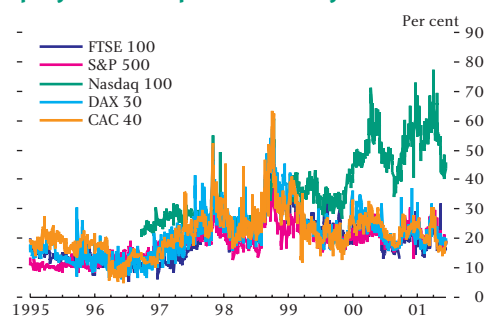


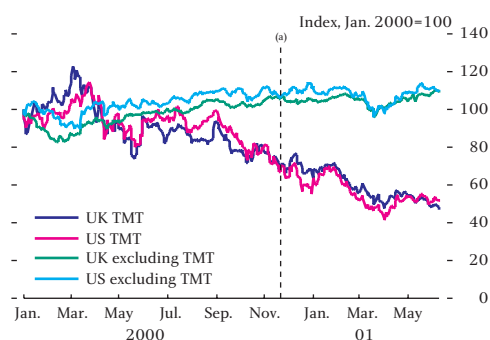
**Chart 23:**  
Equity index implied volatility<sup>(a)</sup>



Source: Bloomberg.

(a) Nasdaq series begins in 1997.

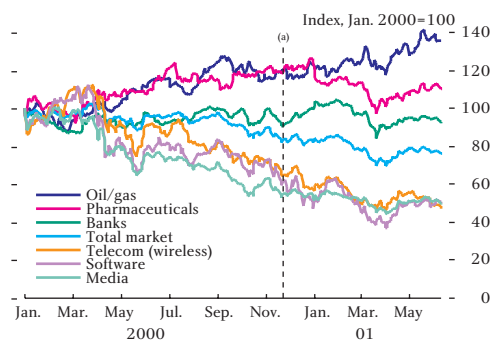
**Chart 24:**  
TMT and non-TMT share prices, UK and US<sup>(a)</sup>



Source: Thomson Financial Datastream

(a) December 2000 *Review*.

**Chart 25:**  
World sectoral indices<sup>(a)</sup>



Source: Thomson Financial Datastream

(a) December 2000 *Review*.

## II International financial markets

The deterioration in the US macroeconomic outlook and the monetary policy response have been the main factors influencing financial asset prices since the December *Review*. Another, closely related development has been the fall in global demand for information communications and technology (ICT) goods and the associated reassessment of the value of technology, media and telecommunications (TMT) companies worldwide.

### Equity markets

Major equity markets are lower than at the time of the December *Review* (Table 4). Price indices dipped sharply in the second half of March, but had recovered somewhat by mid-June. However they remain much lower than the March 2000 peaks. Indeed, the percentage fall in the Wilshire 5000 over the past 15 months is broadly comparable with the 1987 stock market correction; and the fall in the Nasdaq is larger. The decline in US market capitalisation, as measured by the Datastream total market index, has been some US\$4½ trillion or the equivalent of more than 40 per cent of GDP, significantly more than the reduction in wealth from the 1987 stock market correction (when the corresponding figures were US\$0.7 trillion and around 15 per cent of GDP respectively). An important difference from 1987 is that prices have fallen at a slower rate over a longer period – in 1987 the market peaked in October and troughed in December.

**Table 4: Major equity markets**

	24 Nov 2000	12 June 2001	Change (Per cent)
Wilshire 5000 (US)	12354	11632	-6
FTSE All-share (UK)	3030	2815	-7
CDAX (Germany)	529	482	-9
SBF 250 (France)	3887	3418	-12
Topix (Japan)	1342	1273	-5

Source: Thomson Financial Datastream.

This adjustment in prices has been accompanied by periods of high volatility across a number of markets, including developed world equity and US dollar bond markets (Chart 101 in Section VI). Measures of implied volatility from prices of equity index options – one indicator of uncertainty about future returns – have been high for the Nasdaq 100 in 2001 Q1, but have declined since March, suggesting that uncertainty may recently have been decreasing (Chart 23).

Underlying the changes in wider market indices are large variations in share price movements across different industry

sectors. Global sector indices that exclude the TMT sectors are slightly higher than a year ago and have been fairly stable since the December 2000 *Review*, except for a sharp dip in March (Chart 24). Relative to the world equity index, share prices in the oil and gas sector have increased strongly and those in the banking sector slightly less so (Chart 25). In contrast, TMT shares continued to fall globally until the end of March.

#### TMT equity prices

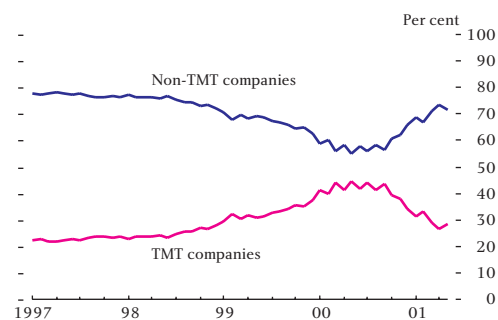
From March 2000 to March 2001, US TMT share prices fell by more than 50 per cent. At the peak, TMT companies comprised 45 per cent of the value of the US equity market<sup>3</sup> (Chart 26), although the output of the TMT sectors as a proportion of GDP was probably much smaller (around 9 per cent in the USA and 6 per cent in the EU in 1997<sup>4</sup>). Falls have varied in severity across different countries, reflecting different mixes of technology, media and telecoms companies (Chart 27).

