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FIFTEEN YEARS OF THE ECB SURVEY OF PROFESSIONAL FORECASTERS

Fifteen years have passed since the launch of the ECB Survey of Professional Forecasters (SPF). Over this period, the SPF has made a significant contribution to the ECB's macroeconomic analysis and monetary policy deliberations and has drawn interest from practitioners and academics alike, both from within and outside the world of central banking. This article reviews some key elements regarding the usefulness of the SPF as a source of information for the ECB's monetary policy assessment. First, the short to medium-term expectations in the SPF offer a useful benchmark against which to assess the Eurosystem staff macroeconomic projections. Second, longer-term inflation forecasts help to assess whether private agents' expectations are in line with the ECB's quantitative definition of price stability, while longer-term expectations for GDP growth and unemployment offer useful insights into the broad forces underlying the euro area's growth potential. Third, the financial crisis has highlighted the usefulness of uncertainty measures for macroeconomic analysis, including those that can be extracted from the SPF.

I INTRODUCTION

Fifteen years have passed since the launch of the ECB Survey of Professional Forecasters (SPF). Around the time of its inception in June 1998, the ECB began preparations, in collaboration with the national central banks (NCBs) of the EU, to establish a survey of the private sector's expectations regarding key euro area macroeconomic developments.[1] The first SPF was conducted in the first quarter of 1999 and, since then, 60 surveys have been carried out on a quarterly basis – in January, April, July and October – asking respondents to provide expectations for euro area HICP inflation, GDP growth and the unemployment rate. Respondents provide point forecasts for rolling horizons (one and two years ahead), fixed calendar year horizons (current year, next year and year after next) and longer-term expectations (five years ahead). SPF participants are also asked to assign a probability distribution to their forecasts. The individual responses are aggregated in the form of mean point forecasts and as aggregate probability distributions. Other central banks from major economies around the world also use surveys of professional forecasters as an independent source of information for expectations of macroeconomic developments (see Box 1 for a comparison between the euro area SPF and that of the United States and of the United Kingdom).

The results of the euro area SPF have drawn considerable interest from both practitioners and academics alike. The latter have used them for a wide range of issues, including testing for rational and efficient expectations both at the individual and aggregate levels, optimal forecast combination methods and the measurement and behaviour of uncertainty. For the ECB, the SPF has been an important source of information in its general economic and monetary analyses. This article assesses three main ways in which the SPF has been used by policy-makers in its 15 years of existence. Section 2 looks at the role of the SPF as a comparator for the Eurosystem staff macroeconomic projections for the current year and the next year, reviewing relative performance and discussing the role of forecasting assumptions.[2] Section 3 examines the longer-term forecasts in the SPF for GDP growth, unemployment rates and inflation in the context of the information these variables provide on key concepts such as potential output and inflation objectives. Section 4 examines professional forecasters' assessments of the uncertainty surrounding their forecasts and compares these assessments with other indicators of macroeconomic uncertainty. Section 5 concludes.

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1   For more details regarding the motivation for launching the SPF, see García, J.A., "An introduction to the ECB's Survey of Professional Forecasters", *Occasional Paper Series*, No 8, ECB, September 2003.

2   For an early assessment of the data collected in the SPF between 1999 and 2006, see Bowles, C., Friz, R., Genre, V., Kenny, G., Meyler, A. and Rautanen, T., "The ECB Survey of Professional Forecasters (SPF) – A review after eight years' experience", *Occasional Paper Series*, No 59, ECB, April 2007.

COMPARING SURVEYS OF PROFESSIONAL FORECASTERS ACROSS COUNTRIES

Central banks conducting surveys of professional forecasters include the Federal Reserve Bank of Philadelphia (FRBP) for the United States, the Bank of England (BoE) for the United Kingdom and the ECB for the euro area.[1] The history of these surveys goes back to 1968 in the case of the FRBP, to 1993 in the case of the BoE and to 1999 in the case of the ECB. The experiences of central banks and other users over the years are important for any future adaptations of such surveys. Against this background, this box examines some key similarities and differences across the three surveys and summarises some of the changes introduced over time.

Key similarities and differences across surveys

The surveys of professional forecasters by the ECB, the FRBP and the BoE are comparable in several respects. In particular, all three surveys cover inflation, real GDP growth and unemployment as *core variables*. This selection of core variables allows the inflation outlook to be assessed in terms of fundamental determinants such as economic activity and unemployment. The FRBP SPF covers by far the broadest set of indicators, as it also requests data on components of GDP, productivity and house prices, for example. All three surveys ask for forward-looking information on variables that often function as *assumptions* or otherwise conditioning variables in forecasts and projections. For instance, the ECB and BoE surveys ask for central bank interest rate and exchange rate assumptions, while the ECB survey also asks for data on oil prices and labour costs. The FRBP survey, in addition to requesting information on the three-month Treasury bill rate, also asks for information on corporate bond yields as a variable that captures financing conditions.

All three surveys are conducted in the first month of each quarter, with the actual deadline depending on the release of relevant national data. The results are then published in the second month of the quarter. The surveys thus form part of the information set available which central banks use as a basis for preparing their own forecasts and projections. In the case of the ECB SPF, the results are based on an *average number of respondents* somewhat greater than 50, compared with fewer than 40 in the case of the FRBP SPF and between 20 and 30 in the case of the BoE SPF.

