

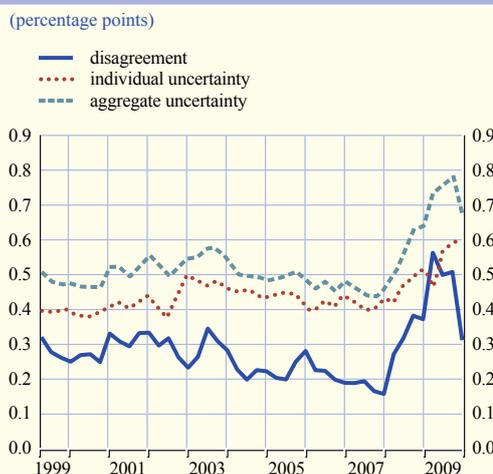
Box 4

MEASURING PERCEPTIONS OF MACROECONOMIC UNCERTAINTY

Since the collapse of Lehman Brothers in September 2008, the macroeconomic outlook has been characterised by greater than usual uncertainty. In addition to complicating the task of assessing the economic outlook, higher uncertainty may have an impact on corporate decisions and household savings choices, thus affecting investment and consumption. However, it is not straightforward to gauge the extent to which uncertainty has increased and whether it has started to return to more typical levels. To shed some light on the issue, this box considers information provided by respondents to the ECB Survey of Professional Forecasters (SPF) concerning the amount of uncertainty they perceive to be surrounding their forecasts.<sup>1</sup>

The SPF provides several dimensions for measuring forecast uncertainty, drawing on the fact that SPF respondents provide both a precise forecast, or point estimate, and a probability distribution around this point estimate. One approach is to rely on information provided by individual point estimates and consider “disagreement” among the differing forecasters’ views to be an indication of uncertainty. This measure of uncertainty is a very narrow one and ignores the extra information provided by SPF respondents concerning the probability distributions they assign to their forecasts. There are two ways to use this extra information. One is to

Chart A Alternative measures of uncertainty surrounding one-year-ahead inflation forecasts from the SPF



Sources: ECB SPF and ECB calculations.

<sup>1</sup> For a view of forecast uncertainty over a longer time span using primarily data from Consensus Economics, see the box entitled “Uncertainty and the economic prospects for the euro area” in the August 2009 issue of the Monthly Bulletin. The analysis in the current box updates that analysis, considers a number of alternative measures of forecast uncertainty and discusses macroeconomic uncertainty more generally, including the perceived uncertainty surrounding both HICP inflation and unemployment rate forecasts in addition to that surrounding the outlook for economic activity (GDP growth).

calculate the average standard deviation of the individual probability distributions supplied by the forecasters, which is known as “individual uncertainty”. While this is informative, there is evidence that individual forecasters tend to underestimate the degree of uncertainty surrounding their forecasts.<sup>2</sup> For a broader measure of uncertainty, one can calculate “aggregate uncertainty”, which combines both disagreement and individual uncertainty.<sup>3</sup> Chart A illustrates the evolution of, and relationship between, the different measures of uncertainty surrounding the one-year-ahead inflation forecasts from the SPF. Aggregate uncertainty is the measure that is focused on in this box as it seems to capture a broader notion of macroeconomic uncertainty.

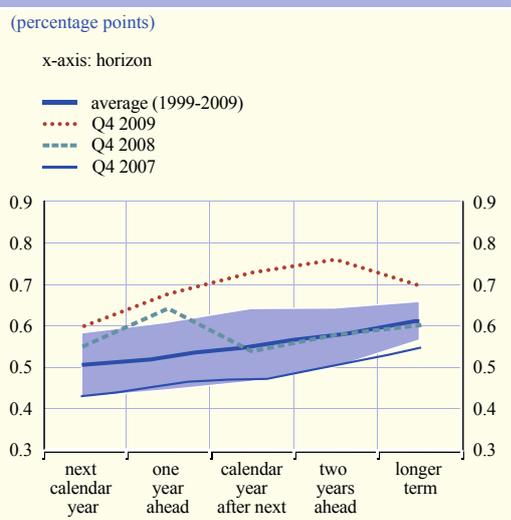
Charts B-D show aggregate uncertainty for HICP inflation, GDP growth and the unemployment rate, as perceived by respondents to the ECB SPF at various horizons. The charts show the average uncertainty for the years 1999-2009, with the shaded area denoting a range of plus and minus one standard deviation. Unsurprisingly, for each variable, as respondents are asked to forecast further ahead, average perceived uncertainty typically increases.<sup>4</sup> The average level of

2 See, for example, C. Bowles, R. Friz, V. Genre, G. Kenny, A. Meyler and T. Rautanen (2007), “The ECB Survey of Professional Forecasters (SPF): A review after eight years’ experience”, ECB Occasional Paper No 59, April.

