

Box 2

Recent trends in the volatility of stock price indices

Stock prices can provide useful information in the context of the analysis of economic developments within the second pillar of the monetary policy strategy of the Eurosystem. For example, movements in stock prices can affect economic wealth as well as economic sentiment and, via these channels, domestic spending decisions. In addition, stock price movements are indicative of changes in the expectations of the private sector regarding economic prospects. In recent weeks stock price developments have been characterised by a relatively high degree of volatility, which has been concentrated in the technology sector, but which has also seemed to affect stock prices more broadly at times.

In recent years historical volatility has been high in the technology sector

Before considering more current developments, it should be pointed out that, over recent years, the average volatility of developments in technology stock prices has been consistently higher than general stock market volatility. Between end-1991 and 10 May 2000 the historical volatility of the US technology sector was 26% per annum, which compared with 14% for the Dow Jones US broad market index and a median of 16% across the ten principal economic sectors defined by Dow Jones (see the table below). In the euro area, corresponding figures were 24% for the technology sector, 16% for the Dow Jones EURO STOXX index and 17% for the median. This general pattern of high volatility in technology stocks seems to reflect the higher proportion of new firms with uncertain business prospects in the technology sector, which results in higher upward and downward risks to their stock prices.

Historical volatility of stock price indices

(percentages per annum)

	Euro area			United States		
	end-Dec. 1991 to 10 May 2000	end-Oct. 1999 to 10 May 2000	end-Mar. 2000 to 10 May 2000	end-Dec. 1991 to 10 May 2000	end-Oct. 1999 to 10 May 2000	end-Mar. 2000 to 10 May 2000
Basic materials	17.0	23.3	20.8	15.5	25.6	24.6
Consumer cyclical	17.1	23.3	29.6	15.1	21.3	25.3
Consumer non-cyclical	15.8	18.6	15.3	14.7	20.2	21.0
Energy	18.5	26.2	23.8	17.6	26.8	23.2
Financial	17.2	17.3	22.1	17.5	27.0	32.2
Healthcare	19.3	28.6	26.7	18.4	26.0	22.2
Industrial	15.7	23.2	23.1	13.8	22.0	30.0
Technology	24.1	46.3	64.0	26.2	37.1	60.3
Telecommunications	26.1	47.1	59.9	17.0	24.7	31.3
Utility	15.6	19.3	19.8	11.0	17.6	18.2
Broad index ^{a)}	15.8	22.0	27.2	13.7	19.9	28.3
Median ^{b)}	17.1	23.3	23.4	16.3	25.1	24.9

Sources: STOXX, Dow Jones Indexes and ECB calculations.

Note: Historical volatility, in annualised terms, is calculated as the standard deviation of daily changes in index levels multiplied by the square root of 250 (the approximate number of business days in a year).

a) For the euro area, the Dow Jones EURO STOXX index; for the United States, the Dow Jones US broad market index.

b) Median of the ten sectors.

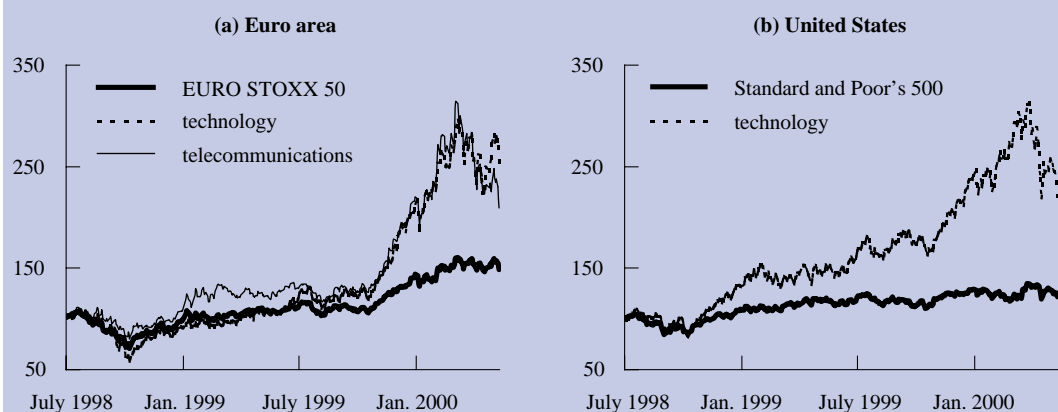
In recent weeks technology stock prices have been subject to particularly large swings

The table also demonstrates that the volatility of stock market developments has been exceptionally high in recent weeks, far higher than over the longer term, and exceptionally pronounced in the technology sector. In April and at the beginning of May these large swings seemed to reflect growing uncertainty on the part of market participants about the ability of firms in the technology sector to deliver the high level of earnings

implicit in their stock price levels following the considerable increases in technology stock prices over previous months. In the United States the Nasdaq Composite index, which comprises a number of technology stocks, increased by 67% between the end of October 1999 and the peak level recorded on 27 March 2000, and then declined by 32% in the period up to 10 May. Over the same periods the technology sub-index of the Dow Jones US broad market index first increased by 76% and then declined by 30% (see Chart A (b) below). In the euro area, technology stock indices followed a pattern similar to that seen in the United States. The Dow Jones EURO STOXX technology index increased by a considerable 104% between the end of October 1999 and 27 March 2000, and then declined by 10% between 27 March and 10 May 2000. The Dow Jones EURO STOXX telecommunications index, which comprises firms with substantial communications technology activities, increased by 101% and then declined by 25% (see Chart A (a) below).

