4 How do professional forecasters assess the risks to inflation?

Perceptions of uncertainty and risks are an important element in assessing the economic outlook, adding to the information gained from point forecasts. Economic agents' expectations of future inflation can affect subsequent economic developments, for example, through their influence on price-setting, consumption and investment decisions. For this reason, analysis of inflation expectations data, such as that in the ECB's Survey of Professional Forecasters (SPF), plays an important role in the overall assessment of the inflation outlook. Such analysis has two dimensions: the point forecasts and the perception of risks around those point forecasts. The point forecasts for the next three years tell us professional forecasters' central views on the evolution of the economy, given the shocks already observed or embodied in their technical assumptions (e.g. for the oil price). Longer-term point inflation expectations can be used to assess the perceived effectiveness of monetary policy. Risk perceptions, on the other hand, reveal useful information on the expected distribution of economic shocks and provide an additional dimension for assessing the strength of the longer-term inflation expectations anchor. This box focuses on how risk metrics can be derived from the SPF data, and what those risk metrics might imply.

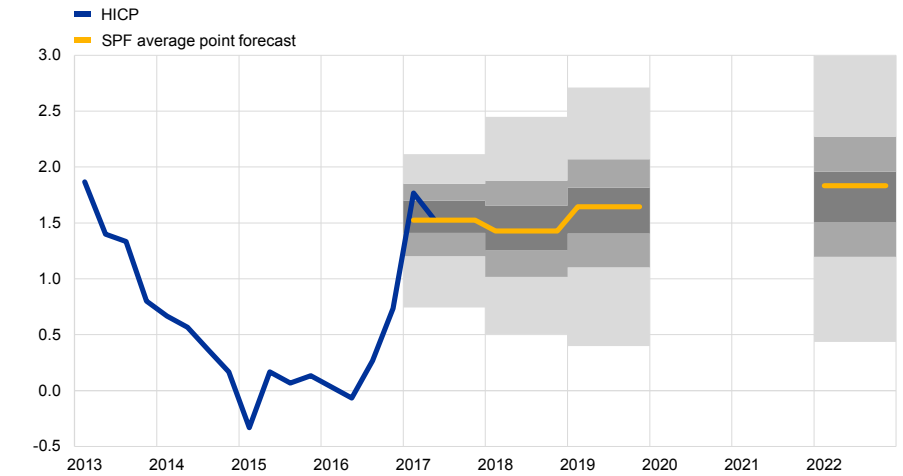
The probability distributions reported in the SPF can be used to derive measures of risk and uncertainty. The SPF asks not just for point expectations, but also for participants' assessment of the probabilities of different inflation outcomes in the future. While the point expectations reflect survey participants' central estimates of future inflation, the probabilities participants assign to different future inflation outcomes reveal their assessments of uncertainty and risks.

Uncertainty, measured by the width of the reported distribution, increases with the forecast horizon (see Chart A). In part, this reflects the general observation that the more distant future is typically more uncertain than the near future. More fundamentally, that may be because the number of different factors which can influence the outcome increases with the horizon: the short term tends to be affected predominantly by oil price developments; in the medium term, the outlook for inflation and the risks around it become more closely connected to those for real economic growth; in the long term, the perceived strength of the nominal anchor provided by monetary policy becomes most relevant.[17]

[17] See "What has been driving developments in professional forecasters' inflation expectations?", *Economic Bulletin*, Issue 1, ECB, 2017.

Chart A

SPF expectations for HICP inflation in 2017, 2018, 2019 and 2022

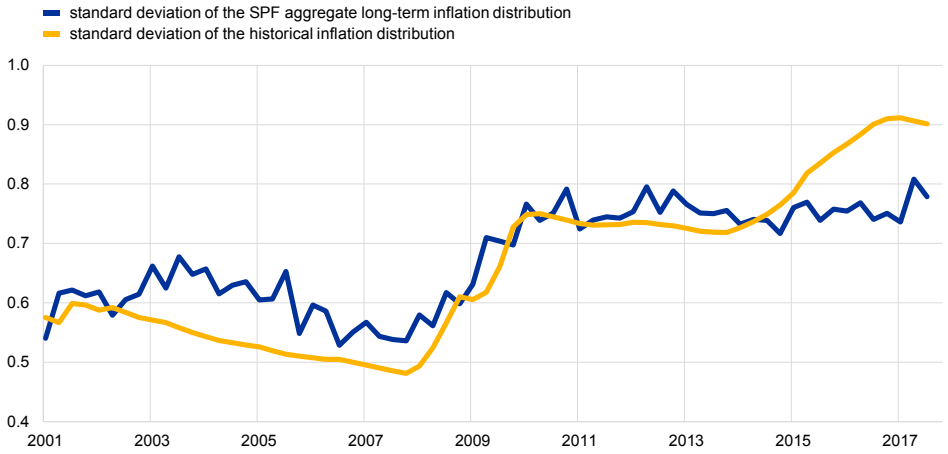


Sources: Eurostat and ECB calculations based on SPF results.
Notes: Quarterly data. The shaded bands denote the 5th, 20th, 35th, 65th, 80th and 95th percentiles of the probability distributions for each horizon.

Overall inflation uncertainty has remained higher than it was before 2008, but the volatility of actual inflation has increased by more. The standard deviation of the aggregate longer-term probability distribution, which measures its width, increased in 2008 and 2009. This movement in the forward-looking uncertainty measure tracked the evolution of the backward-looking, realised volatility in inflation, as movements in oil and other global commodity prices drove quarterly HICP inflation from 2% up to 3.8% in the third quarter of 2008 and then down to -0.4% in the third quarter of 2009. Uncertainty around future inflation outcomes has since remained at that higher level, even though the more recent movements in inflation, down from 2.9% in the fourth quarter of 2011 to -0.3% in the first quarter of 2015, then back up to 1.8% in the first quarter of 2017, have pushed up realised volatility further (see Chart B). This might suggest that while SPF respondents acknowledge the possibility of extreme commodity price swings leading to volatility in inflation, they do not expect large movements in inflation, such as those experienced over 2015 and 2016, to be repeated.