In the ECB and FRBP surveys, forecasts are surveyed for specific *calendar year horizons*. This allows the nature of the forecast revision process, such as its relationship to macroeconomic news, to be examined. Both surveys ask for expectations related to the current calendar year, the next year and the year after next. Additionally, longer-term expectations, relating to a horizon of five calendar years ahead in the case of the ECB and covering the periods one to five years and one to ten years ahead in the case of the FRBP, are surveyed. All three surveys also request information on *rolling horizons*, referring to expectations one year ahead, for instance, of the latest data released for a given variable. Such rolling horizons allow for a consistent comparison of disagreement and uncertainty surrounding the forecasts of different survey rounds, given that, in the case of fixed horizons, these two measures normally decrease as more information becomes available.

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1   Additional examples of the many other countries which carry out surveys of professional forecasters include Japan (Survey of Japanese Economic Forecasts (ESPF) established in May 2009) and Canada (Private Sector Survey (PSS) established in 1975).

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All three surveys ask for *probability distributions* around the core variables. For this purpose the questionnaires provide so-called "bins" (with the lowest and highest bins being open-ended) that can be used as a basis for approximating the underlying distribution. Such distributions allow the risks that forecasters see around their point estimates to be assessed.

Key adaptations made across time and surveys

Notable changes have been made to various features of the designs of the surveys. All surveys have, over time, requested *additional variables*, including core variables such as real GDP in the case of the BoE survey and assumption variables such as labour costs in the case of the ECB survey. Other extensions include requesting expectations for corporate bond yields in the case of the FRBP and for the stock of assets purchased by the central bank in the case of the BoE.

Adaptations of horizons have been introduced in the FRBP and BoE surveys. In the case of the former, this relates in particular to the introduction of the calendar year after next as an additional fixed horizon, as well as the long-term and rolling horizons for inflation and GDP. In the case of the BoE, there has been a switch from a mix of fixed and rolling horizons to just rolling horizons (one, two and three years ahead).

All surveys have seen *adjustments to the number and size of bins* in response to the macroeconomic developments over the last 15 years. These adjustments have occurred at different points in time, but were most prominent in response to developments seen during the 2008 financial crisis and recession. As point forecasts assumed historically unprecedented values, the probability mass moved closer to the open-ended bins, with the consequence that it was no longer possible to reasonably approximate the underlying distribution. The extension of the range covered by closed bins restored this possibility of approximation.

Overall, the current design of the three SPF surveys by the ECB, the FRBP and the BoE and the adaptations seen over time suggest a broad convergence of the key features of the surveys. In particular, the adjustments suggest that an informed assessment of the survey information requires additional information beyond that provided by the core variables, and that probabilities are a highly useful element in the assessment of baseline forecasts. Similarly, the request for expectations at longer horizons reflects the usefulness of assessing the anchoring of expectations in the context of the medium-term orientation of monetary policy.

2   USING THE SPF AS A COMPARATOR FOR PROJECTIONS

The ECB aims to achieve price stability at a medium-term horizon. In its assessment of risks to price stability, the Eurosystem staff macroeconomic projections play an important role in condensing the information provided by economic indicators in a coherent and structured manner. In this respect, the SPF has provided an alternative source of information against which to assess Eurosystem staff projections. Although the focus of this section will be on comparing SPF and staff projections in terms of the magnitude of the projected variables for the individual years of the forecast horizon, policy-makers also obtain highly valuable information from the time profile that the SPF expects for the projected variables (e.g. acceleration or deceleration) over the horizon.

More specifically, this section compares the Eurosystem's own projections for the current and next calendar years with the corresponding mean forecasts from the SPF, with some focus on the reasons for the observed forecast errors, such as different assumptions.[3] In order to interpret differences between forecasts and projections, it is useful to bear in mind the way SPF respondents form their expectations. The results of a special questionnaire for SPF participants provide information on the prevailing forecast practices and some changes that have been observed since 2008 (see Box 2).

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3 A more detailed assessment of the forecast performance of the Eurosystem staff macroeconomic projections for the euro area, including a comparison with those of other international institutions, can be found in the article entitled "An assessment of Eurosystem staff macroeconomic projections", *Monthly Bulletin*, ECB, May 2013.

HOW ARE FORECASTS IN THE ECB SURVEY OF PROFESSIONAL FORECASTERS MADE? RESULTS OF A SPECIAL QUESTIONNAIRE

Understanding how participants in the ECB SPF make their forecasts and form their expectations is important for interpreting both the average outcomes and the heterogeneity across individual forecasts. This box summarises the results of a special questionnaire sent to SPF participants in the summer of 2013, aimed at taking stock of current forecasting practices and gauging potential changes since the start of the financial crisis.[1]

Responses were received from 45 SPF participants, which represents around three-quarters of the average number of responses received in the regular survey rounds. As in the first special questionnaire conducted in 2008, there were questions on timeliness and methods of forecasting, on the use of economic models and judgement, and on the way probability distributions and assumptions are computed.[2] These questions have been partly rephrased and extended to find out whether and in what way the forecasting processes have changed since the start of the financial crisis. It should be noted that on some occasions, the percentages reported may add up to more than 100%, as respondents could indicate more than one category.

Frequency of forecast updates reported in the SPF

The majority of respondents (84%) reported that their forecasts are updated on a regular calendar basis. Around one-third (31%) do so following important data releases that make them change their view of the economy. A number of respondents (16%) update their forecasts both on a calendar basis and in between scheduled updates in case of important data releases. These percentages are broadly the same as those reported in the 2008 special questionnaire.