In part, the decline of TMT share prices has been linked to the slowdown in the US economy. Investment in ICT equipment increased sharply in 1999 and 2000. Year 2000 preparations and the potential of the internet led many companies to invest at rates that may not have been sustainable. The subsequent fall in business investment has brought a reduction in demand for ICT goods, lowering the expected earnings of TMT companies at least for the immediate future.

The TMT reassessment, however, has been global, against a background of increasing global correlations between industry sector indices since the mid-1990s. Weekly price changes of US TMT stocks have been more correlated with those of European TMT stocks than with those of US non-TMT stocks since January 2000 (Chart 28). This probably reflects two factors. First, the industries are highly integrated, so that the same influences affect expected future earnings of companies in each region. Secondly, prices have moved as investors worldwide have changed the way in which they value TMT companies.

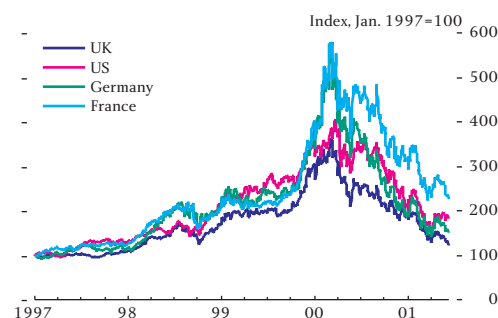
In retrospect, the rise and fall of TMT share prices globally shows many of the characteristics of the inflation and deflation of a bubble. Some investors based their decisions on expectations of how other investors would behave rather than on an assessment of future company earnings. The rise of day trading and flows into so-called 'aggressive growth' mutual funds were perhaps symptoms of a frothy market (Chart 29). This seems the most plausible explanation for some of the exaggerated valuations in early 2000 and the initial falls in 2000 Q2. Day trading has declined since, and turnover, particularly retail trading and via discount brokers, has fallen. For example, the daily average

**Chart 26:**  
Share of total US equity market (by market capitalisation)



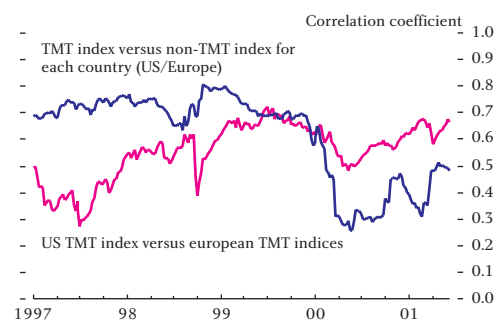
Source: Thomson Financial Datastream.

**Chart 27:**  
TMT indices for major European and US equity markets



Source: Thomson Financial Datastream

**Chart 28:**  
Average of pair-wise correlations of log returns<sup>(a)(b)</sup>



Sources: Thomson Financial Datastream and Bank calculations.

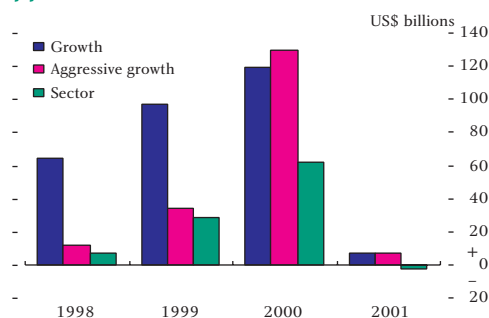
(a) Weekly correlations (of exponentially weighted moving average log returns) calculated over a five-year rolling window.

(b) European indices comprise the French, German and UK indices.

3: As measured by the Datastream total market index for the United States.

4: Estimates from *Measuring the ICT Sector*, p33, OECD (1999).

**Chart 29:**  
**Breakdown of flows into capital appreciation mutual funds<sup>(a)(b)(c)</sup>**



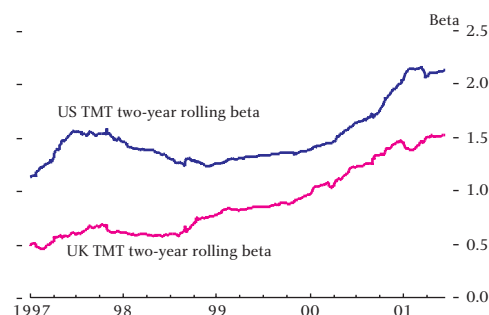
Source: Investment Company Institute.

(a) Growth funds invest primarily in common stocks of well-established companies.

(b) Aggressive growth funds invest primarily in common stocks of small, growth companies.

(c) Sector funds invest primarily in companies in related fields.

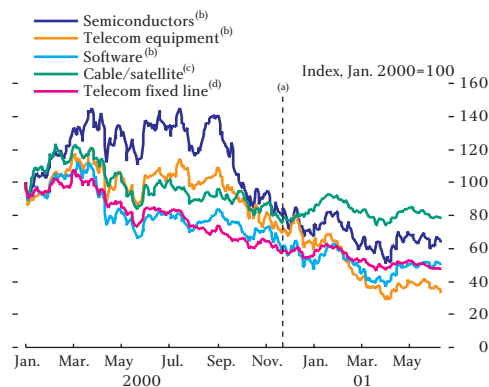
**Chart 30:**  
**US and UK TMT two-year rolling share price betas<sup>(a)</sup>**



Sources: Thomson Financial Datastream and Bank calculations.

