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A look back at 25 years of the ECB SPF

No 364

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Abstract

This paper looks back on the 25-year history of the ECB Survey of Professional Forecasters (SPF). Since its launch in the first quarter of 1999, it has served as an important input for policymaking and analysis, especially over the past five years, where the euro area has, following a period of low inflation, navigated a global pandemic, Russia's invasion of Ukraine and an unprecedented surge in inflation. The survey has evolved over time and provides not only a long time series of economic expectations and forecasts, but also valuable insights on key topical issues and on economic risks and uncertainties. We show that, for each of the three main macroeconomic variables forecast – HICP inflation, real GDP growth and the unemployment rate – the track record of the ECB SPF in forecasting has been broadly comparable to that of the Eurosystem. In addition, its combination of quantitative point forecasts and probability distributions with qualitative explanations has provided useful input for macroeconomic analysis. Beyond analyses of the forecasts for the main macroeconomic variables, there are also two further sections that examine the technical assumptions (oil prices, policy rates, exchange rates and wages) underlying SPF expectations and an analysis and assessment of measures of macroeconomic uncertainty. Technical assumptions are shown to account for the lion's share of the variance in the inflation forecast errors, while uncertainty is shown to have increased considerably relative to that which prevailed during the early years of the SPF (1999-2008). Looking ahead, the SPF – with its long track record, its large and broad panel (spanning both financial and non-financial forecasters) and committed panellists – will undoubtedly continue to provide timely and useful insights for the ECB's policymakers, macroeconomic experts, economic researchers and the wider public.

JEL codes: D84, E31, E37, E52, E66

Keywords: Survey, forecasts, SPF, inflation, expectations

Non-technical summary

Knowing and understanding macroeconomic expectations is important for central banks for many reasons. For instance, they influence decisions on consumption, saving and investment, thus affecting overall economic output and employment levels. As anchoring inflation expectations at target can facilitate the efforts of central banks in moving towards the target, it also makes for more effective monetary policy. More anchored and stable expectations can also help reduce uncertainty and lessen disruptive movements in financial markets.

This paper looks back on the 25-year history of the ECB Survey of Professional Forecasters (SPF), which was launched in the first quarter of 1999, focusing especially on developments over the past five years. Over the latter interval, the euro area has, following a period of low inflation, navigated a global pandemic, Russia's invasion of Ukraine and an unprecedented surge in inflation. The SPF has played an invaluable role in providing information on complex economic situations during these challenging times. In addition to point forecasts, the SPF also provides valuable insights on key topical issues and on risks and uncertainty in the economy.

The SPF is unique in terms of its history, size, panel composition and the information it gathers. It is a survey of euro area macroeconomic forecasts and expectations expressed by professional macroeconomic forecasters located in Europe. It was the first such survey to explicitly canvass expectations for euro area macroeconomic variables. The results and report are made available to the public via a dedicated website. The main variables surveyed are: HICP inflation, real GDP growth and unemployment rate. Both point forecasts and the underlying probability distributions are surveyed, covering short-, medium- and longer-term horizons. Respondents also provide quantitative information on some of the key assumptions underlying their forecasts – namely for policy interest rates, the USD-EUR exchange rate, oil prices in USD terms and labour cost growth. They may also provide qualitative information on the factors underpinning their forecasts, the risks surrounding them, and the reasons for any changes from the previous round.

Over the first 20 years of the survey, SPF HICP inflation forecast errors tended to be positive in the first decade but negative in the second, followed by strongly positive errors from 2020 to 2022, reflecting the effects of the pandemic and the war in Ukraine. While a direct comparison between the forecast performance of the SPF and Eurosystem projections is challenging and subject to caveats, the SPF forecast performance relative to Eurosystem inflation projections is broadly comparable – sometimes better, sometimes worse but not significantly different on average.

When it comes to longer-term inflation expectations, over the history of the SPF, there is some evidence to suggest that they have reacted to actual inflation trends as well as the to the specification of the ECB's monetary policy target for price stability. Looking beyond the main (mean and median) measures, the histogram of point longer-term inflation expectations has yielded considerable insight into the understanding of, and confidence in, the ECB's price stability target among

respondents. In the most recent period since the review of monetary policy strategy in July 2021, the mode (or most frequent value) of the histogram of point longer-term inflation expectations has become clearly focused at 2.0%. Regarding the assessment of risks, a balance of risks indicator constructed from the longer-term inflation expectations of SPF respondents suggests a high degree of congruity with estimates of inflation risk premia embedded within market-based measures of inflation compensation.

As for real GDP forecasts, SPF respondents have tended to over-forecast GDP on average. However, transitory, as opposed to persistent, forecast errors account for the largest portion of the total errors. While there are caveats to comparing the GDP growth forecast performance of the SPF with that of Eurosystem staff, both have performed relatively similarly. Longer-term growth expectations have been systematically revised down from 2.7% in 2001 to around 1.3% currently.

Unemployment rate expectations in the euro area SPF have been fairly accurate on average for the short and medium term, although SPF forecasters have tended to over-forecast the unemployment rate since the onset of the pandemic. Long-term unemployment rate expectations also move somewhat with current conditions in the labour market, suggesting that SPF forecasters perceive hysteresis in euro area labour markets.

With respect to their assumptions regarding key financial and market variables, SPF respondents are influenced to a fair degree by recent developments and disagreement between forecasters is relatively low (especially when we consider the volatility of the variables in question). Forecast errors in the assumptions account for around 80% of errors for headline HICP one year ahead.

The SPF also provides information on how participants assess the uncertainty surrounding their expectations. Aggregate uncertainty (which is equal to average individual uncertainty plus disagreement between forecasters) has increased following the global financial crisis and, more recently, since the pandemic and Russia's invasion of Ukraine. Yet in spite of these increases, reported uncertainty might still be under-estimated as actual outcomes are too often in the tails of their probability distributions.

While the 25 years since the launch of the euro and the SPF have, macroeconomically speaking, been challenging for economic policymakers and forecasters alike, the SPF has provided useful insights and cross-checks for policymakers. Its track record in forecasting has been broadly comparable to that of the Eurosystem. It has also helped us understand how professional forecasters perceived and adjusted to the 2021 ECB monetary policy review and subsequent developments. Looking ahead, forecasters and policymakers will surely face new macroeconomic puzzles and challenges, but the SPF, with its long history and its large and broad panel of committed panellists, will undoubtedly continue to provide timely and useful insights for the ECB's policymakers, macroeconomic experts, economic researchers and the wider public.

1 Introduction

Economic expectations influence economic decisions and therefore surveys of expectations and forecasts are a crucial ingredient for understanding and predicting economic outcomes. Knowing and understanding macroeconomic expectations is important for central banks for many reasons. Expectations matter when it comes to how economic agents (consumers, business, financial sector, etc.) perceive and understand current and future economic conditions.[1] Expectations influence decisions on consumption, saving and investment, thus affecting overall economic output and employment levels. Expectations also matter for the effectiveness of monetary policy. Anchoring inflation expectations at target can facilitate efforts among central banks to reach the target, particularly in an environment of shocks that affect inflation and make it more volatile. Some monetary policy tools, such as forward guidance and communication strategies, rely on shaping expectations about the future path of macroeconomic and policy conditions. Furthermore, substantial shifts in expectations can have implications for financial market stability. More anchored and stable expectations can help reduce uncertainty and lessen disruptive movements in financial markets.

This paper revisits the 25-year history of the ECB Survey of Professional Forecasters (SPF), focusing on developments over the past five years.[2] Back when the SPF was launched (Q1 1999), there was limited knowledge and experience of analysing and forecasting the euro area macroeconomy. Right from its first official round, shortly after the launch of the euro and the start of a single monetary policy, the SPF became an important input for policymaking and analysis, especially when we consider that the length, breadth and depth of macroeconomic series for the new economic area was much more limited than what it is now. The SPF remains a vital source of information (for instance, on longer-term expectations) and continues to offer key insights into economic developments, particularly over the past five years, which we focus on in this paper.[3] Since 2019, the euro area has, following a period of low inflation, navigated a global pandemic, Russia's invasion of Ukraine and an unprecedented surge in inflation. The SPF has played an invaluable role in providing information on complex economic situations during these challenging times. The interest in the survey is evident from the number of users visiting the SPF website (**Chart 1**), which correlates with the evolution of HICP inflation over the period.

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1 The importance of expectations in economic theory has a long history. Expectations, particularly what are known as "animal spirits", played a key role in the work of Keynes (1936). More modern economic theory has extended and deepened the consideration of expectations. Lucas (1972) was foundational in the development of theories about rational expectations, while Kydland and Prescott (1977) elaborated on the role of policy in anchoring expectations. More recently, Caballero and Simsek (2020) discuss how expectations can potentially amplify economic shocks, using the COVID-19 pandemic as an illustration.

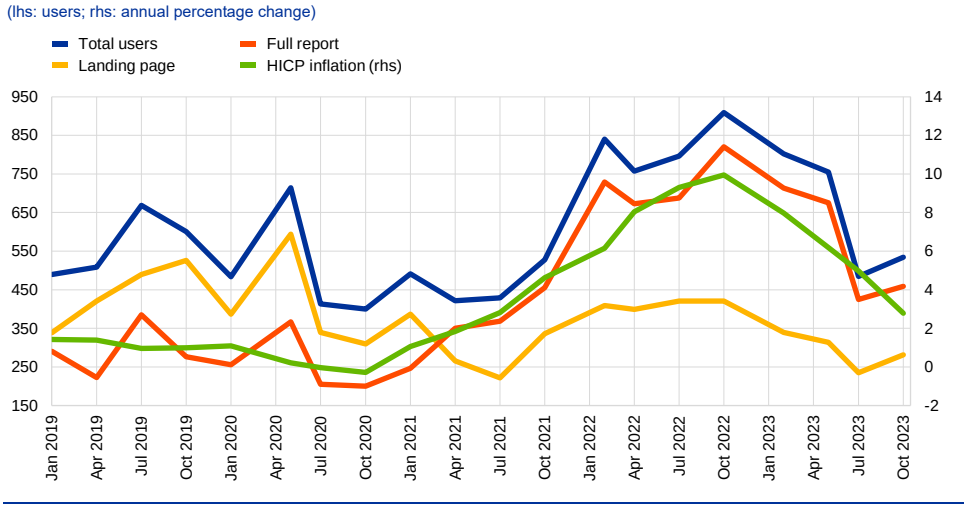
2 The material and analyses described in this paper were presented to the SPF panel at an event held on 19 March 2024 to mark the occasion of 25 years of the SPF. For a short overview and summary of the event, click here.

3 For a more in-depth overview of the first 20 years of the survey, please see de Vincent-Humphreys et al. (2019). For earlier overviews of the SPF, see Garcia (2003) and Bowles et al. (2007).

The survey has evolved over time and provides not only a long time series of economic expectations and forecasts, but also valuable insights on key topical issues and on economic risks and uncertainty. SPF respondents are also regularly asked special ad-hoc topical questions to better understand shocks. For instance, the survey was a useful early source of information on the expected effects of the pandemic, before hard data became available. As managing expectations is a key part of monetary policy, the survey provided useful input for the ECB's monetary policy strategy review (see, for example, ECB 2021b) and helped to inform the changes in the formulation of the price stability objective. In addition to the topical analysis, the granularity of the survey can be used to assess uncertainty and risks, by considering forecaster heterogeneity and cross-sectional information, and by looking at information provided by respondents on the probability distributions underlying their point forecasts.

Chart 1

Users of the SPF website (during the week following publication of the report)



Sources: ECB and Eurostat.
Notes: Users and views (landing page and full report) during the week following the release of the quarterly SPF report. The SPF is published quarterly, on the working day after the monetary policy Governing Council meeting at which it is discussed. The three series shown are: (i) the total number of users visiting the SPF website (either the landing page, or the full report, or both); (ii) the number of users viewing the landing (i.e. main) page; and (iii) the number of users visiting the full report (usually 20 pages).

The information gathered by the survey is widely used in both monetary policy decision-making and research.[4] Each quarter, the survey results and assessment are submitted to the ECB's Governing Council for consideration at its monetary policy meetings. The survey report is then published on the ECB website the working day after the Governing Council meeting. As the SPF offers a long and rich source of data on euro area macroeconomic expectations, it has also been used extensively for economic research. The topics covered include the quality and predictive content

[4] Other central banks conduct similar surveys. The US SPF was started in 1968 by the American Statistical Association (ASA) and the National Bureau of Economic Research (NBER) and taken over by the Federal Reserve Bank of Philadelphia in 1990. For an overview of the first 50 years of the US SPF, see Croushore and Stark (2019). The Bank of England has conducted its Survey of External Forecasters (SEF) since 1996 – see Boero et al. (2008) for more information about the survey. These survey results are reported and commented upon quarterly in the Bank of England Monetary Policy Report.

of SPF point and probability forecasts, macroeconomic uncertainty, and how expectations are formed and anchored.[5]

In this occasional paper, we first provide a brief overview of the SPF, its primary features and the evolution of the panel over its history to date; second, we consider different dimensions of macroeconomic expectations by looking at the main variables (with sub-sections on inflation, economic growth and the unemployment rate), including their forecast performance and the monitoring and understanding of longer-term expectations. Beyond the main variables, there are also two further sections examining the technical assumptions (oil prices, policy rates, exchange rates and wages) underlying SPF expectations and an analysis and assessment of measures of macroeconomic uncertainty. Technical assumptions are shown to account for the lion's share of the variance in inflation forecast errors, while uncertainty is shown to have increased considerably relative to that which prevailed during the early years of the SPF (1999-2008). This paper also includes four boxes, each focusing on a specific topic, namely the main results from the 2023 special questionnaire on forecasting methodologies, the usefulness of the SPF in gaining a clearer understanding of market-based measures of inflation compensation, key insights gained over the years from the special topical ad hoc questions asked in the SPF, and the use of the SPF in economic research.

5 See Box 4 for a selection of such work published over the past five years.

2 What is the ECB SPF?

The ECB SPF is unique in terms of its history, size, panel composition and the information it gathers. It is a survey of the euro area macroeconomic forecasts and expectations of professional macroeconomic forecasters located in Europe (see additional information on criteria below).[6] It was the first such survey to explicitly canvass expectations for euro area macroeconomic variables. The results and report are made available to the public via a dedicated website.[7] The active panel and number of responses are larger than for other similar surveys (Consensus Economics, Euro Zone Barometer, Survey of Monetary Analysts, etc.). The main variables surveyed are HICP inflation, real GDP growth and unemployment rate.[8] Both point forecasts and underlying probability distributions are surveyed, covering short-, medium- and longer-term horizons.[9] Respondents also provide quantitative information on some of the key assumptions underlying their forecasts, namely for policy interest rates, the USD-EUR exchange rate, oil prices in USD terms and labour cost growth. They may also provide qualitative information on the factors underpinning their forecasts, the risks surrounding them, and the reasons for any changes from the previous round. In addition, ad hoc questions are frequently asked addressing key conjunctural issues (see **Box 3** for a further discussion).

Because of when it takes place, the SPF can serve both as a cross-check and a 'kick-off' point for Eurosystem staff projections. The survey is conducted quarterly, in early January, April, July and October, meaning that it takes place in between Eurosystem forecasting exercises (published in early March, June, September and December). As a result, the SPF can be used to cross check the Eurosystem forecasts (i.e. the exercise completed before the SPF round), while also providing a useful 'kick-off' point for the forecast exercise that follows the SPF round.[10]

Participation numbers in the SPF have remained remarkably stable over time. Over the 25 years of the survey, the average number of respondents per round has been 58 (see **Chart 2**).[11] Meanwhile, the size of the active panel (i.e. participating in

6 For a review of the literature on surveys of professionals, see Clements et al. (2022).

7 The SPF results and reports are currently published the working day after the ECB Governing Council meeting at which they are discussed.

8 Since Q4 2016, expectations for HICP inflation excluding food and energy have also been surveyed.

9 The SPF has four calendar year horizons: current calendar year, next calendar year, the calendar year after next and one other longer-term horizon (i.e. the calendar year four or five years ahead). For example, in the Q1 2024 SPF round these were the calendar years 2024, 2025, 2026 and 2028. The longer-term horizon is four calendar years ahead in the Q1 and Q2 rounds, and five calendar years ahead in the Q3 and Q4 rounds. There are also two so-called "rolling" horizons, which are one and two years ahead of the latest available data at the time the survey is conducted. For example, in the Q1 2024 SPF round, these were December 2024 and December 2025 for HICP and HICPX inflation; 2024 Q3 and 2025 Q3 for real GDP growth; and November 2024 and November 2025 for the unemployment rate.

10 It is also possible for Eurosystem projections to inform SPF forecasts. For instance, ECB (2021a) shows that average inflation forecasts compiled by Consensus Economics respond to Eurosystem projections.

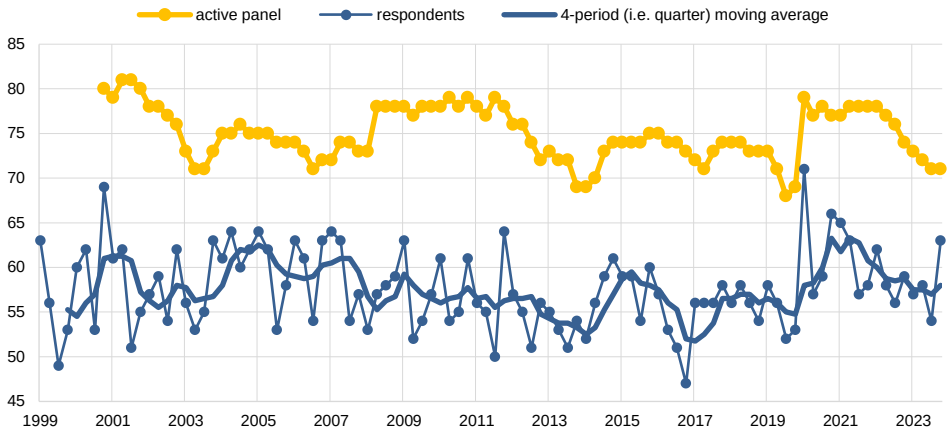
11 Somewhat more respondents on average respond to calendar year horizons (58) than to rolling horizons (51).

at least one of the previous eight rounds) has averaged 75. Thus, the participation rate (i.e. the number of respondents divided by size of the active panel) has averaged over 75%. While no respondent has replied to every single SPF round, 16 have responded in over 90% of rounds to date. There is a "core" of panellists who take part on a very regular basis. For instance, around 35 panellists have participated in each of the eight rounds from Q2 2022 to Q1 2024.

Chart 2

Size of, and participation in, the SPF panel over time

(x-axis: time; y-axis: number of panellists)



Source: ECB SPF.
Note: The active panel includes respondents participating in at least one of the previous eight rounds.

Panel refreshment has been vital in maintaining the size of the active panel. Without panel refreshment (i.e. the entry of new panellists), the size of the active panel would have declined to around 50 and the number of respondents to around 40. Departures from the panel have been down to various factors. In some instances, panel members' organisations have merged, while in others, they have joined "forecasting networks" and thus no longer provide independent forecasts (see criteria below).[12] A small number of respondents have also asked to withdraw from the panel citing a lack of resources or overwhelming workloads.

Potential new entrants to the SPF panel are loosely assessed against a few criteria. These are: (i) a specific economic and forecasting role within the participating organisation (e.g. economics department); (ii) macroeconomic expertise relating to the euro area; (iii) several years of experience and/or international renown in forecasting and publishing forecasts, ideally euro area forecasts; and (iv) autonomy in producing forecasts.

Box 1 Insights from a special questionnaire on forecasting methodologies

This box presents key insights from a special survey to mark the occasion of 25 years of the ECB Survey of Professional Forecasters (SPF) in 2023. The survey repeated some regular questions

[12] Over time there has been some increase in the share of respondents from financial institutions, from around 50% in the early years to around 60-65% currently. This may be partly due to the fact that some research institutions have joined forecasting networks.

from previous special surveys (conducted every five years since 2008), exploring the forecast processes and methodologies underlying the contributions made to the regular quarterly SPF. Additionally, respondents were asked about the implications for forecasting of the unique macroeconomic developments to have unfolded over the past five years, including the pandemic, geopolitical developments, weather- and climate-related considerations, and the recent period of high inflation.[13]

Regular questions asked also in previous special surveys

Compared with previous special surveys, only limited changes have been made to the regular forecast processes. The frequency at which SPF respondents forecast variables still varies systematically across variables and horizons. For example, for shorter- and medium-term horizons, respondents largely forecast the variables at the frequency at which they are reported. Conversely, at longer-term horizons, most forecasts are annual.

As in previous rounds, expert judgement continues to play an important role, particularly for longer-term horizons. Most respondents indicated that shorter- and more medium-term point forecasts for inflation and GDP growth are model-based with judgemental adjustments, whereas for a minority they are based essentially on either models or judgement. In contrast to point forecasts, forecasts of expected probability distributions are predominantly judgement-based across all horizons. When asked about their expectations as to other variables determining their projections, most forecasters indicated that they base their oil price assumptions on market futures prices (slightly more than in the 2018 survey). USD/EUR exchange rate expectations are generally based either on an average of recent values or on model output combined with judgement (similar to the 2018 survey), whereas the use of pure judgement declined between surveys. Meanwhile, ECB interest rate assumptions are still predominantly based on models combined with judgement or on judgement alone, while the use of recent averages and pure models declined since the 2018 survey.