3 “Disagreement” is calculated as the standard deviation of individual point forecasts. “Individual uncertainty” is calculated as the average standard deviation (or dispersion) of each individual probability distribution. “Aggregate uncertainty” is calculated as the standard deviation of the aggregated distribution (which is constructed simply by adding up the individual probabilities reported in the SPF and dividing the sum total by the number of respondents providing probability distributions). It is possible to show that aggregate uncertainty is a function of, and hence captures, both disagreement and individual uncertainty. For further details, see K. F. Wallis, “Combining Density and Interval Forecasts: A Modest Proposal”, *Oxford Bulletin of Economics and Statistics*, 67 (2005 Supplement), 983-94.

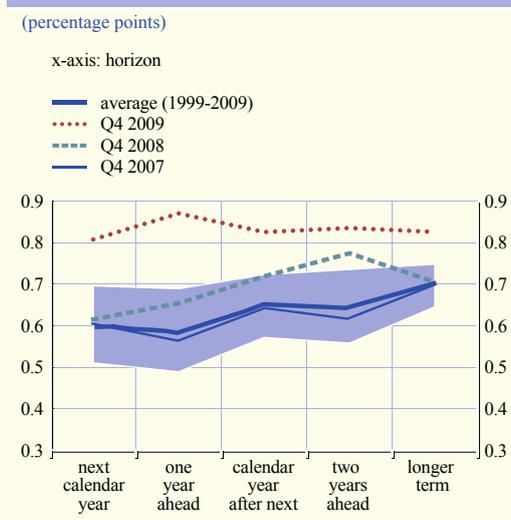
4 SPF respondents are asked for their forecasts for specific “rolling horizons” (one year and two years ahead of the latest available data, at the time the survey is conducted, for each variable) and “calendar-year horizons”. These latter horizons are the current calendar year, next calendar year, calendar year after next (only in the Q3 and Q4 rounds) and a longer-term horizon (of four calendar years ahead in the Q1 and Q2 rounds and five calendar years ahead in the Q3 and Q4 rounds). The perceived uncertainty surrounding the current calendar year forecasts is not shown in the charts as it is very much affected by the timing of the SPF round and the amount of data available to the forecasters. For example, in the Q4 2009 SPF round, forecasters had data on HICP inflation up to September 2009, whereas in the Q1 2009 round they only had data up to December 2008.

**Chart B Aggregate uncertainty surrounding HICP inflation from the SPF**



Sources: ECB SPF and ECB calculations.  
 Note: The light-blue shaded area represents plus and minus one standard deviation from the average observed over the period 1999-2009.

**Chart C Aggregate uncertainty surrounding GDP growth from the SPF**



Sources: ECB SPF and ECB calculations.  
 Note: The light-blue shaded area represents plus and minus one standard deviation from the average observed over the period 1999-2009.

uncertainty, particularly at longer horizons, is highest for the unemployment rate. This may reflect the “non-stationary” nature of the unemployment rate (i.e. in the presence of labour market rigidities, shocks to the unemployment rate tend to persist). On the other hand, longer-term expectations for real GDP growth and inflation are likely to be “anchored” respectively by views concerning the potential growth rate of the economy and the credibility of monetary policy.

