



EUROPEAN CENTRAL BANK

EUROSYSTEM

RESULTS OF THE SECOND SPECIAL QUESTIONNAIRE FOR PARTICIPANTS IN THE ECB SURVEY OF PROFESSIONAL FORECASTERS¹

This document summarises the results derived from the responses to a special questionnaire sent to participants in the ECB Survey of Professional Forecasters (SPF) in July 2013, with the request to return it by September 2013. This special survey was conducted in the context of the fifteenth anniversary of the SPF's launch in January 1999 and aimed to take stock of current forecasting practices and to gauge potential changes since the start of the financial crisis. Understanding how SPF participants make their forecasts and form their expectations is important to interpret both the average outcomes and the heterogeneity across individual forecasts.

Responses were received from 45 SPF participants, which represents around three-quarters of the average number of responses received in the regular survey rounds. As in the first special questionnaire sent out in autumn 2008, there were questions on timeliness and methods of forecasting, on the use of economic models and judgement, and on the way probability distributions and assumptions are computed (see Annex 1).² These questions have been partly rephrased and extended to find out whether and in what way the forecasting processes have changed since the start of the financial crisis. Tables reporting the replies and the response rates for each question are available in Annex 2. It should be noted that on some occasions, the percentages reported may add up to more than 100%, as respondents could indicate more than one category.

In summary, the replies suggest that SPF responses can reflect a relatively diverse set of views. In preparing their forecasts, participants widely use both structural and time series models, but judgement also plays a key role, in particular for the reported probability distributions and to an increasing extent following the start of the financial crisis in 2008. In comparison with the first special questionnaire from 2008, the results below also indicate that time series models are now more commonly used and that key assumptions are now more often formed on the basis of market data such as futures prices than previously. A large majority of respondents report that they use SPF results externally as well as internally, which indicates that the survey is perceived as a useful source of information for expectations about macroeconomic developments by forecasters in financial and non-financial institutions.

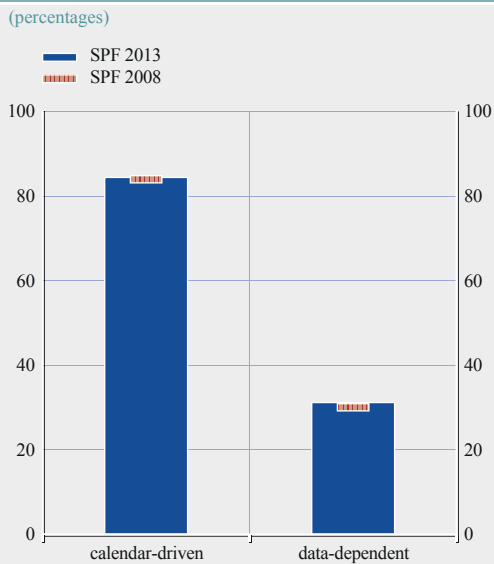
I FREQUENCY OF UPDATES OF THE FORECASTS REPORTED IN THE SPF

The majority of respondents (84%) reported that their forecasts are updated on a regular calendar basis. Around one-third (31%) do so following important data releases that make them change their view of the economy. A number of respondents (16%) update their forecasts both on a

¹ An abridged summary of this note was published as Box 2 in the article entitled "Fifteen years of the ECB Survey of Professional Forecasters" in the January 2014 issue of the ECB's Monthly Bulletin. Any questions or queries on the questionnaire and results should be addressed to Alexandros Melemenidis, Moritz Karber or Aidan Meyler, ecb-spf@ecb.europa.eu

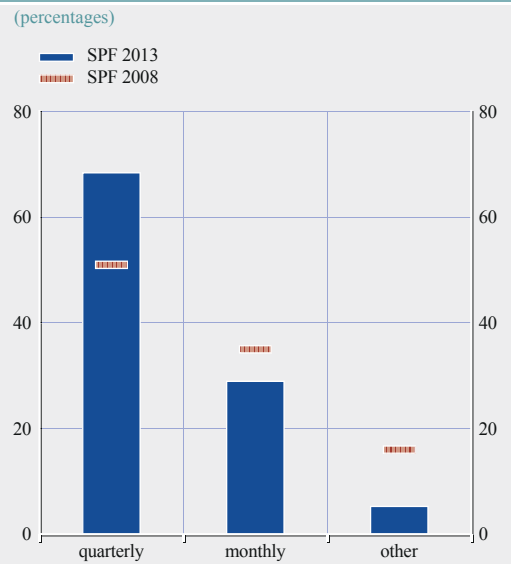
² For a summary of the 2008 SPF special questionnaire, see http://www.ecb.europa.eu/stats/prices/indic/forecast/shared/files/quest_summary.pdf

Chart 1 When do you update your forecasts?



Source: ECB.
 Note: Adds up to more than 100% as some respondents selected both categories.

Chart 2 If it is calendar-driven, how often do you update your forecasts?