Respondents continue to use a variety of models to inform their point forecasts across variables and horizons. Reduced-form models still dominate, while the use of machine learning techniques remains limited. When it comes to the joint determination of macroeconomic forecasts, while respondents frequently consider the economic relationships between variables, such as Okun's law or the Phillips curve – and more so for the medium term than for shorter or longer term – they tend to do so on a less formal basis. There were also some indications that these relationships may have been relied on to a lesser degree for forecasting purposes in recent times, due to the turbulent environment.

When forming their longer-term (five years ahead) inflation expectations, respondents tend to make use of a wide range of information (Chart A). The ECB's inflation target is cited most frequently, followed by trends in actual inflation, forecasts reported in other surveys, longer-term inflation expectations from financial markets, and trends in wages. Compared to previous surveys, the use of other survey-based forecasts saw the biggest increase, while the importance of actual inflation trends and the ECB's inflation target also increased. When asked if their expectations would be different over even longer-term horizons (e.g. ten years ahead) compared to those

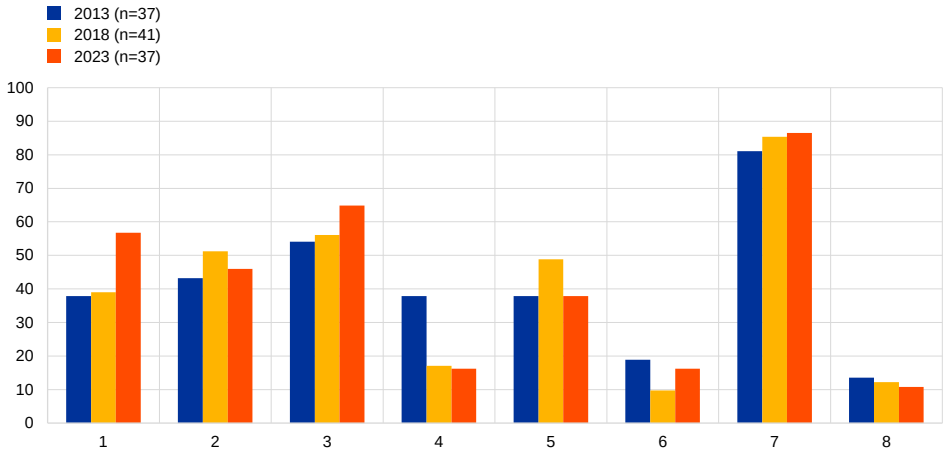
[13] For further information, see the report on the results of the 2023 special survey here.

currently reported (five years ahead), most respondents stated that extending the horizon would have little impact overall.

Chart A

Which of the following information do you typically use to form your longer-term (five years ahead) inflation expectations?

(percentages of responses)



Sources: ECB SPF and staff calculations.
Note: Numbers next to survey year indicate the overall number of respondents answering the question in the respective year. As the respondents were able to select multiple answers, the percentages do not necessarily sum to 100.
1) Long-term inflation expectations reported in other surveys
2) Long-term inflation expectations from financial markets
3) Trends in actual inflation
4) Trends in monetary aggregates
5) Trends in wages
6) Fiscal variables (e.g. debt-to-GDP ratios)
7) The ECB's inflation target
8) Other

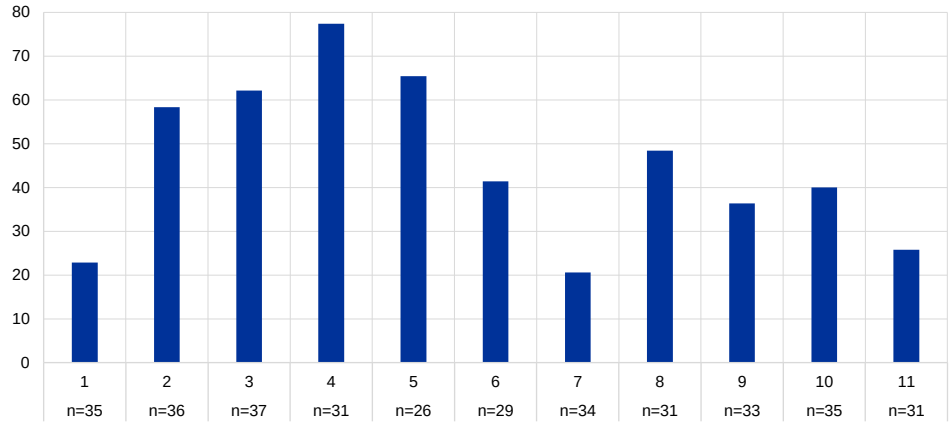
Specific questions asked only in this special questionnaire

The pandemic and recent surge in inflation caused most respondents to change their forecast models or long-term forecasts. Three out of every four respondents reported a sizeable change in the accuracy of their point forecasts since 2020. Many noted that some indicators had become more or less reliable in signalling inflation and that the relationship between inflation and other macroeconomic variables had changed. Many respondents also indicated that (country) bottom-up forecasting had become more important, although (aggregate euro area) top-down forecasting remained dominant. The portion of respondents who reported that their forecasting models allow for non-linearities increased sharply (from around 30% in previous special surveys to around 60% in this survey). Additionally, almost half of the respondents noted that the green transition, demographic developments and the war in Ukraine had affected their models or long-term forecasts. Meanwhile, between 20-30% indicated that climate change or extreme weather, other (non-Ukraine) geopolitical factors and the ECB monetary policy strategy review had affected their models or long-term forecasts (**Chart B**).

Chart B

Impact of specific events and developments on forecast models and longer-term forecasts

(percentages of responses)



Sources: ECB SPF and staff calculations.
Notes: Numbers below the x-axis indicate the overall number of respondents answering that question. As the respondents were able to select multiple answers, the percentages do not necessarily sum to 100.
1) Strategy review changed forecast models/LT forecasts
2) Pandemic changed forecast models/LT forecasts
3) Surge in inflation changed forecast models/LT forecasts
4) Since surge in inflation, some indicators have become more/ less reliable signals of inflation
5) Since surge in inflation, relationship between inflation/macro variables has changed
6) Since surge in inflation, importance of top-down vs bottom-up approach to EA inflation has changed
7) Climate change/extreme weather has changed forecast models/LT forecasts
8) Green transition has changed forecast models/LT forecasts
9) Demographic developments have changed forecast models/LT forecasts
10) Ukraine conflict has changed forecast models/LT forecasts
11) Other geopolitical factors have changed forecast models/LT forecasts

3 Euro area macroeconomic expectations over 25 years

The SPF is regularly used to assess conjunctural developments and can also be used for broader economic analysis and forecasting. The regular quarterly SPF reports focus on average expectations, changes from the previous round and comparisons with Eurosystem projections. It also provides an assessment of the uncertainty and balance of risks surrounding SPF expectations. The long history of macroeconomic data used in the SPF also allows for a broader analysis of inflation expectations, as well as their relationship with real GDP growth and the unemployment rate (e.g. via Phillips Curve-type relationships), while also permitting an assessment of forecasting performance and assumptions used, and a measurement of uncertainty.

3.1 Inflation expectations

3.1.1 Inflation expectations over the short and medium term

Over the first 20 years of the survey, SPF HICP inflation forecast errors tended to be positive in the first decade but negative in the second, followed by strongly positive errors from 2020 to 2022, reflecting the effects of the pandemic and the war in Ukraine. Table 1 below presents descriptive statistics for both the actual HICP inflation data and the SPF forecasts (distinguishing between two rolling forecasting horizons: one-year ahead and two-year ahead) over the whole sample period from Q1 1999 to Q4 2023, plus selected sub-samples (Q1 1999 to Q4 2008, i.e. pre-global financial crisis; Q1 2009 to Q4 2019, i.e. post-global financial crisis; and Q1 2020 to Q4 2023, i.e. pandemic and Ukraine conflict). The figures show that HICP inflation was under-forecast over the period Q1 1999 to Q4 2008 by 0.33 percentage points for the one-year horizon and by 0.24 percentage points for the two-year horizon, but over-forecast over the period Q1 2009 to Q4 2019 by 0.16 percentage points for the one-year horizon and by 0.35 percentage points for the two-year horizon. As discussed in Rostagno et al. (2021), shocks to inflation during the first decade of EMU were almost always to the upside (globalisation and growth in real income coupled with supply side procyclicality), while in the second decade (post global financial and euro area sovereign debt crises) they were almost always to the downside. Thus, over the first 20-year period of the SPF (Q1 1999 to Q4 2019), forecast errors largely cancelled each other out and the mean error was 0.08 percentage points for the one-year ahead horizon and -0.07 percentage points for the two-year ahead horizon. However, in the most recent period (since Q1 2020), the mean error has been strongly positive for both the one-year horizon (3.04

percentage points) and the two-year horizon (5.19 percentage points). However, it should be noted that one-year ahead forecast errors from the Q4 2022 and Q1 2023 rounds of the SPF turned negative (i.e. inflation was lower than forecast).

Table 1

Inflation forecast: summary statistics

(percentages; percentage points)

	1999Q1-2023Q4		1999Q1-2008Q4		2009Q1-2019Q4		2020Q1-2023Q4	
Actual	1YA	2YA	1YA	2YA	1YA	2YA	1YA	2YA
Mean	2.14	2.14	2.13	2.07	1.27	1.29	5.09	6.65
Std. dev.	1.84	1.88	0.79	0.81	0.90	0.97	3.08	2.24
Forecast								
Mean	1.66	1.70	1.79	1.83	1.43	1.64	2.05	1.45
Std. dev.	0.54	0.19	0.22	0.11	0.26	0.16	1.17	0.17
Error								
ME	0.47	0.44	0.33	0.24	-0.16	-0.35	3.04	5.19
MAE	1.06	1.21	0.69	0.66	0.69	0.89	3.44	5.19
RMSE	1.81	2.01	0.92	0.89	0.81	1.08	4.43	5.72

Sources: Eurostat, ECB SPF and staff calculations.
Notes: Std. dev. denotes standard deviation, ME denotes mean error, MAE denotes mean absolute error, RMSE denotes root mean squared error.

Forecast error size was broadly unchanged in both the pre- and post-global financial crisis periods but has increased sharply in recent years. While the one-year ahead mean error (ME) statistic was relatively low over the period Q1 1999 to Q4 2019, suggesting generally accurate forecasts on average, the higher mean absolute error (MAE) of 0.69 percentage points for one-year ahead forecasts for both the Q1 1999 to Q4 2008 and the Q1 2009 to Q4 2019 periods indicates that there are some sizeable errors in the forecast, both over- and under-forecasting. These are masked in the ME, as it averages out these positive and negative deviations. The two-year ahead forecast shows a similar ME-MAE pattern, with some increase from the first period (0.66 percentage points) to the second (0.89 percentage points). For both rolling horizons, we find substantially higher MAE statistics for the most recent period (Q1 2020 to Q4 2023) of 3.44 and 5.19 (the fact that the latter is the same as the ME indicates that all the errors were in the same direction). The RMSE measure, which penalises larger errors more strongly, exhibits a similar pattern to the MAE measure but at a higher level.

3.1.2 Forecast performance – a comparison with Eurosystem projections

A direct comparison of the forecast performance of the SPF and the Eurosystem projections is challenging and subject to caveats.[14] First and foremost, the timing of the two sets of forecasts is different. As indicated previously, the SPF is conducted in early January, April, July and October, while the Eurosystem projections are usually finalised around the end of February, May, August and

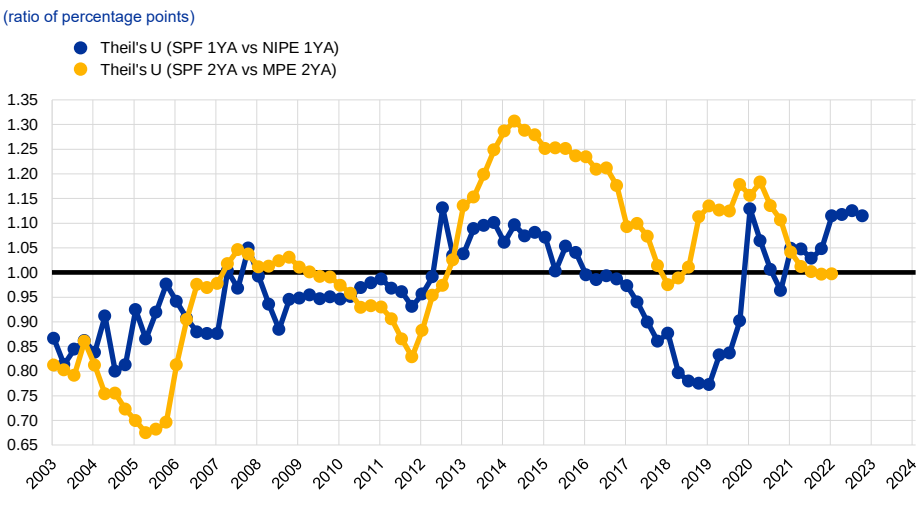
[14] See Grothe and Meyler (2018) for a more detailed discussion.

November. Second, they are based on different information sets and assumptions. The Eurosystem projections use oil price futures and assume a random walk (same as most recent values) for the USD/EUR exchange rate. Third, the projection horizons are slightly different in that the SPF rolling horizons are 12 months and 24 months ahead of the latest available data. For the Eurosystem projections, the closest comparison for the shorter (12-month ahead) horizon comes from the NIPE (Narrow Inflation Projection Exercise), although since 2015 its longest horizon has been 11 months, thus placing the SPF at a slight comparative disadvantage. For the 24-month ahead forecasts, the horizons are closer but also slightly different. For the SPF, the forecasts are made 24 months ahead of the latest available data (i.e. a specific month), whereas for the Eurosystem projections it is eight quarters ahead (i.e. for a quarter – average over three months). Therefore, the SPF may once again be at a slight disadvantage owing to high frequency volatility.

The SPF forecast performance relative to the Eurosystem inflation projections is broadly comparable – sometimes better, sometimes worse but on average not significantly different. Chart 3 below shows the ratio of the root mean squared errors (over four-year moving averages) of the SPF relative to the Eurosystem projection exercises. The ratio of root mean squared errors is also known as Theil's U and a value of above (below) one means that the SPF errors are larger (smaller) than the Eurosystem errors and that the SPF performs worse (better). One important feature to notice is that there is considerable variation over time (with one or other set of forecasts doing better or worse at different points in time). For the *shorter (one-year) horizon*, there is not much difference. The ratio is 0.99 on average, meaning that the SPF does marginally better but certainly not significantly so. For the *longer (two-year) horizon*, the ratio is 1.08 on average, meaning that the Eurosystem projections perform somewhat better on average. In this respect, it is noteworthy that while there were visible differences during the low inflation period, these differences were much less pronounced prior to that point and also more recently during the pandemic and post-pandemic period.

Chart 3

Theil's U – SPF vs Eurosystem MPE



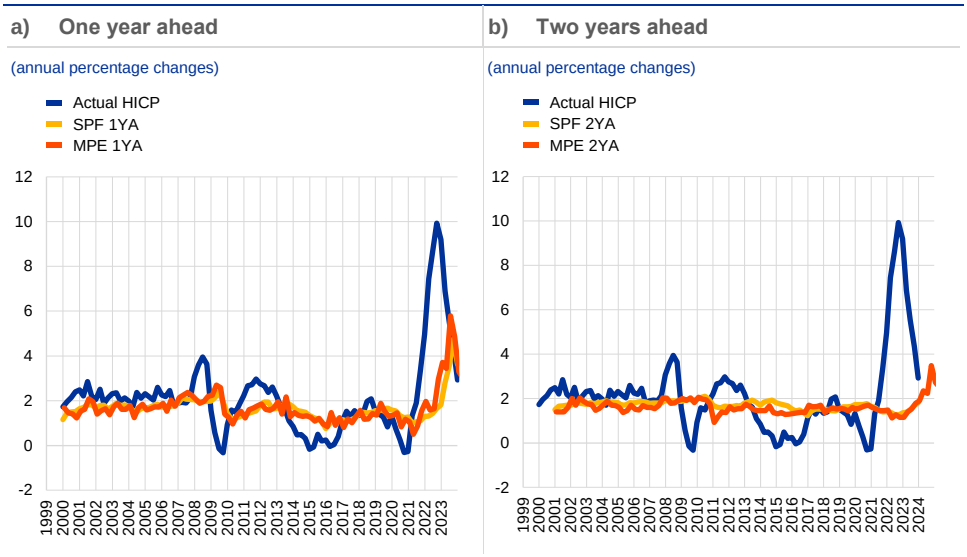
Sources: ECB SPF and ECB/Eurosystem staff projection exercises.

Notes: Theil's U is the ratio of SPF to MPE root mean squared errors (RMSE). A value above (below) unity indicates higher (lower) RMSE for the SPF relative to the MPE. Data for rolling four-year windows are shown.

Relative to the fluctuations in actual inflation, the differences between the two sets of forecasts are comparatively small. Chart 4 shows the forecasts from the SPF and Eurosystem projection exercises alongside actual inflation developments. For the most part, the differences are marginal when compared with the fluctuations in actual inflation and both show limited ability to capture turning points in real time. However, for two-year ahead expectations, some difference can be seen during much of the low inflation period (2010-2020), when the Eurosystem projections were lower on average than the SPF forecasts, thus outperforming the latter.

Chart 4

SPF and MPE projections



Sources: ECB SPF, ECB/Eurosystem staff projection exercises and Eurostat.

3.1.3 Monitoring and understanding longer-term inflation expectations

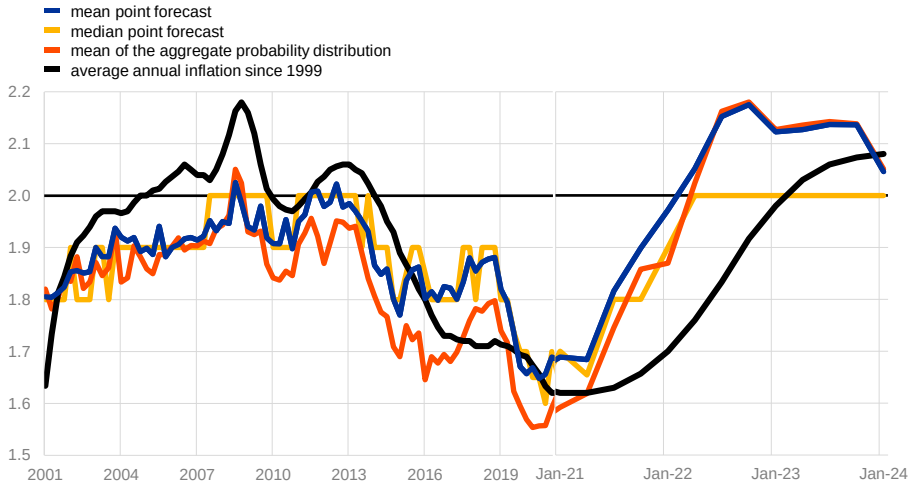
Over the history of the SPF, there is some evidence to suggest that longer-term inflation expectations have reacted to actual inflation trends as well as the specification of the ECB's monetary policy target for price stability. Over much of the history of the SPF, longer-term inflation expectations have remained close (within 0.2 percentage points) of 2.0% (see **Chart 5**). From 1999 to 2019, both the mean point and median point longer-term inflation expectations fluctuated within a range of 1.8% to 2.0%. However, over the period Q4 2019 to Q2 2021, amid low inflation and subdued growth in economic activity, the mean point longer-term inflation expectation dropped to below 1.7% on average. The mean of the aggregate probability distribution fell even lower, dropping below 1.6% between Q4 2019 and Q2 2021. Since the Q3 2021 SPF round, there has been a strong rebound in longer-term inflation expectations. Although the rebound in longer-term inflation expectations happened to coincide with the announcement of the ECB's new monetary policy strategy in July 2021, it also coincided with the pickup in inflation. **Chart 5** shows that there has been a broad co-movement of the central tendencies

of longer-term inflation expectations with actual average annual inflation since 1999. However, as discussed below, the distribution of longer-term inflation expectations has changed in a manner consistent with the ECB's new strategy of pursuing a clear and symmetric target of 2%. In the latest Q1 2024 round, longer-term inflation expectations stood at 2.0%.

Chart 5

Central tendencies of longer-term inflation expectations (and average inflation since 1999)

(y-axis: percentage of respondents; x-axis: annual percentage change)



Sources: ECB SPF, Eurostat and staff calculations.

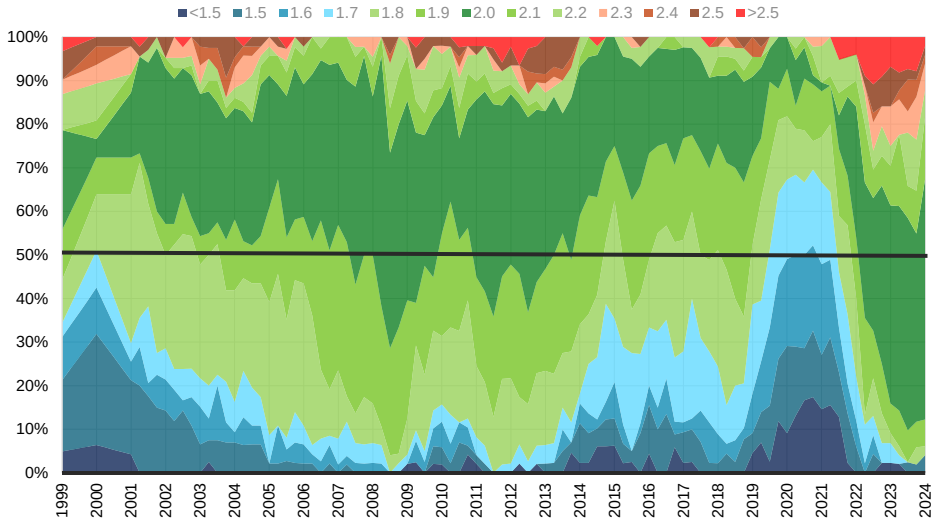
Beyond central tendencies – histograms of point longer-term inflation expectations

Looking beyond the main (mean and median) measures, the histogram of point longer-term inflation expectations has yielded considerable insight into respondents' understanding of, and confidence in, the ECB's price stability target. Chart 6 shows that, aside from the very early period around 2000 and more recently from 2019-2021, the distribution of point longer-term inflation expectations has generally been within 0.2 percentage points of 2.0% (i.e. in the range of 1.8-2.2%).