Chart B

SPF perceptions of inflation uncertainty and the dispersion of actual inflation



Sources: Eurostat and ECB calculations based on SPF results.
Note: The yellow line shows the standard deviation of the expanding sample of quarterly HICP inflation outturns from the first quarter of 1995.

The asymmetry of respondents' probability distributions indicates how they perceive the balance of risks. Put simply, the balance of risks measures how, in the event that a forecast would turn out to be wrong, the forecaster considers it more likely to be wrong. For instance, a positive balance of risks indicates that the forecaster believes that, were their forecast to be wrong, it would more likely be because the outturn was above the forecast than below it.[18] In terms of the expected probability distribution, a positive balance of risks signifies that more probability is assigned to outcomes above the central estimate than to outcomes below it.[19]

There are different ways of measuring the balance of risks numerically, but all measures tend to move closely together. Alternative measures of asymmetry and alternative practical choices which must be made when calculating those measures from survey data lead to a range of calculated asymmetries, rather than a unique value.[20] Furthermore, in the SPF the point forecasts are reported separately and can be compared with the probability distributions to provide an indication of the balance of risks. In the quarterly SPF reports, this is measured numerically as the mean of the aggregate probability distribution *minus* the average point forecast.[21]

SPF respondents see the risks to their inflation projections as broadly balanced at short horizons, but still to the downside in the longer term. The

[18] As a stylised example, consider making a point forecast of one throw of a die with the following six numbers on its faces: 1, 2, 2, 2, 3, 3. The most likely outcome – and therefore the central estimate – is 2, but if the outcome were to be something other than 2, it is more likely that it is above 2 than below. Hence in this example, the balance of risks is positive, i.e. to the upside.

[19] Statistically, this implies that for a positive (negative) balance of risks, the distribution mean is higher (lower) than the distribution mode, i.e. the most likely outcome. In the example above, the distribution mean is: (1+2+2+2+3+3)/6 = 13/6, which is greater than 2, the most likely outcome.

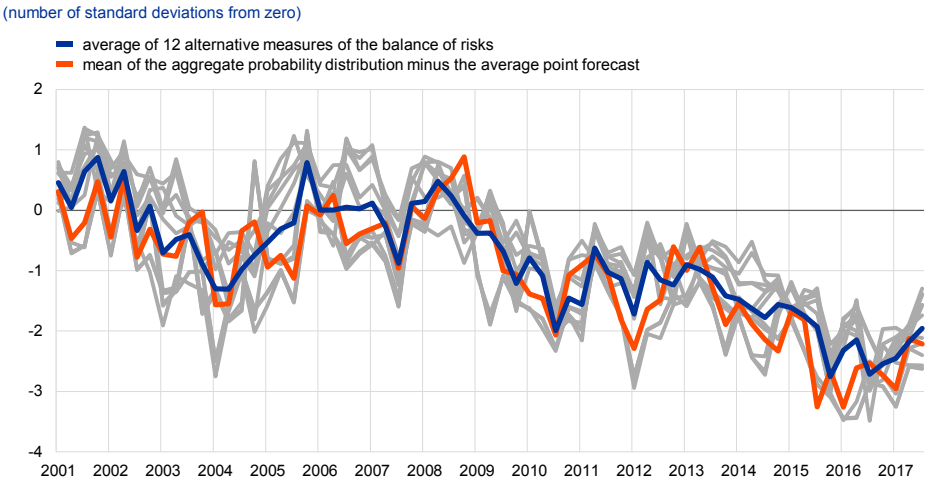
[20] Different theoretical statistical measures of asymmetry include: skewness, quantile skewness, mean *minus* median. The different practical choices which need to be made to calculate these measures from SPF data include: how to close the unbounded bins at each end of the overall probability range in the survey and how to derive a continuous distribution from the discrete probabilities reported.

[21] See the latest SPF report for the third quarter of 2017.

point forecast for inflation in 2017 lies close to the centre of the corresponding probability distribution (shaded darkest in Chart A), which suggests that the risks around that expectation are thought to be broadly balanced. In contrast, at the longer-term horizon, more probability is assigned to inflation outcomes below the point forecast than above it, indicating that the balance of risks around the longer-term inflation expectation is to the downside. However, the longer-term balance of risks has been recovering since 2016, albeit gradually (see Chart C).

Chart C

SPF perceptions of the balance of risks to longer-term inflation projections



Sources: ECB calculations based on SPF results.
Notes: The individual series have been normalised to allow comparability. A negative (positive) sign means the balance of risks is perceived as being to the downside (upside). The measures included in the swathe are the skewness, quantile skewness, mean-median and mean-point forecast of continuous distributions derived from: linear interpolation, cubic spline interpolation and fitting a parametric (beta) distribution.

Overall, the risk information in the SPF supports the notion that longer-term HICP inflation expectations remain anchored. Longer-term inflation expectations have remained stable at 1.8% over the last two years, despite strong volatility in actual HICP outturns. Furthermore, the forward-looking measure of uncertainty has also remained stable, despite the actual volatility, and the downside balance of risks to longer-term inflation expectations has shown some modest improvement in the last few survey rounds. This could suggest that the risks of de-anchoring of longer-term inflation expectations are gradually receding.