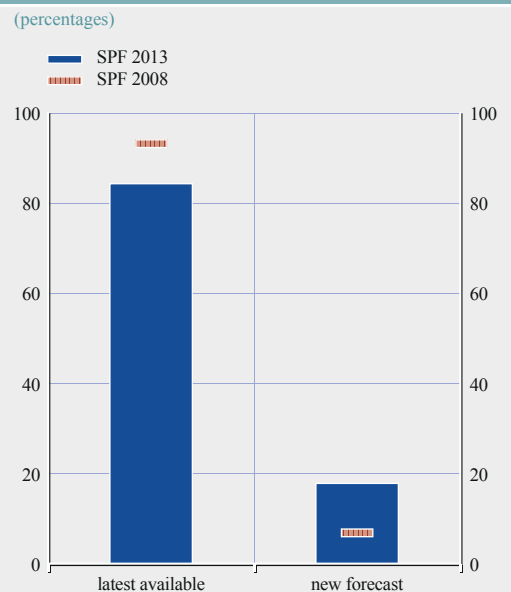
Source: ECB.
 Notes: Adds up to more than 100% as one respondent selected both “monthly” and “quarterly”. “Other” represents two institutions which report that they update two and three times a year, respectively. The other possible answers “weekly” and “annual” were not used by any of the respondents.

calendar basis and additionally also in case of important data releases. These percentages are broadly the same as those reported in the 2008 special questionnaire (see Chart 1). Some of the respondents who reported multiple update schedules commented that ad hoc or monthly updates might only affect parts of their forecasts, or only the short-term horizon.

Of those respondents who update their forecasts regularly according to a calendar, two-thirds reported that they updated on a quarterly basis, while a smaller share (29%) updates them each month. Compared with the 2008 special questionnaire, while now a lower share of participants report that they update their forecasts each month, the share of participants who report that they update their forecasts quarterly has increased (see Chart 2).

Most respondents indicated that they provide their latest available forecast for each SPF round, with only a small proportion preparing a new forecast specifically for the SPF (see Chart 3).

Chart 3 When responding to the SPF, what forecast do you provide?



Source: ECB.
 Note: Adds up to more than 100% as one respondent selected both categories. The figures for 2008 include in “Latest available” also those respondents who replied “It depends on the timing”.

Compared with 2008, more respondents prepare a new forecast for the SPF. Of the forecasts that are sent in a given SPF round, around half are fully fledged new forecasts, while approximately one-third are mechanical updates of previous forecasts on the basis of the latest data or assumptions (see Chart 4).

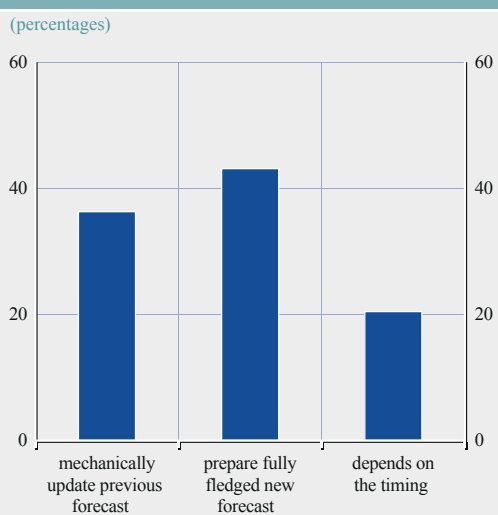
2 FREQUENCY OF THE DATA BEING FORECAST

For the short and, to some extent, medium-term forecast horizons, most respondents tend to forecast the variables at the highest frequency at which these are published. Hence, HICP inflation is typically forecast at a monthly frequency, while real GDP growth is forecast at a quarterly frequency. The responses regarding unemployment rate forecasts were less homogeneous, with some respondents forecasting short and medium-term horizons at a monthly frequency and others forecasting at a quarterly frequency. For all three variables, around 80% of the respondents replied that their longer-term forecasts are annual. In general, one can observe that for longer forecast horizons respondents are more likely to forecast the variables at a lower frequency (see Chart 5).

3 FORECASTING TECHNIQUES AND MODELS

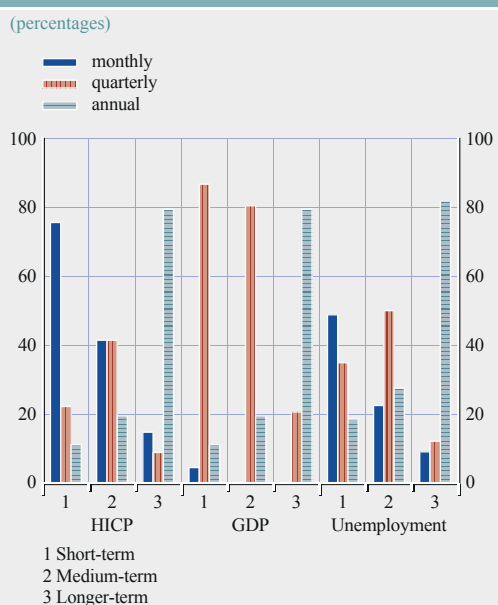
The responses indicate that the type of model preferred to generate forecasts varies according to the forecast horizon and to the variable being forecast (see Chart 6). Reduced form models, such as single equation, vector autoregressive (VAR) or vector error correction (VEC) models, seem to be commonly used for all horizons and variables, although somewhat more prominently to forecast inflation rather than real GDP or unemployment. Structural models, such as supply and demand-based macro models or dynamic stochastic general equilibrium (DSGE) models, are generally used somewhat less

Chart 4 When preparing your forecasts, what do you do?