Chart A: Recent developments in stock indices

(index: end-June 1998 = 100, daily data)



Sources: Reuters, STOXX and Chicago Board Options Exchange.

As can be seen from the chart above, the volatility of developments in broad stock price indices increased somewhat between end-October 1999 and 10 May 2000, but was considerably less than the volatility of developments in technology stocks. When measured on the basis of the standard deviation of daily changes in index levels, the historical volatility of the Standard and Poor's 500 index was 23% per annum during the period from the end of October 1999 to 10 May 2000. Over the same period the historical volatility of the US technology sector index was as high as 37% per annum. In the euro area, the historical volatility of the Dow Jones EURO STOXX index was 22% per annum, which was also considerably smaller than the historical volatility of the technology sector index, which reached 46% per annum (see the table on page 19).

Implied stock price volatility has recently increased, especially in the technology sector

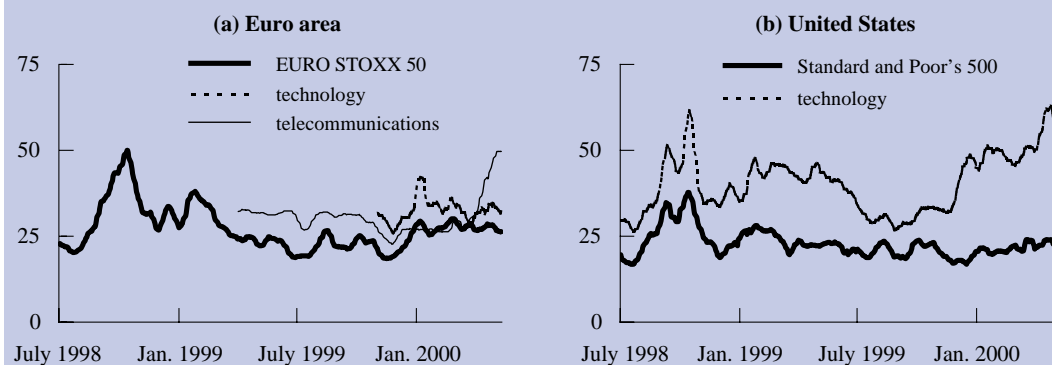
In order to assess the expectations of stock market participants, the implied volatility of stock price indices can also provide information of interest. Measures of implied volatility derived from stock index options prices provide indications of market perceptions of the degree of uncertainty associated with the future path of stock prices (see the article in this issue of the ECB Monthly Bulletin entitled "The information content of interest rates and their derivatives for monetary policy").

Over the past few months implied volatility has been particularly high in the US technology sector. Implied volatility on the technology index of the Chicago Board Options Exchange increased steadily, from 33% per annum at the end of October 1999 to 55% on 10 May 2000, reaching a level close to the peak levels recorded during the period of financial market turbulence in the autumn of 1998 (see Chart B (b)). Over the same period

implied volatility on the Standard and Poor's 500 index increased from 22% to 24% per annum. By contrast, and despite the wide fluctuations seen over recent weeks, implied volatility on the European Dow Jones STOXX technology index remained broadly unchanged between the end of October 1999 and 10 May 2000, at 32% per annum (see Chart B (a)). However, implied volatility on the Dow Jones STOXX telecommunications index increased significantly, from 28% per annum at the end of October 1999 to 50% per annum on 10 May 2000, with most of this increase taking place in the course of April. Possibly reflecting the heightened uncertainty which may be connected with the general rise in stock prices in the euro area, implied volatility on the Dow Jones EURO STOXX index increased from 22% per annum at the end of October 1999 to 26% per annum on 10 May 2000.

Chart B: Recent developments in stock index implied volatility

(percentages per annum, two-weekly averages)



Sources: Bloomberg, Reuters, STOXX, Chicago Board Options Exchange and ECB calculations.

Note: For the technology and telecommunications sectors, owing to the lack of options on pure euro area stock price sub-indices, implied volatilities correspond to indices including firms located outside the euro area but within the European Union.

Overall, the increases in stock market volatility seen in recent months do affect the assessment of the indications of stock price developments for future economic activity and inflation. In principle, higher stock prices can, if they are permanent, lead to positive wealth and confidence effects, which in turn can have a positive impact on aggregate spending. However, if there is a high degree of uncertainty about future stock prices, as indicated by stock price volatility, it is reasonable to assume that investors are expecting, on average, that gains may also be followed by losses, and will not therefore base their spending decisions on the wealth effects arising from stock price developments to the same extent as they would in periods of low stock price volatility. Similarly, other effects arising from higher stock prices, such as declines in the cost of equity capital, will also have a weaker impact when stock price volatility is high than when it is low.