been made over weekly periods in the past seven years on a stylised UK gilt book. The horizontal lines show the profit/loss which was not exceeded on 99% of occasions. As can be seen, there were several spike periods which would have produced profits/losses in excess of the 99% level. The largest were at the time that sterling entered the ERM—when there was a 1% parallel shift in interest rates along the yield curve—and when its membership was suspended, when there was a 10% movement in interest rates at the short maturities. This highlights the need for banks to use stress tests as well as the VAR approach.

Chart 3
Gains/losses on a stylised gilt portfolio^(a)



(a) With a weekly holding period.

Many major banks now carry out stress tests on their trading books, but to date fewer have full VAR models. Some have a series of systems that produce separate figures for different parts of the book—covering interest rate, foreign exchange and equity position risk—which have to be combined (perhaps by adding them) to give the total value at risk. Among those with more comprehensive VAR models, a number still fall short of using a full matrix of correlations.

VAR models can be more easily created for the trading books than for the credit risk in the banking books, because the data needed are more readily available and the risks more homogeneous. Most firms have been storing data on securities prices to formulate hedging strategies, and these can be used to calculate the value at risk. Not all data are easily available, however; for example, many firms do not have a time series of implied volatilities for use in the option-pricing calculations in the simulations.

Future developments on capital requirements

Banks

The Basle Committee is now considering whether in-house VAR models could provide the basis for an alternative approach to the setting of capital requirements for banks' trading books. The main advantage of such an approach would be that it would not generate excessive capital requirements for a widely diversified book in the way that the simple additive structure does. It would also reward sophisticated risk management and work with the grain of firms' own risk management techniques. The Committee's proposals are set out in the consultation paper, 'Proposal to issue a supplement to the Basle Capital Accord to cover market risks.'

One problem, however, is that even where banks' VAR models are built along similar lines, they use different parameters: some may cover price changes over monthly periods, others daily; some may include a 95% confidence interval, and others 99%. Likewise the period of data used for the basis of the calculation can vary widely. And in making the calculation, firms may rely to different extents on weak correlations between markets.

To reduce the differences between models, the Basle Committee is proposing to fix a number of the parameters to govern the way in which the models are specified. These might include the following:

- the use of price changes over a two-week period as the basis for the price volatility calculations;
- a minimum sample period of one year for the past data;
- a 99% one-tailed confidence interval; and
- a requirement to take into account in some way the non-linear behaviour of option prices.

Fixing these parameters, however, would not address the problem that the historical correlations used in VAR models to assess the benefits of hedging and diversification between markets may not hold in extreme (stress) periods. Within a risk category (for example, interest rate risk across a number of markets), the Basle Committee is proposing to allow banks to use the correlations within and between markets that they deem appropriate, provided that their supervisor is satisfied with the process for calculating them. But no hedging or diversification allowances will be permitted between different risk groups: the outcomes of the VAR

Management systems and controls

The Basle Committee is proposing that each supervisor should specify a number of qualitative criteria which banks would have to meet before they could be permitted to use a models-based approach. These criteria would include the following:

- A bank should have an independent risk control unit responsible for the design and implementation of its risk management system. The unit should report directly to senior management, and evaluate the relationship between measures of risk exposure and trading limits. It should also conduct regular back testing—comparison between the risk measure generated by the model and the actual profit and loss.
- Senior management must be actively involved in risk control and review the daily reports produced by the independent risk control unit.
- The risk measurement model must be closely integrated in day-to-day risk management.
- The results of the programme of stress tests should be reviewed by senior management, and be reflected in the policies and limits set by management and the board of directors.
- An independent review of the risk measurement system should be carried out regularly in the bank's internal auditing.

model for each risk group will simply be added together. Despite this, it is recognised that the output of the VAR models may well not provide sufficient comfort for stress periods, and the Committee is considering requiring banks to apply a factor of three to the output to reach an appropriate capital requirement.

As a further safeguard, the Committee is proposing that banks applying the VAR approach must also use a rigorous and comprehensive stress-testing programme covering a range of possibilities which could create extraordinary losses or gains. The stress tests would cover extreme price changes—such as those at the time of the 1987 equity market crash and the suspension of sterling's membership of the ERM in 1992. They would also cover extreme movements in the correlations between markets. A bank would have to convince its supervisors that it had a regular stress-testing programme before its in-house model was recognised for use in setting capital requirements. As another check on the adequacy of the VAR approach, it is also proposed to require banks to report information on the largest losses experienced during the reporting period, which could be compared with the capital requirement for the same dates produced by the VAR model.

Finally, the Committee is also proposing to set extensive qualitative standards for those firms using models, particularly with regard to their management systems and controls; the box opposite summarises what is being proposed. Without effective systems and controls, the models themselves, however accurately they purport to measure risk, are almost useless.

A move towards the use of more sophisticated models for setting capital requirements would be likely to affect banks' attitudes towards risk diversification and hedging. Capital requirements that encourage risk-reducing behaviour provide an incentive for firms to take this sort of action. With time, such an approach to capital standards would encourage more firms to develop sophisticated risk management techniques and to view the risks to which they are exposed in a more sophisticated way.

Securities firms

The proposal to use in-house models and stress tests is not confined to banks. Some of the US securities houses may in future use a combination of the output from VAR models and stress tests to provide reports to the SEC on their affiliated derivatives companies. As with the Basle proposals, the VAR models will cover losses calculated over a two-week holding period with a 99% confidence interval, though no extra multiplying factor will be applied to the overall result. The firms will also carry out stress tests but, in contrast to the Basle proposals, these will be on a number of specified core risk factors and the results of the tests will be reported to the SEC. The firms will calculate the change in value of all positions as a result of the specified movements. This approach has recently been set out in the Framework for Voluntary Oversight by the Derivatives Policy Group.

Comparison of the building-block and VAR and stress-test approaches

The building-block approach to capital requirements for trading books, as embodied in the Capital Adequacy Directive, is based on statistical data and particularly on past price volatilities. In its hedging allowances, it also reflects assumptions about the extent to which hedges between non-identical instruments are likely to reduce risk. But, broadly, it views the risk in each part of the book separately, rather than looking at the extent of the overall risks.

In contrast, the VAR approach—rather than assuming that the risks in different geographical markets for, say, bonds should simply be added together (on the assumption that a firm could face adverse developments in each market simultaneously⁽¹⁾)—calculates the past correlation between movements in the different markets and uses this to estimate the extent of the *overall* risks faced.

(1) The effect is to assume that if a firm is hedged (ie long and short) between two markets, those markets could move in opposite directions, giving no benefit; and that if a firm is diversified—with long positions in two markets—the markets could move together, giving no benefit.

The approach that the Basle Committee is considering would not go as far as firms' own models, which in some cases take account of correlations not only between geographical markets in the same risk class (eg interest rate items), but also between risk classes (interest rate items, equities and foreign exchange)—for example the correlation between price changes in sterling bonds and US equities.

Another difference between the VAR model and building-block approaches as set out in the CAD is that, although the Directive's capital requirements are based on statistical information on price volatilities, its requirements are general. There are not separate requirements to reflect markets' differing volatilities: no distinction is drawn, for example, between the volatility of the Japanese and UK equity markets, although in the recent past the Japanese market has been more volatile. VAR models, in contrast,

take the price data—and therefore the different volatilities—of individual markets into account. Similarly, they are likely to measure spread and basis risk in particular markets more accurately than the building-block approach.

There is also a difference in the way that exceptional price movements are covered. Like the VAR approach, the building-block method does not seek to cover 100% of possible price moves instrument by instrument. However, because its requirements are additive, the method results in a much greater margin of comfort for a whole book, unless it is very specialised. This is one reason for the Basle Committee's caution about the ways in which VAR models may be used. It also underlines the importance of firms assessing possible losses using stress tests that assume extreme volatilities in prices and correlations in a number of markets.

Statistical information about derivatives markets

Derivatives markets have grown rapidly in recent years to play a crucial role in the management and intermediation of risk by the financial system. But obtaining useful information about derivatives activity poses a number of difficulties. This article focuses primarily on over-the-counter (OTC) derivatives. It outlines the main accounting problems they raise, explains current initiatives to encourage firms to disclose information about their derivatives business and describes recent steps to improve the aggregate statistics available on OTC derivatives markets.

The derivatives markets—particularly those in over-the-counter (OTC) contracts, which are negotiated privately between the counterparties, as distinct from those traded openly on organised exchanges—have been at the forefront of financial debate for some time.

What first attracted interest was their novelty, their rapid growth—perhaps exaggerated by the ways in which the size of the market was measured—and the fact that they were bringing the methods and attitudes of trading (as well as complex mathematical techniques) to the core of banking in a way that more traditional trading, for example in the foreign exchange market, had not.

Derivatives markets now play a vital role in the intermediation of risk by the financial system. It is therefore important for any analysis of the contribution that the financial system makes to the economy more generally, or for an understanding of how the financial system now functions and an assessment of its vulnerability to shocks, that information about the derivatives markets should be available to the authorities, market participants and the public at large.