(a) Betas are calculated against Thomson Financial Datastream World index.

**Chart 31:**  
**TMT global sectoral indices<sup>(a)</sup>**



Source: Thomson Financial Datastream.

(a) December 2000 Review.

(b) Technology.

(c) Media.

(d) Telecommunications

number of trades by all global clients of Charles Schwab in April 2001 was 39 per cent lower than in April 2000. Another feature of the market was the Initial Public Offering (IPO) boom, which some have suggested may have pumped air into the bubble. The subsequent volatility of many share prices following their IPOs may partly have been due to the relatively small share of total capital that was often publicly issued – typically around 20 per cent.

The further falls after September 2000 followed downward revisions to expected earnings of TMT companies. The risk premium required on TMT earnings may also have risen as it became apparent that the sector is, after all, subject to cyclical influences. If, for example, investors based their assessment of market risk on moving two-year share price betas – as proxied by the observed change in the value of US or UK TMT shares if the world equity index moves by one unit – their required risk premium would have tended to increase significantly (Chart 30).

But TMT is not a monolith. Since the December Review, share price movements across different TMT sectors have continued to vary (Chart 31). Globally, shares of media companies have fallen less than those of technology and telecom companies. The prices of telecom equipment manufacturers have fallen furthest, reflecting lower demand and perhaps concerns about their provision of so-called ‘vendor finance’ to telecom operators (see below).

### What is the risk of further equity price falls?

The correction in equity prices – especially the relatively gradual deflation of a TMT bubble – over the past year has probably reduced the risk of a dramatic collapse in markets. But could there still be a further correction?

#### Information from options prices

One way of assessing the likelihood of further price falls is to use information derived, on certain assumptions, from prices of options on equity index futures. Taking the TMT and non-TMT sectors together, the volatility of US and European share prices implied by equity index option prices is somewhat lower than at the time of the December Review (Chart 23). Market participants still appear to perceive a significant downside risk: the risk neutral probability assigned to a greater than 20 per cent fall in the S&P 500 in the next six months, based on probability density functions derived from index option prices<sup>5</sup>, is similar to that at the time of the December 2000 Review. But the probability distribution function (PDF) of future price changes is more symmetrical than it was in December, when it was skewed towards further price falls (Chart 32).

<sup>5</sup> See Box 3 of *The financial stability conjuncture and outlook* in the June 2000 Review for a description of the technique and its limitations.

### Equity valuations

Another way of assessing the risk of a future market correction is to look at the excess of market valuations over those generated by theoretical valuation models: the greater the divergence, the stronger the questions about the market's valuation (or about the theoretical techniques used). Charts 33 and 34 present the differences between observed equity price indices for the US and UK and hypothetical indices based on the assumptions that dividend growth in each country is expected to be at its long-run average, and that the equity risk premium is either 4 per cent or 2 per cent<sup>6</sup>. On the face of it, these charts suggest that, first, the UK market's valuation looks less at risk than the US market's and, second, the degree of any implied overvaluation has fallen over the past six months.

The problem is that there is no general agreement about what are the appropriate values of the key parameters used in those models. Indeed, the models are sometimes used to deduce the values of unobserved parameters, assuming that the market values equities correctly. To shed light on this, Box 1 explores the changes in the equity risk premium, expected long-run dividend growth, and expected long-run real rate of return on equity that would have had to have taken place to explain the movements in the US total market index under various assumptions.

### Credit markets

Many of the factors affecting equity markets – and in particular the outlook for earnings – have also been influencing the evolution of credit risk and so conditions in credit markets.

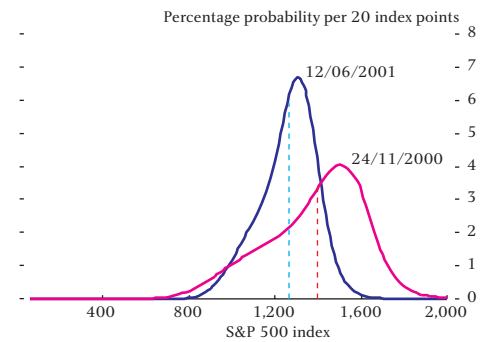
### Investment-grade bonds

Overall, markets are in better health than towards the end of 2000. Investment-grade corporate bond issuance has picked up, sharply so in the United States, and some multinational companies have been able to issue very large amounts (Chart 35 and Table 5). One reason for the fall in net issuance of commercial paper in the US market in 2000 Q1 may be that some companies have taken the opportunity to lengthen the maturity of their debt by issuing bonds.

There is no evidence that credit to good quality companies has been rationed. But some issuers – mainly telecoms firms – have continued to have to pay wider credit spreads than is typical for companies of their credit rating; and to concede clauses allowing for the coupon to increase in the event of a downgrade by the rating agencies. So investors appear – for the moment at least – to have become more discriminating.