Chart 6

Distribution of longer-term inflation expectations over time

(percent)



Source: ECB SPF.

Focusing on period averages provides a clearer understanding of shifts over time. Chart 7 below shows histograms of point longer-term inflation expectations over different periods during the past 25 years. In the early years of the SPF (Q1 **1999 – Q2 2003**), respondents understood that the ECB's strategy of price stability (defined as inflation below 2%) as being inflation at 2% or lower but not considerably so. The histogram is tri-modal, with peaks at 1.5%, 1.8% and 2.0%. In the period (Q3 **2003 – Q1 2014**) following the first ECB monetary policy strategy review (in May 2003, when it was clarified that price stability meant inflation being "below, *but close to*, 2%"), the histogram of longer-term inflation expectations becomes unimodal at 2.0% (around one-third of respondents), with around 20% reporting 1.9% and also 1.8%. While the distribution remains relatively robust in the face of the global financial crisis, in the aftermath of the euro area sovereign debt crisis there is (over the period Q2 **2014 – Q4 2018**) a subtle change in the histogram, with fewer respondents reporting 2.0% and 15% of them reporting 1.7% (the first time the portion reporting 1.7% rose above 10%).[15] In the period Q1 **2019 – Q3 2021** (which was characterised by low inflation and subdued growth in economic activity), there are three noteworthy changes in the histogram. First, 2.0% was no longer the modal forecast and the number reporting 2.0% as their longer-term inflation expectations fell below 10%. Second, the modal longer-term inflation expectation slipped to 1.6-1.7%. Third, the histogram is relatively symmetric at around the 1.6-1.8% range, with largely similar portions reporting 1.4% and 1.5% as reporting 1.9% and 2.0%. In the most recent period (Q4 **2021 – Q1 2024**), following the announcement of the ECB's new monetary policy strategy (July 2021) and coinciding with a period of extreme macroeconomic volatility and high inflation (owing to a combination of the pandemic, supply-side bottlenecks, geopolitical conflict and high energy prices), the histogram

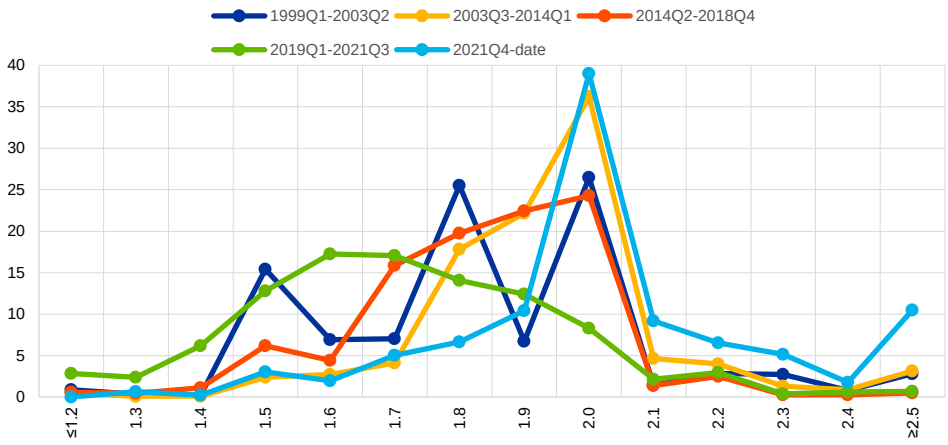
[15] See **Box 3** for a more detailed discussion of special ad hoc questions which were asked to SPF respondents to gain a better understanding of how they interpret "below, but close to, 2%".

again changes shape significantly. Notably, the modal longer-term inflation expectation is once again 2.0% (one-third of responses). However, one noticeable difference in the histogram over the period Q3 2003 to Q1 2014 (when one-third also reported 2.0%) is that fewer now report 1.8% and 1.9% and more report above 2.0%, which is more in line with a symmetric medium-term target of 2%. There also happened to be a 'tail' of respondents reporting longer-term inflation expectations of 2.5% or above (see Górnicka and Meyler (2022) for a discussion of this tail).

Chart 7

Histogram of point longer-term inflation expectations – selected periods

(y-axis: percentage of respondents; x-axis: annual percentage change)



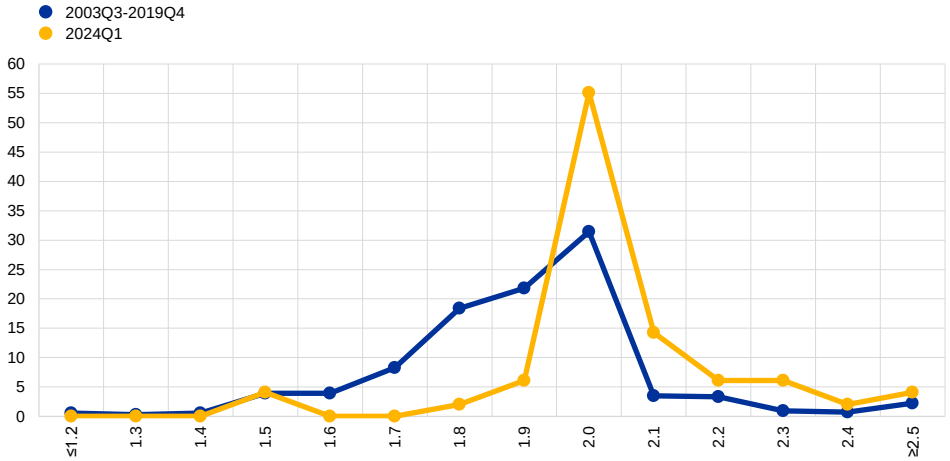
Source: ECB SPF.

Most recently, the mode has settled even more clearly at 2.0% and the tail at 2.5% or above has largely disappeared. Comparing the histogram from the most recent round (Q1 2024) with the average that prevailed over the period Q3 2003-Q4 2019 (see **Chart 8**) reveals three main differences: first, the mode (most frequent value) is more concentrated on 2.0% (55% of respondents in Q1 2024 vs 30% on average between Q3 2003 and Q4 2019); second, there are currently more (less) values above (below) 2.0% compared with the earlier period. Third, the tail of respondents reporting longer-term inflation expectations of 2.5% or above over the period Q4 2019 to Q4 2023 has largely disappeared.

Chart 8

Histogram of point longer-term inflation expectations – Q1 2024 vs Q3 2003 to Q4 2019

(y-axis: percentage of respondents; x-axis: annual percentage change)

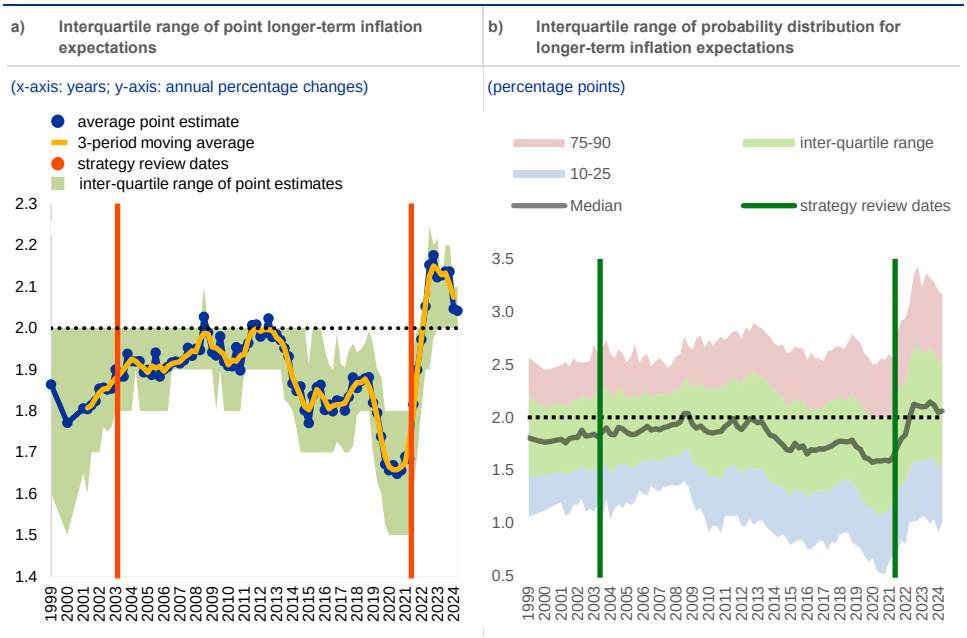


Source: ECB SPF.

The formulation of the ECB's monetary policy strategy has had differing effects on distribution of individual point expectations and aggregate probability distribution. Panel a) of **Chart 9** below shows the interquartile range (i.e. the lower and upper quartiles or 25th and 75th percentiles) of the individual point longer-term inflation expectations. It is striking that, for most of the period up to 2019, the upper quartile was at 2.0% or 1.9%. A temporary exception occurred in Q3 2008. While the upper quartile did drop below 1.9% in the period 2019-2021, in the most recent period since 2022, it has risen above 2.0% on a sustained basis for the first time. Currently, the lower and upper quartiles are moving within the relatively tight range of 2.0 and 2.1%. Panel b) of **Chart 9** shows the interquartile (and inter-decile) range of the aggregate probability distribution for longer-term inflation expectations. For most of the period 1999-2021, the median of the aggregate probability distribution was below 2% (a brief and small in magnitude exception took place during 2008). The interquartile range generally spanned 2.0%, although during the period 2019-2020, the upper end was at 2.0%. At present (Q1 2024) the median is again close to 2.0% (2.05%), while the lower and upper quartiles are at 1.53% and 2.54% respectively.

Chart 9

Interquartile ranges – point expectations and probability distributions



Source: ECB SPF.

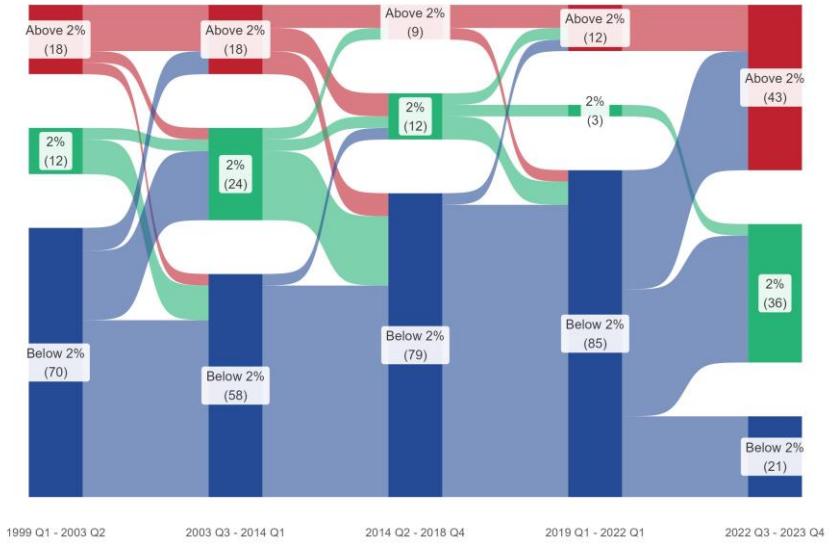
Looking at the response flows between categories and across time periods yields some additional insights.[16] Over much of the history of the SPF, the majority of SPF respondents have had long-term inflation expectations of below 2.0%. Considering how they adjusted their expectations across different time periods, most of the 'flows' were within the below 2.0% category (see **Chart 10**). A small exception occurred between the first (Q1 1999 to Q2 2003) and second (Q3 2003 to Q1 2014) periods and between the second (Q3 2003 to Q1 2014) and third (Q2 2014 to Q4 2018) periods, where there was a flow from below 2.0% to 2.0% in the first instance, which was largely reversed in the second instance. Between the third (Q2 2014 to Q4 2018) and fourth (Q1 2019 to Q1 2022) periods, the flows were relatively small but moved primarily away from 2.0% and primarily towards below 2.0%. In the fifth and most recent period (Q2 2022 to Q1 2024), there was a strong flow away from below 2.0%, with broadly even flows towards 2.0% and above 2.0%. There were no flows away from above 2.0%.

16 Sankey charts are data visualisations that illustrate flow from one state (time period) to another.

Chart 10

Flows between categories of longer-term inflation expectations

(x-axis: selected time periods; y-axis: percentages)



Source: ECB SPF.
Notes: The columns show the portion of SPF respondents reporting, over selected time periods, longer-term inflation expectations of (a) above 2%, (b) 2.0%, or (c) below 2%. For visual representation purposes, above 2% is denoted in red, 2.0% in green and below 2% in blue. The flows represent the 'transition' from one time period to another. Chart based on 34 respondents reporting longer-term inflation expectations in each period. The picture is much the same if we consider a larger sample of 53 respondents who reported longer-term inflation expectations in each of the three latter periods.

Degree of anchoring indicator

The concept of anchoring of expectations is complex and multi-faceted, with no single definition or measure. As discussed in ECB 2021a, traditionally, much of the literature on anchoring has looked to assess it in one of two ways: (i) examining the level of inflation expectations, particularly relative to an inflation target or aim; and/or (ii) examining the responsiveness of longer-term inflation expectations to shorter-term developments (e.g. actual inflation or other economic news). More recently, there has also been a focus on higher moments of inflation expectations – i.e. on their variability, disagreement and uncertainty, and the balance of risks surrounding them, including tail risks.

The distance from the inflation target and the level of disagreement are both relevant considerations when assessing the anchoring of inflation expectations. Economists (see Naggert et al., 2023) from the Federal Reserve Bank of Cleveland (FRBC) have recently proposed a new measure of inflation expectations anchoring, which can also be applied to ECB SPF data, that combines the central tendency with disagreement – two of the dimensions (level and uncertainty) discussed in ECB 2021a. This measure, which they call "degree of anchoring", is calculated as "the average deviation (or distance) of the individual

inflation forecasts from the inflation target".[17] In essence, the measure then equals the sum of (a) the square of the difference between the average (or consensus) forecast and the inflation target, and (b) the average of the squared differences between individual forecasts and the average/consensus forecast (or disagreement). When applied to the SPF longer-term inflation expectations, the indicator has generally been low (and indeed lower than for the United States), indicating a high degree of anchoring at the inflation target, although there have been some episodic spikes, especially during the recent period of high inflation (see panel a) of **Chart 11** below).[18]

During episodes where the SPF signalled less anchoring, disagreement was largely the cause, although when inflation moved below target during the pandemic, the de-anchoring was driven by the difference between consensus expectations and the inflation target. Drilling further into the SPF data, periods in which the (de-)anchoring metric has been high have generally, although not entirely, been driven by outliers. The decomposition into consensus deviation and disagreement suggests that disagreement accounts for the largest part (80% on average) of the metric.[19] The only exception to this was the period Q3 2019 to Q2 2021, when consensus deviation and disagreement each contributed about the same. Considering a 'trimmed' panel, the metric has generally been much lower and not exhibited so much variation (see panel b) of **Chart 11**).[20] In 2020-21, this was largely down to the consensus dropping below target, whereas more recently (2023) disagreement is the more predominant factor. In the Q1 2024 round, the metric for the trimmed panel dropped back significantly, reflecting the fact that the consensus was close to target.

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17 More precisely, it is defined as the average of the squared differences between individual forecasts and the inflation target, as shown in this equation: $DoA_t = \frac{1}{N_t}\sum_i^{N_t}\left(\pi^e_{i,t+h,t} - \pi^*_t\right)^2$, where $\pi^e_{i,t+h,t}$ denotes the inflation forecast of individual i made at time t for horizon h; N_t is the number of forecasters in period t; and π^*_t denotes the inflation target at time t. The authors also show that this may be decomposed as: $DoA_t = \left(\overline{\pi}^e_t - \pi^*_t\right)^2 + \frac{1}{N_t}\sum_i^{N_t}\left(\pi^e_{i,t+h,t} - \overline{\pi}^e_t\right)^2$, where $\overline{\pi}^e_t$ denotes the average (consensus) forecast (given by the average forecast).

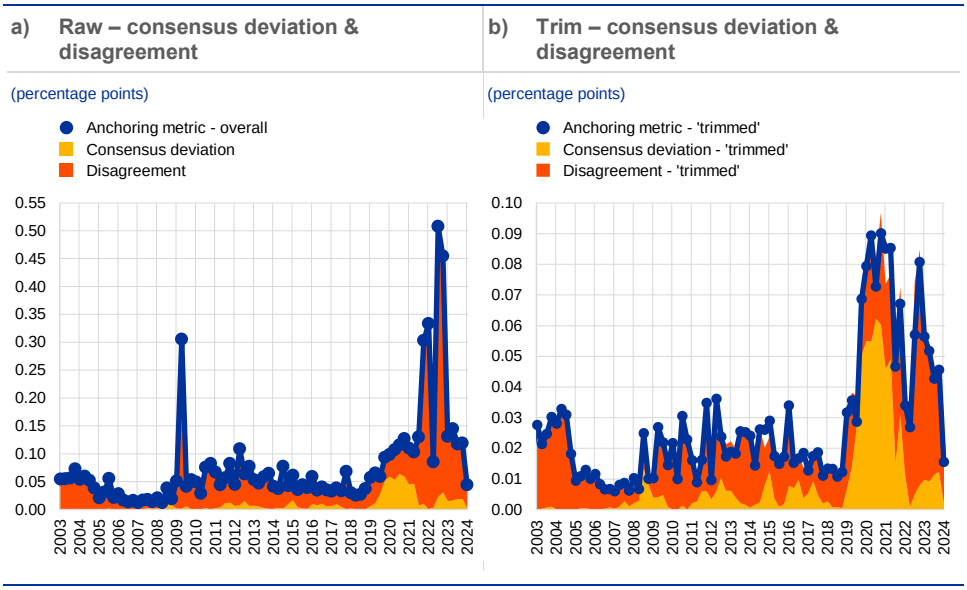
18 When applying their method to the SPF, one issue is the need to account for the change in the inflation target. Between 2003 and the 2021 Strategy Review, price stability was defined as inflation being "below, but close to, 2%". For the purposes of this paper, we assume 1.9% for the period prior to the 2021 Strategy Review (and 2.0% thereafter). The overall message is unchanged if other values in the range 1.7-2.0% are assumed.

19 When it comes to the disagreement part, which has been higher and more volatile, the contribution made by the outliers has been largely dominant at 60% on average (with a minimum of 33% and a maximum of 90%), despite accounting only for some 10% of respondents.

20 When using a 'trimmed' panel (by symmetrically trimming the two highest and two lowest responses, i.e. about 10% of responses), the degree of anchoring indicator has always been below 0.1 percentage points, although from Q4 2019 to Q4 2023 (at 0.06 percentage points on average) it was somewhat above the average level of 0.02 percentage points that prevailed from 2001 to 2019.

Chart 11

Longer-term inflation expectations degree of anchoring indicator



Sources: ECB SPF and staff calculations.
Notes: Trimmed denotes trimming the two highest and lowest responses.

A balance of risk indicator (BoRI)

Forecasts are typically discussed in terms of their central tendency, but it is also informative to consider any balance of risks surrounding this. SPF respondents are asked to provide their point forecasts, as well as the probability distribution underlying their point forecasts, but they are not instructed whether their point forecasts should conceptually reflect the **mean** of all probabilities, the most likely (**modal**) outcome, or the **median** (50th percentile).[21] Over time, an increasing portion of SPF participants indicate that their point forecast may refer to their modal or median forecast rather than their mean (of their probability distribution) forecast. This suggests that differences between the reported point forecast and the mean of the probability distribution (known as a balance of risk indicator, or BoRI for short) may be informative.[22]

The balance of risk indicator has displayed heterogeneous tendencies across different forecast horizons. Chart 12 below shows the BoRI for one-year, two-year and five-year ahead inflation expectations. On average over the whole 25 years of the SPF, the BoRI for **one-year ahead inflation expectations** has been almost exactly zero. For **two-year ahead inflation expectations**, the BoRI fluctuated around zero during the earlier years of the SPF (1999-2008), before turning negative on average after the global financial and euro area sovereign debt crises for a

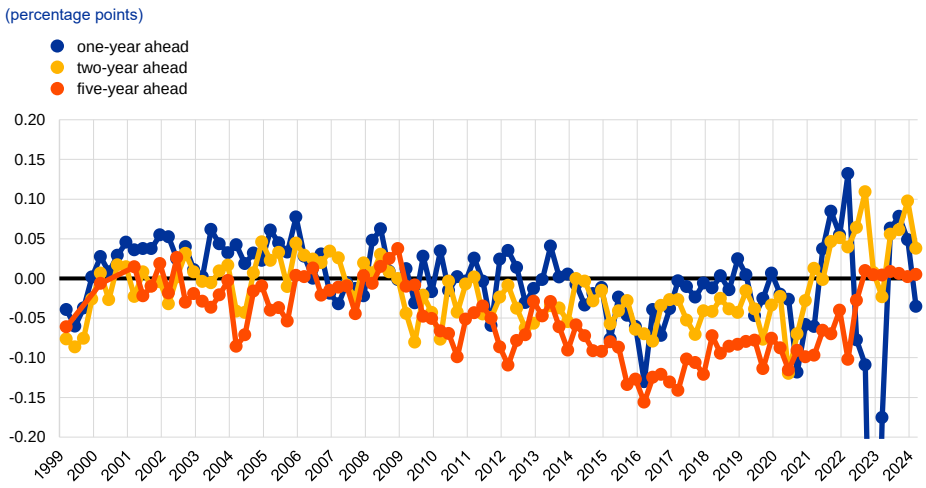
21 Theoretically, which measure is "preferred" depends on their "loss function". See Wallis (1999) for a more detailed discussion.