A more recent impetus to the demands for information about derivatives markets has been the experience both of the problems that can arise when participants misjudge or misunderstand the risks they are taking, and of the speed with which loss-making positions can be built up. Such problems are by no means confined to the OTC markets, nor to derivatives. But there have been a number of well-publicised cases of substantial losses by end-users in derivatives dealings, and it has become evident that the nature and extent of many traders' involvement in derivatives trading—and their reliance on it for profit—is often far from clear to their counterparties or to investors.

These problems have highlighted how difficult it can be to value and account for the more sophisticated products now available, and how little firms are required to disclose about their derivatives dealings in their statutory accounts. They have also drawn attention to the lack of comprehensive and reliable information about the scale and structure of dealings in the OTC markets, and the risk exposures that they

represent. As a result, informed public debate is difficult and prominence is given to anecdotal or partial information.

This article outlines the steps being taken to fill these information gaps. It begins by explaining the accounting issues raised by derivatives in general—and OTC derivatives in particular—which have made it difficult to accommodate them within the standard accounting framework; a box briefly summarises the work now under way to resolve these difficulties. It then discusses the initiatives being taken by the central banks of the Group of Ten (G10) countries and others to promote fuller disclosure of derivatives business by financial firms. Finally, it sets out what is currently known about the scale of the markets and the risks they represent, and describes the steps being taken to add to the aggregate statistics available on OTC derivatives markets—in particular, the recent survey of these markets co-ordinated by the Bank for International Settlements (BIS), the results of which should be available later this year.

Accounting issues

Accounting for derivatives is not straightforward. They are typically 'off balance sheet': entering into a derivatives contract generally does not—as does granting a loan or taking a deposit—give rise to immediate cash flows to the extent of the contract's face value, and it therefore creates no corresponding balance-sheet asset or liability. Instead (initial premium or fees aside), it simply creates future rights or obligations. How those should be valued and reflected in accounting statements remains a matter of debate.

Although no national accounting authority has issued a comprehensive standard on derivatives accounting, there are nonetheless some basic principles which are widely accepted—and applied in practice—in many countries. These include:

- recognition that the accounting treatment should reflect the purpose for which the transactions are entered into—in particular, whether that purpose is trading or risk management;
- consensus that derivatives positions should be treated as trading positions unless they are demonstrably held for hedging purposes;

- acceptance that trading positions should be recognised at ‘fair value’; and
- agreement that hedging positions should be accounted for on the same basis as the items they hedge.

Although these principles have been widely accepted, that acceptance has not been universal or unqualified. It is probably so-called *hedge accounting* that has given rise to most concern. The main difficulty here is how to distinguish trading from dynamic hedging, because the latter may involve frequent adjustment of derivatives positions to maintain a hedged book. Sophisticated treasury operations hedge on a portfolio basis rather than transaction by transaction so, as a firm’s underlying cash portfolio changes and its management’s view of likely market or economic developments evolves, existing hedges may be closed out or offset and new hedges put on. Such dynamic hedging may

Accountancy bodies’ current work-in-progress

The UK Accounting Standards Board began a project on accounting for derivatives in 1994. The project will cover both disclosure and measurement; the first document likely to be published from it is a discussion paper on disclosure. In addition, the British Bankers’ Association’s 1991 Statement of Recommended Accounting Practice on off balance sheet instruments is currently being revised.

The US Financial Accounting Standards Board announced in February that it had decided to adopt a basic model for derivatives accounting that was significantly different from current US methods. Under the new proposal:

- all derivatives would be recognised in the balance sheet at fair value;
- realised gains and losses on all derivatives would be recognised in earnings when they occur; and
- all derivatives would be classified in one or two categories—trading and other than trading. Revaluation gains and losses on derivatives in the trading category would be recognised in earnings; those arising on derivatives not classified as trading would be excluded from earnings and reported as a separate component of equity until realised.

The International Accounting Standards Committee is working towards two international standards on financial instruments—one to cover disclosure, and one recognition and measurement. The disclosure standard (IAS 32) is expected to be applied from the start of 1996.

be difficult to distinguish objectively—either in scale or in pattern—from trading.

This issue matters because profits may be materially different if derivatives positions are classified as hedging rather than trading positions. If they are treated as trades, any profits or losses realised when the position is closed out or terminated (as well as unrealised revaluation gains or losses) will be recognised as they arise. But if they are viewed as hedges for items included in the balance sheet at cost, realised profits and losses may properly be deferred to the accounting period in which the income or expense being hedged is recognised. And unrealised revaluation gains or losses will not be recognised at all.

The subjective element inherent in basing the accounting for derivatives—and indeed for other financial instruments—on management intent has led to ‘fair value’ accounting being actively considered for all financial instruments, or at least for all free-standing derivatives. ‘Fair value’ is, loosely speaking, an extension of ‘mark-to-market’ accounting to positions for which—as for many OTC contracts—there is no readily-available market price. But it too raises a number of difficult issues:

- ‘fair value’ valuation is costly and potentially unreliable for financial instruments which are not actively traded;
- transitory changes in fair value are, arguably, irrelevant when a firm intends and is able to hold a position to maturity;
- it may be appropriate to take some changes in fair value directly to reserves rather than recognising them in earnings; and
- it would not be possible to recognise unrealised, but economically related, gains and losses in the same period as the change in fair value.

Disclosure initiatives

Accountants are still grappling with these and other issues, which makes it difficult to agree universally applicable rules for including comprehensive information on derivatives in published accounts; and in any case, the risks may change rapidly—which limits the value of accounts relating to a specific reporting date. So attention is also being given to other ways—outside the formal framework of statutory accounts—in which firms might be able to disclose more about their derivatives business and the risks to which it exposes them. Such information should help counterparties and investors to make better-informed judgments about firms engaged in derivatives business, and would improve market transparency more generally.

Voluntary disclosure of this kind has so far been patchy. Many firms argue that disclosure of their trading risks could reveal to competitors their appetite for risk or their position-taking strategy. There is an additional concern—

justified by experience—that the information revealed might be misunderstood, or that it might not be meaningful unless it was at a level of detail that would clearly be commercially sensitive. The lack of agreement on techniques for measuring market risk, in particular, leads many firms to conclude that disclosure would require a standardised measurement framework to be imposed, adding to the reporting burden. Some also believe that firms that are prepared to disclose will be seen as riskier than those that do not disclose at all. But it is generally accepted that greater disclosure, if widely supported and followed, should make the markets more stable and so would be in the industry's longer-term interests.

Perhaps the biggest obstacle to fuller disclosure is the lack of consensus on the basis on which it should be done. Accounting standards do not attempt to tackle issues relating to forward-looking risk exposures, which are now typically measured and managed using sophisticated model-based methods founded on concepts such as value at risk and stress tests.⁽¹⁾ The accounting profession, as mentioned above, is working to improve the quality and accuracy of information contained in balance-sheet and income statements to reflect the exposures incurred in firms' trading activities. But the main proposals for greater disclosure have come from other sources and do not depend on further development of the relevant accounting concepts.

The G30 report

The first set of recommendations for greater disclosure of firms' trading risks was contained in a report by the Group of 30 (G30), issued in July 1993.⁽²⁾ Its recommendations were mainly for *qualitative* disclosure, pending the introduction of consistent international accounting standards. It recommended that the financial statements of dealers and end-users should provide enough information to allow investors and counterparties to understand the purposes for which transactions were undertaken, their extent, the degree of risk involved and how the transactions had been accounted for. Specifically, it recommended that they should give:

- information about the management's attitude to financial risks, how instruments were used, and how risks were monitored and controlled;
- a statement of their accounting policies;
- an analysis of positions at the balance-sheet date;
- an analysis of the credit risk inherent in those positions;

and, for dealers only:

- additional information about the extent of their activities in financial instruments.

These recommendations were intended to apply to all financial instruments, not just derivatives, because many of the risks—and management's risk management policies—can only be properly understood in the context of a firm's trading activities as a whole.

The *quantitative* information that the G30 recommended should be disclosed included the notional amounts of off balance sheet positions, a firm's current credit exposure, and (for dealers only) an analysis of revenue by source, in sufficient detail to enable an understanding of the extent of a firm's activities. But it did not include a quantitative measure of market risk (that is, a firm's exposure to loss in the event of movements in market prices), on the grounds that none of the existing measures of market risk seemed to provide a meaningful, objective measure that was comparable between firms without creating an unreasonable reporting burden. The G30 acknowledged, however, that more work should be undertaken to develop such a measure.

The Institute of International Finance report

The proposals by the Institute of International Finance (IIF)—developed by a core group of active market dealers and published in August 1994⁽³⁾—were aimed at major banks and securities houses, rather than at smaller banks and other financial intermediaries. Like the G30, the IIF's report advocated disclosure of information on the current replacement cost of a firm's derivatives book. Such information is produced routinely by many major dealers as part of their reporting to supervisors, and should therefore be relatively easy for firms to prepare.

