

Box 4

**ABNORMAL VOLATILITY IN GLOBAL STOCK MARKETS**

In September and early October the declining trend in global stock prices accelerated when investors became extremely concerned about the health of the banking sector and its potential wider implications for the financial sector and the real economy as a whole. In particular, investors feared a meltdown of the global financial system. In an effort to restore confidence in the financial system, governments intervened with a range of measures. They provided deposit

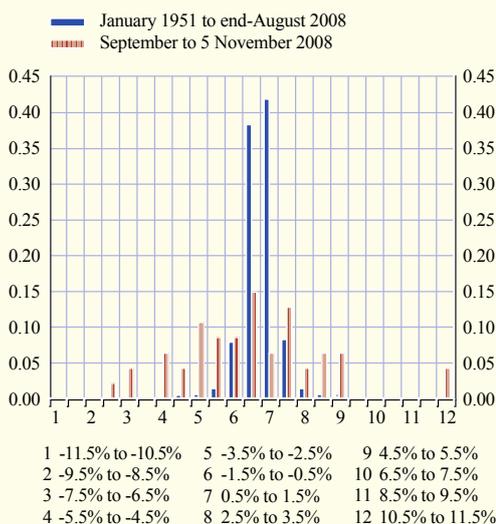
guarantees to private account holders, offered guarantee schemes for interbank lending and bank recapitalisation measures, and undertook efforts to strengthen bank liquidity. Central banks on both sides of the Atlantic stepped up their liquidity-enhancing measures, while at the same time reducing their policy rates. Global stock prices generally increased as an immediate reaction to the announcement of the proposed government measures. This notwithstanding, stock market volatility remained high in subsequent weeks, reflecting market participants' extreme sensitivity to news on the financial situation of banks and on economic activity in particular. Against this background, this box examines the abnormally high stock market volatility during recent weeks in the euro area and the United States.

One way of illustrating the unusual nature of the recent stock market volatility is to compare it with historical patterns. To this end, Chart A shows two histograms in which the vertical axis represents the relative frequency of various outcomes of daily stock returns, spanning a range from a decline of 11.5% to an increase of 11.5%. This range is shown on the horizontal axis and is divided into 23 equally sized segments, with each segment representing a daily return within a 1 percentage point interval.

The blue bars are the histogram for daily percentage stock returns on the US Dow Jones Industrial Average index between 1 January 1951 and 31 August 2008. As seen in the chart, the bulk of the historical frequency distribution of daily stock returns is clustered in two segments, covering the interval between a decline of 0.5% and an increase of 1.5%. Since 1951 daily US stock returns have remained within this 2 percentage point interval on around seven out of ten days on average. At the same time, daily stock returns of below -3.5% or above +3.5% are extremely rare, occurring on only 0.5% of the trading days. The second histogram (the red bars) is computed for daily returns during the period from September to 5 November 2008. This histogram is much more widely dispersed than the histogram based on data since 1951. Daily stock returns that were historically very rare have recently become almost the norm. Daily stock returns of below -3.5% or above +3.5% have, since the end of August, occurred on around one-third of trading days. A similarly unusual stock price pattern can be observed for the euro area.

Chart B further illustrates the abnormal degree of stock price fluctuations during recent weeks and indicates that market participants are expecting high volatility conditions to persist in the euro area in the foreseeable future. The chart shows realised stock price volatility in a

Chart A Distribution of recent and historical stock returns in the United States



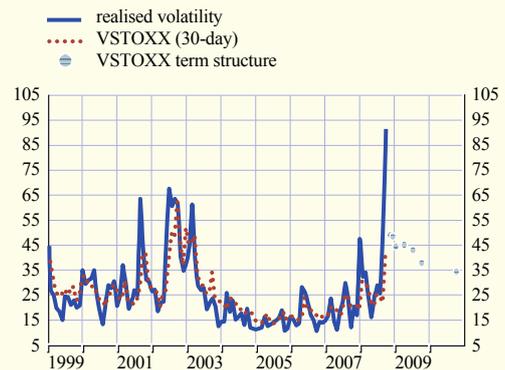
Sources: Thomson Financial Datastream and ECB calculations.  
Note: Stock returns calculated as daily percentage changes in the Dow Jones Industrial Average index.

given month and expected (implied) volatility for that month as measured by the options price-based VSTOXX index at the end of the previous month.<sup>1</sup> The dots represent the “term structure” of average expected volatility for horizons ranging from one month to two years ahead as measured by VSTOXX sub-indices based on the prices of options with corresponding times to expiry as at 5 November 2008.

Three main features can be inferred from Chart B. First, there is a close relationship between actual and expected volatility. This suggests that, to a large extent, investors tend to revise their views about near-term volatility according to the level of the most recent stock price fluctuations. Second, implied stock market volatility tends, on average, to hover slightly above realised volatility. This implies that risk-averse investors demand a premium for bearing the risk of holding volatility-dependent instruments. Third, the volatility forecasts as at 5 November 2008 suggest that investors believe that stock market volatility will, over the next two years, gradually decline from the current extremely high levels. This gradual moderation notwithstanding, euro area stock market volatility is still expected to remain at relatively high levels by historical standards following an extended period of predominantly below-average volatility up to mid-2007. For instance, the latest reading of expected volatility one year ahead (38%) and two years’ ahead (34%) suggests that market participants expect average yearly volatility in a year’s time to remain at 31%. This expected level of stock price fluctuations is still above the average realised volatility of around 20% per annum observed since 1986.

**Chart B Realised and expected stock market volatility in the euro area**

(percentages per annum)



Sources: Thomson Financial Datastream, STOXX and ECB calculations.

Note: The data are explained in footnote 1 and the main text of this box.

<sup>1</sup> Realised volatility is calculated as the square root of the monthly average of squared daily stock returns (daily changes in the natural logarithm of the Dow Jones EURO STOXX 50 index), expressed in terms of percentage per annum. The VSTOXX index is based on Dow Jones EURO STOXX 50 options prices and is designed to reflect the market expectations of near-term (30-day) volatility as measured by the square root of the annualised implied variance across all options of a given time to expiration. See <http://www.stoxx.com/index.html> for more information.