22 If the reported point forecast always referred to the mean of the probability distribution, there would be no difference between the two. However, if the reported point forecast refers to the mode of the probability forecast (i.e. the most common outcome) and the balance of risks is not symmetric, then there will be a difference between the mode and mean of the probability distribution, which may be informative regarding the assessed balance of risks.

sustained period (2009-2020), and ultimately turning positive over the period since 2021. The BoRI for **longer-term inflation expectations** has displayed some similarities to that for two-year ahead inflation expectations, though also some differences. It also fluctuated around zero over the period 1999-2008 and turned negative after the global financial crisis. Over the period 2009-2020, it was on average even more negative than for two-year ahead expectations. Since mid-2022, the five-year ahead indicator is no longer negative but (unlike the two-year ahead indicator, which turned positive), it has been broadly balanced.

Chart 12

Balance of Risks Indicator (BoRI) inflation expectations



Sources: ECB SPF and staff calculations.
Notes: Values for one-year ahead expectations are truncated in the chart for Q4 2022. This is because the one-year ahead inflation forecasts were above 5.0% but the upper bin in the probability distribution for inflation outcomes was set at ≥ 5.0%. It was decided not to change the upper bin so as to minimise the number of bins in the questionnaire. The fact that this would lead to most probability being assigned to the upper bin for some horizons was flagged to respondents when sending out the questionnaire.

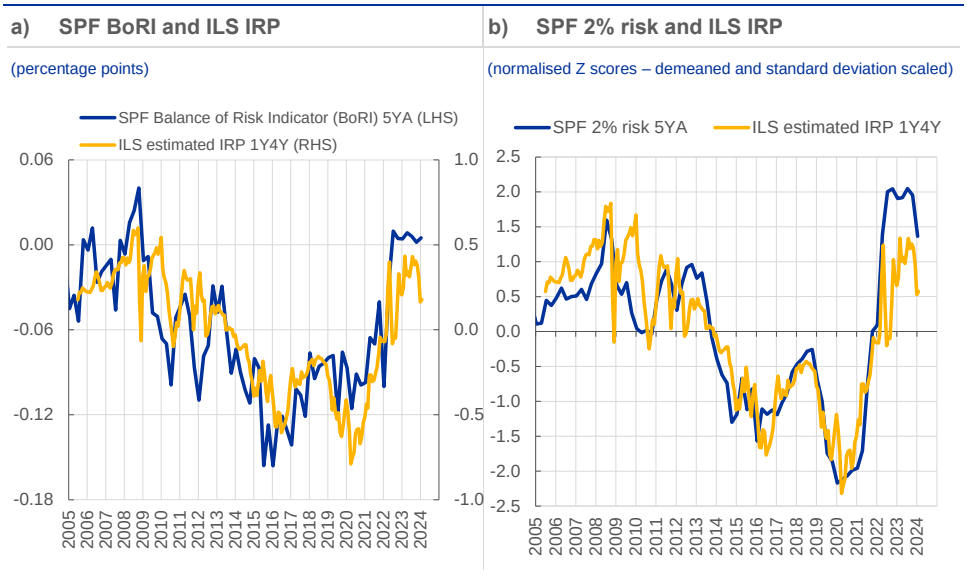
The balance of risks indicator constructed from the SPF respondents' longer-term inflation expectations suggests a high degree of congruity with estimates of inflation risk premia embedded within market-based measures of inflation compensation. Panel a) of **Chart 13** below shows the BoRI indicator from the SPF and the estimated inflation risk premia from market-based measures of inflation compensation. Overall, they show a high degree of congruity over time. For instance, they both showed some upward tendency over the period 2005-2008 (prior to the global financial crisis). Thereafter, they both trended downwards to reach a trough around 2016 and remained relatively low until 2021, whereupon they both began to climb sharply.

This assessment is confirmed when we cross-check it with an alternative simple measure of inflation risk from the SPF. Panel b) of **Chart 13** shows an alternative measure of risk from the SPF alongside the estimated inflation risk premia from market-based measures of inflation compensation. This alternative measure (2% risk) is calculated simply as the reported probability of longer-term inflation being above 2.5% (i.e. above the bin of 2.0-2.4%) minus the reported probability of longer-term inflation being below 1.5% (i.e. below the bin of 1.5-1.9%).

Again, there is a high degree of congruity between the two series, particularly in terms of turning points over the past ten years since 2014.

Chart 13

SPF longer-term inflation expectations balance of risk indicator (BoRI) and estimates of inflation risk premia in market-based measures of inflation compensation



Sources: ECB SPF, Refinitiv and staff calculations.
Notes: The SPF balance of risk indicator (BoRI) is calculated as the mean of the aggregate probability distribution minus the average point forecast. The inflation risk premia (IRP) in market-based measures of inflation compensation (inflation linked swaps – ILS) are estimated using the methodology put forward in a paper by Joslin et al. (2011) and are applied to end-of-month ILS rates adjusted for the three-month indexation lag, as in Camba-Méndez and Werner (2017). In panel b), both series have been z-normalised (i.e. adjusted for mean and standard deviation) so that they can be plotted in one chart.

Box 2 Using the SPF to identify supply and demand factors affecting estimated inflation risk premia in market-based measures of inflation compensation

Prepared by Luís Fonseca

According to economic theory, positive (negative) inflation risk premia emerge when market participants expect a future macroeconomic environment to be primarily dominated by supply-side (demand-side) shocks. This box infers such dominance from the expected co-movement between future inflation and GDP growth in the individual SPF survey responses and finds that movements in the survey-based measures have behaved similarly to model-based estimates of inflation risk premia.

Longer-term measures of market-based inflation compensation have increased in recent years, primarily reflecting movements in inflation risk premia. Inflation compensation measured by inflation-linked swap rates has increased gradually but substantially since 2020 across maturities. Measures of inflation compensation embed compensation for expected inflation and for the inflation risk premium. According to results obtained from the model of Burban et al. (2021), the increase at longer horizons has been largely driven by rising risk premia.

According to asset pricing theory, positive (negative) inflation risk premia are likely to emerge when market participants expect a future macroeconomic environment to be dominated primarily by supply-side (demand-side) shocks. These shocks lead to high inflation in periods when real activity declines. In those periods, the returns on nominal bonds are low in real

(inflation-adjusted) terms precisely when investors value income more, leading to demand for extra compensation, i.e. a positive inflation risk premium. Conversely, if market participants foresee future macroeconomic shocks as demand-driven, they will be inclined to accept a negative premium because nominal bonds offer a hedge to investors by paying higher real (inflation-adjusted) returns in tough economic times.[23]

Empirically, this box looks at the co-movement between expected inflation and GDP growth in individual survey responses to infer the prevalence of demand or supply shocks. To study this co-movement, the analysis relies on estimating the joint subjective distribution of future inflation and GDP growth, based on individual responses to the ECB's Survey of Professional Forecasters for the fifth calendar year ahead, the longest horizon available. More precisely, it is built upon model-based estimates that account for biases and precisions of individual respondents and for sample composition effects.[24]

The resulting survey-based measures of future inflation-GDP growth co-movement are consistent with historical accounts of euro area economic drivers and suggest a post-pandemic trend away from a predominantly demand-driven economy towards a more balanced mix between future demand and supply factors.[25] **Chart 14** shows the estimated correlation and covariance parameters.[26] In the early years of the monetary union, in the context of oil shocks, the expected covariance of inflation and GDP growth was broadly negative, suggesting that survey participants saw macroeconomic risks as stemming mainly from supply shocks. Around the 2008 financial crisis, the correlation became strongly positive, suggesting a heightened role for future demand shocks. During the sovereign debt crisis period, the correlation decreased significantly, reflecting the sharp increase in oil prices at that time, and possibly also concerns over the resolution of the crisis. The period of below-target inflation starting in around 2013 and lasting through to the pandemic was marked by a strongly persistent and positive correlation, suggesting a focus on demand shocks. After the onset of the pandemic, the measure gradually declined towards a balance between demand and supply shocks, as market participants reassessed the balance of future macroeconomic risks following a period of supply chain disturbances.[27]

Consistent with the asset pricing reasoning, movements in these survey-based measures have tracked model-based estimates of inflation risk premia quite closely over the last decade, including during the significant increase observed since the pandemic. Chart 15

23 For other work discussing this channel, see Chen et al. (2016) and Bekaert et al. (2021). In related work, Campbell et al. (2017) study the time-varying covariance of bond and stock returns and find that the covariance of inflation with the real economy is an important channel. More generally, in a benchmark asset pricing model, investors would care about the covariance with the future marginal utility of consumption. For practical reasons, we proxy the latter with future GDP growth, which should be inversely related.

24 The model is based on Fonseca (2024). Specifically, the model accounts for forecaster biases and turnover in participation across survey rounds, and distinguishes whether extreme or uninformative responses come from forecasters frequently at odds or in line with the consensus, the latter of which provide more informative signals of change. To do so, it assumes that each forecaster i in period t reports a draw $(g_{i,t}, \pi_{i,t})$ from their individual joint distribution of growth (g) and inflation (π) for the selected future horizon with the mean $(\mu_t^g + b_i^g, \mu_t^\pi + b_i^\pi)$, standard deviations $(\sigma_t^g \upsilon_i^g,\ \sigma_t^\pi \upsilon_i^\pi)$, and correlation ρ_t. Both mean and covariance matrix feature common information $(\mu_t^g, \mu_t^\pi, \sigma_t^g, \sigma_t^\pi, \rho_t$; these are the main objects of interest) and private parameters $(b_i^g, b_i^\pi, \upsilon_i^g, \upsilon_i^\pi)$ reflecting individual biases and precisions. The model also assumes that ρ_t, σ_t^g and υ_i^g are autoregressive. The model is estimated using Bayesian methods, namely the Hamiltonian Monte Carlo algorithm implemented by the Stan Development Team (2023).

25 See Rostagno et al. (2021) for a detailed account of euro area economic and monetary policy history.

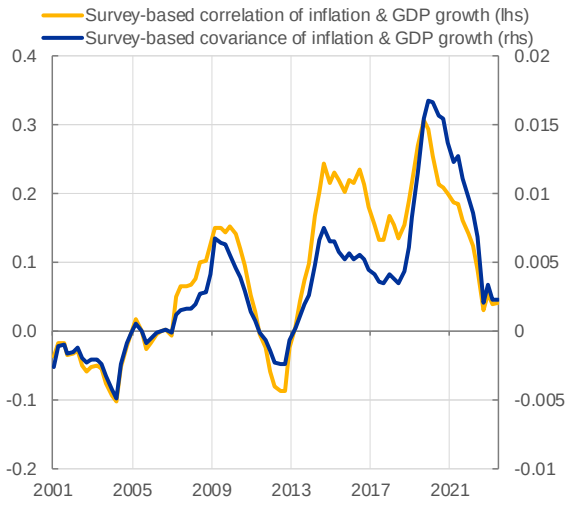
26 These are ρ_t and $\rho_t \sigma_t^g \sigma_t^\pi$, respectively.

27 Note that these mechanisms rely on expectations as to the balance between future demand and supply shocks, not on the sign of recently realised shocks.

compares the survey-based correlation measure with the market-based risk premium estimate from Burban et al. (2021). While in the early part of the sample the two measures do not necessarily always co-move, they have tracked each other very closely since around 2011, with both having turning points in similar periods, namely 2015, 2018 and 2020. Importantly, both approaches agree that the inflation risk premium has increased gradually but significantly since 2020 and should explain a significant part of the increase in inflation compensation since then. Since 2011, the estimated correlation and covariance parameters have had a correlation coefficient of 0.83 and 0.70, with the level of the inflation risk premium estimated by the term structure model. This result holds when controlling for the Balance of Risk Indicator (BoRI) discussed in Section 3.1.3, as both indicators have economic and statistically significant coefficients. The results suggest that investors care about both the skewness of inflation risks and the covariance with the state of the economy.

Chart 14
Survey-based estimated correlation and covariance of future GDP growth and inflation

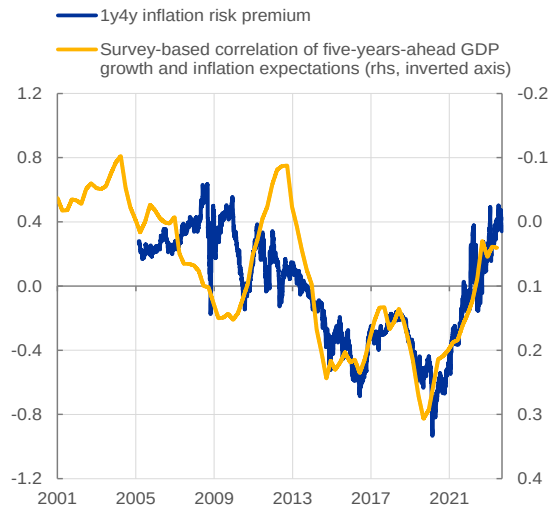
(lhs: correlation; rhs: covariance)



Sources: ECB SPF and staff calculations.
Notes: The yellow and blue lines show model estimates of the survey-based correlation and covariance of five-year-ahead GDP growth and inflation based on SPF responses. Latest observation: July 2023 (quarterly data).

Chart 15
Comparison of survey-based estimated correlation of future GDP growth and inflation with term structure model estimates of inflation risk premium

(rhs: percentage per annum, rhs: correlation)



Sources: Refinitiv, ECB SPF and staff calculations.
Notes: The yellow line shows model estimates of the survey-based correlation of five-year-ahead GDP growth and inflation, with an inverted axis. The inflation risk premium is based on estimates from two affine term structure models using inflation-linked swap rates as in Joslin, Singleton and Zhu (2011) applied to ILS rates not adjusted for indexation lag; see Burban et al. (2022), ECB Economic Bulletin Issue 8, 2021, Box 4. Latest observation: 9 October 2023 for risk premia; July 2023 for survey-based measure (quarterly data).

3.2 Real GDP growth expectations

3.2.1 Growth expectations over the short and medium term

On average, SPF respondents have over-forecast GDP. Table 2 presents descriptive statistics for both the actual real GDP growth data and the SPF forecasts (distinguishing between two rolling forecasting horizons: one-year ahead and two-year ahead) over the whole sample period of Q1 1999 to Q4 2023, plus selected sub-samples (Q1 1999 to Q4 2008, i.e. pre-global financial crisis; Q1 2009 to Q4 2019, i.e. post-global financial crisis; and Q1 2020 to Q4 2023, i.e. pandemic and Ukraine conflict). The figures show that real GDP growth has been consistently overestimated over both the one- and two-year horizons, with an average overshoot of 29 and 68 basis points, respectively. While the one-year ahead mean error (ME) statistic is relatively low – suggesting generally unbiased forecasts *on average* – the higher mean absolute error (MAE) of 1.20 percentage points indicates that there are some sizeable errors in the forecast, including both over and underestimations. Croushore (2010) finds that for the US SPF, although individual sub-samples may appear "biased", over longer samples, these tend to balance out and that "*it is difficult, though not impossible, to improve the forecasts by exploiting the measured bias in real time*" (see Croushore, 2023). The two-year ahead forecast shows a similar ME-MAE pattern, with larger errors reflecting the greater challenge of making predictions for specific points in time further out. For both rolling horizons we find substantially higher RMSE statistics of 2.15 and 3.03, respectively. The RMSE measure penalises larger errors more strongly with our results, thus indicating a high level of variability in the error sizes, which is mainly caused by the strong peaks during the Global Financial Crisis (GFC) and even more so during the COVID-19 pandemic.

Table 2
Real GDP growth forecasts: summary statistics

(percentages; percentage points)

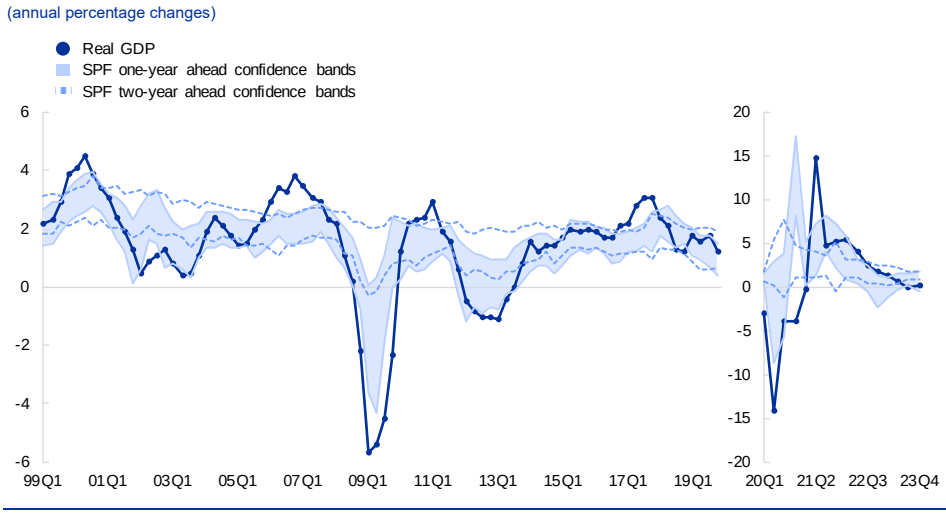
	1999Q1-2023Q4		1999Q1-2008Q4		2009Q1-2019Q4		2020Q1-2023Q4	
Actual	1YA	2YA	1YA	2YA	1YA	2YA	1YA	2YA
Mean	1.38	1.27	1.72	1.25	0.74	0.97	2.49	2.87
Std. dev.	2.94	2.95	2.12	2.28	2.77	3.51	4.63	1.94
Forecast								
Mean	1.66	1.95	2.01	2.31	1.08	1.50	2.59	2.50
Std. dev.	1.66	0.54	0.62	0.37	0.88	0.24	3.80	0.55
Error								
ME	-0.29	-0.68	-0.28	-1.06	-0.34	-0.54	-0.10	0.34
MAE	1.20	1.75	1.22	1.71	1.17	1.80	1.23	1.70
RMSE	2.15	3.03	1.78	2.52	2.54	3.59	1.75	1.93

Sources: Eurostat, ECB SPF and staff calculations.
Note: Std. dev. denotes standard deviation, ME denotes mean error, MAE denotes mean absolute error, and RMSE denotes root mean squared error.

Shorter-term (one-year ahead) forecasts were more often within the confidence bands than more medium-term (two-year ahead) forecasts. Chart 16 shows actual real GDP growth over the period Q1 1999 to Q4 2023 together with 95% confidence bands of the SPF forecasts over the two rolling horizons. The 95% confidence bands are calculated using the standard deviation of the aggregate probability distributions multiplied by 1.96. While for the one-year ahead forecast, actual GDP growth is within the confidence bands in 52% of rounds, the rate for the two-year ahead projections drops to 42%. While the two major crises in 2008 and 2020 are obvious examples of when actual figures were not within the bands, it is notable that some forecasters were able to predict strong downward momentum, as the actual values – especially in the GFC – are not far from the confidence bands of the one-year ahead forecast.

Chart 16

Realised real GDP growth alongside SPF uncertainty bands



Sources: ECB SPF, Eurostat and ECB staff calculations.
Notes: The shaded and dotted areas indicate 95% confidence bands. The 95% confidence bands are calculated using the standard deviation of the aggregate probability distributions multiplied by 1.96.

Transitory, as opposed to persistent, forecast errors account for the largest portion of forecast errors. Chart 17 uses a simple method to decompose forecast errors into a persistent and a transitory component. We compute the persistent component as the four-year (16-quarter) moving average of one-year ahead forecast errors, with the residual of this to the actual forecast error being the transitory counterpart.[28] When looking at the two major crises, namely the GFC and the COVID-19 pandemic, it becomes apparent that due to upward surprises in prior periods, both shocks occurred in times of persistent underestimation of GDP growth (i.e. actual GDP growth was stronger than forecast). Conversely, we can see differences in how the SPF panel members projected the respective recoveries from the two crises. The recovery from the GFC was underestimated, in the sense that it was forecasted to take place more gradually. Conversely, forecasters expected a strong recovery from the COVID-19 crisis for Q4 2020 – sooner than the actual pick-

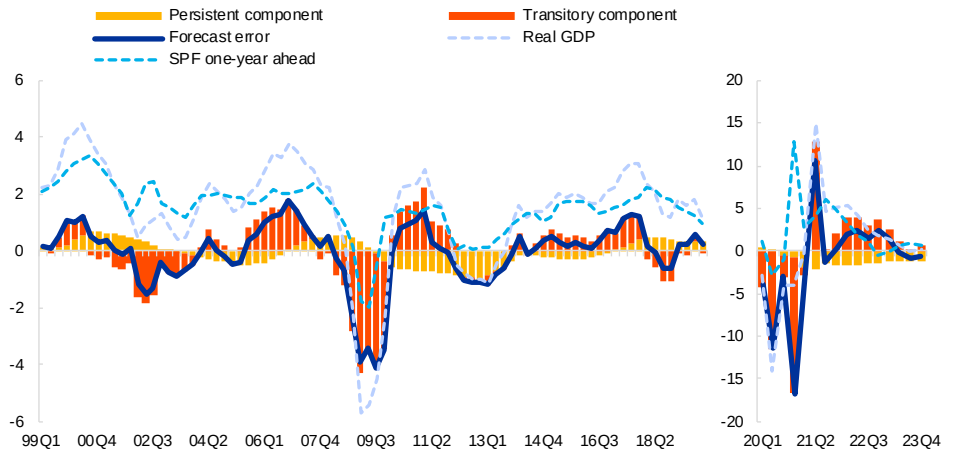
[28] Note that as the persistent component can be heavily influenced by a few very large errors, this representation is for illustrative purposes.

up in Q2 2021 – leading to a larger forecast error than the initial shock and marking the most substantial deviation in the 25 years of the SPF. This is likely due to the second wave of the pandemic and renewed mitigation measures affecting economic activity.