The current replacement cost of a derivatives book provides a measure of its credit risk (although it does not capture the potential future credit exposure, which supervisors also take into account in setting capital requirements). In addition, as the IIF recognised, the proposed disclosures (like the G30's) would provide only a snapshot of a firm's derivatives positions on the reporting date. The concern would remain, therefore, that such information would not adequately convey a sense of how stable the risks had been—or were likely to be in future.

The IIF recommended that exposures should be broken down by counterparty type (using either credit rating agencies' scorings, an internal credit rating or the Basle Accord's credit risk categories) and that activity levels should be further analysed by product type, notional amount, maturity structure and market value. This quantitative disclosure would be supported by qualitative disclosure: statements of accounting and netting policies, and information about the tools used by management to manage and control risks, and about the sectoral profile of activity (eg between foreign exchange, interest rates and equities).

The IIF's report recognised that further progress needed to be made on disclosure, particularly of market risks.

(1) These models are discussed in the article on risk measurement and capital requirements for banks on pages 177–84.

(2) The report was entitled: 'Derivatives: practices and principles'.

(3) In 'A preliminary framework for public disclosure of derivatives activities and related credit exposures'.

However, it argued that the lack of consensus over the measurement of market risk precluded greater public disclosure at present. It also suggested that the authorities might improve the functioning of derivatives markets by publishing quarterly aggregate statistics.

The Fisher report

The Governors of the G10 central banks also recognised the benefits that greater disclosure might bring, and set up a working party under the chairmanship of Peter Fisher, of the Federal Reserve Bank of New York, to consider ways in which this might be brought about. This group's recommendations—published in a consultative paper in September 1994⁽¹⁾—went beyond the disclosure of credit exposures and proposed in addition the disclosure of quantitative information on market risk.

Like the G30 and IIF reports, the Fisher report acknowledged the current lack of consensus on methods of calculating market risk, and recognised that as a result it was not yet possible to ensure comparability between firms in what they disclosed. Instead, the report recommended that what was disclosed should be based on each firm's own assessment of its risk, measured against its performance in managing that risk. So although taking the form of quantitative disclosure, the report's recommendations would if adopted permit a qualitative assessment of each firm's capacity to manage and control risk.

One suggestion in the report was that firms could use as the measures of market risk the high, low and average 'values at risk' (over one-day and two-week horizons) that occurred during the reporting period; alternatively, they might disclose the histogram (frequency distribution) of daily changes in portfolio value over the period. Other, more sophisticated, forms of disclosure were also discussed.

Although the Fisher report's main innovation was in the area of market risk, it also recommended disclosure of credit risk at least to the extent provided for by the IIF model. It suggested too that firms might disclose: a measure of actual losses over the reporting period; a measure of losses relative to the capital supporting the activity in which those losses occurred; and the variability of credit exposures over time (high, low and average gross or net replacement values over the reporting period). The clear advantage of these forms of disclosure is that they move a step beyond the 'snapshot' recommended by the IIF, and would give some indication of the exposures incurred during a period as well as those on the reporting date.

In these ways, the Fisher report sought to avoid the difficulty of achieving comparability between firms' market risk disclosures by focusing instead on a comparison of each firm's own estimate of its risks with the outturn. So comparison between firms would be possible only in relation to their ability to manage and control risks, not in terms of the absolute scale of those risks. Extending quantitative

comparison into that area will depend on achieving greater convergence of risk measurement concepts and techniques. It is possible that the package of proposals currently being developed by the Basle Supervisors Committee⁽²⁾ may provide a basis for this.

Information about risk exposures

For all the reasons outlined above, firms' published accounts and other disclosures do not yet provide a reliable source from which aggregate statistics about risk can be compiled. But a range of information about the risks created by firms' derivatives activities is available to supervisors and other responsible bodies, such as futures exchanges and clearing houses. Much of it is necessarily confidential and cannot be made publicly available; much also—for example, that available to exchanges—may give an incomplete picture of firms' exposure to risk. It is possible, however, to derive a certain amount of information about risk at an aggregate level from prudential returns.

Supervisors are of course principally interested in data which enable them to assess the financial strength of individual institutions and their ability to honour their obligations. As a result, their reporting requirements concentrate on the risk-related—rather than product-specific—information that is necessary to assess the current adequacy of a firm's capital resources or that casts light on the structure of a firm's balance sheet.

Most of the data reported to UK banking supervisors are of the first type: they help measure current risk and capital. Given the different ways in which banks organise their business, the varied markets in which they may be involved and their differing levels of expertise, standardised reporting on, for example, changes in business profile is rarely appropriate. Such information is obtained instead through routine prudential interviews, discussion of banks' own management accounts or specially commissioned reports, and so does not lend itself to quantification or aggregation.

The predominant risk in banking business typically arises from credit exposures rather than market risk. UK-incorporated banks are currently required to hold adequate capital to cover all their credit exposures—off and on balance sheet—and these are measured in accordance with internationally agreed standards, such as those in the 1988 Basle Accord and the 1989 EU Solvency Ratio Directive (which came into effect at the end of 1992). They are also required to cover foreign exchange risk, but—until the implementation of the EU Capital Adequacy Directive in January 1996—this is the only type of market risk that is covered systematically.

Because the emphasis is on risk, prudential returns contain little product-specific information; as a result, exposures arising from derivatives contracts usually cannot be identified separately from them. In addition, in the case of exchange-traded products, the payment of daily variation

(1) The paper, issued by the Bank for International Settlements, was entitled: 'Public disclosure of market and credit risks by financial intermediaries'.

(2) The Basle Committee is a committee of banking supervisory authorities set up by the G10 central banks.

margin means that counterparty exposures (other than to the clearing house) do not arise. But the credit risk on OTC derivatives, and the methodology which has been developed by supervisors to measure it and convert it into equivalent on balance sheet exposures, requires the submission of data which cast some light on the scale of OTC activity. The supervisors' current rules require banks to distinguish between interest rate and foreign exchange rate related OTC derivatives (the latter category in fact includes *all* non interest rate contracts, eg equity-related and commodity-related derivatives); and to differentiate between those with less than a year to maturity and those that are longer-term. In the United Kingdom, banks active in derivatives markets are expected to measure credit exposures using methods which require them to calculate both the notional principal of the contracts and their current replacement cost.

The requirements are reflected in the standard reporting forms and make it possible to derive the aggregate statistics shown in Table A. As can be seen, at recent reporting dates the replacement cost of these contracts has amounted overall to only 2%–3% of their face value; and the credit risk (which also takes account of potential future exposure and the creditworthiness of counterparties) has accounted for some 5%–6% of banks' total credit risk.

Table A
OTC derivatives

Active UK banks' credit exposures at end period (£ billions)

Percentages in italics

	1993		1994	
	H1	H2	H1	H2
Interest rate related contracts:				
Notional principal	1,849	2,333	3,300	3,356
Replacement cost (a)	34	44	37	38
<i>as a percentage of notional principal</i>	<i>1.8</i>	<i>1.8</i>	<i>1.1</i>	<i>1.1</i>
Credit equivalent exposure (b)	39	49	46	47
<i>as a percentage of balance sheet</i>	<i>4.9</i>	<i>6.6</i>	<i>5.3</i>	<i>5.6</i>
Credit risk (c)	10	12	11	12
<i>as a percentage of risk weighted assets</i>	<i>2.3</i>	<i>2.9</i>	<i>2.5</i>	<i>2.6</i>
Foreign exchange related contracts:				
Notional principal	1,141	1,066	1,447	1,400
Replacement cost (a)	31	23	39	27
<i>as a percentage of notional principal</i>	<i>2.7</i>	<i>2.2</i>	<i>2.7</i>	<i>1.9</i>
Credit equivalent exposure (b)	48	40	62	50
<i>as a percentage of balance sheet</i>	<i>6.1</i>	<i>5.3</i>	<i>7.2</i>	<i>6.0</i>
Credit risk (c)	12	11	15	12
<i>as a percentage of risk weighted assets</i>	<i>2.9</i>	<i>2.5</i>	<i>3.4</i>	<i>2.8</i>

(a) The current market value of contracts (when positive).

(b) The sum of the replacement cost and the potential future exposure.

(c) The credit equivalent exposure weighted according to counterparty risk weighting.

Two conflicting factors affect the likely future availability of such data. The Basle Accord's treatment of OTC derivatives is soon to be more finely differentiated: separate risk weightings are being introduced for equity-related and commodity-related contracts; and longer-term contracts are being divided into those with less and those with more than five years to maturity. That will in turn require more detailed reporting. But the credit-reducing benefit of netting agreements is also to be recognised. Because netting can be effective across maturities and across product types, this will disguise the gross, unnetted positions banks run. UK

supervisors have yet to determine how these new rules will be reflected in reporting requirements.