Of those respondents who update their forecasts regularly according to a calendar, two-thirds reported that they do so on a quarterly basis, while a smaller share (28%) updates them each month. Compared with the 2008 special questionnaire, a higher share of participants now reports that they update their forecasts at least once each quarter.

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1 A copy of the questionnaire and a more detailed summary of the results can be found on the ECB's website at http://www.ecb.europa.eu/stats/prices/indic/forecast/html/index.en.html.
2 For a summary of the 2008 SPF special questionnaire, see http://www.ecb.europa.eu/stats/prices/indic/forecast/shared/files/quest_summary.pdf.

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Most respondents indicated that they provide their latest available forecast for each SPF round, with only a small proportion preparing a new forecast specifically for the SPF. Of the forecasts that are sent in a given SPF round, less than half are new forecasts, while around one-third are mechanical updates of previous forecasts on the basis of the latest data or assumptions. Overall, given the high frequency and nature of the updates, the replies suggest that the SPF expectations are quite timely.

Forecasting techniques and models

The responses indicate that the type of model preferred to generate forecasts varies according to the forecast horizon and to the variable being forecast. Reduced form models, such as single equation, vector autoregressive (VAR) or vector error correction models (VECM), seem to be commonly used for all horizons and variables, although somewhat more prominently to forecast inflation rather than real GDP or unemployment. Structural models, such as supply and demand-based macro models or dynamic stochastic general equilibrium (DSGE) models, are increasingly used for the longer forecast horizons.

Most respondents (84%) reported that they use at least one type of reduced form model, with a substantial share of respondents reporting that they use two or more types of these models for a given variable and horizon. With regard to structural models, the responses suggest an increased use of DSGE models in comparison with the 2008 questionnaire, putting them now on a more or less equal footing with more traditional supply and demand-based macro models. More generally, the use of different models for the same horizons and variables is motivated by cross-checking results or by forecasting components of the core variables with different models and later combining them in a bottom-up approach. Moreover, the comparative advantage of using different models at different forecast horizons also plays a role.

SPF participants were asked to what extent their forecasts are model or judgement-based. Most respondents (81% on average, across all variables and horizons) consider their forecasts to be, at least in part, judgement-based – in the sense that model-based outcomes are complemented by judgemental adjustments – with one-third of respondents reporting that their forecasts are essentially, i.e. to a very high degree, judgement-based. Across horizons, a slightly higher share of respondents reports essentially judgement-based forecasts for unemployment than for HICP and GDP. When looking at the combined shares of essentially judgemental forecasts and model-based forecasts including judgement, they are roughly the same for all three variables. Looking at the impact of judgement on forecasts for different forecast horizons, the share of respondents providing essentially judgement-based forecasts is higher for longer-term horizons than for short and medium-term horizons. These results correspond to those in the 2008 special questionnaire.

When forming their longer-term (five years ahead) inflation expectations, most respondents make use of a wide range of information: the ECB's inflation objective is mentioned most often (81%), followed by trends in actual inflation (54%), long-term inflation expectations from financial markets (43%) and trends in wages and monetary aggregates (both 38%).

Almost all respondents stated that they changed their models following the financial crisis in 2008 and that, since then, the importance of judgement in forming their expectations had increased. Some of the changes relate to the treatment of model parameters, with some respondents placing

more emphasis on the post-crisis parameters (50%) and others freezing parameters to values derived before the pre-crisis period (22%). Around one-third of respondents introduced more real financial linkages to their models. Most forecasters (72%) reported that they use linear models, while others explicitly allow for non-linearities such as those captured in structural breaks, the zero lower bound for nominal interest rates or time-varying parameters.

The euro area forecasts are formed on the basis of data and models for the euro area as a whole, but also on the basis of aggregating from bottom up the forecasts for individual countries (mostly the largest euro area economies). The use of both practices is mentioned by some respondents to be due to different practices for different variables, while others mention using bottom-up approaches as a means of cross-checking results.

SPF participants were also asked how they generate their reported probability distributions for HICP inflation, GDP growth and the unemployment rate. A large majority of respondents (72% on average over all variables and horizons) said that these probability distributions are estimated on the basis of judgement, while 14% generate them from models and 13% from models with judgmental adjustments.[3]

Other variables and conditioning assumptions

With regard to other variables and conditioning assumptions, most respondents produce in-house forecasts for oil prices, exchange rates, interest rates and wage growth. In-house forecasts of oil prices are often complemented by market data, for example futures prices or averages of recent spot prices. A few respondents reported that they use external forecasts to complement and cross-check in-house forecasts for oil prices. In terms of other sources, a small number of respondents use automatic rules (e.g. a random walk or they assume a constant rate of change in oil prices).

In summary, these replies suggest that SPF responses can reflect a relatively diverse set of views and assumptions but also indicate that the SPF responses are quite timely. In addition, although both structural and time series models are widely used, judgement also plays a key role, in particular for the reported probability distributions and, to an increasing extent, following the financial crisis in 2008.

3   The high share of probabilities based at least partly on judgement might also be explained by the fact that, for the vast majority of respondents (around 80%), they are computed exclusively for the purposes of the SPF.

2.1 COMPARING THE FORECASTING PERFORMANCE OF THE SPF AND THE EUROSYSTEM STAFF MACROECONOMIC PROJECTIONS

Since December 2000, the ECB has been publishing the Eurosystem staff macroeconomic projections twice a year (in June and December) for the current year and the next year.[4] Below, these projections are compared with the mean forecasts of the SPF for inflation and real

4   These projections have been complemented by ECB staff macroeconomic projections, published in March and September since September 2004. In order to facilitate a comparison with the SPF, the mid-point of the projection ranges in the Eurosystem staff macroeconomic projections is considered for those periods where point estimates have not been published.