Source: ECB.
Note: Adds up to more than 100% as one respondent selected “mechanically update previous forecast” and “prepare fully fledged new forecast”.

Chart 5 What is the frequency of the variables of interest in your forecast?



Source: ECB.
Note: Adds up to more than 100% as some respondents selected multiple frequencies.

than reduced form models but their relative use increases strongly for the longer forecast horizons.

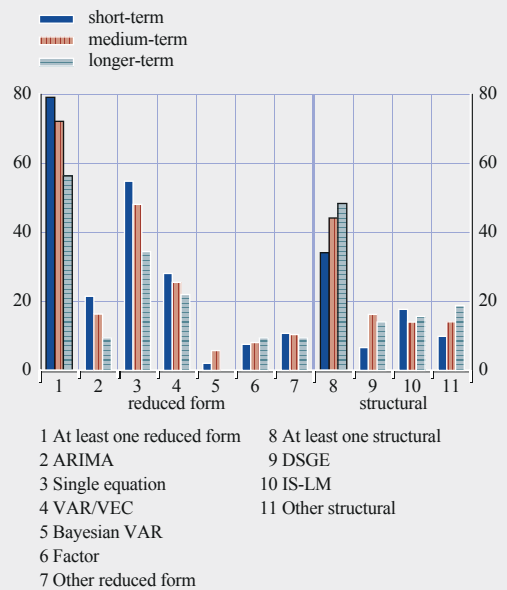
Most respondents reported that they use at least one type of reduced form model, with a substantial share of respondents reporting that they use two or more types of these models for a given variable and horizon. For all variables and horizons except longer-term GDP growth, more respondents indicate that they use reduced form models rather than structural models, which is an increase compared with the 2008 questionnaire where for the medium-term forecast horizon (except for inflation) and beyond, traditional macro models were more commonly used than time series models. With regard to structural models, the responses suggest an increased use of DSGE models in comparison with the 2008 questionnaire, putting them now on a more or less equal footing with more traditional supply and demand-based macro models.

More generally, the use of different models for the same horizons and variables is motivated by the aim to cross-check results or by the practice to forecast components of the core variables with different models and later combine them in a bottom-up approach. Moreover, the comparative advantage of using different models at different forecast horizons also plays a role.

Most respondents consider their forecasts to be, at least in part, judgement-based – in the sense that there is a mix of model-based outcomes and judgemental adjustments – with one-third of respondents reporting that their forecasts are essentially, i.e. to a very high degree, judgement-based. Across horizons, a slightly higher share of respondents report essentially judgement-based forecasts for the unemployment rate than for HICP inflation and real GDP growth (see Chart 7). When looking at the combined shares of essentially judgemental forecasts and model-based forecasts including judgement, they are roughly the same for all three variables. Looking at the impact of judgement on forecasts for different forecast horizons,

Chart 6 Types of models used for forecasting

(average over all variables; percentages)

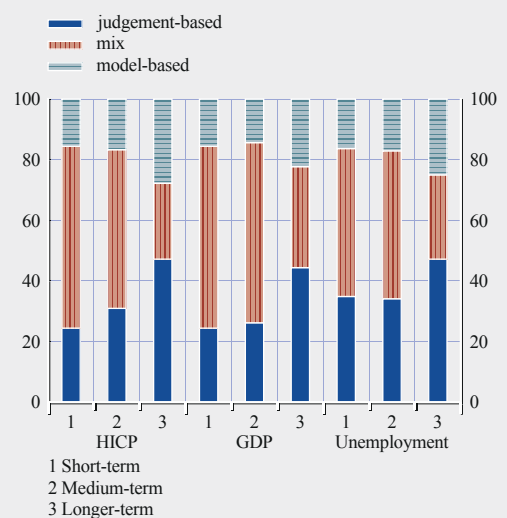


Source: ECB.

Notes: The columns for “at least one reduced form/structural” include all respondents who use at least one type of model of the respective model class. In case of multiple model use, especially common with reduced form models, this will be less than the sum of the shares of respondents using individual model types.

Chart 7 Importance of judgement applied to forecasts

(percentages)



Source: ECB.