Information about market size

The information available to supervisors and presented above is not available routinely to the markets or the public at large; in any case, its specific purposes mean that it is not especially illuminating about the overall scale of derivatives trading in the markets.

Information on exchange-traded contracts

Data on exchange-traded derivatives activity are, however, published by the exchanges themselves. Exchanges tend to emphasise the number of contracts traded—an indication of the liquidity of the market—and open interest, which gives some sense of the risks being traded through the market and position-taking in it. Such data can (for futures contracts, at least) be converted into 'cash equivalents' to allow comparison with cash-market dealings. Tables B and C provide a comparison of both measures in recent years.

Table B
Exchange-traded derivatives

Annual turnover (US\$ billions)

Contract	Exchange	1992	1993	1994
Three-month interest rate futures:				
Eurodollar	CME	60,531	64,411	104,823
Sterling	LIFFE	9,975	9,087	12,713
Euromark	LIFFE	7,812	12,883	18,080
Paris interbank	MATIF	6,045	10,506	11,909
Euroyen	TIFFE	11,844	21,043	36,631
Eurolire	LIFFE	325	953	2,173
Government bond futures:				
US T-bond	CBOT	7,000	7,948	9,996
Long gilt	LIFFE	777	886	1,455
Bund	DTB	848	1,149	2,191
	LIFFE	2,177	3,085	5,754
French government bond	MATIF	2,937	3,249	4,529
Equity index futures:				
Standard & Poor's 500	CME	2,567	2,970	4,273
FT-SE 100	LIFFE	293	345	505
Nikkei 225	Osaka	1,604	1,376	1,145
	Simex	222	421	536

Sources: FIA, Bank of England.

Table C
Exchange-traded derivatives

Open interest at year end (US\$ billions)

Contract	Exchange	1992	1993	1994
Three-month interest rate futures:				
Eurodollar	CME	1,325	2,117	2,384
Sterling	LIFFE	152	294	313
Euromark	LIFFE	248	405	452
Paris interbank	MATIF	91	254	187
Euroyen	TIFFE	321	894	1,103
Eurolire	LIFFE	7	59	62
Government bond futures:				
US T-bond	CBOT	30	32	35
Long gilt	LIFFE	8	7	8
Bund	DTB	5	14	16
	LIFFE	15	14	32
French government bond	MATIF	18	8	9
Equity index futures:				
Standard & Poor's 500	CME	34	42	48
FT-SE 100	LIFFE	5	9	7
Nikkei 225	Osaka	20	11	21
	Simex	4	7	10

Sources: FIA, Bank of England.

Information on OTC markets

Aggregate information on OTC derivatives markets is, by the nature of the business, somewhat less accessible: they are markets in bilaterally negotiated, rather than in publicly quoted and traded, contracts; and the data which are available tend to be less timely and less reliable than those for exchange-traded derivatives. There are also differences between the various reporting systems, in terms of the breakdown by instrument type and counterparty, which hamper the full aggregation of reported data. Furthermore, existing published data focus almost exclusively on notional amounts outstanding, and provide only limited information on the patterns of participation and liquidity in derivatives markets.

The principal source of data on OTC derivatives markets is the survey carried out every six months by the International Swaps and Derivatives Association. This relies on voluntary reporting by its members, and its main focus is the interest rate and currency swap markets. The survey provides useful information both on turnover (every six months) and amounts outstanding (at year-ends)—both expressed in terms of notional principal amounts. But the reporting population varies and there are questions about how comprehensive its coverage is; it also provides very little product-specific detail.

It was because of the lack of comprehensive and consistent data on the OTC markets that the G10 central banks set up a working party—chaired by Jan Brockmeijer of the Netherlands Central Bank—to agree the information on derivatives markets that central banks needed to perform their functions. Specifically, the group was commissioned:

- to identify the macroeconomic and macroprudential requirements for statistical information on derivatives markets; and
- to develop the necessary measurement concepts to meet those needs on an internationally consistent basis.

The Brockmeijer Group's report,⁽¹⁾ which was published in February, outlined: the general lack of transparency in derivatives markets; the lack of information on market liquidity and the market linkages produced by derivatives transactions; and the need for statistics on market size, disaggregated into the underlying market risk categories (foreign exchange, interest rate, equity and commodity price), by contract maturity and counterparty type.

It recommended that occasional surveys of derivatives activity should be conducted. This recommendation was endorsed by the G10 Governors last May and the first such survey was carried out with the well-established triennial central bank survey of foreign exchange market activity this April. Each of the 26 participating central banks has surveyed its own market, on the basis of an agreed 'core' survey format, and the results will be aggregated by the BIS

to provide global statistics on the OTC markets. The Bank of England has been closely involved, and invited some 450 banks and securities firms in London to participate.

The survey questionnaires were sent to UK market participants early in December, after consultation with relevant trade associations, other industry regulators, and some banks and securities firms identified as particularly active in derivatives markets. UK participants have been asked to return the completed questionnaires by 5 June and aggregate results should be available for publication in the autumn.

The survey will provide data on turnover during April (notional principal) and on stocks outstanding at the end of March (notional principal *and* gross positive and negative market values). In each case, the data will be disaggregated by market risk category, instrument, counterparty type and maturity. In addition, foreign exchange and interest rate data will be disaggregated by currency.

It is likely that surveys of this type will become a regular triennial exercise. But the Brockmeijer Group also recommended regular reporting (perhaps on a semi-annual basis) by a fairly small number of major intermediaries in global derivatives markets. It suggested that this reporting should be on a consolidated basis for each participant, rather than location by location, and should be restricted to outstandings. But no decisions have yet been taken on this recommendation, and the value of—and framework for—more regular reporting will be considered in the light of the experience and information gained from this spring's survey.

Derivatives in the national accounts

The growing significance of derivatives activities makes it important to capture them fully in national accounts. UN and IMF guidelines for both national accounts and balance of payments statistics recommend that derivatives positions (at market value) should be included in balance-sheet data and that the associated financial flows should be included in financial accounts.

Work is currently being undertaken jointly by the Bank and the Central Statistical Office (CSO) with the aim that derivatives markets should, for the first time, be identified explicitly within the United Kingdom's national accounts and balance of payments. This will allow the financial flows (particularly cross-border flows) associated with their use to be recorded in a way that will ease comparison with other markets and instruments; it will provide more information on the economic sectors holding and using derivative contracts; and, by specifying a framework for the recording of derivatives business, it should help to improve the overall reliability and coherence of the macroeconomic statistics to which these activities contribute. The work is given added impetus by a wider European programme to harmonise the presentation of macroeconomic data within the European Union.

(1) The report was entitled: 'Issues of measurement related to market size and macroprudential risks in derivatives markets'.

The needs of national accounts and balance of payments statisticians do not, however, align well with those of financial supervisors or others concerned with the monitoring and regulation of global markets. The national accounts do not, for example, seek to measure risk, but instead are concerned with the current value of the contingent assets and liabilities. They do not require a detailed classification by instrument or market risk, but do seek to classify counterparties by broad economic sectors. They are not concerned with global positions, but instead record assets held and transacted within and across national borders. And they are less concerned with market turnover than with the financial flows to which this gives rise.

Further consultation with market practitioners and end-users will be needed before statistics can begin to be collected

regularly for this purpose. The aim will be to see how UK statistical needs (and commitments under the European programme of statistical harmonisation) can be met in a way which is least burdensome to reporters.

Conclusion

Much remains to be done to make the statistical data on derivatives markets as comprehensive and reliable as that on more traditional business, and to make firms' dealings in derivatives markets more transparent to investors and to their counterparties. But progress is being made and, although it is unlikely to be rapid, worthwhile additional data—including the results of the first central bank survey of the OTC derivatives markets—can be expected to be made available in the coming year.

The economics of EMU

The Governor argues⁽¹⁾ that the need for a careful and dispassionate assessment of the economic case for and against Economic and Monetary Union (EMU) should not be overlooked amid the broader political debate about the future of Europe.

The heart of the economic justification for EMU—the irrevocable locking of parities—is that the permanent elimination of exchange rate fluctuations would promote prosperity by deepening the benefits from competition and free trade. EMU would be likely to be useful in helping to convince the business community that intra-European monetary stability would be maintained over the medium and longer term.

The case against, in essence, is that there could be significant continuing intra-EU economic differences causing tensions between Member States which would be difficult to relieve without the possibility of exchange rate adjustment. Real and sustainable economic convergence among the states participating in EMU needs to be achieved to avoid the risk of long-term stagnation in some parts of the Union.

It is a very great honour to have been invited to deliver this 21st Churchill Memorial Lecture to such a distinguished audience here in Luxembourg—a city which is familiar to me from my days as a Director of the European Investment Bank, and a city which is familiar to me also as a European financial centre with so many interests in common with our own City of London.