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Forecasting errors in the Eurosystem staff macroeconomic projections and in the SPF forecasts				
(percentage points)				
	Inflation		**Real GDP growth**	
	Current year	**Next year**	**Current year**	**Next year**
Forecasts and projections made in the second quarter[1]				
Eurosystem staff projections				
Mean error	0.0	0.4	-0.1	-0.9
Mean absolute error	0.1	0.8	0.5	1.7
SPF forecasts				
Mean error	0.2	0.3	-0.2	-1.0
Mean absolute error	0.2	0.7	0.5	1.6
Forecasts and projections made in the fourth quarter[2]				
Eurosystem staff projections				
Mean error	0.0	0.3	0.0	-0.6
Mean absolute error	0.0	0.5	0.1	1.0
SPF forecasts				
Mean error	0.0	0.3	0.0	-0.7
Mean absolute error	0.1	0.7	0.1	1.2

Sources: ECB, Eurostat and ECB calculations.
Notes: The mean error is the average difference between the realised and the forecast value and the mean absolute error is the average of the absolute errors. Forecast errors are computed for the first release of inflation data and for the third release of GDP growth data.
1) Based on forecasts made from 2001 to 2012 for the current year, and from 2001 to 2011 for the next year.
2) Based on forecasts made from 2000 to 2012 for the current year, and from 2000 to 2011 for the next year.

GDP growth collected in the second and fourth quarters of each year.[5] Performance is assessed in terms of bias (as measured by the mean projection error) and the size of the projection errors (as measured by the absolute mean squared error). The size of the forecasting errors could be influenced by the particular vintage of data used to calculate the actual outcomes. Since macroeconomic data can be revised after initial releases, real time data are used in the analysis.[6]

The table reports the mean error and the mean absolute error for HICP inflation and GDP growth for the forecasts made in the period 2000-12. In order to avoid mixing projections with different forecast horizons, the table distinguishes the forecasts made in the second quarter from those made in the fourth quarter of each year. Considering first the results for inflation, both SPF respondents and Eurosystem staff have tended to underestimate next year inflation in particular (by an average of between 0.3 and 0.4 percentage point in each forecasting round). The mean error statistics conceal large errors at individual points in time, both positive and negative, as evidenced by the higher value of the mean absolute error statistics. As it is typically more difficult to make accurate forecasts over longer periods, the mean absolute errors increase with the forecast horizon and are higher for the forecast made in the second quarter than that in the fourth quarter. Looking across projections, for the current year and for both forecasting rounds the mean absolute errors are, on average, somewhat smaller in the projections by Eurosystem staff than in the SPF forecasts. This slightly better performance might be due to, inter alia, the fact that the Eurosystem projections benefit from one additional month of data, which is particularly advantageous when

5 The data collected in the SPF have normally been summarised by means of a simple average of point forecasts. The question arises as to whether a different combination of SPF forecasts (principal components, trimmed means, performance-based weighting, etc.) could deliver gains in terms of forecast accuracy. Evidence suggests that there is only a modest case for deviating from the simple average as a means of better summarising the information collected in the SPF. For more details, see Genre, V., Kenny, G., Meyler, A. and Timmermann, A., "Combining expert forecasts: Can anything beat the simple average?", *International Journal of Forecasting*, Vol. 29(1), 2013, pp. 108-121.
6 The vintage data used for inflation are for January of the following year, while for GDP the vintage data used are the third release of real GDP growth. Revisions to historical data have been sizeable for real GDP growth and unemployment, but less so for HICP inflation. For more details on revisions to GDP, see the article entitled "Revisions to GDP estimates in the euro area", *Monthly Bulletin*, ECB, April 2009.

forecasting inflation at a short-term horizon.[7] For the next year, the SPF performs slightly better in the first forecast round (0.7 versus 0.8 percentage point), while the Eurosystem performs better in the second round (0.5 versus 0.7 percentage point).

By contrast with the inflation forecasts, real GDP growth rates have tended to be overestimated by both Eurosystem staff and SPF participants. For the next year, when overestimation is larger, the mean forecast error ranges between -0.6 and -0.7 percentage point for the second forecasting round and between -0.9 and -1.0 percentage point for the first forecasting round. As in the case of inflation, the mean absolute errors increase with the forecast horizon. Looking across error measures, the degree of overestimation by SPF respondents for the year ahead tends to be slightly larger than that by the Eurosystem (by about 0.1 percentage point).

2.2 DIFFERENCES IN METHODS BETWEEN SPF FORECASTS AND EUROSYSTEM STAFF MACROECONOMIC PROJECTIONS

Various factors are likely to explain the differences between the Eurosystem staff macroeconomic projections and those of the SPF vis-à-vis actual outcomes. These factors include the timing, the type of model used, the degree and role of judgment and the assumptions made. This section focuses on the role of assumptions upon which the forecasts/projections are conditioned. The Eurosystem bases its forecast on a number of technical assumptions about commodity prices, interest and exchange rates and fiscal policies.[8] For instance, the Eurosystem uses futures prices as assumptions for commodity prices in US dollars, while for the exchange rate it applies a "no change" assumption based on the most recent data points. Assumptions for fiscal policy measures can have a large bearing on projections; in the case of the Eurosystem only those measures that have been approved by national parliaments, or have already been defined in detail and are likely to pass the legislative process, are taken into account. In the case of the SPF, less is known about how respondents make their assumptions, although responses to the special questionnaire indicate that they are based mainly on in-house forecasts.