Charts B-D also show the degree of uncertainty perceived by SPF respondents for each variable in the Q4 2009, Q4 2008 and Q4 2007 rounds.<sup>5</sup> For HICP inflation, aggregate uncertainty, as reported by SPF respondents, was at a relatively low level in the fourth quarter of 2007, mainly reflecting a low level of disagreement. It had risen noticeably, particularly for the short-term horizons, by the fourth quarter of 2008, mainly reflecting increased disagreement but also high individual uncertainty. In the latest (Q4 2009) round, aggregate uncertainty was considerably above historical average levels. Although disagreement about the inflation outlook has declined from its peak (in the first half of 2009), it remains relatively high. Average individual uncertainty was at historically high levels in the fourth quarter of 2009. For GDP growth, aggregate uncertainty about the forecast outlook, as reported by SPF respondents, was also clearly above historical averages in the fourth quarter of 2009. However, although uncertainty about the growth outlook is still relatively high, it has fallen substantially compared with its peak recorded in the Q1 2009 round. For the unemployment rate, uncertainty as reported by SPF respondents was also high in the Q4 2009 round, particularly for longer-term horizons, but was below the peak levels observed in the Q2 2009 round.

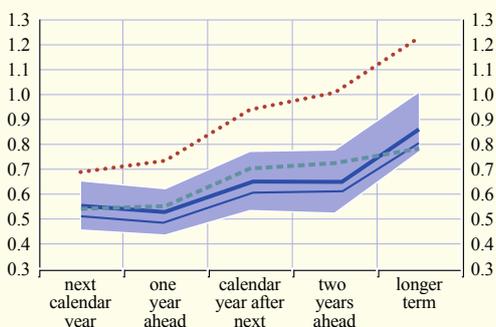
5 The Q4 rounds are reported as the latest available SPF is the Q4 2009 round conducted in October 2009 and to avoid the possible problem of seasonality, particularly for the calendar-year horizons (see also footnote 4).

**Chart D Aggregate uncertainty surrounding the unemployment rate from the SPF**

(percentage points)

x-axis: horizon

- average (1999-2009)
- ... Q4 2009
- - - Q4 2008
- Q4 2007

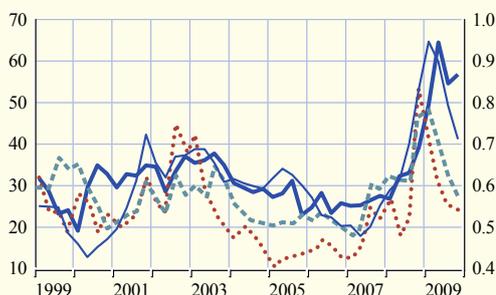


Sources: ECB SPF and ECB calculations.  
Note: The light-blue shaded area represents plus and minus one standard deviation from the average observed over the period 1999-2009.

**Chart E Cross-checking against selected indicators of macroeconomic uncertainty**

(percentage points)

- two-year-ahead uncertainty (right-hand scale)
- ... implied stock market volatility (left-hand scale)
- - - implied bond market volatility (left-hand scale)
- economic sentiment indicator (left-hand scale)



Sources: Bloomberg, European Commission (DG-ECFIN), ECB SPF and ECB calculations.

Notes: Two-year-ahead uncertainty refers to the arithmetic average of the aggregate uncertainty measures for the two-year-ahead forecasts of HICP inflation, GDP growth and the unemployment rate. The implied bond market volatility measure has been scaled upwards by a multiple of five. The economic sentiment indicator has been inverted and the scale has been adjusted.

Chart E presents the average of the two-year-ahead aggregate uncertainty measures for HICP inflation, GDP growth and the unemployment rate, alongside other possible indicators of macroeconomic uncertainty, such as implied stock market volatility (for the Dow Jones EURO STOXX 50 index), implied bond market volatility (for the Eurex Generic 1<sup>st</sup> “RX” future) and the European Commission (DG-ECFIN) Economic Sentiment Indicator. Generally, a degree of co-movement among the different indicators is present. It also seems that although the level of uncertainty moderated somewhat during the course of 2009, having reached strong highs at the beginning of the year, it remained elevated. This pattern is stronger for the SPF measure and the economic sentiment indicator. Implied stock and bond market volatilities were closer to historical averages, but also remained higher than the levels observed in recent years.

In summary, macroeconomic forecast uncertainty, as reported by SPF respondents, has increased substantially since the second half of 2008. However, the peak seems to have been reached in the first half of 2009. Thereafter, perceived uncertainty in the SPF has unwound to some extent, even though it remained elevated up to the last quarter of 2009.