I am delighted to be here—delighted but also, frankly, somewhat nervous. I am nervous because deep in the consciousness of the Bank of England is an awareness that it was one of my predecessors as Governor, Montagu Norman, who in 1925 advised Winston Churchill to return to the gold standard. That was—I hasten to point out—well before I was born! But our experience of fixing sterling's exchange rate parity, in the conditions of that time, was deeply unfortunate. And shortly before we were forced off gold again in 1931, Winston Churchill wrote to Edward Marsh, his Private Secretary:

‘Everybody I meet seems vaguely alarmed that something terrible is going to happen financially. I hope we shall hang the Governor of the Bank of England if it does. I will certainly turn King's Evidence against him!’

You see now why I am nervous—especially since I shall be talking about the fixing of exchange rate parities within monetary union this evening!

The title of my lecture is ‘The *economics* of Economic and Monetary Union’. I realise of course that ‘Europe’ is about much more than economics. The inspiration that lay behind the concept of ‘Europe’—after the two wars—was, above all, the need to ensure that Europe could never be devastated

by war again. And this meant achieving political harmony within Europe itself, as well as ensuring that Europe's legitimate interests were effectively represented and protected at the broader international level in a world of superpowers.

I am only too well aware that the question of what this objective means—in terms of the future political organisation of Europe, and for the nature of the relationship between European institutions and their powers on the one hand and those of the individual Member States of the European Union on the other—is a matter of sometimes passionate political debate, and not just, I think, in the United Kingdom. At one extreme, there are some across Europe who are persuaded that only the creation of a single European state will be enough. At the other extreme, there are some who distrust even the most modest steps towards collective decision-making. But I suppose that most people are essentially somewhere in between, having in mind some point on a spectrum of possible forms of political organisation within Europe, involving more or less close co-operation between sovereign states; and they tend to react somewhat instinctively to particular proposals for collective action in this or that field, depending on where they position themselves along that spectrum.

But there is also an economic dimension to ‘Europe’. There are, potentially, very considerable economic benefits to be achieved through economic and monetary co-operation within Europe—through the Single Market, through the collective promotion of free and fair trading relationships with the rest of the world, and through the achievement of economic and monetary stability in the region as a whole. But there are equally economic risks in seeking to go too far or too fast. My concern is that steps towards Economic and

(1) In the Churchill Memorial Lecture given at the Fondation J P Pescatore in Luxembourg on 21 February.

Monetary Union within Europe (EMU) should be debated on their economic merits, and that the economic issues should not be lost sight of in the heat of the broader political debate.

There are dangers on either side. The potential benefits of economic integration would be denied to us if the member countries took a narrowly protective political view. But on the other side, there would be dangers if political aspiration were to run ahead of the economic realities. So whatever one's political starting-point, the political judgments that have to be made—and they are of course inherently political judgments—need to be informed by an assessment of the possible economic costs and benefits of further steps towards EMU; the economic issues cannot be simply brushed aside.

The Single Market

The heart of the economic justification for EMU is the familiar argument about the economic advantages of competition and free trade.

Now I appreciate that in saying this I run the risk of appearing to confirm the widespread suspicion that the United Kingdom is only interested in belonging to a large free-trade area or customs union and nothing more. This is simply not true on the evidence. It is an example of the way in which much of the debate about Europe tends to be conducted in terms of assertion and slogan. The fact is that the European Union has already moved well beyond just a free-trade area in establishing the Single Market—which involves not just the free movement of goods and services within the European Union. It involves also the free movement of both labour and capital, as well as supporting European legislation to avoid market distortions from, for example, state aids and government procurement, or restrictive practices within the private sector. And the Single Market was created with—and still enjoys—the enthusiastic support of the British Government and a large majority of the British people. But that is by the way.

More generally, if—in economic terms—EMU is not fundamentally about achieving the potential benefits of competition and free trade within Europe, then I cannot imagine what it is about. The basic argument is certainly well known to you and I do not propose to take up a lot of time this evening spelling it out in detail. Put very simply, it is an argument in favour of increased competition and free trade throughout the European Union in order to ensure that productive resources are efficiently deployed to satisfy consumer demands more effectively and to increase aggregate economic welfare in Europe.

Now none of this is immediately obvious at the 'microeconomic' level. Existing activity is likely to feel threatened by competition, and there is a natural temptation—to employees, their employers and their national governments—to seek to defend existing activity through protective action in one form or another, inviting retaliation from others in what would rapidly degenerate into a negative-sum game. The benefits of greater competition and

the removal of unnecessary barriers or distortions to free trade, on the other hand, lie essentially in the future activity that is likely to be created—so that the benefits are less tangible or immediately self-evident. Nor, in the short term anyway, do the benefits necessarily accrue evenly across the Single Market area or between different groups in the member countries. Even though it can be shown in principle that future aggregate benefits do indeed exist, and even though we have seen in practice that competition and free trade represent a powerful positive-sum game, there are bound to be visible—and vocal—losers. And this is bound to provoke outbursts of resistance. It is hardly surprising that establishing the Single Market should have been a slow and difficult process. But it is a very remarkable achievement which it is crucially important to preserve.

The Single Market is still not complete and there is a constant danger of backsliding. A number of the relevant directives have yet to come into effect. Restrictions and distortions remain, even in areas that are already in principle governed by European legislation, and there is work to be done to uncover and remove unjustifiable distortions. The European Commission, whose task this is, can hardly expect universal popularity!

But a huge amount has been achieved and the framework is in place for reaping a large part at least of the benefits of free trade within Europe. The question is whether we should attempt to do more to even out remaining bumps in the competitive playing-field through European legislation, or can things now be left quite happily to national discretion? Given how far we have already come, it is not at all clear that—in terms of the economic benefits—we need to go further with collective decisions. But would it be nevertheless desirable in principle to do so, and would it be possible in practice?

There is no clear-cut answer. We already have collective rules, and the means of enforcing them, in the more obvious areas. As a general principle, I suppose that one might argue incrementally that the more even the playing-field the greater the benefits of the Single Market. And I suppose that there is a presumption that removing restrictions and distortions, and reducing as far as possible the burdens on business, would be more likely to increase competitive efficiency than the introduction of new regulations. But while we clearly need some collective rules, it is equally clear that it would not be desirable—or feasible—to eliminate all competitive differences between the Member States. No-one has seriously suggested, for example, that wage rates should be harmonised across Europe!

That leaves a large grey area in between, relating perhaps more to matters of social policy than specifically economic policy, where there are deep-seated differences of view—both within the Member States of Europe and between them—on the appropriate policy choices. Policy action in these areas—whether collective action or action by individual Member States—may well involve economic costs. That does not necessarily mean of course that the

policy action should not be undertaken. But it does mean that we need to be clear about the motivation and aware of the economic implications, including, for example, the impact on overall fiscal policy or on employment incentives, as well as the impact on competitive efficiency. And we need to recognise too that decisions in these areas are necessarily constrained by the differences that inevitably exist between the Member States of the European Union and competing countries in the rest of the world.

There is every reason, it seems to me, for proceeding cautiously and pragmatically in these areas. There is a danger that we would put at risk what has already been achieved in establishing the Single Market if we were to proceed simply on the basis of harmonisation for its own sake, or for the sake of advancing political integration.

Monetary union

A similar calculus applies to the question of European monetary union. If we ask why we should be contemplating a move to monetary union, the economic—as distinct from the possible political—answer would have to be that the permanent elimination of exchange rate fluctuations between the Member States would promote economic prosperity within Europe by increasing further the benefits to be derived from the single European market. That is the case that I want to consider in the rest of my lecture this evening.

But let me first define more precisely what I mean by monetary union in this context. Most people think immediately of monetary union and a single currency in terms of the replacement of their familiar national banknotes and coinage by common European banknotes and coins. They think of familiar national currency prices of goods and services being redenominated in an unfamiliar European currency unit. This is understandable; but it seems to me to be unfortunate because, like so many aspects of the European debate, it immediately arouses political and popular sensitivities that tend to obscure the more fundamental economic issues. As someone said recently, the change from fahrenheit to centigrade may not have changed the temperature in the room, but it certainly raised the temperature of the debate!

From the economic perspective, monetary union requires the irrevocable locking together of exchange rates and a single monetary policy (that is effectively uniform short-term interest rates) independently pursued by a single monetary authority, the European central bank.

There is an important question about whether people would ever be totally persuaded that exchange rates really had been irrevocably fixed—even though this would have been enshrined in both European and national legislation—so long as national currencies had not in fact been withdrawn in favour of a single European currency. But, in principle at least, this is not a necessary condition for monetary union. As my colleague, Dr Duisenberg, President of the Nederlandsche Bank, has pointed out recently, it would be

possible for national currencies to continue to be used alongside or instead of the European currency unit for a generation—even in principle indefinitely. And in practice, there is bound to be a relatively long transitional period during which this occurs anyway, because in the nature of things it will take time, for example, for new notes and coins to be produced, and for financial institutions and retailers to prepare—which can only seriously begin once decisions have been taken on when monetary union will start and which countries will participate.