Among the different conditioning assumptions, those for oil price developments have traditionally accounted for a large proportion of forecasting errors for inflation.[9] Chart 1 reports, for different projection and forecast rounds, the actual oil price together with futures prices for Brent crude, and the corresponding forecast by SPF respondents. For most of the time period, the broad contour of the oil price assumptions is rather similar for the SPF and the Eurosystem. By contrast, over the last three years, SPF respondents have been posting a broadly stable or a slightly increasing oil price profile, while the futures prices used by the Eurosystem have been sloping downwards. All other things being equal, this difference in the assumption of oil prices would, to a large extent, explain why SPF inflation forecasts have been higher than those by Eurosystem staff over the last few years. In particular, elasticities implied by Eurosystem macroeconometric models suggest that these differences accounted for about three-quarters of the difference in inflation projected over a two-year horizon by the Broad Macroeconomic Projection Exercise and the SPF participants.[10]

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7   The Eurosystem staff macroeconomic projections use data until the end of the third week of May and until the end of the third week of November for the June and December forecasting rounds, respectively. The cut-off date for the data used in the SPF projections is less clear-cut. While the second and fourth quarter survey rounds are carried out in the middle of April and October, respectively, the exact cut-off date for the data is unknown to the ECB. According to a special questionnaire, 84% of SPF respondents report their latest available forecast, which in 82% of cases is quarterly or monthly.

8   For more details regarding the assumptions in the Eurosystem staff projections, see the article entitled "An assessment of Eurosystem staff macroeconomic projections", *Monthly Bulletin*, ECB, May 2013.

9   See the article entitled "Commodity prices and their role in assessing euro area growth and inflation", *Monthly Bulletin*, ECB, October 2013.

10 For these elasticities, see "Energy markets and the euro area macroeconomy", *Occasional Paper Series*, ECB, No 113, June 2010.

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Chart 1 Assumptions of Brent crude oil prices in the SPF and in the Eurosystem staff macroeconomic projections and actual oil price developments
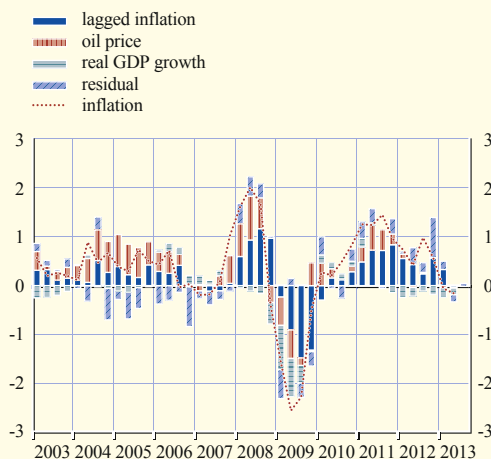
(USD per barrel; quarterly data)

▬▬ oil futures price
⋯⋯ SPF
▬ ▬ oil price
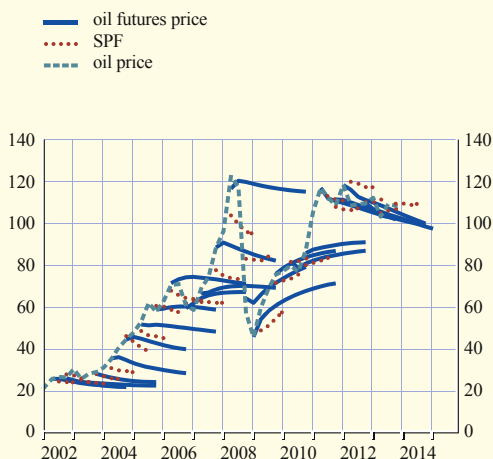
Sources: ECB and SPF.

Chart 2 Decomposition of forecast errors for HICP inflation in the SPF based on forecast errors for both real GDP growth and the oil price

(percentage points)

▬▬ lagged inflation
▬▬ oil price
▬▬ real GDP growth
▨ residual
⋯⋯ inflation

Sources: ECB and SPF.
Note: Based on rolling horizon forecasts. For more details, see footnote 12.

Taking a long-term perspective, however, since 1999 the absolute error made in respect of the level of oil prices assumed in the projections and forecasts is broadly similar across the Eurosystem and the SPF. For the period since 2000, excluding the error in the first quarter of 2009 (the largest in both cases), it has stood at around 22%.[11] This error has contributed significantly to the overall error in the respective projections and forecasts for HICP inflation.

In the case of the SPF a simple regression analysis illustrates the impact of forecast errors in oil prices on errors in predicting HICP inflation one year ahead (Chart 2).[12] Controlling for the errors in real GDP growth expectations, the evidence shows that the underestimation of oil prices by SPF participants in the period from 2004 until before the financial crisis was strongly associated with the underestimation of inflation during the same period. By contrast, the overestimation of both oil prices and GDP growth at the peak of the financial crisis (between late 2008 and until 2009) was associated with a corresponding overestimation of inflation. More recently, the underestimation of oil prices in 2010 and 2011 also contributed to the underestimation of inflation during that period, while errors in predicting real GDP growth are assessed to have played only a minor role.