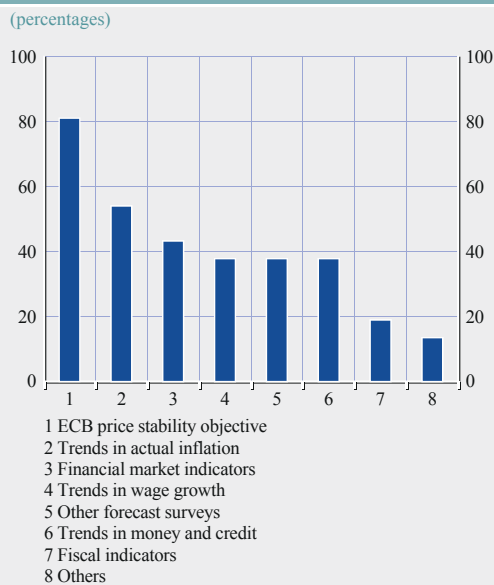
Note: “Mix” refers to respondents who reported that their forecasts are model-based but with judgemental adjustments.

the share of respondents sending essentially judgement-based forecasts is higher for longer-term horizons than for short and medium-term horizons. These results correspond to those in the 2008 special questionnaire when respondents assigned higher weights to judgement as a basis for their longer-term forecasts than for the short to medium-term forecasts.

For longer-term horizons, respondents tend to rely more on model-based forecasts than is the case for short and medium-term horizons.

When forming their longer-term (five years ahead) inflation expectations, most respondents make use of a wide range of information: the ECB's inflation objective is mentioned most often (81%), followed by trends in actual inflation (54%), longer-term inflation expectations from financial markets (43%) and trends in wages and monetary aggregates and other survey-based forecasts (all 38%; see Chart 8).

Chart 8 Information used to form longer-term inflation expectations



Source: ECB.
Note: Adds up to more than 100% as respondents selected multiple sources of information.

Regarding longer-term forecasts provided for real GDP growth and the unemployment rate, most respondents indicated that these can be interpreted as their estimates for long-term potential growth (68%) and the non-accelerating inflation rate of unemployment (NAIRU) (53%).

Respondents were also asked whether changes in the forecasts of different variables are dependent on one another. For a majority of respondents, at least at the short (56%) and medium-term (70%) horizons, changes in GDP growth and inflation forecasts are dependent on one another in a kind of Phillips Curve relationship. Across all time horizons, a majority of respondents also replied that changes in forecasts for real GDP growth and the unemployment rate follow some kind of Okun's Law relationship.

Almost all respondents stated that they changed their models following the financial crisis in 2008 and the majority indicated that, since then, the importance of judgement in forming their expectations had increased. Some of the changes relate to the treatment of model parameters, with some respondents placing more emphasis on the post-crisis parameters (50%) and others freezing parameters at values derived for the pre-crisis period (22%). Around one-third of respondents introduced more real financial linkages into their models. Most forecasters (72%) reported that they use linear models, while others explicitly allow for non-linearities such as those captured in structural breaks, the zero lower bound for nominal interest rates or time-varying parameters.

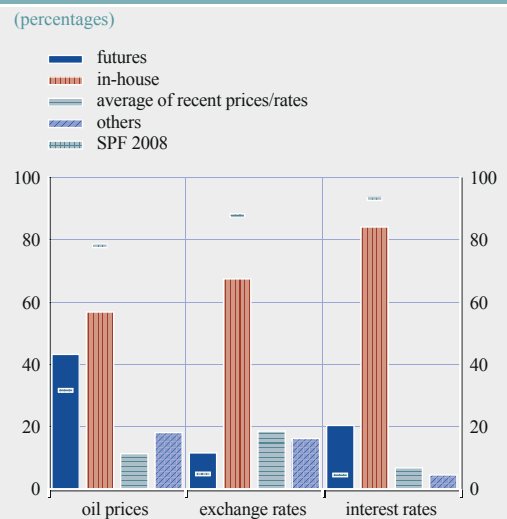
The euro area forecasts are mostly formed on the basis of data and models for the euro area as a whole, but also on the basis of aggregating from bottom up the forecasts for individual countries (mostly the largest euro area economies). The use of both practices is mentioned by some respondents to be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

Around three-quarters of the respondents conduct dedicated evaluations of the accuracy of their models, most of these on an annual or quarterly basis and in a formal way, which means on the basis of forecast error statistics.

4 OTHER VARIABLES AND CONDITIONING ASSUMPTIONS

With regard to other variables and conditioning assumptions, most respondents produce in-house forecasts for oil prices, exchange rates, interest rates and wage growth (see Chart 9). In-house forecasts of oil prices are often complemented by market data, for example futures prices or averages of recent spot prices. A few respondents reported that they use external forecasts to complement and cross-check their in-house forecasts for oil prices. In terms of other sources, a small number of respondents use automatic rules (e.g. a random walk or a constant rate of change in oil prices). In comparison with the 2008 questionnaire, while not entirely comparable due to a changed design of the questions, in-house forecasts are still the main input for key assumptions, but their use has decreased slightly while at the same time the reported use of market data has increased. Overall, the strong role of in-house forecasts or time-dependent futures prices suggests that SPF responses can reflect a relatively diverse set of views and assumptions.

Chart 9 How are key assumptions formed?



Source: ECB.
Notes: Adds up to more than 100% as some respondents selected multiple categories. The markers refer to the results from the 2008 special questionnaire. The other two categories of the 2008 questionnaire “consensus/average forecasts” and “other” are not directly comparable and thus left out.

