Box 4

HOW HAS MACROECONOMIC UNCERTAINTY IN THE EURO AREA EVOLVED RECENTLY?

High macroeconomic uncertainty – through its likely adverse effect on the spending decisions of both consumers and firms – is considered to be one of the main factors contributing to the protracted weakness of euro area activity in recent years.[1] Quantifying uncertainty is challenging, as it is not an observable variable but relates to subjective perceptions. It can only be gauged indirectly, and this can be done using various sources.

This box describes recent developments in macroeconomic uncertainty by examining a number of measures of uncertainty compiled from a set of diverse sources, namely: (1) measures of economic agents' perceived uncertainty about the future economic situation based on surveys, (2) measures of uncertainty or of risk aversion based on financial market indicators and (3) measures of economic policy uncertainty.

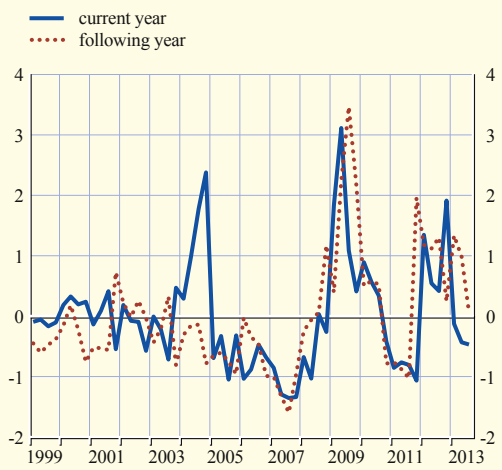
Starting with the measures of uncertainty related to future economic outcomes, the following three sets of indicators are considered:

- The degree of disagreement about the projections for activity among professional forecasters measured as the standard deviation of the projections from Consensus Economics for annual real GDP growth in the current calendar year and the following calendar year. Forecast disagreement is a popular measure of uncertainty and is available on a monthly basis. It should, however, be interpreted with some caution.[2] The range of disagreement among forecasters has tended to be higher in periods of recession or weak growth, notably during the 2008-09 recession (see Chart A). More recently, the dispersion of views on the economic prospects for the euro area has narrowed and appears to be broadly in line with pre-crisis levels.

- "Aggregate uncertainty" from the ECB's Survey of Professional Forecasters (SPF). The SPF provides another dimension for measuring forecast uncertainty, as respondents give both a point estimate and a probability distribution around it, which highlights the individual uncertainty of a given forecaster. To obtain a broad measure of uncertainty, it is possible to calculate "aggregate uncertainty", which

Chart A Dispersion of projections for real GDP growth in the euro area

(standard deviations from the mean; quarterly data)



Sources: Consensus Economics and ECB staff calculations.

1 For a discussion of the macroeconomic impact of uncertainty, see, for example, Haddow, A., Hare, C., Hooley, J. and Shakir, T., "Macroeconomic uncertainty: what is it, how can we measure it and why does it matter?", *Quarterly Bulletin*, Vol. 53, No 2, Bank of England, 2013 Q2.

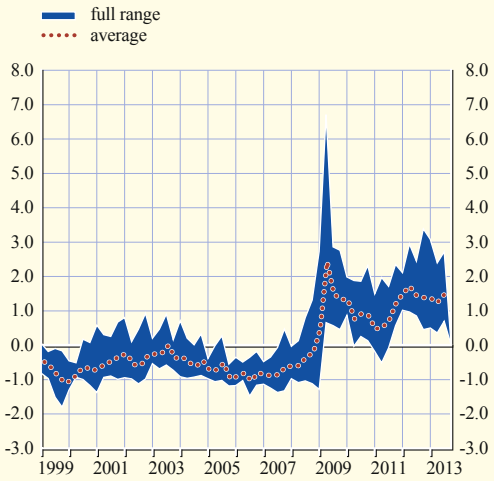
2 For a discussion of uncertainty over a longer time span using primarily data on disagreement among forecasters, see the box entitled "Uncertainty and the economic prospects for the euro area" in the August 2009 issue of the Monthly Bulletin.

combines both disagreement among forecasters (see the first set of indicators) and individual uncertainty.[3] In this box, forecasters' uncertainty is measured by the average variance of the aggregate probability distribution surrounding the projections for GDP, HICP and unemployment over four time horizons (current year, one year ahead, two years ahead and long term). Given that the SPF is only available quarterly, the measure can only be calculated at this frequency. Chart B shows the average uncertainty over all variables and horizons, with the shaded areas denoting the full range of individual measures. According to these measures, uncertainty has increased significantly since late 2008 and remains high.