Chart 17

Decomposition of one-year ahead growth forecast errors

(annual percentage changes)



Sources: ECB SPF, Eurostat and ECB staff calculations.
Notes: The persistent component shows the past four-year moving average forecast errors; the transitory component is the residual. A forecast error above (below) zero indicates an underestimation (overestimation) of real GDP growth.

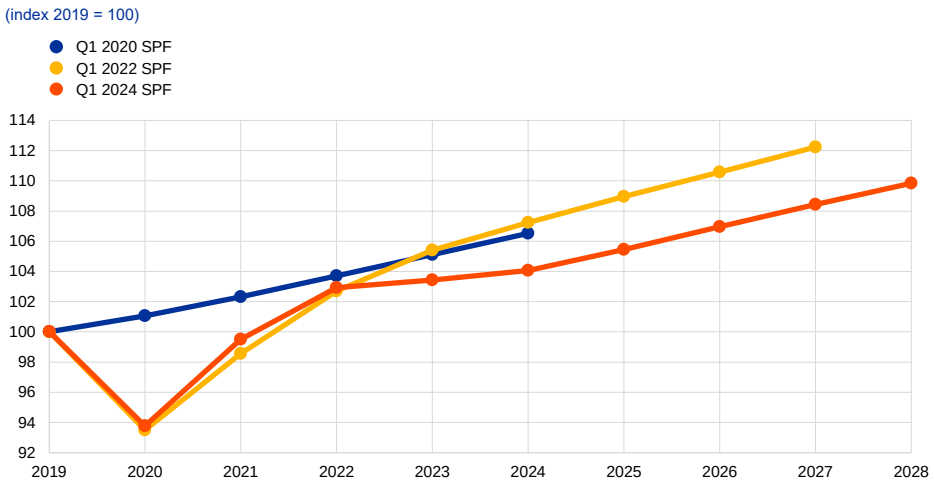
The SPF data provide some insight into the impact of the two large shocks to economic activity to have taken place in the euro area in the past five years (the pandemic and the war in Ukraine). Over the history of the SPF, the impact of the COVID-19 pandemic (and associated mitigation measures) on economic activity has been unprecedented.[29,30] However, notwithstanding the extraordinary drop in economic activity that took place in 2020, two years later (by the Q1 2022 SPF round) GDP was forecast to recover beyond the level previously forecast in the Q1 2020 SPF round. GDP was expected to move above the level previously forecast (from the Q1 2020 SPF round) in the course of 2022-2023; see **Chart 18**. However, Russia's invasion of Ukraine and the ensuing negative terms of trade shock have pushed down the forecast profile once again.

29 A telling illustration of the unprecedented nature of the pandemic shock was the need to widen the probability bins for real GDP growth to the range of -15% (instead of -1%) and +10% (instead of +4%). In addition, the bins outside the normal ranges were widened to 2.0 percentage points instead of the usual 0.5 percentage points.

30 The information provided in the Q2 2020 SPF round (conducted in April 2020) provided a useful frame of reference for Eurosystem forecasters when preparing their June 2020 macroeconomic projections, including their mild, baseline and severe scenarios. SPF panellists were explicitly asked to "elaborate on how you have factored in the impact from the coronavirus to your inflation, growth and unemployment rate forecasts. Specifically, we would like to know (a) what are the key coronavirus-related assumptions (e.g. lockdown duration, shape of path to normality, etc.) underlying your baseline projections; (b) what effect do various (public, fiscal and monetary) policy measures have in your baseline; (c) what risks/scenarios have you considered around the baseline; and (d) how do you see demand and supply effects playing out on inflation?"

Chart 18

GDP expectations (in 2019 = 100) level terms



Sources: ECB SPF, Eurostat and ECB staff calculations.
Note: The chart shows the forecast level of real GDP relative to 2019 levels (i.e. 2019 = 100).

Quarterly growth profile

The inclusion of an additional question on the near-term quarterly growth profile has added a valuable "nowcasting" dimension to the SPF. Given the unprecedented impact of the pandemic on global and euro area economic activity, since 2021 Q1 SPF panel members have been asked to provide their assessment of a quarterly growth profile, starting from one quarter behind to two quarters ahead.[31] This serves as a valuable extension of our comprehensive data set, complementing it with a nowcasting dimension that has since proven useful in policy-related issues. In addition to providing nowcasts for economic activity, the profile of near-term quarterly forecasts can (1) shed additional light on dynamics that may be concealed in calendar year forecasts and (2) help assess the role of so-called carry-over effects on calendar year forecasts.

While initial forecast errors were large (reflecting economic conditions), over time they are likely to moderate. It is important to note that this extra question was introduced in what were particularly challenging times, with several crises having led to increased volatility. We therefore expect the deviations to be more moderate in the long run; a trend that is already observable to some extent.

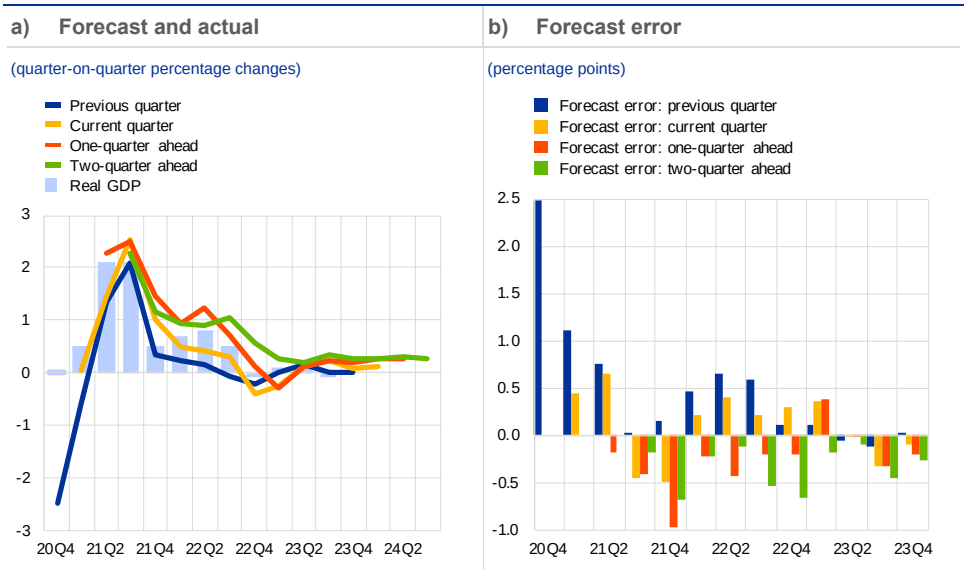
Over the short period this question has been asked (Q1 2021 to Q1 2024), SPF forecasters have tended to under-forecast the most recent and current quarters and over-forecast subsequent ones. Chart 19 shows the quarterly growth assessments for each forecast horizon alongside actual GDP figures, since the time this question was added to the SPF (panel a), and the related forecast errors (panel b). Starting at the beginning of the time horizon, it becomes apparent

[31] Owing to the lag in compiling and publishing GDP data, at the time the SPF is conducted there are no official data on GDP for the quarter before the SPF is conducted.

that the strong and quick rebound from COVID-19 was underestimated, resulting in a forecast error of 2.5 percentage points in Q4 2020 for the previous quarter horizon. While this was the largest forecast error over the entire time period, the underestimated recovery following COVID-19 was soon followed by Russia's invasion of Ukraine, resulting in lower-than-expected growth outcomes, and thus an overestimation period. It is notable that, thus far, the shorter-term nowcasting horizons, namely the previous and current quarter, have tended to underestimate quarterly growth, while we can clearly observe the opposite trend of overestimation for the one- and two-quarter ahead forecasts.

Chart 19

Quarterly growth assessment



Sources: ECB SPF, Eurostat and ECB staff calculations.
Note: A forecast error above (below) zero indicates an underestimation (overestimation) of real GDP growth.

3.2.2 Forecast performance – a comparison with Eurosystem projections

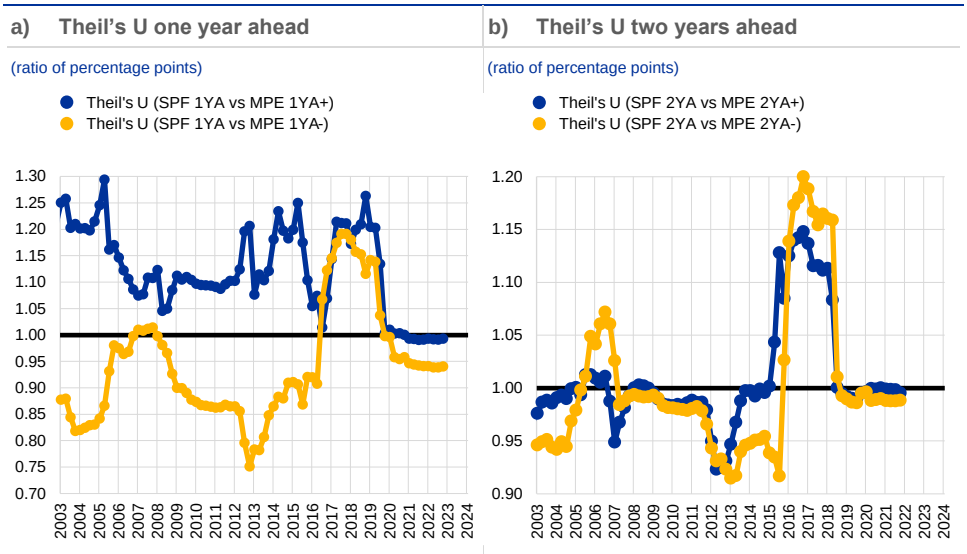
While there are challenges to comparing the GDP growth forecast performance of the SPF with that of the Eurosystem staff, both have performed fairly similarly. The caveats outlined above regarding forecast comparisons (between SPF and Eurosystem) are magnified when it comes to economic growth forecasts. This is because GDP data are quarterly, meaning that the information set available matters hugely when making forecast comparisons.[32] For the shorter (one-year) horizon, which forecast appears better depends on whether one considers the Eurosystem projection before or after the SPF. For example, taking the MPE six weeks after, the MPE has performed better most of the time (average 1.12), whereas taking the MPE six weeks before, the performance is more mixed and broadly similar

[32] The SPF is usually conducted in early January, April, July and October with GDP data available up to Q3, Q4, Q1 and Q2 respectively. Meanwhile, the BMPE is published early March, June, September and December and usually concluded around the end of the previous month (i.e. late February, May, August and November). Thus the BMPE can be roughly considered as taking place either six weeks before or after the SPF. This matters, particularly for the shorter (one-year ahead) horizon.

on average (0.94); see **Chart 20**. For the longer (two-year) ahead horizon it makes little difference, with the average being either 1.01 or 1.00.

Chart 20

Theil's U – SPF vs Eurosystem MPE

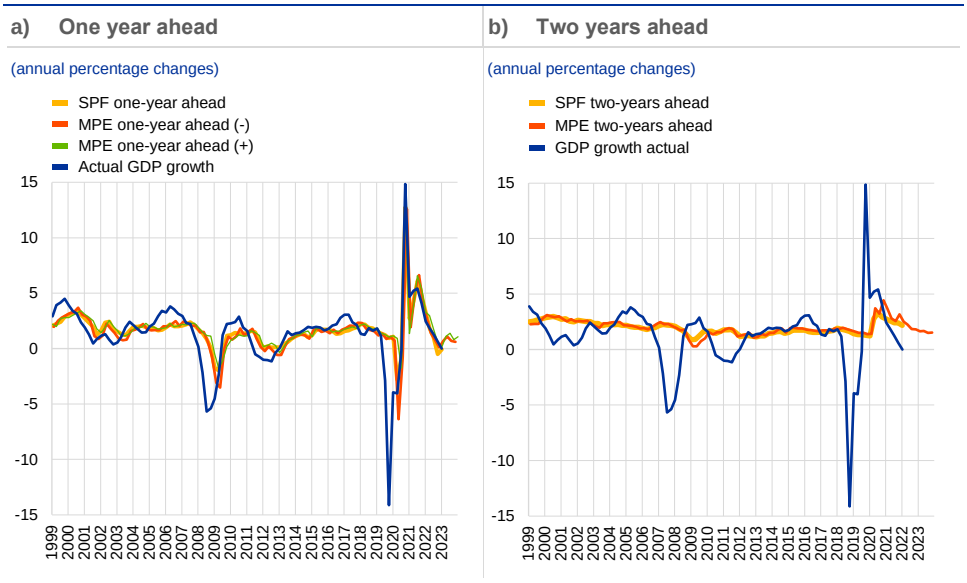


Sources: ECB SPF and ECB/Eurosystem staff projection exercises.
Notes: Theil's U is the ratio of SPF to MPE root mean squared errors (RMSE). A value above (below) unity indicates higher (lower) RMSE for the SPF relative to the MPE. Data for rolling four-year windows are shown. + denotes that the SPF is being compared with the MPE conducted after it, while – denotes that the SPF is being compared with the MPE taking place before it.

Relative to the fluctuations in actual GDP, the differences between the two sets of forecasts are comparatively small. Chart 21 shows the forecasts from the SPF and Eurosystem projection exercises alongside actual inflation developments. Generally, the differences are marginal when compared with the fluctuations in actual growth.

Chart 21

Performance vs BMPE – actual growth and forecast error



Sources: ECB SPF, Eurostat and ECB staff calculations.

Notes: + denotes that the SPF is being compared with the MPE conducted after it, while – denotes that the SPF is being compared with the MPE taking place before it.

3.2.3 Long-term growth expectations

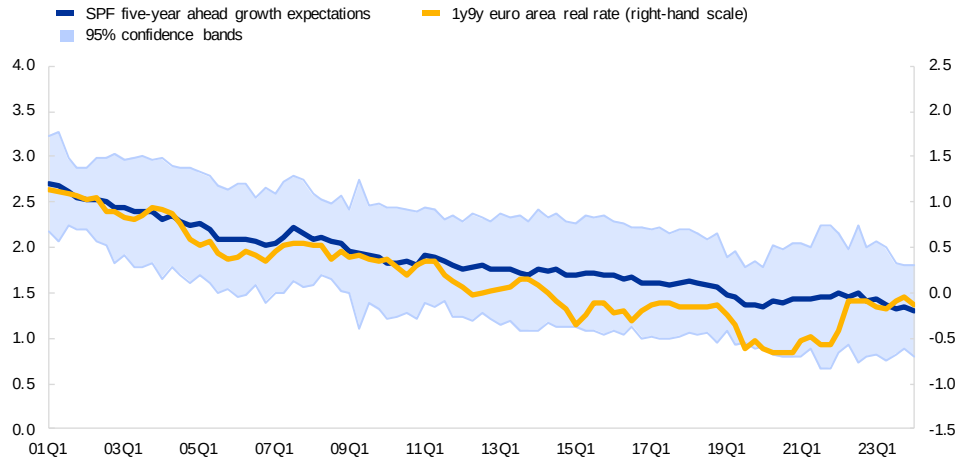
Longer-term growth expectations can shed light on how professionals assess the growth potential of the economy. In the SPF, the longer-term horizon looks five years ahead to portray the forecasters' assessment of the economy's steady state. The concept of steady state represents the condition that the economy is expected to reach when the effects of past and present disruptions have subsided and are consistent with the structural trends of the economy. These long-term projections rest on the assumption that the economy's response to shocks is not overly prolonged, and therefore that impacts from cyclical economic shocks are expected to have faded within this five-year scope. Longer-term forecasts are thus valuable, as they reflect the degree of confidence forecasters have in the structural foundation of the economy.

Longer-term growth expectations have been systematically revised down from 2.7% in 2001 to around 1.3% currently. Chart 22 shows the evolution in expectations for future growth trends and the degree of uncertainty inherent in these forecasts. Longer-term growth expectations peaked in Q1 2001 at 2.7% – around the time of the so-called "new economy" or "dot.com" bubble. They have declined fairly steadily ever since, with the latest survey round in Q1 2024 expecting 1.3% growth for the five-year ahead horizon. This drop in confidence in future economic growth for the euro area is further evident when we consider the forecasters' assessments as to the probability of a GDP growth rate of 2% or more, which declined progressively from 83% in Q1 2001 to 22% in Q1 2024. It is also noteworthy that this more pessimistic outlook comes without increased disagreement, as the confidence bands are at somewhat constant levels over the time span. This downward trend in long-term growth expectations from the SPF is also reflected when considering real rates for inflation-linked swaps. The intuition behind the inflation-linked real rates is that since they automatically adjust to changes in inflation (i.e. hedging inflation/nominal developments), they are therefore a "real" indicator. Therefore, it may be another useful indicator for the economy's health as it is mainly driven by the overall supply and demand for capital. The overall picture of declining confidence in long-term growth may well reflect a combination of the shift away from "irrational exuberance" (Shiller 2000) towards a more realistic stance, as well as underlying structural factors such as demographic trends.

Chart 22

Long-term growth expectations

(percentages)



Sources: ECB SPF, Refinitiv and ECB staff calculations.
Notes: The euro area 1y9y term premia adjusted real rate is computed as the difference between the corresponding term premia adjusted overnight-interest swap (OIS) rate and the inflation-linked swap (ILS) rate. The measure is also adjusted for risk premia.

3.3 Unemployment rate expectations

3.3.1 Unemployment rate expectations over the short and medium term

Unemployment rate expectations in the euro area SPF have on average been quite accurate for the short and medium term. Table 3 below presents descriptive statistics for both the actual unemployment rate data and the SPF forecasts (distinguishing between two forecasting horizons: one-year ahead and two-year ahead) over the whole sample period of Q1 1999 to Q4 2023, plus selected sub-samples (Q1 1999 to Q4 2008, i.e. pre-global financial crisis; Q1 2009 to Q4 2019, i.e. post-global financial crisis; and Q1 2020 to Q4 2023, i.e. pandemic and Ukraine conflict). On average, over the entire period of Q1 1999 to Q4 2023, the mean error for the one-year ahead horizon was low at just 0.04 percentage points, while that for the two-year ahead horizon was 0.25. Considering subsamples, the figures show that over the period Q1 1999 to Q4 2008, the unemployment rate expectations were under-forecast by 0.36 percentage points for the one-year horizon, and by 0.74 percentage points for the two-year horizon; over the period Q1 2009 to Q4 2019, they were broadly correct for both surveyed horizons; but over the most recent period (Q1 2020 to Q4 2023), they were over-forecast.

SPF forecasters have tended to over-forecast the unemployment rate since the onset of the pandemic. In the most recent period since Q1 2020, the mean forecast error was negative both for the one-year horizon (0.82 percentage points) and the two-year horizon (1.20 percentage points). In other words, the actual unemployment rate outcomes were lower than the forecasts made by SPF participants. The pandemic period was characterised by strong uncertainty over labour market

outcomes. Policy support in the form of job retention schemes and the shift from office work to remote work are among the most important factors to have contributed towards the better performance of unemployment rate outcomes during this period.[33] Overall, professional forecasters managed to navigate this uncertainty relatively well by learning over time how the euro area labour market adapted to the pandemic.

Table 3

Unemployment rate forecasts: summary statistics

(percentages; percentage points)

	1999Q1-2023Q4		1999Q1-2008Q4		2009Q1-2019Q4		2020Q1-2023Q4	
Actual	1YA	2YA	1YA	2YA	1YA	2YA	1YA	2YA
Mean	9.11	9.10	8.75	8.85	10.04	9.84	7.08	6.66
Std. dev.	1.51	1.54	0.66	0.79	1.50	1.61	0.66	0.20
Forecast								
Mean	9.08	8.85	8.39	8.11	10.04	9.73	7.90	7.86
Std. dev.	1.46	1.36	0.85	0.78	1.41	1.34	1.02	0.65
Error								
ME	0.04	0.25	0.35	0.74	0.00	0.11	-0.82	-1.20
MAE	0.62	1.06	0.57	1.13	0.56	0.97	0.94	1.20
RMSE	0.79	1.32	0.77	1.45	0.69	1.19	1.08	1.34

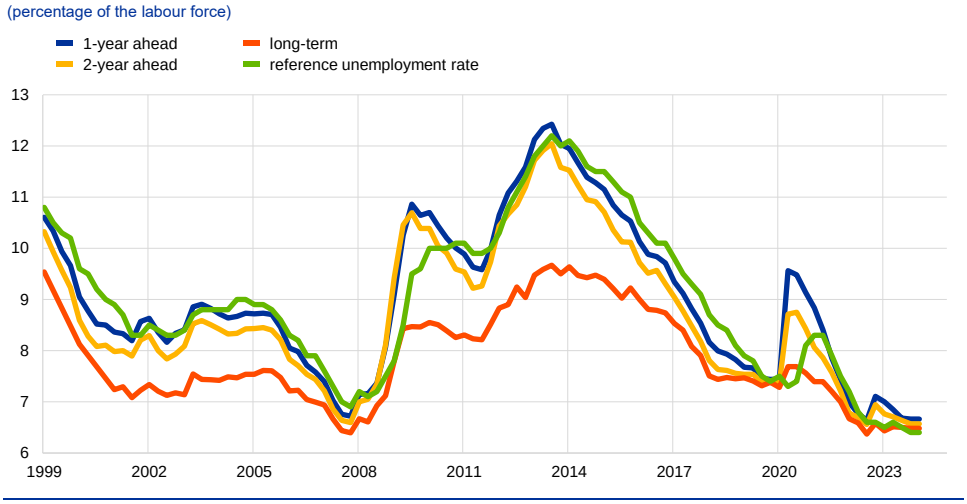
Sources: Eurostat, ECB SPF and staff calculations.
Notes: Std. dev. denotes standard deviation, ME denotes mean error, MAE denotes mean absolute error, and RMSE denotes root mean squared error.