5 PROBABILITY DISTRIBUTIONS AND CORRESPONDING POINT ESTIMATES

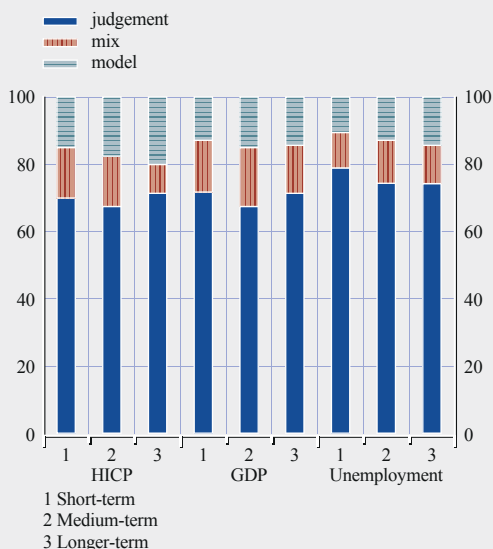
SPF participants were also asked how they generate their reported probability distributions for HICP inflation, real GDP growth and the unemployment rate. A large majority of respondents indicated that these probability distributions are derived on the basis of judgement, while the remaining respondents generate them from models or from models with judgemental adjustments. Among the three variables, the probability distributions for the unemployment rate are marginally more likely to be essentially judgement-based than those for HICP inflation and real GDP growth (see Chart 10).

For those SPF participants that report probability distributions, the point forecasts mostly refer to the mean of the distribution (61%), but in some cases also to the median or the mode (22% and 19% respectively).³ The mode and, to a smaller extent, the median of the probability distributions are

³ The mean is the weighted average of all possible outcomes, where the weights are the respondents’ assessment of the probability associated with each outcome. The mode is the forecast that is most likely to occur, but does not necessarily reflect the balance of risks surrounding the most likely outcome. The median is the outcome with 50% probability above and 50% probability below, and does not take into account the outliers above or below the median.

Chart 10 Are your reported probability distributions model or judgement-based?

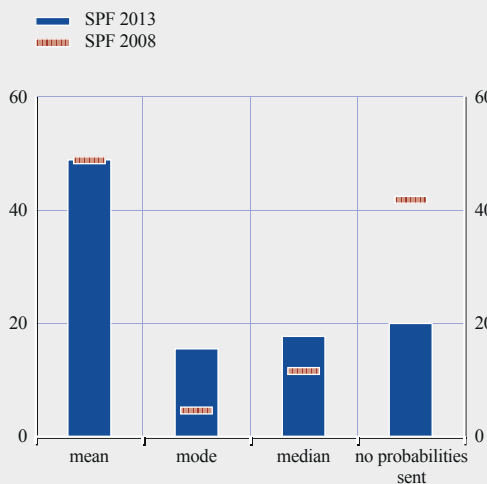
(percentages)



Source: ECB.
Note: "Mix" refers to respondents who reported that their forecasts are model-based but with judgemental adjustments.

Chart 11 To which statistic of your reported probability distribution in the SPF does your reported point forecast refer?

(percentages)



Source: ECB.
Note: Adds up to more than 100% as some respondents selected multiple categories.

now being reported more often than in 2008. The important role of distributions is highlighted by the result that, compared with 2008, the share of respondents not providing probability distributions at all has significantly decreased (by half; see Chart 11).

6 USE OF THE FORECASTS

A large majority of respondents (86%) stated that they publish externally, at least partly, the forecasts they send to the ECB when replying to the SPF, which is a higher percentage than in 2008.

Participants were also asked to what extent they make use of the results of the SPF for their own purposes. Most respondents use them as an input to internal or external reports or as an input for their own forecasts in the next SPF round. This is however mostly the case for the results for the point estimates, while only a few respondents indicated that they make use of the probability distributions provided in the SPF.

ANNEX I

SPECIAL QUESTIONNAIRE FOR PARTICIPANTS IN THE ECB SURVEY OF PROFESSIONAL FORECASTERS¹

A) QUESTIONS ON FORECASTING PROCESSES

1a. **When do you update your forecasts?** (For example, following a regular calendar schedule, new data releases for the variables of interest, or in the light of significant shocks, such as to commodity prices or exchange rates.) If the frequency of updates varies with the length of the forecast horizon, please explain below.

Regular calendar schedule:

- Quarterly
- Monthly
- Weekly
- Whenever new data on variables of interest are released
- Other

Additional comments: _____

1b. **When responding to the SPF, do you typically ...**

- ... provide your latest available forecast?
- ... prepare a new forecast specifically for SPF purposes?

1c. **When preparing your forecasts, do you ...**

- ... mechanically update your previous forecasts with new actual data and assumptions?
- ... prepare a fully fledged new forecast?
- Neither of the above. It depends on the timing (e.g. fully fledged on a quarterly basis, mechanical on a monthly basis; please explain below).

Additional comments: _____

2. **What is the frequency of the variables of interest (HICP inflation, GDP growth, unemployment rate) in your model/forecast?**

2a. **Short-term forecasts (one year or less)**

	HICP	GDP	Unemployment
Annual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Quarterly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Monthly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

¹ The questionnaire was sent out on 16 July 2013 and the SPF participants were asked to return the form by 13 September. The questionnaire also contained a few internal and procedural questions, which aimed to elicit feedback about the SPF itself. These are excluded from this sample form.