- An indicator capturing the uncertainty of private households and enterprises based on the European Commission's Business and Consumer Surveys.[4] This survey entails some forward-looking questions and respondents can choose between various answers.[5] The heterogeneity of responses, which reflects the dispersion of expectations, is used as a measure of uncertainty. The advantages of this indicator are its monthly availability for all euro area countries and the fact that it aims to measure uncertainty directly at the level of agents who make consumption and investment decisions. Chart C shows that uncertainty among households increased markedly in late 2007 and early 2008. After declining in 2009, it rose

Chart B Aggregate uncertainty of professional forecasters[1)]

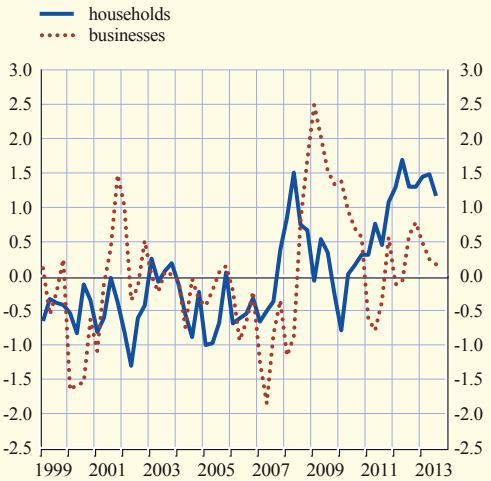
(standard deviations from the mean; quarterly data)



Sources: The ECB's Survey of Professional Forecasters (SPF) and ECB staff calculations.
1) Measured as average variance of the aggregate probability distribution surrounding the projections for GDP, HICP and unemployment over four time horizons (current year, one year ahead, two years ahead, long term)

Chart C Dispersion of expectations of households and businesses in the euro area

(standard deviations from the mean; quarterly data)



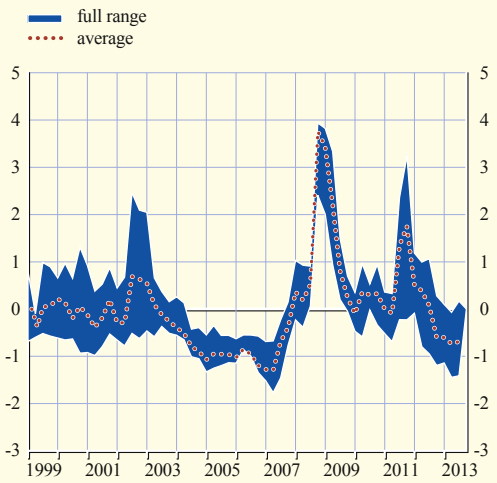
Sources: European Commission Business and Consumer Surveys and ECB staff calculations.

3 For a discussion of this measure of uncertainty, see the box entitled "Measuring perceptions of macroeconomic uncertainty" in the January 2010 issue of the Monthly Bulletin.
4 See Balta, N., Valdés Fernández, I. and Ruscher, E., "Assessing the impact of uncertainty on consumption and investment", Section I, *Quarterly Report on the Euro Area*, Vol. 12, No 2, European Commission, 2013.
5 For industrial firms: "How do you expect your production to develop over the next three months?", with three possible answers ("increases", "remains unchanged", "decreases"); for consumers: "How do you expect the financial position of your household to change over the next 12 months, "How do you expect the general economic situation in this country to develop over the next 12 months?", with six possible answers ("gets a lot better"/"… worse", "gets a little better"/"… worse", "stays the same", "don't know").

again in 2010-11 and remained high until mid-2013. Businesses' uncertainty about future production increased even more strongly during the 2008-09 recession, but it has recently returned to a level close to its historical average.

Chart D Financial market uncertainty in the euro area

(standard deviations from the mean; quarterly data)



Sources: ECB financial market database and ECB staff calculations.

Financial market uncertainty or risk aversion measures can be derived from two types of financial market indicators.[6] First, various spreads of asset returns, compared with risk-free assets, could be used; second, measures of implied volatility can also be derived. For example, the option-implied volatility of the exchange rate may provide an indication of companies' uncertainty about future export receipts or the costs of imports. This box uses a set of financial market indicators (implied bond and stock market volatility, implied euro/US dollar volatility and CDS spreads over government bond yields) and a number of systemic stress indicators (exchange rate volatility, equity market volatility, bond market volatility, money market volatility, financial intermediation and a composite systemic stress indicator). In order to mitigate problems related to specific measures, Chart D shows both an average of these measures and their full range. Financial market uncertainty rose sharply during the 2008-09 recession, and again in 2011, but has receded significantly since mid-2012.