Perhaps this is a point which I do not need to labour here in Luxembourg. You still retain your own currency despite having been in monetary union with Belgium for decades. But it is a point which is less well understood elsewhere. Once exchange rates are irrevocably fixed, Deutsche Marks or francs or pounds, for example, would become simply different—albeit broken-amount—denominations of the European money, immediately convertible into each other or into the European currency unit through the introduction of the appropriate constants into banks' accounting systems.

Now the practicalities of all this certainly need to be properly explored. It may be that, as a matter of convenience, people would choose to switch from their national currencies to a common currency quite rapidly—especially for larger financial transactions. But it is important that the debate about monetary union does not become bogged down in the technicalities of a single currency, at the expense of the more fundamental issue of whether irrevocably to fix exchange rates in the first place. It would be a classic case of the tail wagging the dog!

So what, then, are the potential benefits and the possible risks of monetary union in this more fundamental sense? I start with the potential advantages.

I certainly would not question the view that sustained monetary and exchange rate stability within the European Union is wholly desirable and would substantially increase the benefits of the Single Market by improving the efficiency of resource allocation within Europe. Monetary stability is desirable in itself—whether regionally or nationally—as a necessary condition for sustainable growth and to reduce the risks of long-term investment. And it contributes to real exchange rate stability, encouraging investment to be located where, within the European Union, it is most productive.

Now, how far monetary union would contribute to this is a matter of degree. Countries individually have a strong national interest in pursuing monetary stability quite independently of the European dimension. I doubt whether we would be contemplating monetary union at all if it were not for the strength of the consensus that has emerged over the past decade and more—within Europe, but also much more widely—on the crucial importance of monetary stability to economic prosperity. And if we were all individually successful in pursuing domestic monetary stability, then that would help to produce some measure of exchange rate stability. In other words, some of the

undoubted advantage of monetary and exchange rate stability could be achieved, in principle, without formal monetary union.

The economic argument for monetary union is that it would deliver greater union-wide stability in practice and, importantly, that it would carry greater conviction with investors that intra-European stability would be maintained into the medium and longer term. Given past experience of both domestic and exchange rate instability within the countries of Europe, I am inclined to agree that there is substance in this.

The single monetary policy would anyway be beyond the reach of national governments if they were tempted to seek a short-run increase in output at the expense of higher inflation. And the Maastricht Treaty logically imposes continuing constraints on excessive overall fiscal deficits, although within those constraints overall fiscal policy, as well as decisions on taxation and expenditure separately, are matters for national governments. Given this, and given that monetary union removes the safety valve of exchange rate realignment within Europe so that this escape route would no longer be available, persistent relative inflationary pressures in one part of the monetary union would tend to be punished by falling economic activity and rising unemployment. That realisation ought to make inflationary price or wage behaviour in the private sector too less likely than hitherto.

Even so, monetary stability within Europe would not be guaranteed. It would depend upon how successfully the independent European Central Bank pursued its mandate to maintain price stability within the monetary union as a whole. But there is no reason to suppose that it would be less successful than European countries generally have been in the past in pursuing price stability through independent national policies—rather the reverse.

Some people argue that even if, as a matter of degree, monetary union did make for greater monetary stability within Europe than would otherwise be achieved, national acceptance of such a strong external discipline would be a high price to pay. That, of course, is intrinsically a political judgment. But it would be a mistake to imagine that the discipline of monetary stability could be avoided without monetary union. If anything, that discipline would be more important for countries that did not participate, because they would have to demonstrate that remaining outside monetary union was not simply seen as a soft option. Otherwise they would be likely to suffer in terms of both financial and physical investment, and their economies would remain vulnerable to disruptive intra-European capital flows.

While European monetary stability can in principle be achieved without monetary union, and while this could deliver *de facto* relative exchange rate stability, this would not provide the business community with certainty about intra-European exchange rates over the medium and long term. That would be a unique advantage of monetary union. Opinions nevertheless differ on just how great an advantage

it would be, given that market mechanisms for eliminating the exchange risks are available—at a price.

Similarly, monetary union—even without a single currency—would yield some benefits in terms of intra-area transaction costs. But while this is undoubtedly a factor on the plus side, it is certainly not significant enough on its own to be decisive.

What, then, is the economic case on the other side? Essentially, the argument is that there are, and could continue to be, significant economic differences between the member countries of the European Union that could cause tensions between them that would be difficult to relieve without the continuing possibility of exchange rate adjustment between the member currencies. In that case, in monetary union the monetary policy appropriate in some countries would be inappropriate in others, leaving the European Central Bank in a dilemma as to what (single) monetary policy to pursue.

People point to the problems that arose within the ERM, as a result of the economic ‘shock’ of reunification, as an example of the sort of tensions that could arise. It is certainly true that that did produce a situation in which the appropriate monetary policy in Germany was excessively tight for the conditions prevailing elsewhere in Europe—and while the circumstances in that case were, of course, quite exceptional, it is possible to envisage other shocks which could have similar asymmetrical effects.

The possibility of inadequate convergence is explicitly recognised in the Maastricht Treaty, which lays down more or less precise criteria designed to ensure that conjunctural convergence, at least, is achieved before any move to the irrevocable locking of exchange rates. Those criteria relate to relative rates of inflation, to exchange rate stability and to relative long-term interest rates—all observed over a qualifying period—as well as to fiscal deficits and public debt ratios. The Treaty also, as I noted earlier, contains on-going provisions to prevent the subsequent emergence of excessive national fiscal deficits.

There is a concern that the Maastricht convergence criteria are not in themselves sufficient. The worry is that it may be possible for a country to meet the Maastricht criteria—which relate to nominal values—at a particular point in time, but with no assurance that such convergence could be sustained into the medium and longer term. What matters fundamentally for the successful functioning of monetary union is that economic convergence is capable of being sustained.

This concern has increased with the growing recognition of serious disequilibrium in the European economy reflected in the very high levels of unemployment almost everywhere, but differing substantially from one country to another. Among the larger countries, the rate of unemployment in December 1994, as measured by Eurostat, ranges from 6% in the western part of Germany through 9% in the United

Kingdom, 11½% in France, 12% in Italy, to 23% in Spain. The problem of unemployment is now acknowledged almost everywhere as much the most urgent problem currently facing Europe. Some part of the problem is certainly cyclical, though we do not know just how much of it is cyclical in any particular case. That in itself makes the Maastricht convergence criteria more difficult to interpret.

But to differing degrees in different countries much of the present unemployment is more fundamental, and is unlikely to be eroded by the present cyclical expansion. This longer-term problem of unemployment reflects, at least in part, structural features of the European labour market, which also differ from one country to another—for example in the degree of flexibility in wages and other conditions of employment, or in the degree of non-wage, social costs of employment. It is being addressed, variously, through structural policies nationally and through measures such as those that are being explored by the European Commission and debated by the European Council. But it will not easily go away. And it could, in fact, become more difficult to resolve within monetary union as a result of on-going differences between member countries, for example as a result of differences in rates of productivity growth or unrelated differences in earnings growth, or as a result of divergent demographic trends and associated differences in dependency ratios.

Now I do not pretend to know—I do not think anyone can really know—how all of this will evolve over the next few years. It is possible that we will see clearer evidence of real convergence, between some countries anyway, that would reduce the risk of tensions arising between them in monetary union. But we cannot—at this stage, at least—rely on that. It is precisely because this is so uncertain that it is difficult to know whether nominal convergence in the Maastricht sense really would be sustainable, even if the Maastricht criteria are rigorously applied—as they clearly must be. Given the uncertainty, it cannot be excluded that resolution of the problem of wide differences in structural unemployment levels will ultimately require adjustments in relative real wages—whatever the present differentials. And given the real-world inflexibility of nominal wages, it cannot be ruled out that there will be a continuing need for exchange rate adjustment to help to bring that about.

I do not suggest that the Maastricht criteria should be changed to take account of all this. I am concerned with the substance rather than the form. The important thing is that we should be confident that convergence is real and that it is sustainable, before moving forward. It is in no-one's interest for that decision to be fudged.

If it were to be fudged, the costs could be substantial. The European Central Bank is, quite rightly, required by its statute to set the single monetary policy so as to maintain price stability in the monetary union as a whole. In that case—and if inadequate sustainable convergence were not to result in long-term stagnation and unemployment in some parts of the union—there really are only two possible

adjustment mechanisms, neither of which on present evidence looks likely to be particularly effective.

First, there is the possibility of migration from areas of high unemployment to areas of lower unemployment. This possibility already exists in principle under the Single Market provisions for the free movement of labour. But in practice, actual labour mobility within the European Union remains limited. In 1992, less than 5% of the total resident population in EU member countries was foreign, and only one third of them originated from other EU countries. Monetary union in the United States, for example, relies upon much greater labour mobility than this implies.

Secondly, there could be pressure for larger fiscal transfers from countries with lower unemployment to countries where unemployment was higher. In fact, the size of the EU budget currently amounts to less than 1¼% of EU GDP (compared with an average of about half of GDP accounted for by national government spending in EU countries). Fiscal transfers from the western to the eastern part of Germany amount to 4% of all-German GDP.