2b. **Medium-term forecasts (from one to three years)**

	HICP	GDP	Unemployment
Annual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Quarterly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Monthly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2c. **Longer-term forecasts (five years ahead)**

	HICP	GDP	Unemployment
Annual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Quarterly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Monthly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Additional comments: _____

3. **To what extent are your point forecasts model or judgement-based?** (By “model” we mean a mathematical representation of relationships between economic variables; by “judgement” we mean experience and intuition. We recognise that this distinction may depend on the timing and vary over time, so please provide the most representative answer and possibly additional comments.)

3a. **Short-term (one year or less)**

	HICP	GDP	Unemployment
Essentially judgement-based	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Model-based with judgemental adjustments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Essentially model-based	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3b. **Medium-term (from one to three years)**

	HICP	GDP	Unemployment
Essentially judgement-based	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Model-based with judgemental adjustments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Essentially model-based	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3c. **Longer-term (five years ahead)**

	HICP	GDP	Unemployment
Essentially judgement-based	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Model-based with judgemental adjustments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Essentially model-based	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Additional comments: _____

4a. **If you use models for forecasting, what type do you use?** (If you use different types, please indicate the main one in the space to the right of the box.)

Short-term (one year or less)

	HICP	GDP	Unemployment
Reduced form models:			
ARIMA	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Single equation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
VAR/VEC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bayesian VAR	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Factor models	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Others ()	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Structural models:			
DSGE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IS-LM, AS-AD	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Others ()	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Medium-term (from one to three years)

	HICP	GDP	Unemployment
Reduced form models:			
ARIMA	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Single equation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
VAR/VEC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bayesian VAR	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Factor models	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Others ()	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Structural models:			
DSGE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IS-LM, AS-AD	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Others ()	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Longer-term (five years ahead)

	HICP	GDP	Unemployment
Reduced form models:			
ARIMA	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Single equation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
VAR/VEC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bayesian VAR	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Factor models	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Others ()	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Structural models:

DSGE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IS-LM, AS-AD	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Others ()	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4b. If you use different models, what is your reason for doing so?

We apply a bottom-up approach and use different models for different components

To cross-check results

Because of the comparative advantages of different models at different forecast horizons

4c. If you use different models to cross-check results, how do you choose the final result?

We apply averaging across model results

We decide between model outcomes on the basis of plausibility

Additional comments: _____

5. If you use models for forecasting, which of the following statements is true for them?

They are linear

They allow for non-linearities, e.g. structural breaks, the zero lower bound on nominal interest rates, time-varying parameters

(Please specify below the type of non-linearity and for which variable it applies, e.g. inflation, GDP, unemployment.)

6. If you use models for forecasting, did the 2008 crisis have an impact on their use?

Yes No

If yes, what has changed?

We complement with a higher degree of judgement	Yes <input type="checkbox"/>	No <input type="checkbox"/>
We froze model parameters derived from the pre-crisis period	Yes <input type="checkbox"/>	No <input type="checkbox"/>
We place more emphasis on the post-crisis model parameters	Yes <input type="checkbox"/>	No <input type="checkbox"/>
We introduced more real financial linkages	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Other changes (please specify below)	Yes <input type="checkbox"/>	No <input type="checkbox"/>



7. **How do you form the key assumptions?**

Oil prices:

- Futures prices
- In-house forecast
- Average of recent prices (length of the sample used for the average: _____)
- Other (please explain) (_____)

If your oil price assumptions are based on futures prices, which crude oil quotation do you use?

- Brent
- WTI (West Texas Intermediate)
- Other (please specify) _____

Exchange rates:

- Futures prices
- In-house forecast
- Average of recent prices (length of the sample used for the average: _____)
- Other (please explain) (_____)

Interest rates:

- Futures prices
- In-house forecast
- Average of recent prices (length of the sample used for the average: _____)
- Other (please explain) (_____)

Wage growth rates:

- In-house forecast
- Average of recent rates (length of the sample used for the average: _____)
- Other (please explain) (_____)

If you use in-house forecasts for these variables, please provide details on how they are computed: _____

8. **Does your reported point forecast refer to the mean, mode or median of your reported probability distribution in the SPF?**

- Mean
- Mode
- Median
- None of the above (please explain below)
- We do not calculate/report probability distributions

Additional comments: _____

9. **Are your reported probability distributions model or judgement-based?** *(By “model” we mean a mathematical representation of relationships between economic variables; by “judgement” we mean experience and intuition. We recognise that this distinction may depend on the timing and vary over time, so please provide the most representative answer.)*

9a. **Short-term (one year or less)**

	HICP	GDP	Unemployment
Essentially judgement-based	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Model-based with judgemental adjustments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Essentially model-based	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

9b. **Medium-term (from one to three years)**

	HICP	GDP	Unemployment
Essentially judgement-based	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Model-based with judgemental adjustments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Essentially model-based	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