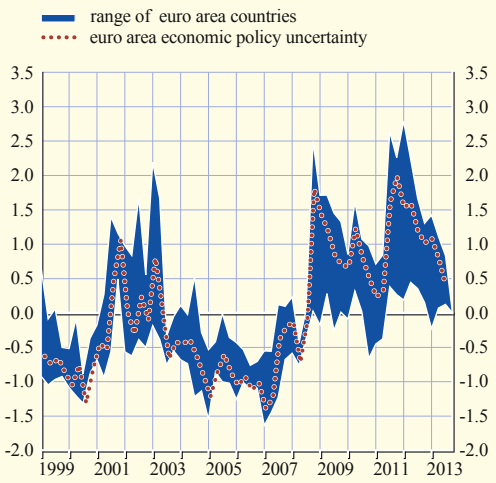
Developments in economic policy uncertainty might be illustrated by a recently developed indicator.[7] This measure of uncertainty is an index based on the following underlying components: the newspaper coverage of policy-related economic uncertainty (i.e. the frequency of references to economic and policy uncertainty in ten leading European newspapers) and the disagreement among forecasters as regards the outlook for inflation and budget balances (i.e. a measure of the dispersion of forecasts for each of these two variables in the Consensus Economics survey). These components are aggregated using weights of 50% for the former and 25% for each of the dispersion measures. Data are available for the European Union as a whole, as well as for the five largest EU economies. In this box, a proxy for the euro area is constructed by aggregating the results for Germany, France, Italy and Spain, using GDP weights. Economic policy uncertainty rose significantly during the 2008-09 recession and has moderated somewhat since mid-2011, although it remains above its average pre-crisis level (see Chart E).

The various measures of uncertainty show a significant negative correlation with key macroeconomic variables, such as quarterly growth rates of real GDP, total investment, private consumption and, in particular, total employment. None of the above measures is a perfect proxy for uncertainty and each has disadvantages, as they concern only specific types of economic agents, specific aspects of the economy or specific sources of uncertainty. For this reason,

6 See, for example, Popescu, A. and Smets, F., "Uncertainty, risk-taking and the business cycle in Germany", CESifo Economic Studies, Vol. 56, 4/2010.
7 Baker, S., Bloom, N. and Davis, S., "Measuring economic policy uncertainty", Chicago Booth Research Paper No 13-02, 2013.

Chart E Economic policy uncertainty in the euro area

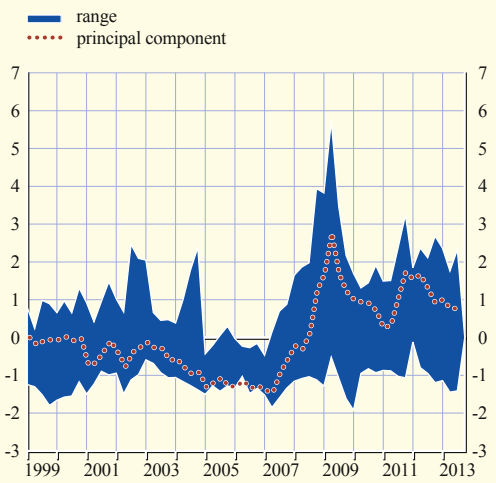
(standard deviations from the mean; quarterly data)



Sources: Baker, Bloom and Davis (2013) and ECB staff calculations.

Chart F Summary measures of economic, financial market and economic policy uncertainty

(standard deviations from the mean; quarterly data)



Sources: Consensus Economics, European Commission, ECB financial market database, Baker, Bloom and Davis (2013) and ECB staff calculations.
Note: The principal component and the ranges are all based on the full set of individual measures.

it is useful to look at a set of different measures of uncertainty in order to achieve a more representative picture. Furthermore, different sources of uncertainty are not easy to disentangle. For example, forecasts of professional forecasters obviously incorporate expectations of future economic policies, and different beliefs about these policies or their impact can result in disagreement or individual uncertainty. In the same way, financial market-based measures of uncertainty may also be affected by policy uncertainty.

The set of measures described in this box is likely to give a useful indication of the overall degree of uncertainty in the euro area economy. Moreover, while there is some variation among the different measures of uncertainty, they do tend to move together, pointing to the existence of an uncertainty component common to all measures. For this reason, the individual sets of series, as well as the overall set of series, can also be combined using principal component analysis. This is a common statistical technique, which extracts from a set of variables a subset of variables, called principal components, explaining most of the variation of the original dataset.

Chart F shows the range of all considered measures of uncertainty, together with the first principal component that is used as a single summary indicator of uncertainty. Following the outbreak of the financial crisis in 2008, all uncertainty measures showed very similar developments: they rose sharply, with most of them peaking at more than two standard deviations above their respective means in the last quarter of 2008 or in the first quarter of 2009. After falling back somewhat in the course of 2009 and 2010, all indices then rose again in the second half of 2011, against the background of the intensification of the euro area debt crisis.

More recently, the various sets of uncertainty measures have fallen, even though there was a widening of the range around the summary indicator. While financial market uncertainty has

declined significantly and has been below its long-term average since the fourth quarter of 2012, economic policy uncertainty still remains somewhat higher than its pre-crisis average level. Finally, most measures capturing economic agents' perceived uncertainty about the future economic situation have fallen by less, often remaining at elevated levels.

Overall, the latest developments in the various uncertainty measures suggest that uncertainty in the euro area has declined, which should support economic activity over time. However, it appears that uncertainty in financial markets fell earlier and more significantly than uncertainty about the economic outlook or policy.