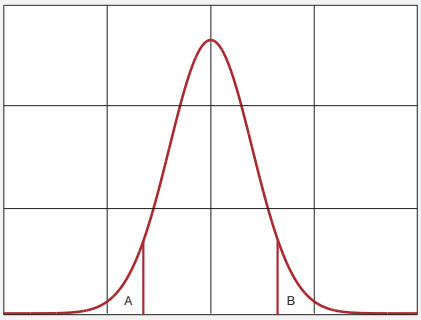
IMPLICIT PROBABILITY DISTRIBUTIONS AND EXPECTED STOCK-MARKET TENDENCY

Figure B3. Skewness and kurtosis (see text).



Source: The Riksbank.

Stock markets have been turbulent in recent years and as sizeable share price fluctuations affect household wealth, for monetary policy it is relevant to develop an indicator of the stock market's future path. As illustrated here, market expectations of the future share price tendency can be extracted from option pricing. This is done by calculating the distribution of the probabilities of future stock-market developments that are implicit in option prices.

One way of facilitating the interpretation of probability distributions is to calculate a number of statistical measures that describe the distributions' characteristics. The statistical properties that are most appropriate for analysing the implicit probability distribution are skewness and kurtosis. An illustration of these two aspects of a distribution can start from Fig. B3. The skewness of a probability distribution can be described in terms of the relative sizes of areas A and B, where A represents the probability of the stock market falling by a certain amount (10 per cent or more, for example) and B the probability of the market rising by the same amount. If A is greater than B, the probability is said to be negatively skewed and vice versa. For share-index options, for example, a positive skewness (B is greater than A) means that market players judge that the stock market is more likely to rise than to fall. Kurtosis can be illustrated as the sum of A and B. Kurtosis, like variance, is an indicator of uncertainty but whereas variance measures aggregate uncertainty, kurtosis measures the probability of extreme outcomes.

The following measures were chosen for the analysis below:

Uncertainty indicator: the probability of the stock market rising 10 per cent or more *plus* the probability of the market falling 10 per cent or more. This corresponds to B plus A in Fig. B3.

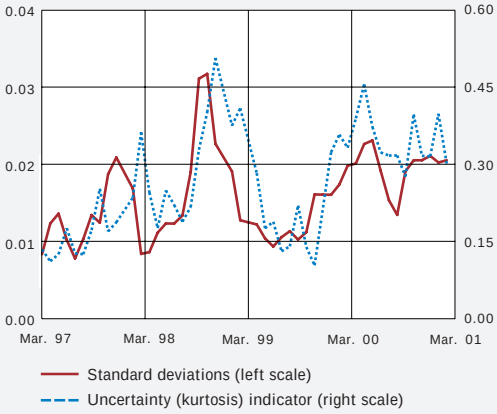
Skewness indicator: the probability of the stock market rising 10 per cent or more *less* the probability of the market falling 10 per cent or more. This corresponds to B minus A in Fig. B3.

From Fig. B4 it will be seen that the uncertainty indicator is a fairly good predictor of the future uncertainty.[10]

The next question is to what extent it is possible to predict the direction in which the stock market may move. The skewness indicator can be used to answer this. As Fig. B5 shows, the skewness indicator is a fairly good predictor of the stock market's future tendency, at least in some periods. Positive bars point to a rising stock market (in the coming 45 days) and vice versa. The indicator seems to have predicted the stock market fall during 2000 rather well, whereas it failed to catch the sharp fall in autumn 1998.

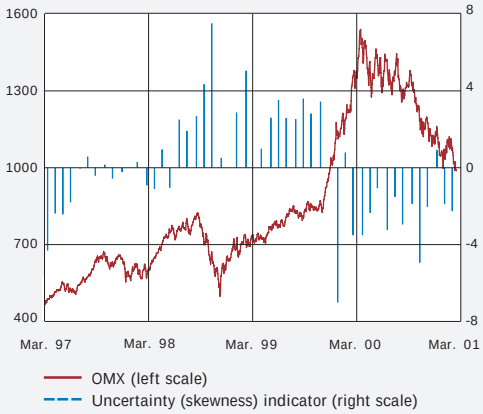
To sum up, the implicit probability distributions for OMX share-index options are above all a good indicator of future uncertainty. As an indicator of the stock market's future tendency they are more questionable. To some extent, the implicit probability distributions have managed to predict extended upward and downward tendencies in the stock market, whereas they have failed to provide satisfactory advance indications of corrections that are sudden and pronounced.

Figure B4. Uncertainty expressed as standard deviations and as the uncertainty indicator (kurtosis in the implicit probability distribution).



Sources: Reuters och the Riksbank.

Figure B5. OMX index and uncertainty indicated by the skewness in the implicit probability distribution.



Source: Reuters och the Riksbank.

10 Future uncertainty calculated as the stock market's standard deviation over the coming 45 days.