9c. **Longer-term (five years ahead)**

	HICP	GDP	Unemployment
Essentially judgement-based	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Model-based with judgemental adjustments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Essentially model-based	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

10. **Do you compute the probability distributions only for the SPF or does your institution normally use them for other purposes (e.g. for internal/external reports)?** *(If this varies systematically across forecast variables and horizons, please provide details.)*

- Only for the SPF
- Also for other purposes (please specify below)
- _____

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

- | | |
|--|--------------------------|
| Long-term inflation expectations from other surveys
(e.g. Consensus Economics, Euro Zone Barometer) | <input type="checkbox"/> |
| Long-term inflation expectations from financial markets
(e.g. break-even inflation rates, inflation-linked swaps) | <input type="checkbox"/> |
| Trends in actual inflation | <input type="checkbox"/> |
| Trends in monetary aggregates | <input type="checkbox"/> |
| Trends in wages | <input type="checkbox"/> |
| Fiscal variables (e.g. debt-to-GDP ratios) | <input type="checkbox"/> |
| The ECB's inflation objective | <input type="checkbox"/> |
| Other variables (please specify below) | <input type="checkbox"/> |
-

12. **Relationships between forecasts of different variables**

12a. **Are changes in your *inflation* and GDP growth forecasts dependent on one another (e.g. according to a Phillips Curve relationship)?**

- Our inflation and GDP growth forecasts tend to change according to a given relationship ...
- | | | |
|--|------------------------------|-----------------------------|
| ... in the short term (up to one year) | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| ... in the medium term (from one to three years) | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| ... in the longer term (five years ahead) | Yes <input type="checkbox"/> | No <input type="checkbox"/> |

12b. **Are changes in your *unemployment* and GDP growth forecasts dependent on one another (e.g. according to an Okun's Law relationship)?**

- Our unemployment and GDP growth forecasts tend to change according to a given relationship ...
- | | | |
|--|------------------------------|-----------------------------|
| ... in the short term (up to one year) | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| ... in the medium term (from one to three years) | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| ... in the longer term (five years ahead) | Yes <input type="checkbox"/> | No <input type="checkbox"/> |

Please comment on the type of relationships you apply: _____

13. **How do you compute your forecasts for the euro area?** *(If this varies systematically across forecast variables and horizons, please provide details.)*

Directly for the euro area as a whole

By aggregating country/regional forecasts

Additional comments: _____

14. **Do you publish externally the forecasts that you send to the ECB?**

Yes, all of the forecasts

Yes, but only some of them (please provide details)

No, none of the forecasts

15. **Do you conduct dedicated evaluations of the accuracy of your forecasts?** *(If this varies systematically across forecast variables and horizons, please provide details.)*

Yes No

15a. **If yes, at which frequency?**

Yearly

Quarterly

Other (please specify: _____)

15b. **If yes, how do you conduct the evaluation?** *(Please provide details below.)*

Formally (e.g. computing forecast error statistics)

More informally

B) QUESTIONS ON THE SPF QUESTIONNAIRE AND PROCEDURES

16. Do you use the aggregate results of the ECB SPF for your own purposes?

16a. Do you use the aggregate point forecasts? *(If this varies systematically across forecast variables and horizons, please provide details. Tick more than one box if appropriate.)*

No

Yes, previous results provide input to my own SPF forecasts

Yes, I use them for other purposes such as internal or external reports

Additional comments: _____

16b. Do you use the aggregate probability distributions? *(If this varies systematically across forecast variables and horizons, please provide details. Tick more than one box if appropriate.)*

No

Yes, previous results provide input to my own SPF forecasts

Yes, I use them for other purposes such as internal or external reports

Additional comments: _____

17. Would you be able to provide forecasts for the following HICP exclusion measures?

HICP excluding food and energy Yes No

HICP excluding energy Yes No

Other exclusion measures (please specify below) Yes No

18. Interpretation of longer-term forecasts

18a. Can your longer-term forecast (five years ahead) of real GDP growth be interpreted as your estimate of potential output growth?

No Yes

18b. Can your longer-term forecast (five years ahead) of the unemployment rate be interpreted as your estimate of the non-accelerating inflation rate of unemployment (NAIRU) or an otherwise defined structural unemployment rate?

No Yes

Additional comments: _____

ANNEX 2

SUMMARY OF THE ANSWERS AND RESPONSE RATES

Q1a When do you update your forecasts?

For example, following a regular calendar schedule, new data releases for the variables of interest, or in the light of significant shocks, such as to commodity prices or exchange rates.

Annual	0	0%
Quarterly	26	58%
Monthly	11	24%
Weekly	0	0%
Calendar driven	14	31%
Whenever new data on variables of interest are released	2	4%
Responses	45	

Note: Seven respondents replied that they follow a regular schedule, but would also update their forecasts ad hoc in case of data releases that make them change their expectations. From the qualitative comments of these respondents, as well as the respondent who indicated quarterly as well as monthly updates, one can see that updates at higher frequency or ad hoc are often only done for part of the forecasts. The two respondents reporting “other calendar-driven schedule” forecast twice and three times a year, respectively.