Neither of these possibilities is particularly attractive. Either long-term stagnation in some countries or the rapid expansion of these adjustment mechanisms could become a source of political, as well as economic, disharmony within Europe, rather than monetary union acting as something that brings us closer together.

My purpose this evening, Mr Chairman, has been to identify the issues, not to point to conclusions. I have no doubt at all that the Single Market brings huge economic benefits to Europe as a whole and to its individual Member States. There may be advantages in extending it into other policy areas—though proposals in this sense need to be examined very carefully on their economic merits and not pursued simply for their own sake. The same applies to monetary union. There are potential economic advantages in monetary union to the extent that it would increase economic and monetary stability within Europe and make the Single Market more effective. But there are also potential economic risks in moving ahead before sustainable convergence is assured. It would be an enormous step. A decision to take that step is, quite rightly of course, a decision that has to be taken through the political process. But it must be in the interests of the European Union as a whole that that decision is informed by a careful and dispassionate assessment of the economic arguments.

It is not a decision that can, or should, be taken now. We all have our work cut out to achieve economic and monetary stability, and to address the problem of structural unemployment within Europe, through our independent national efforts and through European co-operation. And we have a great deal still to do in continuing to explore both the economic and technical conditions that would need to be met before any decision could be made. The important thing at this point, Mr Chairman—or so it seems to me—is that we all carry forward this work patiently and with an open mind.

Banking supervision in the transitional economy

Brian Quinn, Executive Director, Financial Stability at the Bank, considers⁽¹⁾ some of the challenges confronting banks and banking supervisors in countries making the transition from command to market economies. Among the general problems facing banks is the need to conduct their business in step with the changing pattern in the wider economy; more specifically, they have often inherited poorly-performing loans from the previous regime, and have to operate in money markets that are not yet well developed. A number of supervisory elements seem particularly important for countries in transition: including adequate assessment of the fitness and properness of a bank's owners, directors and managers—and of the links between a bank and its owners—and the assurance of adequate capital, given the uncertain operating environment.

A sound and efficient banking system is an absolutely fundamental element of a market economy. The balance sheets of commercial banks are virtually a mirror of the economic and commercial life of the country; their assets and liabilities represent the activities of all economic agents—consumers, savers, investors, companies, governments. Banks exist to facilitate the economic intercourse of the nation and to do so in a way that combines confidence in their own financial strengths with the provision of products and services that people want, and at a price that reflects the risks of intermediating between savers and borrowers. This is why banks are special.

Countries seeking to move from command to market systems, of course, know this well enough—at least instinctively. But instinct is not enough. What they are looking for is the path that takes them from where they are to where they want to be, and preferably with as few accidents and alarms as possible along the way. They may sometimes feel that the problem is not lack of advice, but a surfeit of it. It may seem to them that there are too many things that they are told need to be done.

For example, they are told that a banking system will not be able to function properly unless there is a properly established law of property, including bankruptcy arrangements; and that an infrastructure that includes reliable accounting laws and conventions is a vital precondition for a sound banking system. This is undoubtedly so: paradoxical as it may seem, the foundations of a sound banking system have to be securely based on contractual arrangements that encompass the possibility of failure. However, rather than repeat these points—which I am sure will be driven home more effectively by others—I thought it might be helpful to look at some of the challenges facing banks and banking supervisors during the transition process. If this does not necessarily chart a path from the command to the market economy, it may nevertheless mark out some of the more important milestones along the way.

The nature of the transition

Let me start by offering some observations at a general level. Perhaps the first—and maybe the most important—point is that the way in which banks conduct their own business cannot be out of step with what is going on in the wider economy. This is true, of course, regardless of the state of development of any country, but it presents particular problems to those converting to the market system.

The transition process is essentially one in which resources are *increasingly* allocated by relative prices—and by changes in relative prices—rather than by administrative decision. Banks have to move in step with their customers, on both sides of the balance sheet, if they are not to experience fundamental problems. If they fail to price their loan and deposit products in a way that reflects the appropriate ratio of risk and reward, they will, of course, pick losers rather than winners, with predictable effects on their performance and perhaps even their capacity to survive. The riskiness and profitability of their customers will, however, be significantly determined by the stage that the economy has reached in the transition process. Some sectors will be more open, more deregulated than others; and the degree of government involvement will also vary, sometimes sector by sector, sometimes firm by firm.

Price signals—which are the mechanism by which decisions are made—will be difficult to read, since profitability of the customer or sector will not always be the only or main force at work. The point is that this is a process, not a steady state; and so the banker has not only to be continuously alert to changes in the structure of the economy as the transition proceeds, but has to be quick to price his (or her) whole range of products and services accordingly. Now this is easier said than done.

This point may be worth elaborating since it is pretty basic. Bankers in developed market economies are in a position to price their loans in such a way as to take account of the

(1) In a speech at the European Bank for Reconstruction and Development's annual meeting in London on 9 April.

differential effect of changes in interest rates on their customers' business. For example, the real-estate sector is customarily more sensitive to changes in short-term interest rates than most other sectors. This observation is supported by experience over several cycles of economic activity. Changes in the structure of the economy may take place over this period in a way that affects the precise degree of sensitivity of the sector to interest rate changes, and bankers have to be conscious of those changes and reflect this in their loan rates. That they have not always done this successfully can be seen from the losses posted in many countries in recent years.

However, the challenges facing bankers in these cases are minor when compared with the effects of moving from a state-controlled to a market-orientated property sector in a piecemeal and sometimes unpredictable way. Assessing credit risk in a developed market system, where relative prices are constantly changing, is already very difficult; but at least one central assumption—what can I expect to happen if my counterparty is unable to meet his obligations—no longer necessarily applies.

How are bankers in transition to cope? There is, I am afraid, nothing more that they can do than try to keep fully informed of the changes going on in the economy, pressing continuously for more and better macroeconomic and microeconomic data and talking continuously to their customers. And—here is the hard part—they must price their products and services to allow for the higher uncertainty that attends their operations in this environment. Finally, they should warn their wives and families that they are unlikely to win many popularity contests.

Let me now move from general observations to some more specific matters in addressing the transition. Firstly, there are the problems that arise in the earliest stages of transition. These are, I am sure, familiar to most of you. The first and almost certainly least useful comment is that one is too often starting from the wrong position. The new banks too often inherit the problems of the past. Poorly-performing economies mean poorly-performing loans. But they do not go away, as if by magic, when the banking system is reformed. These loans represent a drag on earnings, and can seriously deflect managements' energies from the more productive and rewarding job of serving the needs of economic agents who are finding their own way in the evolving market economy. Managers of companies, whether they be in brand new firms or from converted state-owned companies, may have limited experience of financial planning or of business planning more generally. Both sets of managers have the job of learning about financial management and applying it at the same time. It is little wonder that mistakes are sometimes made. Indeed, it is perhaps not a great exaggeration to say that both the bankers and their customers proceed by learning from one another's mistakes.

In discussions of these matters, attention tends to focus on credit, for reasons that are easy to understand. However, in

the early stages of transition, when money and interbank markets are not well developed, the management of liquidity may represent every bit as much of a problem. Bankers have to be more self-reliant in ensuring that they can engage in maturity transformation—and therefore make money—and nevertheless meet all of their obligations as they fall due. And here, as in credit, they cannot run far ahead or behind of what is happening in the market-place; otherwise they risk having a profitable business that cannot meet its need for cash and that, as we know, spells the end for a bank. In practice, this means that banks must take a close interest in the authorities' activities in the financial markets and encourage them to develop the necessary infrastructure in the form of money-market instruments and efficient payments systems; and the banks must stand ready to play their part in establishing this infrastructure.

Banking supervision

Let me now turn to the subject of banking supervision and the role it plays in the process of transition.

It is, I think, important to recognise that the stability of any banking system is determined by a package of factors the elements of which may vary to some extent in their detail, but which essentially remain the same; and which are mutually interdependent. At the most general level, the stability of the system depends upon the arrangements for the supervision of financial institutions, the deposit insurance scheme and any public safety net provided by the central monetary authorities. Each plays off the other and it is important that attention is given to them as a balanced package, rather than looking at them in isolation. The behaviour of both bankers and their customers is dominated more by these factors than they sometimes appreciate.

At the bottom of it all is the blend of market discipline and official intervention which the package delivers. There are three things to say about this blend. Ultimately it is a political decision, in the sense that the blend will reflect the social objectives of each country. Some will place a higher priority on the protection of the consumer than others, just as some will show greater trust in the market mechanism as a disciplinary force than others do. Secondly, the part played by the constituent parts—as well as the thrust of the package as a whole—may be expected to vary as the transition proceeds. In the earlier stages, it may be necessary to adopt a fairly generous and forgiving attitude to bank failures, given the need to avoid severe shocks to savers and to the evolving banking system. But that approach may have to change fairly soon if moral hazard is not to impose unacceptably high indirect costs on the same savers.