Professional forecasters anchor their shorter- and more medium-term unemployment rate projections on the information provided by the latest available data. Chart 23 shows that one-year and two-year ahead expectations tend to be lower (higher) than the reference unemployment rate if the labour market is in an expansionary (contractionary) phase. However, forecasters usually consider future upward movements in the euro area unemployment rate to be short-lived, with two-year ahead unemployment rate expectations traditionally being below the reference unemployment rate. The global financial crisis and the COVID-19 pandemic were the exceptions to this general rule, as professional forecasters expected the unemployment rate to increase strongly during both periods and then only gradually adjust as the economy recovered. In the aftermath of the pandemic, the unemployment rate fell to historical lows. In recent rounds, the actual unemployment rate has been at around the same level as expectations over all surveyed horizons. This indicates that forecasters expect the unemployment rate to remain broadly stable over the next five years.

[33] Job retention schemes helped protect employment, limited the increase in the number of unemployed workers, and facilitated the labour market adjustment via other margins, such as the number of hours actually worked by employees. Moreover, the shift from office work to teleworking also helped to contain the impact of the pandemic and ensuing lockdowns on the unemployment rate, especially for workers with higher levels of education, who may avail more of work with digital technologies. See Botelho et al. (2021) and Anderton et al. (2020) for more detailed discussions.

Chart 23

SPF average point forecasts and reference unemployment rate



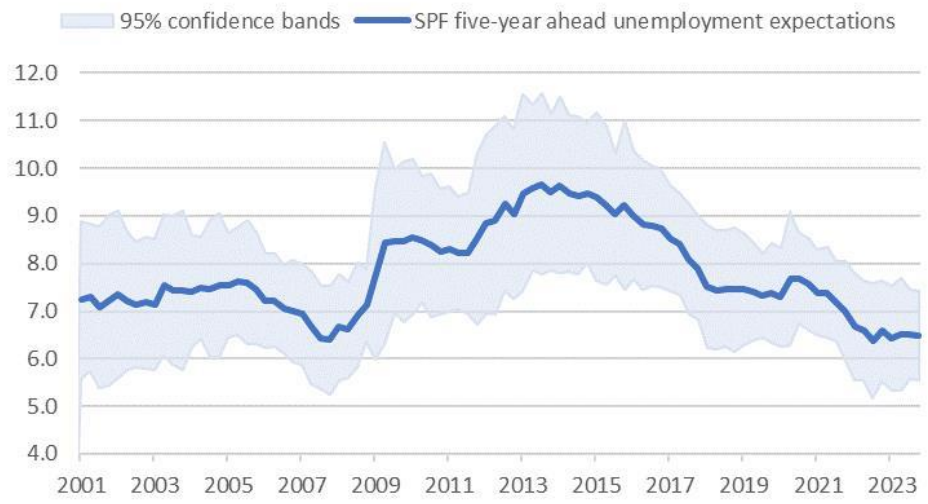
Sources: ECB SPF and Eurostat.
Notes: Latest observation refers to Q1 2024 for the SPF data and November 2023 for the unemployment rate. The reference value coincides with the unemployment rate as observed at the time of each SPF round in real time.

Long-term unemployment rate expectations also move somewhat with current conditions in the labour market. Since the beginning of the SPF, long-term unemployment rate expectations have tended to be considerably below the reference unemployment rate. The gap between the reference unemployment rate and the long-term expectations widened in recessions and increased during the global financial crisis and the sovereign debt crisis, and more recently during the pandemic. Conversely, it narrowed during the 2013-19 expansion and more recently in the aftermath of the pandemic. **Chart 24** shows that the width of confidence intervals for long-term unemployment rate expectations has narrowed over time, suggesting that there has been less discrepancy among forecasters regarding their long-term expectations for the unemployment rate since the end of the sovereign debt crisis. More recently, 2023 has been a rather unique year for unemployment rate expectations, in the sense that forecasters consider the current unemployment rate to be close to a “steady state”. This might suggest that professional forecasters expect the labour market to remain relatively tight, and the unemployment rate to remain broadly unchanged moving forwards. It is a similar story when it comes to the probability of long-term expectations being above certain thresholds. For example, **Chart 25** further below shows the probability of long-term unemployment rate expectations being equal to or above 7.5%. These probabilities have fallen in the last five years to very low levels, comparable to those observed before the global financial crisis, further suggesting that professional forecasters do not see significant risks of the unemployment rate rising over the next five years.

Chart 24

Long-term unemployment rate expectations – confidence intervals

(percentage of labour force)

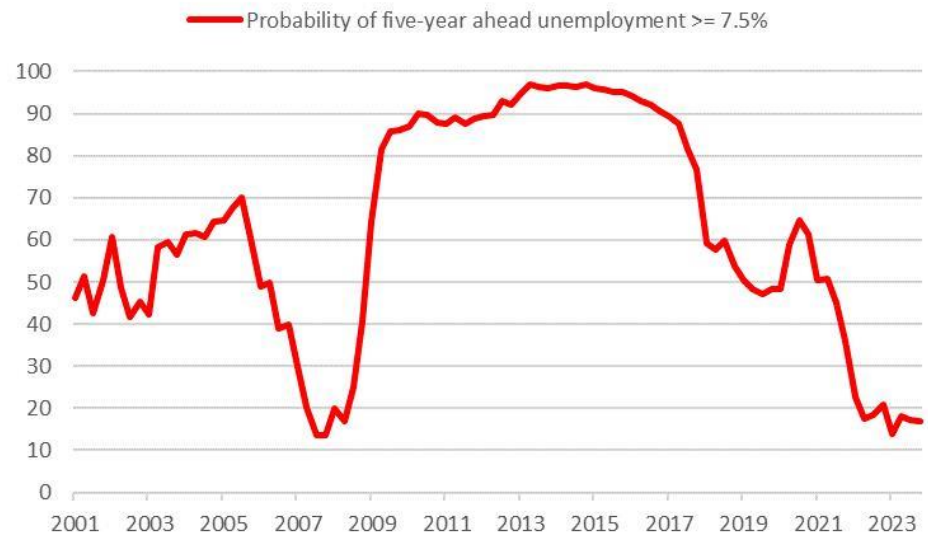


Source: ECB SPF.
Note: 95% confidence bands are calculated using the standard deviation of the aggregate probability distributions multiplied by 1.96.

Chart 25

Unemployment rate expectations – probability

(percentages)



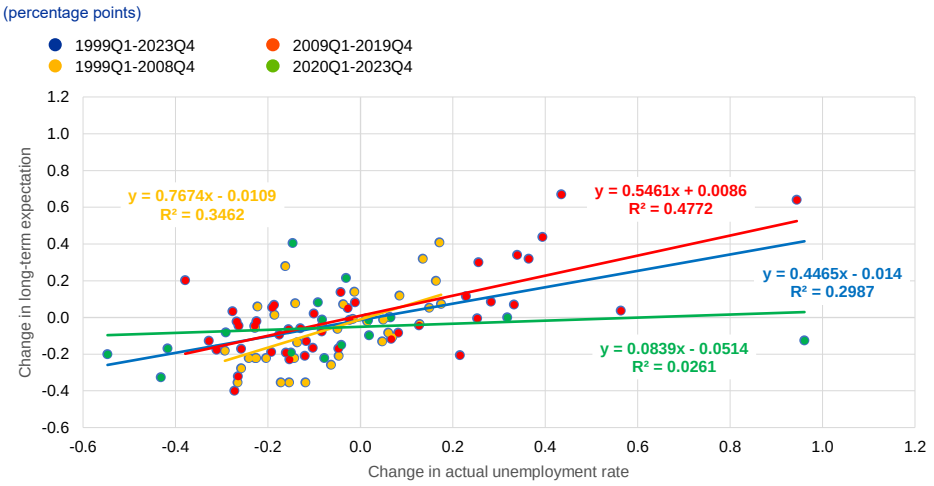
Source: ECB SPF.
Notes: The threshold of 7.5% was chosen to mimic the lowest levels achieved in terms of the unemployment rate before the Great Financial Crisis. At the current juncture, it would also reflect an increase of more than one percentage point in the unemployment rate.

Historically, changes in longer-term unemployment rate expectations have shown a high degree of correlation with changes in actual unemployment, suggesting SPF respondents perceive "hysteresis" in euro area labour markets. Chart 23 above already suggested that long-term expectations move to some extent with actual unemployment. Looking at this more rigorously, over both

the earlier periods (Q1 1999 to Q4 2008 and Q1 2009 to Q4 2019) there was a strong correlation between changes in actual unemployment and revisions to longer-term unemployment rate expectations (see **Chart 26**). This suggests that SPF respondents expected shocks to the unemployment rate to have long-lasting impacts on unemployment (see Blanchard and Summers (1986) for an original discussion of hysteresis in European labour markets). This correlation seems to have disappeared during the most recent period in our analysis (Q1 2020 to Q4 2023). However, as this period is relatively short and happens to be characterised by unprecedented shocks and significant policy measures in euro area labour markets, caution should be exercised when assuming that this lack of correlation will remain the case.

Chart 26

Have hysteresis effects in unemployment rate expectations disappeared?



Sources: ECB SPF and Eurostat.

3.3.2 Assessing relationships between unemployment and growth expectations in terms of Okun's Law

Short-term unemployment rate expectations are linked to the expectations of professional forecasters regarding economic growth generally in line with Okun's law. Okun's law asserts that there is a positive relationship between employment and economic growth. The positive and somewhat surprising performance of the labour market in recent years, given relatively modest economic growth developments, raises the question as to what extent this evidence is compatible with Okun's law. Okun's Law also may hold for expectations regarding the future performance of the unemployment rate, as most professional forecasters use an Okun's relation to formulate their unemployment rate expectations. Estimating an Okun's law-type equation by regressing average unemployment expectations with average GDP growth expectations, we find that the estimated

Okun's elasticity is -0.39.[34] This implies that for each additional percentage point increase in GDP growth expectations, professional forecasters expect a decline in the unemployment rate over the following year of 0.4 percentage points.[35] This result is in line with the historical relationship between yearly changes in the unemployment rate and GDP growth.

Our analysis suggests that SPF participants were able to adapt their expectations to cater for pandemic-related effects. Chart 27 panel a) displays the estimated time-varying elasticities, while panel b) shows the corresponding residuals, from a ten-year rolling window estimation of the Okun's relationship for the average expectations of professional forecasters regarding future changes in the unemployment rate. Two versions of the model are estimated: (i) a naïve version not accounting explicitly for the pandemic; and (ii) an alternative version that uses a set of dummies to control for the period between the first quarter of 2020 and the second quarter of 2022.[36] Okun's elasticity is estimated to be relatively stable, at between -0.4 and -0.5 from the start of the SPF until the end of 2019. The large and unexpected pandemic shock and the unprecedented policy response in the form of job retention schemes shifted the relationship between the unemployment rate and GDP growth expectations. Professional forecasters adapted their views and since 2020 have been more inclined to believe that future changes in the unemployment rate would be broadly orthogonal (unrelated) to their expectations regarding economic activity. Counterfactually accounting for the pandemic, Okun's elasticity would have remained stable over time, implying that SPF participants kept on average their long-term views regarding the Okun's relationship between real activity and the euro area labour market.

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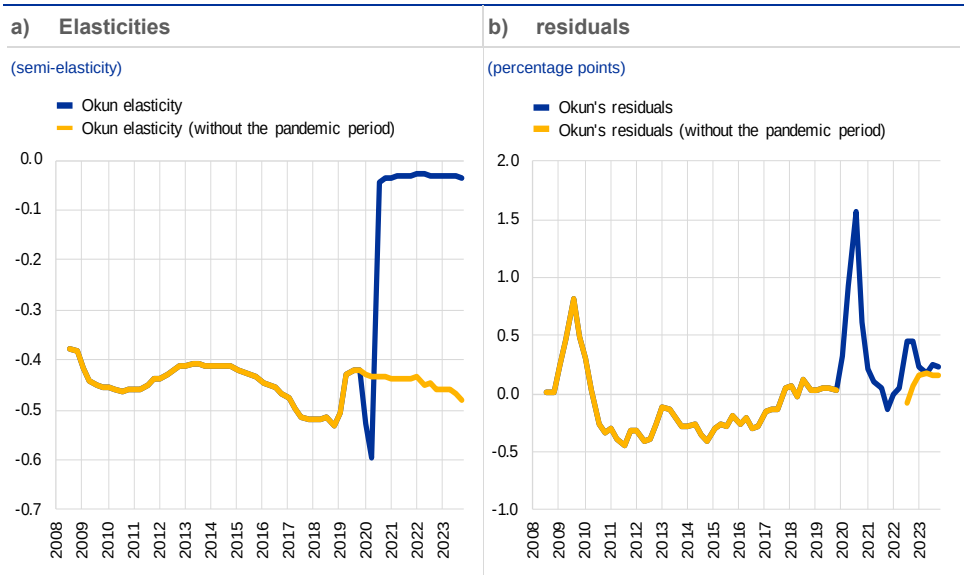
34 Specifically, we estimate a regression of the form $\Delta u_t^e = \alpha + \beta \Delta y_t^e + \varepsilon_t$, where Δu_t^e reflects the average expectations of professional forecasters regarding changes in the unemployment rate one year ahead, and Δy_t^e the one-year ahead expected growth rate of real GDP from the same SPF round. The effects of the pandemic, including the recovery effects, need to be accounted for to avoid biases in the interpretation of Okun's elasticity. This can be achieved via an interaction with a dummy variable taking the value of unity between the first quarter of 2020 and the second quarter of 2022.

35 The pandemic introduces a strong bias in the estimated Okun's elasticity. Not accounting for the pandemic period, this elasticity would be estimated at -0.12 percentage points and would not be viewed as statistically significant.

36 The Okun residuals from the rolling window estimation are computed only for the latest available date in the period of analysis. For example, the residuals for Q4 2023 are obtained from a rolling window comprising the period running from Q1 2014 to Q4 2023. Moreover, in the model accounting for the pandemic period, the Okun's residuals for Q1 2020 to Q2 2022 are equal to zero by construction.

Chart 27

Okun's relationship between unemployment rate expectations and GDP growth expectations – elasticities and residuals – 10-year rolling window estimations



Sources: ECB SPF and Eurostat.
Note: In the model without the pandemic, the period between Q1 2020 and Q2 2022 was accounted for using dummies.

Okun's residuals are positive in 2023, suggesting slight pessimism regarding the expected future performance of the unemployment rate. Okun's residuals can be interpreted in this framework as being a measure of pessimism (when positive) or optimism (when negative) regarding the expected performance of the labour market. They measure the difference between the expected changes in the unemployment rate in the eyes of professional forecasters, and what would have been implied by the estimated Okun's relation given the expectations on future economic growth. As of the fourth quarter of 2023, the expected increase in the unemployment rate was 0.27 percentage points, and the expected increase conditional on the expectations of GDP growth (i.e. via the Okun's relation) stood at 0.12 percentage points, when the model caters also for the impact of the pandemic. As such, professional forecasters are expecting an increase in the unemployment rate that is 0.15 percentage points higher than what their expectations for real activity would historically indicate, possibly owing to past labour hoarding.

Making use of the panel dimension of the SPF allows for a deeper assessment of the compatibility of unemployment expectations with Okun's law. The previous estimation framework is modified to allow each panellist i to have their own views regarding average underlying changes in the unemployment rate that are independent on possible GDP changes over time. This results in a specification of the type $\Delta u^{e}_{i,t} = \alpha_i + \beta \Delta y^{e}_{i.t} + \varepsilon_{it}$. The estimated Okun's elasticity stands at -0.37 percentage points, similar in magnitude to the elasticity estimated with the time series regression.[37] The average expected yearly change in the unemployment rate in Q4 2023 stands at 0.27 percentage points, while the average Okun implied

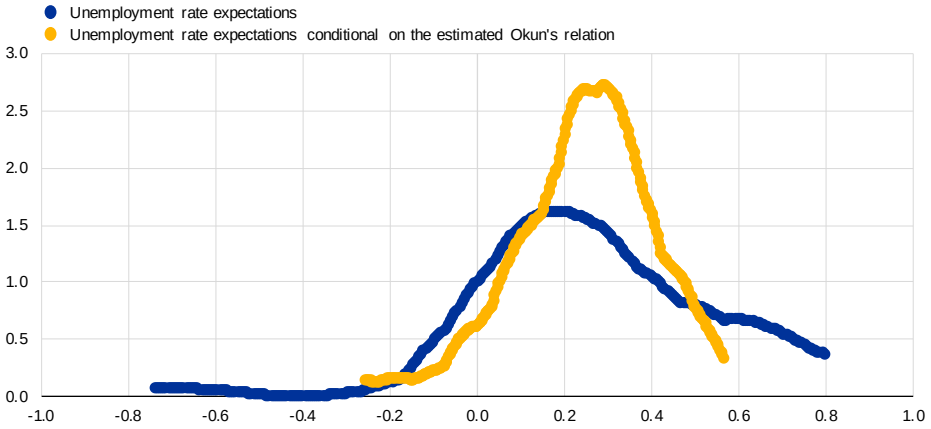
[37] As in the time series framework, the panel Okun's law specification accounts also for time dummies containing a pandemic effects period and its interaction with GDP growth expectations.

change in the unemployment rate stands at 0.25 percentage points. However, the distribution of these expectations differs significantly. **Chart 28** displays the kernel density estimates of the expected changes in the unemployment rate ($\Delta u^{e}_{i,t}$) in Q4 2023 and compares it with the predictions resulting from the Okun's law relation. Notably, it shows that professional forecasters go beyond Okun's law and impose additional judgement when forming their unemployment rate expectations.[38] The Okun's residuals of the SPF panellists were positive on average during 2023, at around 0.07 percentage points. This suggests that the average panellist is including a small positive (upward) judgement to the performance of the unemployment rate in comparison to what would otherwise be implied by their GDP growth expectations.

Chart 28

Kernel density estimates on the changes in the unemployment rate over the next 12 months in Q4 2023: unconditional expectations and estimated Okun's relation

(horizontal axis: expected change in the unemployment rate, in percentage points; vertical axis: Epanechnikov kernel density estimates)



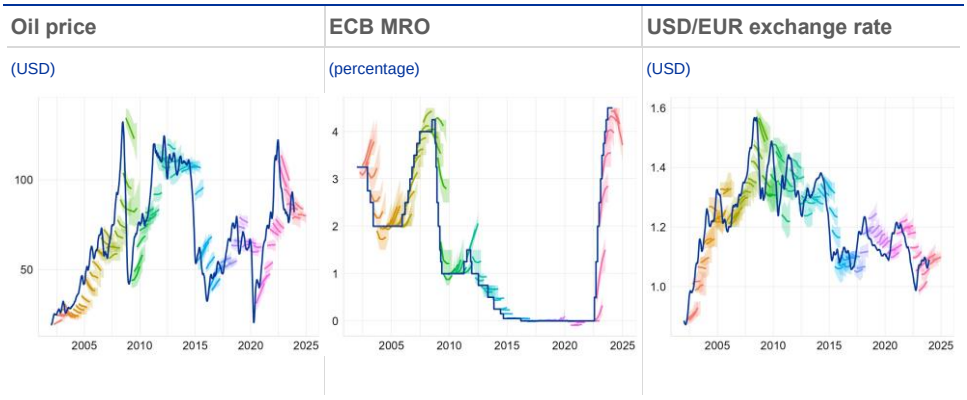
Sources: ECB SPF and Eurostat.
Notes: The blue line depicts the (unconditional) distribution of the expected change in the unemployment rate over the next 12 months across professional forecasters. The yellow line plots the implied (conditional) distribution for the expected change in the unemployment rate over the next 12 months, considering the professional forecasters' real GDP growth expectations via an estimated Okun's law regression that explores the panel dimension of the SPF over time.

[38] In Q4 2023, the distribution of expected changes in the unemployment rate over the following year (standard deviation equal to 0.28) is more volatile than the Okun's implied expectations (standard deviation equal to 0.16). In **Chart 28**, this is reflected in unemployment rate expectations having a larger density in both tails of the distribution of expected changes in the unemployment rate.

4 Assumptions

In forming their assumptions regarding key financial and market variables, SPF respondents are somewhat influenced by recent developments and disagreement between forecasters is relatively limited (especially considering the volatility of the variables in question). Respondents can, and mostly do, provide quantitative expectations for four other variables: oil prices, exchange rate, interest rates, and labour costs. These so-called "assumptions" cover the expected developments in (i) oil prices, (ii) the EUR/USD exchange rate, (iii) the ECB's main refinancing operations interest rate (MRO), and (iv) the annual growth in euro area unit labour costs. For each of the first three variables, respondents offer their expectations for the subsequent four quarters ahead, one calendar year ahead and two calendar years ahead, while for labour costs, expectations are provided for the current calendar year, the following two calendar years, and also for the longer term. There tends to be a high degree of agreement between forecasters on the direction that each of the variables will take over the forecast horizon. Their one-quarter ahead expectations also tend to be quite close to the on-the-day value of the corresponding variable, with the range of values spreading out over the horizon. Despite this spreading, the interquartile range remains relatively narrow in most periods, particularly when compared with actual developments. The exceptions typically occur after turning points, or at points of inflection (see oil price panel in **Chart 29**).