3 THE INFORMATION CONTENT OF THE SPF LONGER-TERM EXPECTATIONS

Panellists in the SPF also provide longer-term expectations (i.e. five year ahead) for euro area real GDP growth, unemployment and inflation. Responses to the special questionnaire suggest that the

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11 The mean absolute error is computed based on a rolling forecast horizon (using the longest available forecast in the SPF) rather than for the current or next year's projections. This is because oil price assumptions for the current year and next year in the SPF started to be made only in the second quarter of 2010.

12 The analysis is based on an instrumental variable (IV) regression of forecast errors in inflation on the lagged dependent variable and forecast errors in real GDP growth and in the oil price. The estimated effect of the exchange rate proved to be insignificant. Real GDP growth is treated as an endogenous variable in the regression because most SPF respondents to a special questionnaire indicate that inflation and real GDP growth forecasts are dependent on one another in the short and medium term. Instruments used in the regression are the lagged forecast errors in real GDP growth and the remaining explanatory variables.

longer-term expectations for real GDP growth can be interpreted as the rate of growth of potential output (68% of respondents) and those for unemployment as the Non-Accelerating Inflation Rate of Unemployment – NAIRU (53%). At the same time, longer-term inflation expectations may help to assess the ECB's credibility in terms of maintaining its objective of price stability. Respondents stress that these expectations are determined mainly by the ECB's price stability objective of below but close to 2% (81% of respondents) and past inflation trends (54% of respondents).

Longer-term GDP growth expectations in the SPF declined steadily from 2.6% at the beginning of the sample to 1.7% in the fourth quarter of 2013. The real-time forecasts by international organisations of potential output growth five years ahead display a similarly broad downward trend over the past decade, but have been consistently below SPF expectations over this period. If anything, the gap between the two sets of series appears to have widened over the last few years (Chart 3).

In the case of long-term unemployment, SPF expectations increased slightly between 2002 and the first half of 2005, then declined and reached a minimum of 6.5% in 2007. Subsequently, expectations increased gradually to stand at around 9½% in the fourth quarter of 2013 (Chart 4). Compared with the real-time forecasts by international organisations for the NAIRU five years ahead, the SPF expectations have tended to stand at the lower end, and for the period since 2008 in particular the long-term forecasts for the NAIRU estimates have increased more strongly than the SPF expectations, especially in the case of the European Commission.[13] The recently lower long-term

Chart 3 Long-term real GDP growth expectations by the SPF and long-term estimates of potential output growth by international organisations
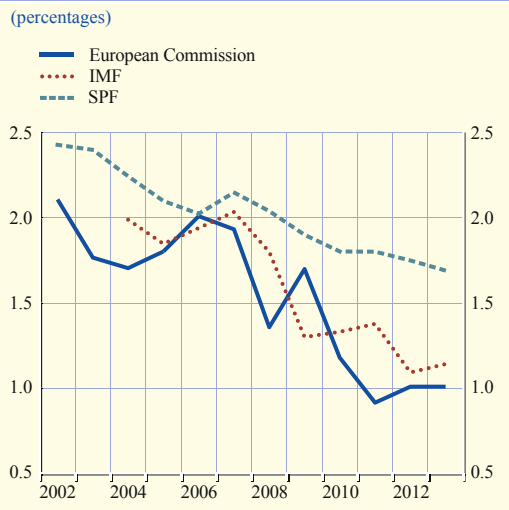
(percentages)

- European Commission
- IMF
- SPF

Sources: European Commission, IMF and SPF.
Notes: For the European Commission and the IMF, data refer to the autumn forecast. For the SPF, data refer to the fourth quarter round. The EC figure for 2006 has been constructed using national figures (12 countries) weighted by the GDP shares of 2005.

Chart 4 Long-term unemployment expectations by the SPF and long-term NAIRU estimates by international organisations

(percentages)

- European Commission
- IMF
- SPF

Sources: European Commission, IMF and SPF.
Notes: For the European Commission and the IMF, data refer to the autumn forecast. For the SPF, data refer to the fourth quarter round. The EC figure for 2006 has been constructed using national figures (12 countries) weighted by the GDP shares of 2005.

13 In the case of the ECB SPF, it has been found that revisions to longer-term unemployment expectations are driven largely by revisions in the short-term unemployment outlook, suggesting that respondents perceive a high degree of hysteresis in unemployment data. See Bowles, C., Friz, R., Genre, V., Kenny, G., Meyler, A. and Rautanen, T., "The ECB survey of professional forecasters (SPF) – A review after eight years' experience", *Occasional Paper Series*, No 59, ECB, April 2007.

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unemployment expectations in the SPF compared with forecasts by international organisations are qualitatively consistent with the higher long-term real GDP growth expectations in the SPF.

Long-term inflation expectations in the SPF have remained quite stable over recent years. The average five-year ahead expectation has remained between around 1.9% and 2.0%, with the median remaining even more stable. At the same time, headline HICP inflation has been subject to fairly large fluctuations. SPF data available since the start of EMU point to a relatively weak link between long-term inflation expectations surveyed in a particular quarter and the latest actual inflation rate known at the time of the survey. However, the link is stronger between long-term inflation expectations and longer-term moving averages of past inflation. It is particularly high for the cumulative average of annual inflation rates calculated for each quarter in the period from the first quarter of 1999. The cumulative average inflation rate can be seen as a proxy for the track record, and the resulting credibility, of the ECB's monetary policy in terms of the inflation outcome.[14]

Overall, the analysis of long-term expectations suggests that they provide important information on how firmly anchored expectations are around the ECB's objective of price stability and how forecasters perceive the evolution of the euro area's longer-term growth potential.