<sup>6</sup> For example, a recent estimate of the average yield difference between US stocks (S&P composite index, calculated as the sum of the dividend yield and the average growth rate of dividends) and US Treasury bonds over the period 1926-1999 is around 4.3% but this yield difference falls to around 1% in the period 1990-1999. Jagannathan, R., McGrattan, E.R., and Scherbina, A. (2001) 'The declining US equity premium', Working Paper 8172, NBER.

**Chart 32:**  
**Implied PDFs for S&P 500<sup>(a)(b)</sup>**

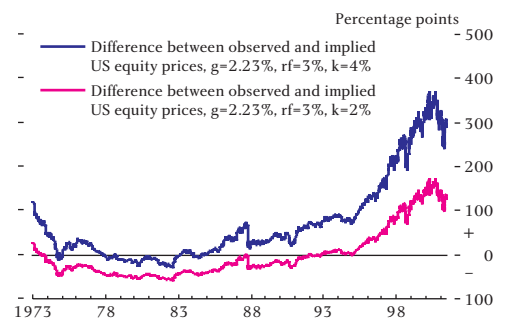


Sources: Chicago Mercantile Exchange and Bank calculations.

(a) Probability density functions calculated from three-month futures contracts.

(b) Dashed lines show the mean.

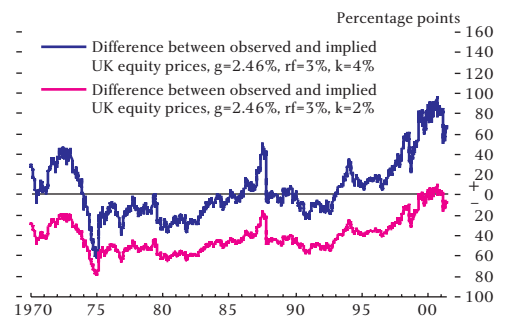
**Chart 33:**  
**Difference between observed and implied US equity prices<sup>(a)</sup>**



Sources: Thomson Financial Datastream and Bank calculations.

(a) See Box 1 for definitions of  $g$ ,  $r_f$  and  $k$ .

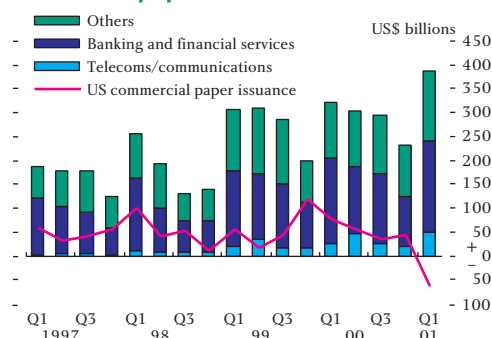
**Chart 34:**  
**Difference between observed and implied UK equity prices<sup>(a)</sup>**



Sources: Thomson Financial Datastream and Bank calculations.

(a) See Box 1 for definitions of  $g$ ,  $r_f$  and  $k$ .

**Chart 35:**  
**Non-government international bond and US commercial paper issuance<sup>(a)</sup>**



Source: Capital Data.

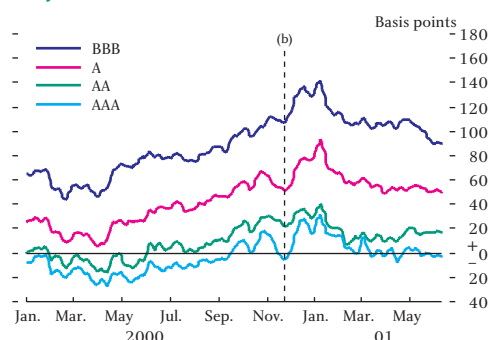
(a) Commercial paper issuance refers to all issuers and all net flows.

**Table 5:**  
**Largest corporate bond issuers since December Review**

Company	US\$ billions
France Telecom	19.8
Ford Motor Company	19.8
British Telecommunications	19.2
Daimler Chrysler	15.4
General Motors	15.2

Source: Capital Data

**Chart 36:**  
**US dollar investment-grade spreads over swap rates<sup>(a)(b)</sup>**



Source: Bloomberg.

(a) Ten-year maturity bond yields less ten-year swap rates. Five-day moving average.

(b) December 2000 Review.

Average investment-grade credit spreads in the United States and Europe are much the same as at the time of the December Review (Charts 36, 37 and 38). The continued fall in TMT asset values has, however, been reflected in higher credit spreads on telecom corporate debt. Spreads over swap rates on US industrial companies' A-rated bonds have returned to levels similar to those at the time of the June 2000 Review (although they are still higher than between 1997 and 2000). But spreads on US A-rated telecom bonds remain around 40 basis points higher (Chart 39). Nonetheless, perceptions of credit risk for large European telecom operators do appear to have improved since March, with spreads over swaps on bonds and credit default swap premia decreasing (Chart 40).