Chart 29
Evolution of assumptions



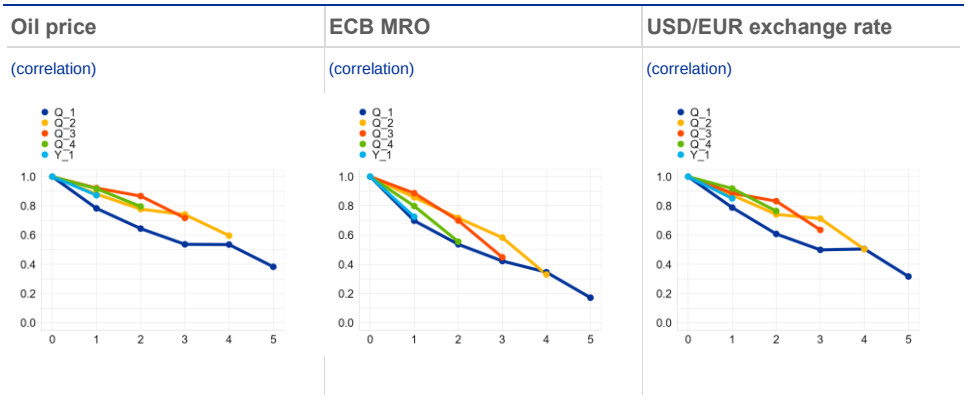
Sources: ECB SPF, Bloomberg, ECB and staff calculations.
Notes: The solid blue line represents the benchmark indicator for each graph (for oil price it is the 50-day moving average of the Brent Crude spot price; for the MRO it is the ECB main refinancing rate; for the exchange rate, a 50-day moving average of the USD/EUR rate is used. The coloured lines and shaded areas represent the median and interquartile range of forecasters' expectations over the horizon, with a different colour used for each SPF round.

The assumptions show a strong positive correlation with "initial" conditions. The agreement between forecasters and the close relationship with an underlying index is evidence (as also confirmed by the SPF special questionnaire) that they use a very similar set of indicators in their assumptions. **Chart 30** visualises the correlation matrix of forecasters' assumptions in a way that takes advantage of the time relationship between each of the forecast horizons. The visualisation shows the

relatively strong correlation that a horizon's values have with the next period (i.e. at position 1 on the x-axis). That all correlations are positive is a further indication that the forecasters' assumptions tend to follow one direction in each forecast round. For each variable, the one-quarter ahead (Q_1) forecast shows the lowest correlation with subsequent forecast periods. This may arise where forecasters already have some hard data available for Q_1 when submitting their expectations to the SPF, while their subsequent expectations are extrapolations based on historical values.

Chart 30

Correlation of assumptions across forecasters for different horizons



Sources: ECB SPF and staff calculations.
Notes: For each variable, assumptions are asked for six horizons: four quarters (current quarter, next quarter, quarter after next and two quarters after next) and two calendar years (next calendar year and calendar year after next). For each variable, in each round, a forecaster's horizon of assumptions is de-meaned. A correlation matrix of the assumption values across the horizon is then calculated. The lines represent the correlation of each period in the horizon's value with the values of the remaining subsequent horizons. For example, Q_1 shows the correlation of the current quarter assumptions with the assumptions over the next three quarters (1, 2, 3 on the x-axis) and the next two calendar year horizons (4 and 5 on the x-axis). Q_4 shows the correlation of the assumptions three quarters ahead with the assumptions over the next two calendar year horizons (1 and 2 on the x-axis). Y_1 shows the correlation of the assumptions for the next calendar year with those for the calendar year after next (1 on the x-axis). The x-axis shows the number of periods ahead.

Forecast errors in the assumptions account on average for around 80% of those for headline HICP one year ahead. A simple OLS between the average forecast error of the one-year ahead expectations for HICP and the forecast error of the underlying assumptions reveals that the forecast error of those assumption variables explains the lion's share of the variance in the HICP forecast error. Oil price assumptions were the most prominent contributor, whereas the forecast error of labour costs had no explanatory power (**Table 4**). However, these results should be read with caution, as the recent period of high inflation has affected the significance of the interest rate, which had little explanatory power before 2022. By way of comparison, errors in the conditioning assumptions, particularly for energy prices, explain about three-quarters of the recent Eurosystem and ECB staff projection errors for inflation (see Chahad et al., 2022). In contrast to the HICP forecast error, labour costs play more of a role in explaining the forecast error for real GDP and the unemployment rate, while energy, along with exchange rates, does not make a significant contribution. This result also holds up when controlling for the impact of the high inflation period.

Table 4
Assumption forecast error

	Dependent variable:		
	e_HICP	e_GDP	e_UNEM
	(1)	(2)	(3)
e_OIL	0.071***	-0.009	-0.006
	(0.007)	(0.020)	(0.004)
e_FX	-11.342***	6.704	1.173
	(1.815)	(5.251)	(1.100)
e_MRO	2.151***	2.627***	-0.952***
	(0.309)	(0.893)	(0.187)
e_LAB	-0.009	-1.952***	0.352***
	(0.138)	(0.400)	(0.084)
Constant	0.556***	-1.190***	0.049
	(0.135)	(0.391)	(0.082)
Observations	50	50	50
R^2	0.834	0.417	0.428
Adjusted R^2	0.819	0.365	0.377
Residual Std. Error (df = 45)	0.862	2.493	0.522
F Statistic (df = 4; 45)	56.504***	8.044***	8.421***
Note:		* p<0.1; * *p<0.05;* ** p<0.01	

Notes: For each variable HICP, OIL, FX, MRO, and LAB, in each round from April 2010 onwards, the average of forecasters' one-year ahead expectations is compared with the actual observed value of its target variable. The difference is calculated to produce forecast errors (prefixed with "e_" in our model) and the relationship is investigated.

Box 3
Insights from SPF special (ad hoc topical) questions

In addition to quantitative forecasts and qualitative comments, SPF respondents are also regularly asked special ad hoc topical questions. While special ad hoc questions on topics of current interest have been included in the SPF since late 2001, they were not used on a regular and systematic basis until the global financial crisis in late 2007. In total, 68 special questions have been asked to date, each examining one or more major themes or variables (inflation, growth or unemployment) and with a large majority of them covering inflation (78%) and/or GDP (54%). Additionally, each question investigates one or more concepts related to, or driving, the target variables (see **Table 5**), with wages and the financial environment featuring most prominently (18% and 16% respectively).

The insights obtained from the special questions have proven to be highly informative in better understanding shocks. For example, in Q2 2020 (early April), respondents were asked to elaborate on the economic impact of the coronavirus.[39] Most respondents expected the severe restrictions to remain in place until the end of April, with a gradual relaxation thereafter, with some degree of normality likely returning in the third quarter and specific restrictions lasting for longer. A sharp contraction in activity was expected in March and April 2020, with some pickup from May onward and a return to pre-pandemic activity levels no earlier than 2022. However, respondents expected downside risks to materialise in the case of further lockdowns. Regarding the impact on

[39] See the Q2 2020 SPF report.

inflation, they deemed that the negative demand effects would likely outweigh the positive supply-side effects (e.g. relating to food, oil or supply chains). Given the significant uncertainty over the future course of the pandemic and its economic effects, this proved to be a valuable source of information about alternative scenarios for the euro area economy.

The survey has also been used to inform interpretations of the monetary policy strategy. In Q3 2019 and Q4 2020, respondents were asked what level or range of inflation they viewed as being in line with the ECB's price stability objective.[40] At the time, the ECB's objective was to keep inflation "below, but close to, 2%". Nearly all respondents to the question believed the objective to be flexible, i.e. a range rather than a single point value. The median respondent interpreted the objective as being 1.7-2.0%. All of those responding to the question considered 1.8% and 1.9% as being consistent with the objective, and more than 75% also considered 1.7% and 2.0% to be consistent. These data helped to inform deliberations in the context of the ECB's 2021 monetary policy strategy review[41], in which the target was revised to be "symmetric", meaning that it is equally undesirable for inflation to rise above or drop below the target.

Table 5

Share of special questions covering concepts related to, or driving, the target variables

(Percentages do not sum to 100% as questions may cover multiple concepts)

Concept	Share of special questions
Wages	18%
Financial environment	16%
Oil/ energy	13%
Fiscal measures	12%
Labour/employment (without wages)	9%
ECB/monetary policy	9%
Commodities (general)	7%
Slack/output or unemployment gap	7%
Uncertainty	7%
Coronavirus	6%
Exchange rates	6%
Input/production factors	4%
Profits	4%

40 See the Q4 2020 SPF report.

41 See Overview of the ECB's monetary policy strategy.

5 Understanding macroeconomic uncertainty

Aggregate uncertainty, covering both individuals' assessment of the uncertainty surrounding their forecasts plus disagreement between forecasters, has been a useful metric, particularly over the past five years. The information provided by ECB SPF respondents on the probability distributions (and thus uncertainty) underlying their point forecasts allows for a quantification of uncertainty surrounding their point forecasts (in addition to providing information on the balance of risks as discussed in Section 3.1.1). This insight has been particularly valuable over the past five years, owing to the extreme events that have taken place (e.g. pandemic, supply disruptions, conflict, weather and climate). Frequently, disagreement between forecasters is used as a proxy for macroeconomic uncertainty (see Clements et al. 2022), especially when no measure of probabilistic uncertainty is available. However, disagreement is an imperfect measure, particularly for longer-term horizons, where expectations may be anchored by monetary policy (e.g. inflation target) or by structural features (e.g. long-term growth potential). Average individual uncertainty is quantitatively more meaningful, yet it is also limited. First, it ignores disagreement with other forecasters about their point forecasts and second, forecasters have tended on average to underestimate the actual uncertainty surrounding their forecasts (see below for a more detailed discussion).

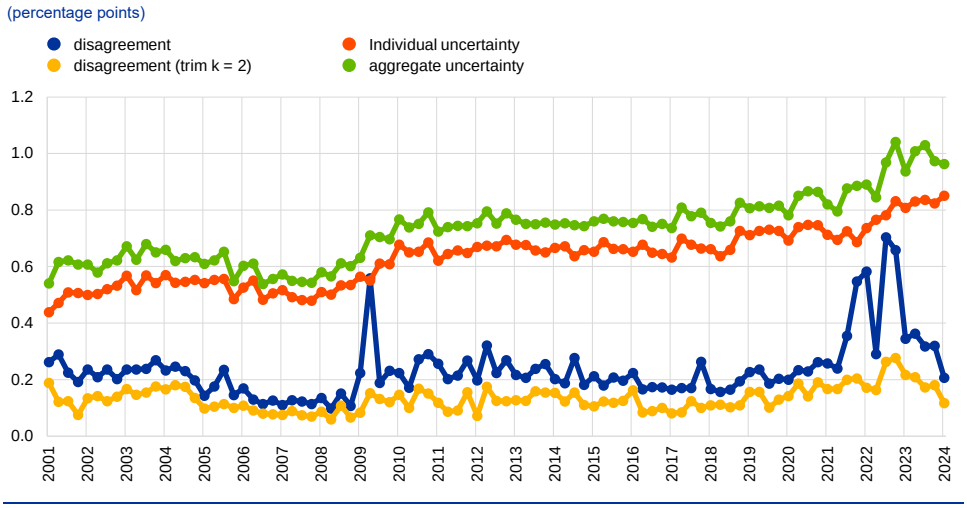
Aggregate uncertainty is accounted for mainly by average individual uncertainty, although disagreement can add volatility. Chart 31 shows the following uncertainty measures for longer-term inflation expectations: aggregate uncertainty, average individual uncertainty, disagreement and trimmed disagreement (trimming the two highest and lowest responses). On average, individual uncertainty accounts for about 85% of aggregate uncertainty. Over the history of the SPF, there have been three broad "phases" of uncertainty. Individual uncertainty, which averaged around 0.5 percentage points over the period 1999-2008, but increased following the global financial crisis and averaged almost 0.7 percentage points over the period 2009-2019.[42] Since 2020, it has increased further to around 0.8 percentage points amid the pandemic, global supply bottlenecks and the impact of the war in Ukraine. This increase in individual uncertainty can be seen both in the context of an under-estimation of the actual degree of uncertainty plus an increase in macroeconomic volatility since the global financial crisis and again since 2020. While disagreement is quantitatively lower, at around 0.2 percentage points on average, it has displayed some more volatile movement. However, much of this may be down to one or two "outliers" and trimming the point forecasts before calculating disagreement yields a lower (around 0.1 percentage points) and more stable level.

[42] The uncertainty measures are reported in percentage points. The underlying reference should be the variable for which they are calculated. For inflation and GDP growth, this is the annual percentage change, while for the unemployment rate it is the percentage of the labour force.

However, even the trimmed measure of disagreement did show some increase in the period after 2020 but has “normalised” in the most recent quarters.

Chart 31

Components of uncertainty – longer-term inflation expectations

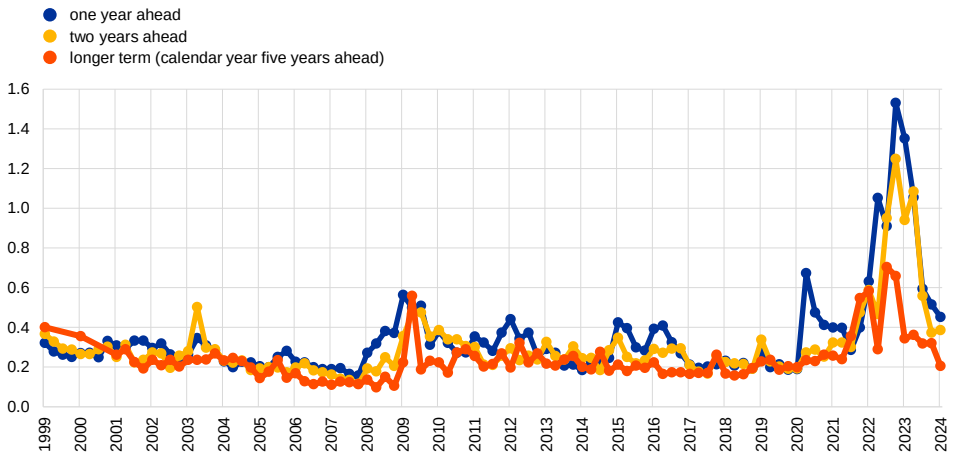


Sources: ECB SPF and ECB staff calculations.
Note: trim k = 2 shows the disagreement measure when the bottom and top two values are trimmed.

Disagreement was broadly similar across horizons for the period 1999-2019 but has been more volatile for shorter (one-year and two-year) horizons, especially since 2020. **Chart 32** below shows disagreement about inflation forecasts at different (one-year, two-year and longer-term) horizons. Over the period 1999-2019, the average level was broadly similar across horizons but somewhat more volatile for shorter horizons (particularly since 2009). However, since 2020, there has been a significant increase in the level and volatility of disagreement, particularly for the one-year and two-year ahead horizons. In 2020, only one-year ahead disagreement spiked, implying that disagreement among respondents did not extend beyond this horizon. However, in 2022 and 2023 both one-year and two-year ahead disagreement rose notably, indicating an increase in disagreement about the inflation outlook persisting beyond the shorter horizon. However, in the most recent quarters disagreement has declined across all horizons, albeit not quite yet to historical levels for the shorter (one-year ahead) and more medium-term (two-year ahead) horizons.

Chart 32

Disagreement – inflation

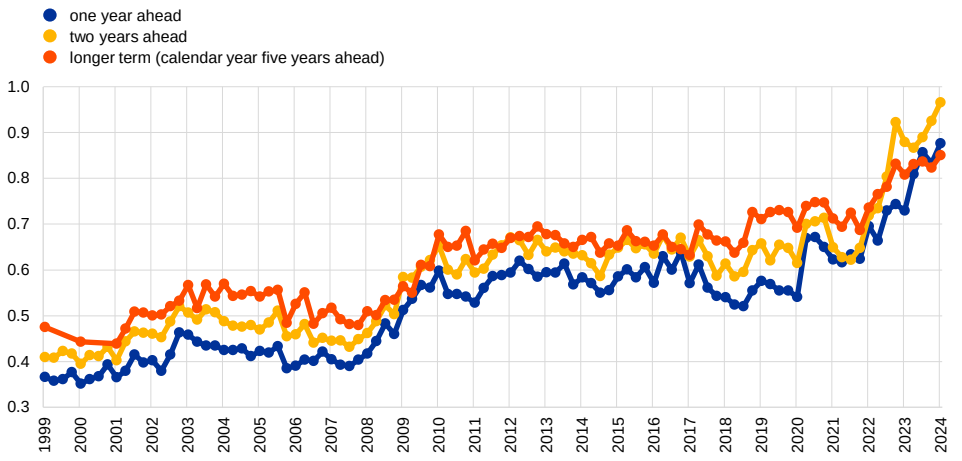


Sources: ECB SPF and ECB staff calculations.

The "term-structure" of individual uncertainty has generally been upward sloping across horizons and has "stepped up" twice since the global financial crisis – see Chart 33. Unlike disagreement, average individual uncertainty has tended to increase as the forecast horizon increases (i.e. individual uncertainty over one-year ahead expectations is less than that over two-year ahead expectations, which in turn is lower than that over longer-term expectations). Average individual uncertainty has "stepped up" twice – first following the global financial crisis and second since 2020. In this most recent period, the increase has been particularly noticeable for the shorter one-year and two-year ahead horizons, so much so that the "term" structure was hump-shaped (being higher for two years ahead than for the one-year and longer-term horizons).

Chart 33

Individual uncertainty – inflation

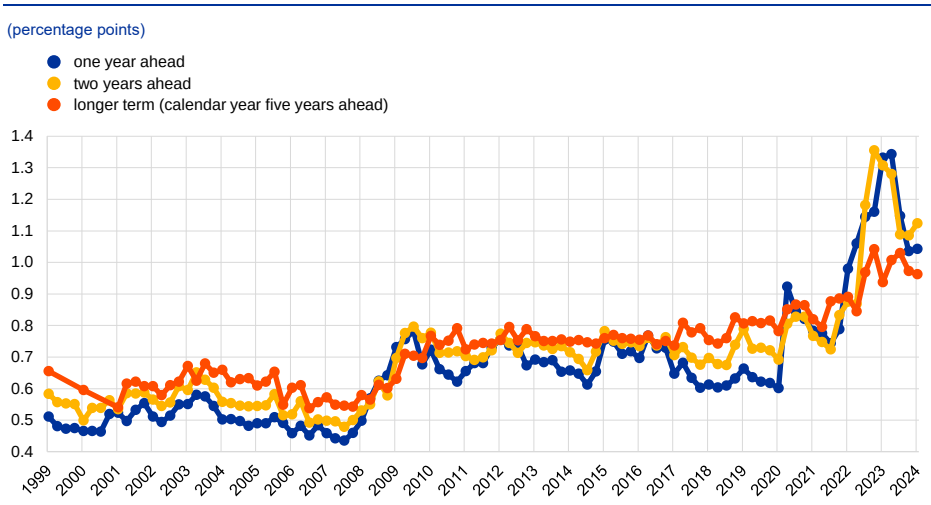


Sources: ECB SPF and ECB staff calculations.

Estimated aggregate uncertainty surrounding inflation expectations has increased considerably relative to that which prevailed during the early years of the SPF (1999-2008) – see Chart 34. Although sloping upward for much of the period since 1999, more recently (since 2020) the term structure of aggregate uncertainty has become inverted. It is not yet clear to what extent this inversion will persist or whether it will revert to normal when/if the current elevated uncertainty eases.

Chart 34

Aggregate uncertainty – inflation



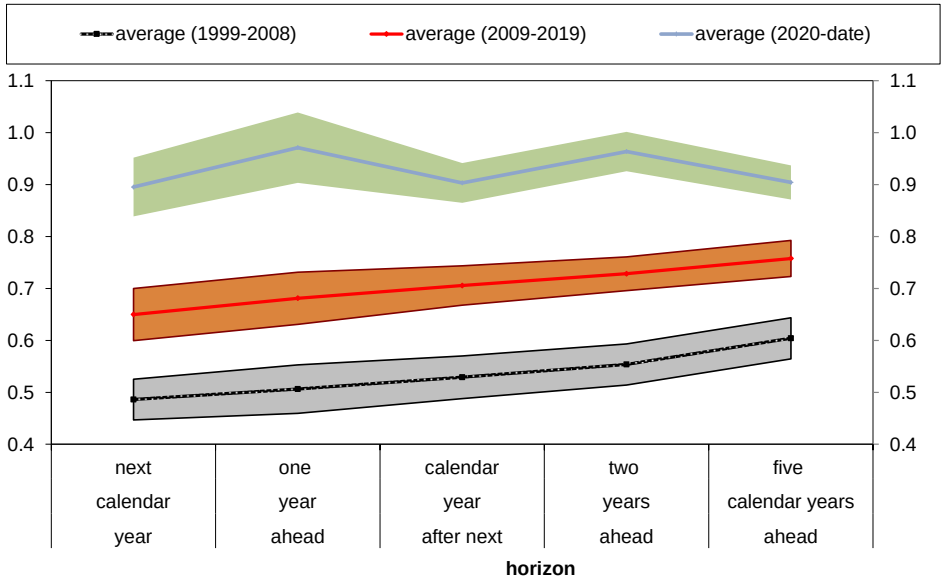
Sources: ECB SPF and ECB staff calculations.