4 REVIEWING PROFESSIONAL FORECASTERS' ASSESSMENT OF UNCERTAINTY SURROUNDING THEIR FORECASTS

Since the start of the financial crisis in 2008, the macroeconomic outlook has been characterised by greater than normal uncertainty. Whilst it is generally accepted that uncertainty has increased, there is no agreed metric to indicate by how much. An assessment of the degree of uncertainty is important, as it is likely to have an impact on corporate investment and household saving decisions.[15]

An important feature of the ECB SPF is that it provides an insight into respondents' assessments of the degree of uncertainty surrounding their forecasts. More specifically, SPF participants are asked to assign a probability distribution to their forecasts.[16] Although the ECB SPF provides several dimensions for measuring forecast uncertainty, this section extracts information on uncertainty from (i) disagreement and (ii) probabilities, with the focus on aggregate uncertainty and more specifically on the standard deviation of the probability distribution aggregated across all respondents.[17] In the absence of a direct measure of uncertainty, disagreement has often been used as a proxy variable. However, it does not appear to be a good proxy for overall macroeconomic uncertainty. In the case of the ECB SPF, across all macroeconomic variables and horizons, the spread of individual point

14 See the box entitled "The anchoring of long-term inflation expectations", *Monthly Bulletin*, ECB, October 2013.
15 For a discussion on the evolution of various measures of uncertainty and their potential implications for the macroeconomic outlook, see the box entitled "Measuring perceptions of macroeconomic uncertainty", *Monthly Bulletin*, ECB, January 2010, and the box entitled "How has macroeconomic uncertainty in the euro area evolved recently?", *Monthly Bulletin*, ECB, Oct. 2013.
16 This distribution provides information about the probability, expressed as a percentage, of the future outcome being within a specific range. The probability distribution resulting from the aggregation of responses also helps to assess how, on average, survey participants gauge the risk of the actual outcome being above or below the most likely range.
17 Calculating the standard deviation of the SPF distributions is somewhat problematic in practice as respondents attach probabilities to specific ranges. We present the approach that assumes that all the probability for a given range relates to the mid-point of that range. Although this may shift the estimated standard deviation upwards, as it is more likely that more of the probability within a range is located closer to the centre of the distribution than further away, other methods, which include fitting functional forms such as normal, skew-normal or beta distributions, are not without their drawbacks either, particularly at the individual level.

forecasts has rarely been wide enough to encompass the actual outcome.[18] Aggregate uncertainty combines information on disagreement between (standard deviation of) individual point forecasts and forecasters' individual assessments of uncertainty (average individual uncertainty) measured by the average of standard deviations of the probability distributions reported by each forecaster.[19]

Uncertainty can normally be expected to increase over the different forecast horizons requested from SPF participants (i.e. next calendar year, one year ahead, calendar year after next, two years ahead and five calendar years ahead). Chart 5 shows values for this term structure for two sub-periods: pre-crisis (1999-2008) and post-crisis (2009-2013). There are a couple of noteworthy features. First, although uncertainty generally increases as the forecast horizon increases, the upward slope is relatively flat for HICP inflation and particularly for GDP growth, while it is steeper for unemployment. Whereas longer-term expectations of inflation and GDP growth may be anchored by monetary policy and potential growth respectively, longer-term unemployment expectations tend to be linked to the NAIRU, which may vary substantially over time, as seen in the previous section. Second, there has been a clear upward shift in the perceived degree of uncertainty surrounding macroeconomic forecasts since the economic crisis began. For each variable and forecast horizon, aggregate uncertainty has shifted upwards for the post-crisis period.

The increase in perceived uncertainty is broadly consistent with other indicators of macroeconomic uncertainty. There has been a significant degree of co-movement with other macroeconomic indicators of uncertainty, such as stock and bond market volatility and sentiment surveys. Chart 6 reports the uncertainty measure for two-year ahead outcomes (unweighted average of the uncertainty measure for HICP inflation, real GDP growth and unemployment rate forecasts), as this is probably the forecast horizon closest to the horizons implied by the medium-term orientation of monetary policy. This co-movement indicates that measures of uncertainty derived from the SPF may be useful complements to financial indicators measuring the direction of movement of uncertainty. Overall, since early 2008, all measures of forecast uncertainty from the ECB SPF have risen for all variables across all horizons. Although some of this increase has since unwound, uncertainty remains fairly elevated when compared with financial market indicators. This suggests that, while perceptions of market-specific risks may have eased, perceptions of overall macroeconomic risks have remained elevated according to forecasters.
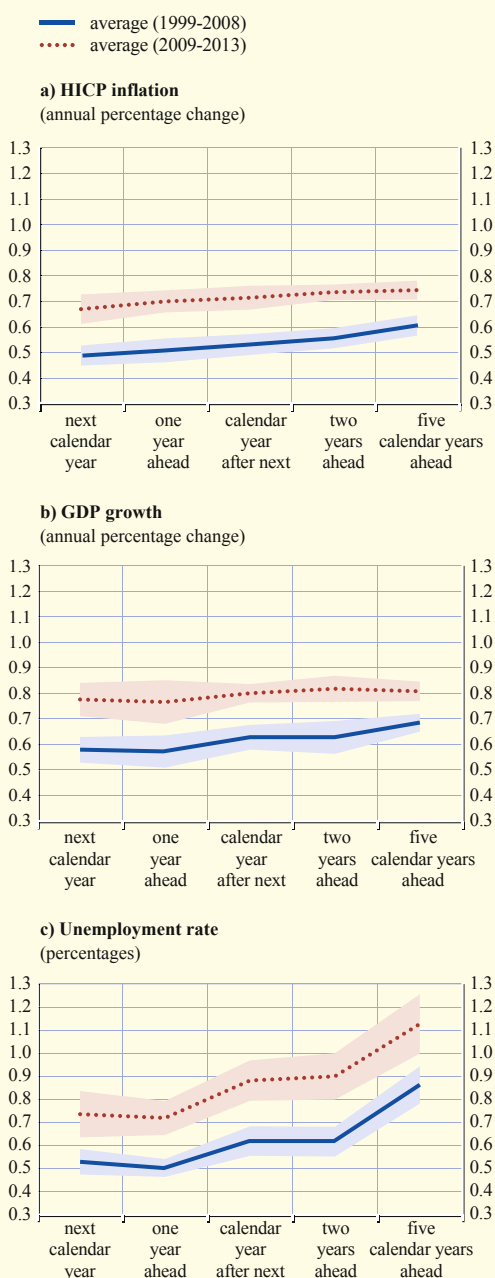
However, in this regard, unlike for point forecasts, there is no directly observable benchmark for forecast probabilities that could facilitate a test of how closely they correspond to the true density of the variable under consideration. Nonetheless, there is indirect evidence that ECB SPF forecasters, in common with many macroeconomic forecasters, appear generally to have underestimated uncertainty over the last decade.[20] Evidence from the US SPF suggests that these forecasters also tend to be over-confident regarding the uncertainty surrounding their forecasts.[21] In this regard, it may also be that the ongoing elevated perceptions of risk depicted in Chart 6 merely reflect the adoption of a more realistic assessment of macroeconomic uncertainty compared with before, rather than an actual increase in the underlying degree of uncertainty.