#### Sub-investment-grade bonds

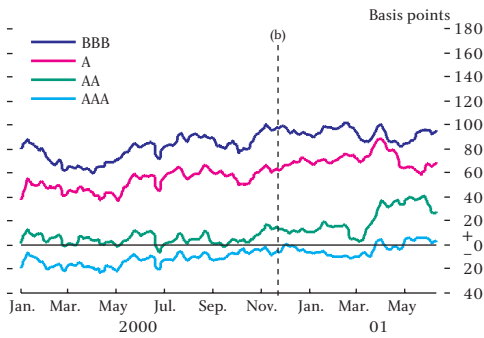
Average sub-investment-grade credit spreads are lower than in December (Chart 41)<sup>7</sup>. Market assessments of credit risk towards the lower end of the credit quality spectrum are more difficult to reconcile with the macroeconomic story of a temporary shock to the outlook for the corporate sector offset to some extent by monetary policy responses. In broad terms, the value of corporate equity has fallen somewhat, which is likely to have increased firms' gearing (measured at market prices). Asset returns in general are a little less uncertain than six months ago, judging by measures of implied volatility (Chart 23). Those two factors might have been expected to have had small but opposite effects on default risks among firms (as outlined in the December Review, where it was suggested that the Merton model for valuing individual stocks provides a framework for linking equity prices, uncertainty about asset values, and default risk)<sup>8</sup>. But for firms with lower quality credit ratings – outside the telecoms industry at least – default risk, as assessed by the market, appears to have fallen considerably. A possible explanation is that spreads over swaps of high yield bonds are based on quoted dealer prices, and that dealers reacted to a sharp decrease in market liquidity at the end of 2000 by widening their bid:offer spreads. On this basis, the reduction in spreads in 2001 may reflect lower liquidity risk as well as decreasing credit risk.

Another possible explanation, at least for the United States, is that the initial monetary easing by the Federal Reserve at the beginning of the year helped to reassure creditors that the downturn would not be allowed to push up default rates across the board (hence narrowing credit spreads), but that further policy action was necessary to convince market participants that medium-term growth prospects would be maintained (hence

<sup>7</sup>: The spread for Euro-denominated BB-grade bonds has been particularly volatile following two specific bonds being added to the index in January.

<sup>8</sup>: According to Merton's model, the price of risky debt should fall if the net asset value of the company (as reflected in the share price) falls closer to zero or if greater volatility in the share price indicates greater uncertainty about the value of the company's assets (see Box 1 of *The financial stability conjuncture and outlook* in the December 2000 Review).

**Chart 37:**  
Sterling investment-grade spreads over swap rates<sup>(a)(b)</sup>

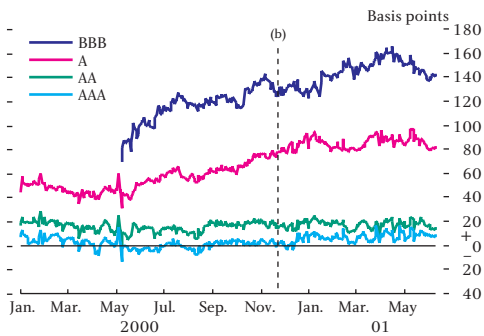


Source: Bloomberg.

(a) Ten-year maturity bond yields less ten-year swap rates. Five-day moving average.

(b) December 2000 Review.

**Chart 38:**  
Euro investment-grade spreads over swap rates<sup>(a)</sup>

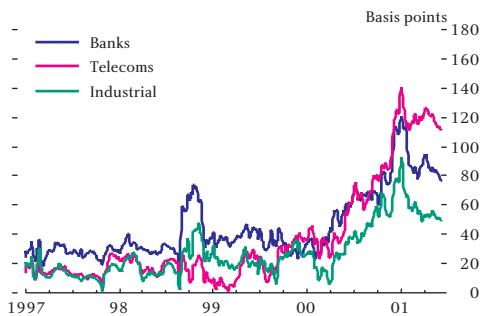


Source: Bloomberg.

(a) Ten-year maturity bond yields less ten-year swap rates. Five-day moving average.

(b) December 2000 Review.

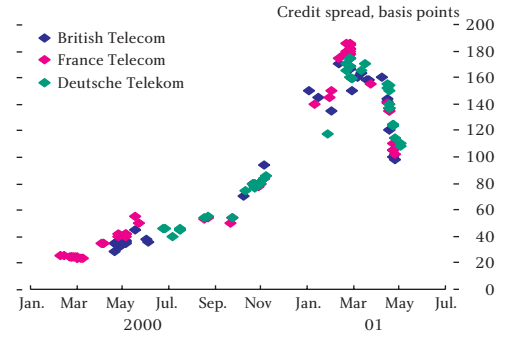
**Chart 39:**  
US A-rated spread over swap rates<sup>(a)</sup>



Source: Bloomberg.

(a) Ten-year maturity A2-rated bond yields less ten-year swap rates. Five-day moving average.

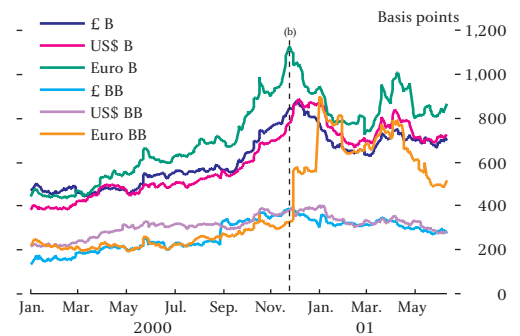
**Chart 40:**  
Five-year credit default swap premia for European telecoms<sup>(a)</sup>



Source: Creditex.