Thirdly, among the three elements of the package there is least room for compromise in the system of supervision. The banking system never will become strong if the supervisory arrangements do not seek to reflect the highest international standards from the earliest stage—consistent with the state of evolution of the national laws and accounting conventions, of course. It can also be helpful to introduce a two-stage process in considering whether to take

supervisory action: are the prudential requirements being met and, quite separately, if they are, is it in depositors' interests that the banking supervisor should use his powers? This leaves open the option that other official or private remedies may be applied.

Before I go on to say more about the supervisory arrangements themselves, I feel I must say something to contradict any impression that it is entirely, or even primarily, the duty of the supervisor—or the authorities more generally—to protect depositors. From the very earliest stages of transition, the banker has to recognise his responsibility for the safety and soundness of his institution and for its creditors. He should put official supervision support in all of its manifestations out of his mind, and tell himself that he and only he (or she) is responsible for the success or failure of his institution.

Of course, telling himself this is only the beginning of his job, and must be supported by practical and workable systems and controls with the aim of limiting risk. There must also be a professionally trained internal auditor with access to an audit committee, which stands apart from management, or to the board of directors. Supporting these internal controls will, of course, be the external auditor who, in discharging his own legal responsibilities, nevertheless should develop a working relationship with the internal auditor. Together they can constitute a powerful safeguard against imprudent or dishonest behaviour, not only within the bank but also by customers or other outsiders. These three players—the manager, the internal auditor and the external auditor—form the corporate safety net. They are much closer to the action day by day, and so are both in principle and in practice the best safeguards against serious problems.

Supervisory criteria

Coming back to official supervision, here too one should think of the banking supervisor as providing a package of functions which are mutually interdependent and mutually reinforcing. The process of authorisation, the on-going supervisory arrangements, and the provisions for restricting or withdrawing authorisation must mesh together; no part is more important than the other. That said, I should like to concentrate on one or two elements in the supervisory package which seem to me to be of especial importance in the transition phase.

Banking supervision may appear to be about numbers and ratios, but is essentially and fundamentally about people. If the owners, the directors and the managers of a bank are not suitably equipped to play their separate parts, then one can predict confidently that trouble will arise sooner or later. For this reason, I would argue that it is vital that the authorisation criteria include one relating to the fitness and properness of each of these classes of people.

Clearly, whether a person is fit and proper to carry out the job which he occupies is a matter of judgment—indeed one of the most difficult judgments the banking supervisor has to

make. However, it need not be just as difficult as it may seem. There are certain guidelines which may be used which, though they are not capable of being scored or quantified in any objective way, can nevertheless break the process down into something which is more structured and manageable, and less likely to be capricious.

Let me offer some suggestions drawn from the Banking Act here in the United Kingdom. Is the individual in question honest and does he possess the necessary integrity to be entrusted with other people's money: for example does he have any record of infringement of the criminal law or other official regulations? Is he competent: does he have any experience or training for the job in question, and has he demonstrated this over a reasonable period of time, using his own money rather than other people's? Is he a man of probity and is his word to be trusted? Here again there may be objective evidence to support this from his previous business dealings. Is he diligent, does he pay sufficient attention to detail and show the adequate seriousness of purpose in the way he has conducted himself in the past?

It will be quite clear that these questions may be particularly difficult to answer in a country going through the transition process. There is an absence of experience on which to rely, and indeed the standard of what is acceptable conduct may be hard to pin down in a society in which values and attitudes are undergoing radical change.

The link between ownership and the bank is, I think, particularly problematic. Individuals or companies with both capital and enterprise will normally be in short supply in these circumstances, and it is common—and perhaps even natural—for new entrepreneurs to wish also to own or direct banks. They may also have very considerable influence with government, which would itself wish to see the transition to a market economy achieved successfully and with maximum speed. This is a potent combination, and the banking supervisor may face very considerable pressures in resisting the ambitions of newly-rich or powerful individuals or companies seeking to own, direct or manage the relatively new commercial banks.

That is not to say that banks cannot and should not be owned by individuals or companies whose main interests lie outside the banking system. One has to be realistic about these things and the practice is common enough in developed market economies. But if there is one phenomenon that recurs in banking crises more frequently than any other, it is the large, connected loan. This often begins innocently but too often ends in tears. Management has to be sufficiently independent of owners to refuse to accommodate the latter's requests for bank finance, except within limits defined by the law.

The role of capital

This brings me naturally on to the role of capital, the benchmark against which most restrictions on banks' activities are set by the supervisory authority. As I said earlier, everything matters; but few things matter more than

capital. The late Huib Muller, the last Chairman of the Basle Group of Supervisors, used to say that only three things mattered when the question arose about the safety and soundness of a bank: capital, capital and more capital. Banks need capital because of uncertainties about the value of assets. For all the reasons I have mentioned earlier, it is particularly difficult to value assets while an economy is undergoing a process of fundamental change. This is partly a matter of accounting conventions and techniques, since without a reliable means of measuring the value of assets the balance sheet of a bank lacks all proper substance. But beyond the question of accounting conventions, there lies the intrinsic difficulty of coming to a view on the value of any item where the market is illiquid and subject to unpredictable change.

The evolution of financial markets in developed market economies is leading bankers and banking supervisors to look increasingly at the concept of marking assets to market. If there is no market or if, more accurately, the market is truly in the early stages of evolution—when reliable values have not yet been established—then one can see how remote the concept of marking to market must seem to banks and banking supervisors coming from transitional economies. I remember that not very many years ago bankers and auditors would look to the Bank of England for some indication of the level of provisions that banks should raise against their portfolios of real estate. This arose from the fact that the commercial property market in the United Kingdom at that time was effectively moribund and the determination of a fair value for the property loan book was virtually impossible. There was no market liquidity. Without exaggerating the problem, I can imagine that, in some countries making the move to a market economy, this situation might be the rule rather than the exception. What do the bankers and banking supervisors do in these circumstances?

The answer, I believe, is that they must take great care to satisfy themselves that the bank has sufficient capital in the balance sheet to cope with a pessimistic estimate of the value of assets; the distinction between a going and gone concern can be crucial in this connection and poses a particular challenge for the supervisor.

The supervisor must also ensure that the bank is supported by proper capital. By this I mean that the banking supervisor should not compromise on the definition of capital. Given all the uncertainties, I am sure the bank manager shares this objective since it is surely in his best interests that the bank's assets are supported by as much equity as the owners can manage. I appreciate that this raises almost as many questions as it answers in countries where capital markets are themselves poorly developed. However the basic characteristic of capital is clear enough: those putting up the funds must understand with absolute clarity that what they are supplying is risk money and not loan funds. They must accept that they are last in line when any residual value is being paid out, if liquidation of the institution should ever be necessary. I would especially stress that bankers in the

transition should rely as much as possible on pure equity and should not be tempted into thinking that capital instruments with bells and whistles can ever provide them or their creditors with the same comfort.

Fraud and criminality

I made reference earlier to the uncertainties created by changing social values, and by lack of experience with financial planning and accounting techniques. These circumstances create opportunities for fraud and for criminal activities of other kinds through or on the banking system. Of course, this is not a phenomenon peculiar to economies in transition; there is good evidence that financial systems everywhere face new threats from this source. But the problem may be more acute in countries where the institutions are still in the process of changing from one system of economic management to another. All that one can say here is that the premium attaching to well-trained and hard-headed bankers and supervisors is high, and that developed countries should be ready to assist in providing practical technical help. It is also important that the authorities in both sets of countries set up arrangements for exchanging information on people and institutions speedily and efficiently.

Conclusion

The challenges for both bankers and banking supervisors in the transition are many and varied, and I have been able to mention only a few of the more obvious of them. The objective of 'no surprises' is especially difficult to accomplish. Nevertheless from what we in the Bank of England can see, there is no lack of determination from those facing the challenges to tackle them. The Know How Fund is an important part of the effort to give what we can to help.

But of course, the main input comes from the countries themselves. And the signs are on the whole good: I take encouragement from the willingness to adopt the Basle minimum standards as a model for banking supervision in many countries. International contact between supervisors also plays a vital part in the learning process. This can range from attendance at the biannual international conference of banking supervisors—held last year in Vienna and next year in Stockholm—to participation in courses organised by the Bank of England's Centre for Central Banking Studies both in London and in participating countries. We are certainly keen to continue to do our bit and to adjust our courses as countries move along the path to a full market economy. Finally, let me point out that our experiences are not really so very different, even in recent years. After all, deregulation and liberalisation is a matter of degree, and in many countries commonly thought of as having highly developed markets, the process really got seriously under way only in recent years. Credit ceilings were in place as recently as 1970 here in the United Kingdom. So delivering safe and profitable banking in a changing economy is a task in which we have all been engaged during our working lifetimes. Let us therefore be ready to learn from one another.