18 D'Amico and Orphanides also suggest that disagreement may be a weak proxy for forecast uncertainty. See D'Amico, S. and Orphanides, A., "Uncertainty and Disagreement in Economic Forecasting", *Finance and Economics Discussion Series*, No 2008-56, Board of Governors of the US Federal Reserve System, 2008.
19 Other higher moments of the aggregate distribution that might provide information on the balance of risks or tail risk events, in particular the skew and kurtosis, are not considered here. See Kenny, G., Kostka, T and Masera, F., "How informative are the subjective density forecasts of macroeconomists?", *Working Paper Series*, No 1446, ECB, July 2012.
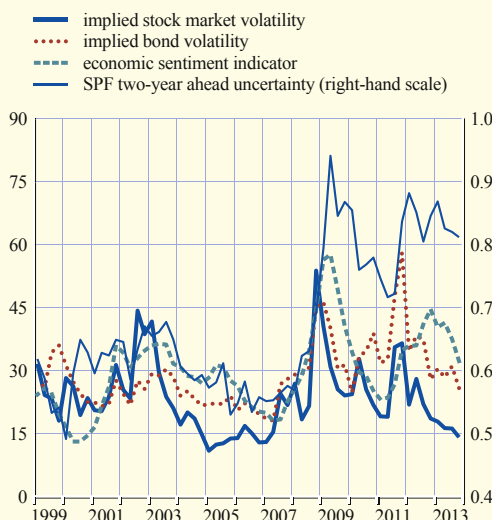20 See Bowles et al. (2010) "An Evaluation of the Growth and Unemployment Forecasts in the ECB Survey of Professional Forecasters", OECD Journal: Journal of Business Cycle Measurement and Analysis, Vol. 2010/2.
21 See Clements, M.P., "Subjective and Ex Post Forecast Uncertainty: US Inflation and Output Growth", The Warwick Economics Research Paper Series (TWERPS), No 995, September 2012.

ARTICLES

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professional
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Chart 5 Term structure of macroeconomic uncertainty according to SPF respondents

— average (1999-2008)
····· average (2009-2013)

a) HICP inflation
(annual percentage change)

b) GDP growth
(annual percentage change)

c) Unemployment rate
(percentages)

Sources: SPF and ECB calculations.
Notes: The charts show the average dispersion (as measured by the standard) of aggregated SPF probability distributions. The shaded areas illustrate the variation about the average and represent plus and minus one standard deviation from the average observed over each period. The x-axis denotes the horizon. Note that the current calendar year horizon is not reported as it is strongly impacted by seasonality in terms of how many months remain when the round is conducted.

Chart 6 Cross-checking against other selected indicators of macroeconomic uncertainty

— implied stock market volatility
····· implied bond volatility
‐ ‐ ‐ economic sentiment indicator
— SPF two-year ahead uncertainty (right-hand scale)

Sources: Bloomberg, European Commission, SPF and ECB calculations.
Note: Economic sentiment indicator is inverted and rescaled.

5 CONCLUSION

In line with the importance of expectations for the economy, the ECB Survey of Professional Forecasters gathers information on the private sector's short to medium-term outlook. The survey has provided very useful services to policy-makers in their assessment of risks to price stability, providing a rich source of information on the outlook for euro area macroeconomic developments and the uncertainty surrounding these developments. In this respect, the SPF has offered a useful comparator to the Eurosystem staff macroeconomic projections in terms of point forecasts. In addition, the longer-term GDP growth, unemployment and inflation expectations in the SPF have provided a useful insight into the broad forces underlying the long-term dynamics of the euro area and the credibility of the ECB's monetary policy with regard to its price stability objective. Finally, the SPF has provided information on professional forecasters' assessments of the uncertainty surrounding their forecasts, which can be considered a key value added of the SPF.