(a) Quoted offer prices on Creditex, an inter-dealer broker.

**Chart 41:**  
Sub-investment-grade corporate bond spreads: US dollar, euro and sterling<sup>(a)</sup>

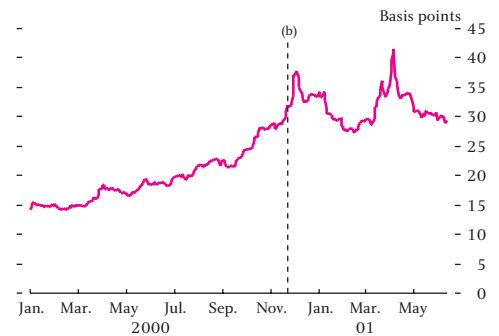


Sources: Merrill Lynch and Bloomberg.

(a) High yield indices spread over maturity-matched swap rates.

(b) December 2000 Review.

**Chart 42:**  
Dispersion<sup>(a)</sup> of US high-yield spreads

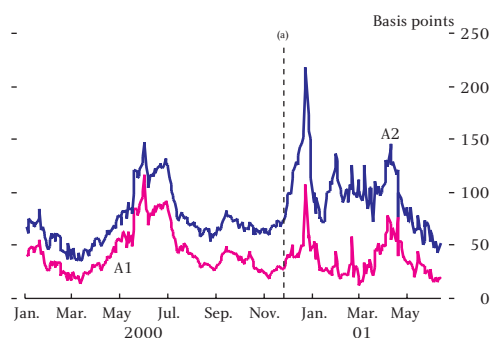


Sources: Merrill Lynch and Bloomberg.

(a) Dispersion is defined as standard deviation.

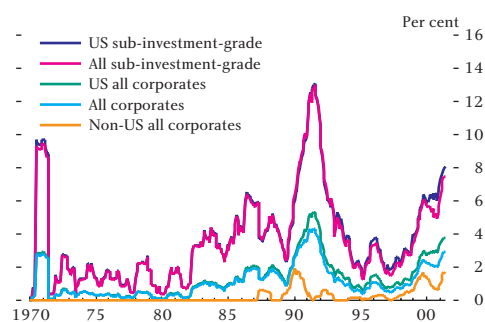
(b) December 2000 Review.

**Chart 43:**  
Commercial paper spreads to US treasury bills



Source: Bloomberg.  
(a) December 2000 *Review*.

**Chart 44:**  
Moody's trailing twelve-month default rates<sup>(a)</sup>



Source: Moody's Investors Service.  
(a) Defaults in the previous 12 months divided by the number of issues in the rating category 12 months previously.

**Chart 45:**  
Moody's rating drift<sup>(a)</sup>



Source: Moody's Investors Service.  
(a) Rating drift: issuer upgrades minus issuer downgrades, divided by rated issuers.

reversing the broadly-based March dip in equity prices). The fall in current and expected near-term nominal interest rates will also have helped to reduce somewhat the risk of cashflow problems for borrowers.

The small narrowing in the dispersion of US high-yield spreads (Chart 42) and the more significant reduction in the tiering of credit in the US commercial paper market (Chart 43), following sharp increases in December, also suggest that concerns about prospective creditworthiness in the nearterm may have diminished, despite the downturn in US GDP growth. On the other hand, according to Moody's, *ex post* default rates have increased sharply for sub-investment-grade issues (Chart 44), and ratings drift (upgrades minus downgrades as a proportion of rated issues) has turned negative (Chart 45). These data may reflect risks already discounted in the market last autumn, and news this year may have improved the outlook. Moody's forecast that sub-investment-grade default rates will start to fall at the beginning of next year, which is not inconsistent with that possibility.

#### *Alternative telecom operators and vendor finance*

The US domestic and, to a lesser extent, the international sub-investment-grade bond markets reopened in the first half of 2001 (Chart 46). But issuance by sub-investment-grade telecom operators has remained low, with the exception of a few large convertible bond issues by stronger companies<sup>9</sup>. The spread over swap rates of Merrill Lynch's sub-investment-grade telecom bond index is, at around 12 per cent, nearly three percentage points higher than at the time of the December *Review*, although it has fallen since April 2001 (Chart 47). Moody's data show that, globally, sub-investment-grade telecom sector borrowers defaulted on US\$6.5 billion of debt in 2000, almost 90 per cent higher than 1999. This was the largest amount by any single sector, and accounted for 13.3 per cent of all defaults (by dollar value). But credit losses have so far still been relatively low, and the main losses have been to the market value of bonds.

With the effective closure of the sub-investment-grade bond market in 2000, equipment suppliers were left as one of the only remaining sources of finance for many so-called 'alternative' telecom operators<sup>10</sup>. In the United States, some equipment suppliers have provided additional funds to such companies, but some have also had to make provisions against loans and to write down the value of equity investments. For example, Lucent Technologies' earnings in 2001 Q2 included a large provision

<sup>9</sup>: See Section VI for a discussion of convertible bond issuance and convertible bond arbitrage.