The upward shift in, and flattening of, the term structure of inflation uncertainty is particularly striking when comparing over sub-periods. Chart 35 shows the "term structure" of aggregate uncertainty over three sub-periods (pre-GFC, post-GFC and post-2020). In the pre-GFC period (Q1 1999 to Q4 2008) the term structure was slightly upward sloping from around 0.5 percentage points for the next calendar year to 0.6 percentage points for the longer term. In the period after the GFC (Q1 2009 to Q4 2019) the curve shifted upwards by about 15 basis points (0.65 for next calendar year to 0.75 percentage points for the longer term), although the slope was broadly unchanged. In the latest period (Q1 2020 to the present date), there was a further upward shift to around 0.90 percentage points, although the curve was broadly flat on average with little difference between the next calendar year and the longer-term horizons. This would suggest that in addition to the general overall increase in uncertainty, short-term uncertainty increased proportionally more.

Chart 35

Term structure – aggregate uncertainty – inflation

(units, axis description)

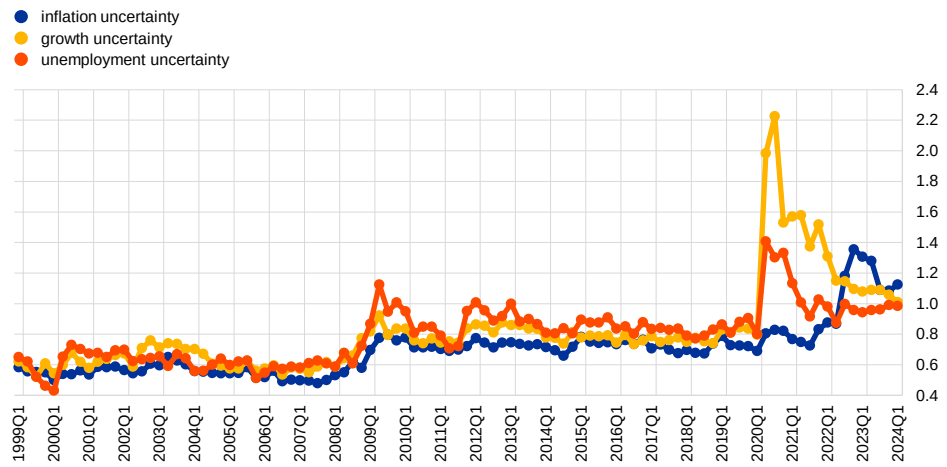


Sources: ECB SPF and ECB staff calculations.

While the "step up" in aggregate uncertainty has been seen across variables, the timing and magnitude has varied, particularly over the period since 2020. **Chart 36** shows aggregate uncertainty for the two-year ahead horizons for inflation, real GDP growth and the unemployment rate. Uncertainty for all three variables shows a level increase in the period after the global financial crisis (2009-2019). In 2020, there was a further increase. This happened firstly, and most noticeably, for real GDP growth and the unemployment rate, reflecting the impact of the pandemic on these two variables. While uncertainty for these two variables had reverted to a large extent by 2023, uncertainty over inflation increased notably in 2022-2023, largely due to the impact of the war in Ukraine on energy prices. While uncertainty has moderated over the most recent quarters and is now some way off its peak value, it remains, for all three variables, above the average that prevailed in the period prior to 2020.

Chart 36

Aggregate uncertainty – two years ahead

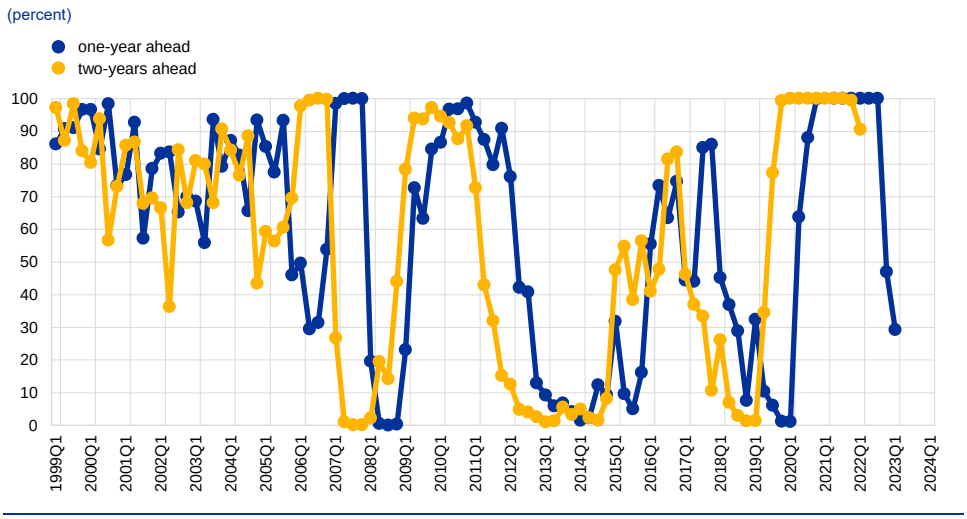


Sources: ECB SPF and staff calculations.

In spite of the increases, reported uncertainty might still be under-estimated. At first glance, assessing ex ante uncertainty against ex post data outcomes is conceptually challenging. However, the probability integral transform (PIT) can be useful in determining whether uncertainty is under- or over-estimated on average over periods of time. The PIT simply records where the ex post outcome is in the cumulative ex ante probability distribution. While at any one given point in time an outcome anywhere in the distribution cannot be considered reasonable or unreasonable, over longer periods of time, outcomes should be in the lower decile 10% of the time, the second decile (10-20%) 10% of the time, and so forth. **Chart 37** shows the PIT for inflation forecasts one year and two years ahead. Despite the increase in aggregate uncertainty, forecasters have tended to under-estimate the actual uncertainty surrounding their forecasts with actual outcomes falling too often in the tails of their probability distributions. In the earlier years of the SPF (1999-2008), outcomes were too often in the upper tail of the distribution. While in the period since then they have fluctuated between the upper and lower end, they have been too often in the tails (namely upper and lower deciles) and too infrequently in the middle.

Chart 37

Probability Integral Transform (PIT) – inflation



Sources: ECB SPF and staff calculations.
Notes: The PIT records where the ex-post outcome is in the cumulative ex-ante probability distribution (e.g. a value of 20 indicates that the outcome was at the 20th percentile of the cumulative aggregate probability distribution).

Box 4 Use of SPF data for economic research

As the SPF offers a rich source of expectations data, it has been extensively used for economic research. Compared to households or firms, participants in the SPF are considered better informed and more equipped to respond to technical questions, which should enhance the quality of the information received. Consequently, researchers from both academia and policy institutions have extensively used such data for a variety of analytical work, such as incorporating direct measures of expectations into economic models to enhance forecasting performance, extracting timely measures of uncertainty, and monitoring central bank credibility. Focusing on the five years since the 20-year anniversary, this box provides a non-exhaustive overview of the findings of selected studies that have made use of the SPF dataset.

Numerous empirical studies have evaluated the quality and predictive content of SPF point and probability forecasts relative to benchmark forecasting models. Coroneo et al. (2019) assess the real-time predictive ability of various SPF probability forecasts and show that those for unemployment and real GDP growth beat simple benchmarks such as the Gaussian random walk at the one-year horizon, whereas probability forecasts for inflation do not consistently outperform those simple benchmarks. Overall, they document an improved SPF performance post-2008 across all macroeconomic variables. Ganics and Odendahl (2021) and Banbura et al. (2021) combine real-time forecasts from a broad range of Bayesian vector autoregressions with SPF point and/or probability forecasts. Their analysis illustrates significant forecasting gains driven by SPF point forecasts, while incorporating information from SPF densities does not appear to particularly enhance the predictive performance. Papers looking into the accuracy of SPF forecasts can generate virtuous feedback loops, given that the participants in the SPF also routinely conduct evaluations of their own forecasts. In the questionnaire discussed in Box 1, more than two-thirds to evaluate the accuracy of their point forecasts, particularly for headline inflation and GDP growth. In contrast, very few respondents indicated that they evaluate the accuracy of their probability distributions.

The SPF offers important insights in relation to uncertainty. When asked for the possible factors behind the observed increase in SPF forecast uncertainty, respondents cited an increase in the actual uncertainty as the main explanation, but to some degree also a more accurate assessment of uncertainty. Focusing on individual SPF forecasts of real GDP growth, Casey (2021) evaluates overconfidence among professional forecasters by determining whether the uncertainty levels reported by survey respondents are lower than what the subsequent forecasting performance would imply. The results suggest that overconfidence dominates underconfidence, with individual forecasters appearing to have only limited understanding of whether they are "good" or "bad" forecasters. Glas (2020) explores the relationship between disagreement (dispersion of point forecasts across respondents) and uncertainty (dispersion/width of the probability distribution) to confirm that disagreement is not a reliable proxy for uncertainty, although the strength of this finding appears to depend critically on how one measures dispersion. In a similar spirit, Rich and Tracy (2021) find that forecasters' uncertainty and disagreement display substantial heterogeneity across respondents and, for the individual forecaster, are quite persistent.

The SPF has also been used by researchers to investigate how expectations are formed and revised. For example, Manzan (2021) finds that as forecasters get closer to the target date, they become more attentive to real-time news and evaluate their density forecasts more accurately. Uncertainty seems to increase occasionally as the forecast date nears the target date, particularly when forecasters encounter unexpected news in the most recent data release. The author further documents that the updating behaviour of SPF macroeconomic forecasts is characterised by substantial heterogeneity, with forecasters clustering into different groups that react differently to surprises. Czudaj (2022) investigates the expectations formation mechanism in the Brent crude oil expectations from the SPF dataset and shows that forecast heterogeneity appears widespread in this case also.

A growing body of literature has addressed the anchoring, or stability, of inflation expectations, which is a significant transmission channel of monetary policy. Among recent work, Grishchenko et al. (2019) propose a novel measure of anchoring of inflation expectations that accounts for inflation uncertainty, and they offer a corresponding comparison between the US- and ECB-SPF using this measure. Their analysis suggests that in the aftermath of the Great Recession a mild de-anchoring occurred in the euro area, while the anchoring of US long-term inflation expectations improved over the same period. Focusing on alternative measures of anchoring, Corsello et al. (2021) show evidence that long-term inflation expectations from the ECB-SPF de-anchored after the beginning of disinflation in early 2013, while also becoming more sensitive to short-term expectations and to negative surprises to inflation.

6 Conclusions

Macroeconomically speaking, the 25 years since the launch of the euro and the ECB SPF have been challenging for economic policymakers and forecasters alike. In this context, the SPF has provided useful insights and cross-checking for policymakers and its track record in forecasting has been broadly comparable to that of the Eurosystem. Its combination of quantitative point forecasts and probability distributions with qualitative explanations have served as useful quarterly inputs for the ECB's Governing Council discussions for over 100 rounds.

The ECB SPF has also been useful in helping to understand how professional forecasters perceived and adjusted to the 2021 ECB monetary policy review and subsequent developments. In addition to the information gathered from the special questionnaire conducted shortly after the strategy review in 2021 (ECB 2021c), more recently the actual evolution of SPF expectations has been a valuable source of evidence regarding how professional macroeconomists have understood the impact of the unprecedented macroeconomic turbulence and high and volatile inflation on expectations. Longer-term inflation expectations, which had risen to 2.1% between the Q2 2022 and Q4 2023 SPF rounds, dropped to 2.0% in the Q1 2024 SPF round.

Looking ahead, forecasters and policymakers will be faced with new macroeconomic puzzles and challenges. Thanks to its long history (now extending over 25 years) and its large, broad and highly committed panel (spanning both financial and non-financial forecasters), the ECB SPF will undoubtedly continue to provide timely and useful insights for the ECB's policymakers, macroeconomic experts, economic researchers and the wider public.

7 References

Anderton, R., Botelho, V., Consolo, A., Dias da Silva, A., Foroni, C., Mohr, M. and Vivian, L. (2020), "The impact of the COVID-19 pandemic on the euro area labour market", *ECB Economic Bulletin*, Issue 8, 2020.

Bekaert, G., Engstrom, E. and Ermolov, A. (2021), "Macro risks and the term structure of interest rates", *Journal of Financial Economics*, Vol. 141, Issue 2,, pp. 479-504.

Bańbura, M., Brenna, F., Paredes, J. and Ravazzolo, F. (2021), "Combining Bayesian VARs with survey density forecasts: does it pay off?", *ECB Working Paper*, No 2021/2543, May; http://dx.doi.org/10.2139/ssrn.3838719.

Blanchard, O. and Summers, L.H. (1986), "Hysteresis and the European Unemployment Problem," *NBER Macroeconomics Annual*, Vol. 1.

Boero, G., Smith, J. & Wallis, K.F. (2008), "Uncertainty and Disagreement in Economic Prediction: The Bank of England Survey of External Forecasters", *The Economic Journal*, 118 (530), 1107–1127; http://www.jstor.org/stable/20108849.

Botelho, V., Consolo, A. and Dias da Silva, A. (2021) "Hours worked in the euro area", *ECB Economic Bulletin*, Issue 6.

Bowles, C., Friz, R., Genre, V., Kenny, G., Meyler, A. and Rautanen, T. (2007) "The ECB Survey of Professional Forecasters (SPF) – A review after eight years' experience", *Occasional Paper Series*, No 59, European Central Bank, April.

Burban, V., De Backer, B., Schupp, F. & Vladu, Liliana, A. (2022), "Decomposing market-based measures of inflation compensation into inflation expectations and risk premia," *Economic Bulletin Boxes*, European Central Bank, Vol. 8.

Caballero, R.J. and Simsek, A. (2020), "A Model of Asset Price Spirals and Aggregate Demand Amplification of a 'COVID-19' Shock", *NBER Working Paper* 27044, April.

Camba-Mendez, G. and Werner, T. (2017), "The inflation risk premium in the post-Lehman period", *ECB Working Paper Series*, No 2033.

Campbell, J.Y., Sunderam, A. and Viceira, L.M. (2017), "Inflation Bets or Deflation Hedges? The Changing Risks of Nominal Bonds", *Critical Finance Review*, 6(2):263-301.

Casey, E. (2021), "Are professional forecasters overconfident?", *International Journal of Forecasting*, Vol. 37, Issue 2, pp. 716-732; https://doi.org/10.1016/j.ijforecast.2020.09.002.

Chahad, M., Hofmann-Drahonsky, A., Meunier, B., Page, A. and Tirpák, M., “What explains recent errors in the inflation projections of Eurosystem and ECB staff?”, *ECB Economic Bulletin*, Issue 3/2022.

Chen, A., Engstrom, E., and Grishchenko, O. (2016), “Has the Inflation Risk Premium Fallen? Is it Now Negative?”, *FEDS Notes* 2016-04-04, Board of Governors of the Federal Reserve System (U.S.).

Clements, M., Rich, R. and Tracy, J. (2022), “Surveys of Professionals”, *Working Paper* No 22-13, Federal Reserve Bank of Cleveland.

Coroneo, L., Iacone, F. & Profumo, F. (2019), “A Real-time Density Forecast Evaluation of the ECB Survey of Professional Forecasters”, *Discussion Papers* 19/14, Department of Economics, University of York.

Corsello, F., Neri, S. and Tagliabracci, A. (2021), “Anchored or de-anchored? That is the question”, *European Journal of Political Economy*, Vol. 69; https://doi.org/10.1016/j.ejpoleco.2021.102031.

Croushore, D. and Stark, T. (2019) “Fifty Years of the Survey of Professional Forecasters”, *Federal Reserve Bank of Philadelphia Economic Insights*, Fourth Quarter 2019, Vol. 4, Issue 4.

Croushore, D. (2023), “Real-Time Uncertainty in Estimating Bias in Macroeconomic Forecasts”, September; http://dx.doi.org/10.2139/ssrn.4576286.

Croushore, D. (2010), “Philadelphia Fed forecasting surveys: their value for research”, Federal Reserve Bank of Philadelphia, *Business Review*, Q3 2010.

Czudaj, R.L. (2022), “Heterogeneity of beliefs and information rigidity in the crude oil market: Evidence from survey data”, *European Economic Review*, Vol. 143; https://doi.org/10.1016/j.euroecorev.2022.104041.

de Vincent Humphreys, R., Dimitrova, I., Falck, E., Henkel, L. and Meyler, A. (2019), “Twenty years of the ECB Survey of Professional Forecasters”, *Economic Bulletin*, Issue 1, European Central Bank, 5 February.

ECB (2024), “Forecast processes and methodologies: results of the 2023 special survey. Survey conducted on the occasion of the 25th anniversary of the ECB SPF”, *Mimeo*, April.

ECB (2021c), “Results of a special survey of professional forecasters on the ECB’s new monetary policy strategy”, *Mimeo*, November.

ECB (2021b), “The ECB’s price stability framework: past experience, and current and future challenges”, *ECB Occasional Paper*, No 269, September.

ECB (2021a), “Inflation expectations and their role in Eurosystem forecasting”, *ECB Occasional Paper*, No 264, September.

ECB (2019), “The ECB Survey of Professional Forecasters: Forecast processes and methodologies: results of the 2018 special survey”, *Mimeo*, February.

ECB (2010), “Oil Prices – Their determinants and the impact on euro area inflation and the macroeconomy”, *Monthly Bulletin*, Issue 8.

Fonseca, L. (2024), “Survey-based proxies for the inflation risk premium”, *Mimeo*.

Ganics, G. and Odendahl, F. (2021), “Bayesian VAR forecasts, survey information, and structural change in the euro area”, *International Journal of Forecasting*, Vol. 37, Issue 2, pp. 971-999; https://doi.org/10.1016/j.ijforecast.2020.11.001.

Garcia, J.-A. (2003), “An introduction to the ECB’s Survey of Professional Forecasters”, *Occasional Paper Series*, No 8, European Central Bank, September.

Glas, A. (2020), “Five dimensions of the uncertainty–disagreement linkage”, *International Journal of Forecasting*, Vol. 36, Issue 2; https://doi.org/10.1016/j.ijforecast.2019.07.010.

Górnicka, L. and Meyler, A. (2022), “Does the tail wag the dog? A closer look at recent movements in the distributions of inflation expectations”, *ECB Economic Bulletin*, Issue 6, September.

Grishchenko O., Mouabbi, S. and Renne, J.-P. (2019), Measuring Inflation Anchoring and Uncertainty: A U.S. and Euro Area Comparison”, *Journal of Money, Credit and Banking*, Vol. 51: 1053-1096; https://doi.org/10.1111/jmcb.12622.

Grothe, M. and Meyler, A. (2018), “Inflation Forecasts: Are Market-Based and Survey-Based Measures Informative?”, *International Journal of Financial Research*, Vol. 9, No 1; https://doi.org/10.5430/ijfr.v9n1p171.

Joslin, S., Singleton, K.J. and Zhu, H. (2011), “A new perspective on Gaussian dynamic term structure models”, *The Review of Financial Studies*, Vol. 24, Issue 3, pp. 926-970.

Karber, M., Melemenidis, A. and Meyler, A. (2014), “Results of the second special questionnaire for participants in the ECB Survey of Professional Forecasters”, *Mimeo*, January.

John Maynard Keynes (1936), *The General Theory of Employment, Interest and Money*, London, Macmillan.

Finn E. Kydland and Edward C. Prescott (1977), “Rules Rather Than Discretion: The Inconsistency of Optimal Plans”, *Journal of Political Economy*, Vol. 85(3), pp. 473-491, June.

Lucas Jr., R.E. (1972), “Expectations and the Neutrality of Money”, *Journal of Economic Theory*, Vol. 4(2), pp. 103-124, April.

Sebastiano, M. (2021), “Are professional forecasters Bayesian?”, *Journal of Economic Dynamics and Control*, Vol. 123; https://doi.org/10.1016/j.jedc.2020.104045.

Meyler, A., Saez Moreno, M., Arioli, R. and Fischer, F. (2021), “Results of a special survey of professional forecasters on the ECB’s new monetary policy strategy”, *Economic Bulletin*, Issue 7, European Central Bank, November.

Meyler, A. and Rubene, I. (2009), “Results of a special questionnaire for participants in the ECB Survey of Professional Forecasters”, *Mimeo*, April.

Naggert, K., Rich, R.W. and Tracy, J. (2023), “The Anchoring of US Inflation Expectations Since 2012”, Federal Reserve Bank of Cleveland, *Economic Commentary* 2023-11, July; https://doi.org/10.26509/frbc-ec-202311.

Rich, R. and Tracy, J. (2021), “A Closer Look at the Behavior of Uncertainty and Disagreement: Micro Evidence from the Euro Area”, *Journal of Money, Credit and Banking*, 53: 233-253; https://doi.org/10.1111/jmcb.12728.

Rostagno, M., Altavilla, C., Carboni, G., Lemke, W., Motto, R., Guilhem, A.S. and Yiangou, J. (2021), “Monetary Policy in Times of Crisis: A Tale of Two Decades of the European Central Bank”, Oxford University Press.

Shiller, R. (2000), *Irrational Exuberance*, Princeton University Press, Princeton, NJ; ISBN 0 691 05062 7.

Stan Development Team (2023), *Stan Modelling Language Users Guide and Reference Manual*, 2.34.

Wallis, Kenneth F. (1999), “Asymmetric density forecasts of inflation and the Bank of England’s fan chart,” *National Institute Economic Review*, National Institute of Economic and Social Research, Vol. 167(1), pp. 106-112, January.

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