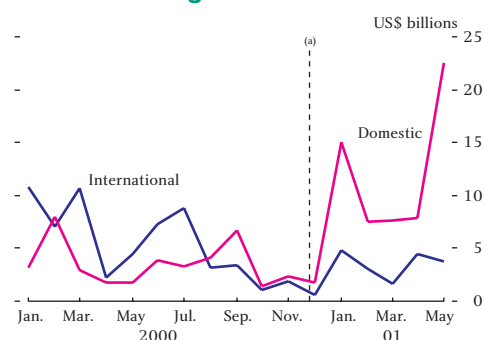
<sup>10</sup>: Including companies using new technologies to develop long distance networks, start-up cable operators, start up mobile telephone operators and those entering deregulated local telecom markets (competitive local exchange carriers or CLECs) in the US and, to a lesser extent, Europe.

against loans to Winstar Communications, a US telecom operator which had entered Chapter 11 proceedings. In Europe, equipment manufacturers are thought to have provided a major share of the finance this year for construction of 3G networks, especially by new entrants. In some cases, they have provided significantly more finance than needed to purchase the equipment they were selling to the network provider. Equipment providers have also provided vendor finance to telecom operators in Asia and Latin America.

On the one hand, equipment suppliers may be in a good position to assess and monitor loans, because they should understand the industry. On the other, they may have incentives to lend even if they have doubts about a borrower's creditworthiness, because the alternative is loss of market share, growth in inventories, and delays in the construction of infrastructure. Lending in order to finance sales might also raise questions about quality of earnings and the timing of income recognition.

Large vendor finance portfolios may mean that companies have concentrations of credit risk on their balance sheets even if their underlying business is strong. Portfolios are likely to be undiversified and credit quality may be correlated with the equipment manufacturers' earnings. Both factors would tend to increase risk. While many equipment manufacturers have relatively low debts and annual accounts suggest that long-term customer receivables were, in most cases, relatively modest at end-2000, this position may change quickly and some contacts have aired concerns about a lack of transparency in some vendor finance commitments. Estimates are that a half or more of vendor facilities are undrawn and companies will need to manage their own liquidity as these are drawn down: for example by arranging new bank facilities. Although a number of companies have securitisation programmes for finance receivables, it appears that investors sometimes have recourse to the manufacturer.

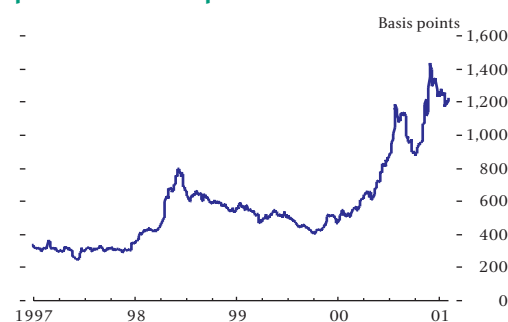
**Chart 46:**  
Sub-investment-grade bond issuance



Sources: Capital Data and SDC Platinum.

(a) December 2000 Review.

**Chart 47:**  
Sub-investment-grade telecom bond spreads over swap rates<sup>(a)</sup>

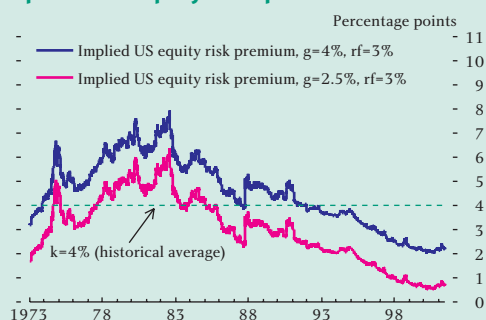


Sources: Merrill Lynch and Bloomberg.

(a) Yield is spread over maturity-matched swap rate.

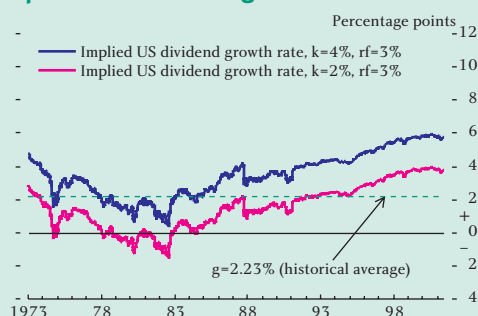
## Box 1: Equity market valuations

**Chart A:**  
Implied US equity risk premium



Sources: Thomson Financial Datastream and Bank calculations.

**Chart B:**  
Implied US dividend growth rate



Sources: Thomson Financial Datastream and Bank calculations.

What changes would be required in the major determinants of equity price indices to explain the large increases since the mid-1990s? Possible answers can be derived using the simple Dividend Discount Model (DDM), as discussed in Box 3, pp 19–20, of the June 1999 *Review*. According to the DDM, equity prices ( $P_t$ ) are determined by the present value of expected future dividends:

$$(1) \quad P_t = \frac{D_t(1+g)}{(k+rf)-g}$$

where the current (nominal) flow of dividends is  $D_t$ , real dividends are expected to grow at a constant rate  $g$ , and  $k$  and  $rf$  are a constant equity risk premium and risk-free real interest rate respectively. An acceleration in equity price indices could be triggered by falls in the equity risk premium or risk-free real interest rate, increases in the expected real growth rate of dividends, or more rapid general price increases inflating the nominal value of dividends. These are treated here as exogenous variables but, in reality, they are likely to interact – for example, a rise in the expected growth rate of dividends might lead shareholders to expect an increase in their lifetime incomes, leading them to borrow to increase their current consumption and therefore putting upward pressure on real interest rates.

Rising inflation can be ruled out as an explanation for the increase of the past few years. But recent academic literature argues that the equity risk premium might have fallen or appeared to fall during the 1990s, for a variety of reasons:

1. Greater opportunities for portfolio diversification, both domestic and across borders<sup>1</sup>;
2. Increased participation in equity markets<sup>2</sup>;
3. Past unexpected capital gains on equities exaggerating estimates of the equity risk premium based on differences in realised returns on equities and bonds<sup>3</sup>;
4. Falling trading costs<sup>4</sup>;
5. Investors acting as if they were insured against downside risk by the Federal Reserve<sup>5</sup>, the so-called 'Greenspan put'.

**1:** Jagannathan, R., McGrattan, E.R., and Scherbina, A. (2001) 'The declining US equity premium', Working Paper 8172, NBER.

**2:** Heaton, J. and Lucas, D.J. (2000) 'Stock prices and fundamentals', NBER Macroeconomics Annual.

**3:** Fama, E.F. and French, K.R. (2001) 'The equity premium', Working Paper 522. Center for Research in Security Prices, Graduate School of Business, University of Chicago.

**4:** Domowitz, I. and Steil, B. (2001) 'Innovation in equity trading systems: The impact on Transaction Costs and Cost of Capital', Princeton University Press, January 2001.

**5:** Miller, M., Weller, P., Zhang A. (2001) 'Moral hazard and US stock market: Is there a 'Greenspan put'?', mimeo, University of Warwick.

Chart A shows, for the United States, how the premium would have had to have fallen almost to zero to explain movements in the US total market index, assuming expected annual real dividend growth of 2.5 per cent (around the historical average) and a risk-free rate of 3 per cent. Even if investors now expected real dividend growth to be 4 per cent annually as a result of higher trend productivity growth, the premium would have had to have fallen to around 2 per cent, well below most estimates of the average over the second half of the 20th century. Another possibility is that the real risk-free interest rate has fallen. But the US Treasury Inflation Protected Securities (TIPS) market suggests that, if anything, medium-long term real rates probably rose between 1997 and the beginning of 2000. A third possibility is that expected annual real dividend growth has increased. Chart B shows that it would have had to have risen to almost 6 per cent, assuming an equity risk premium of 4 per cent; or to almost 4 per cent if the risk premium has fallen to 2 per cent. In either case, these rates are well above the long-run average growth rate of just over 2 per cent.

One possible reason expected dividend growth rates might have increased is that, since the mid-1990s, fewer US firms have been paying any dividends, despite higher earnings, and those firms still paying dividends have been paying out a smaller share of their earnings (Table A)<sup>6</sup>. More companies are repurchasing their stock, although the effect on these calculations should be limited because they are based on dividend yield per share. Firms may also have been reinvesting a higher share of earnings with the intention of boosting future earnings growth. It is possible to incorporate changes in corporate dividend policy in the DDM, assuming that increased retention of post-tax earnings are used to finance more investment. Assuming further that the reinvested funds are expected to earn the same real rate of return ( $r$ ) as existing assets and that that rate is expected to be unchanged, equation (1) is replaced by:

$$(2) \quad P_t = \frac{D_t(1+rb_t)}{(k+rf)-rb_t}$$

where the reinvestment rate ( $bt$ ) and rate of return on equity ( $r$ ) are observable variables.

Just as 'g' can be allowed to vary under the simpler variant of DDM, so 'r' can be allowed to vary in equation (2). What change in the real rate of return on equity would have warranted the actual change in the equity price index? Chart C shows that, assuming a constant risk premium of 4 per cent, it would have had to have risen to around 8 per cent (but to only around 5 per cent if the premium has halved to 2 per cent). That may seem more plausible, but in fact requires just the same increase in expected dividend growth as reported in Chart B. The question is whether the observed fall in the dividend pay-out ratio since the mid-1990s has really increased expected future earnings and so dividend growth to 6 per cent per annum?

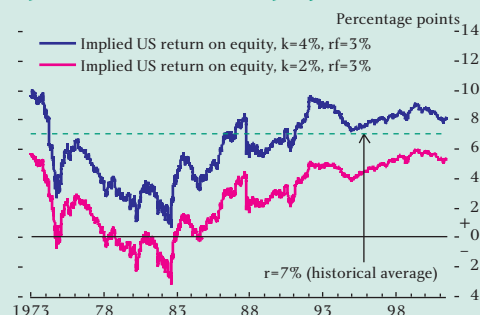
<sup>6</sup>: Fama and French (2000): 'Disappearing dividends: changing firm characteristics or lower propensity to pay', CRSP, Working Paper 509.

**Table A:**  
average US dividend-payout ratios (per cent)

	US
1973–01	44.7
1990–93	50.9
1994	45.4
1995	39.0
1996	37.6
1997	34.9
1998	33.8
1999	34.8
2000	30.8
2001*	28.5

\*Second quarter  
Source: Thomson Financial Datastream and Bank calculations.

**Chart C:**  
Implied US return on equity



Sources: Thomson Financial Datastream and Bank calculations.