Q1b When responding to the SPF, do you typically ...

... provide your latest available forecast?	38	84%
... prepare a new forecast specifically for SPF purposes?	8	18%
Responses	45	

Note: One respondent checked both possible answers and commented that he would not produce a new forecast if the variables of interest were still within the probability space of the last forecast.

Q1c When preparing your forecasts, do you ...

... mechanically update your previous forecasts with new actual data and assumptions?	16	36%
... prepare a fully fledged new forecast?	19	43%
Neither of the above. It depends on the timing (e.g. fully fledged on a quarterly basis, mechanical on a monthly basis).	9	20%
Responses	44	

Note: One respondent who indicated that he provides mechanical updates for the SPF commented that, depending on how different data releases are from his forecasts, he might also consider preparing a fully fledged new forecast.

Q2 What is the frequency of the variables of interest (HICP inflation, GDP growth, unemployment rate) in your model/forecast?

Q2a Short-term forecasts (one year or less)

	HICP	GDP	Unemployment
Annual	11%	11%	19%
Quarterly	22%	87%	35%
Monthly	76%	4%	49%
Responses	45	45	43

Q2b Medium-term forecasts (from one to three years)

	HICP	GDP	Unemployment
Annual	20%	20%	28%
Quarterly	41%	80%	50%
Monthly	41%	0%	23%
Responses	41	41	40

Q2c Longer-term forecasts (five years ahead)

	HICP	GDP	Unemployment
Annual	79%	79%	82%
Quarterly	9%	21%	12%
Monthly	15%	0%	9%
Responses	35	35	33

Note: A number of respondents indicated more than one frequency.

Q3 To what extent are your point forecasts model or judgement-based?

Q3a Short-term forecasts (one year or less)

	HICP	GDP	Unemployment
Essentially judgement-based	24%	24%	35%
Model-based with judgemental adjustments	60%	60%	49%
Essentially model-based	16%	16%	16%
Responses	45	45	45

Q3b Medium-term forecasts (from one to three years)

	HICP	GDP	Unemployment
Essentially judgement-based	31%	26%	34%
Model-based with judgemental adjustments	52%	60%	49%
Essentially model-based	17%	14%	17%
Responses	42	42	41

Q3c Longer-term forecasts (five years ahead)

	HICP	GDP	Unemployment
Essentially judgement-based	47%	44%	47%
Model-based with judgemental adjustments	25%	33%	28%
Essentially model-based	28%	22%	25%
Responses	36	36	36

Q4a If you use models for forecasting, what type do you use?**Short-term forecasts (one year or less)**

	HICP	GDP	Unemployment
ARIMA	38%	12%	15%
Single equation	47%	55%	63%
VAR/VEC	25%	33%	26%
Bayesian VAR	3%	3%	0%
Factor	3%	12%	7%
Other reduced form	16%	9%	7%
DSGE	6%	6%	7%
IS-LM, AS-AD	13%	18%	22%
Other structural	9%	9%	11%
Responses	32	33	27

Medium-term forecasts (from one to three years)

	HICP	GDP	Unemployment
ARIMA	28%	10%	12%
Single equation	41%	45%	58%
VAR/VEC	28%	26%	23%
Bayesian VAR	7%	6%	4%
Factor	7%	10%	8%
Other reduced form	14%	10%	8%
DSGE	14%	19%	15%
IS-LM, AS-AD	10%	16%	15%
Other structural	14%	13%	15%
Responses	29	31	26

Longer-term forecasts (five years ahead)

	HICP	GDP	Unemployment
ARIMA	10%	9%	10%
Single equation	33%	32%	38%
VAR/VEC	29%	18%	19%
Bayesian VAR	0%	0%	0%
Factor	10%	9%	10%
Other reduced form	10%	9%	10%
DSGE	10%	18%	14%
IS-LM, AS-AD	14%	18%	14%
Other structural	19%	18%	19%
<hr/>			
Responses	21	22	21

Note: Percentages do not add up to 100% as most respondents reported that they use more than one model per variable and horizon.

Q4b If you use different models, what is your reason for doing so?

We apply a bottom-up approach and use different models for different components	13	65%
To cross-check results	13	65%
Because of the comparative advantages of different models at different forecast horizons	13	65%
<hr/>		
Responses	20	

Note: Percentages do not add up to 100% as most respondents reported that they agree with multiple (or all) of the provided explanations.

Q4c If you use different models to cross-check results, how do you choose the final result?

We apply averaging across model results	5	29%
We decide between model outcomes on the basis of plausibility	15	88%
<hr/>		
Responses	17	

Note: Three respondents indicated that they use both methods.

Q5 If you use models for forecasting, which of the following statements is true for them?

They are linear	26	72%
They allow for non-linearities, e.g. structural breaks, the zero lower bound on nominal interest rates, time-varying parameters	11	31%
Responses	36	

Note: One respondent indicated that he normally uses non-linear models, but sometimes cross-checks these results with linear models.

The use of the zero lower bound on nominal interest rates is mentioned three times. Two respondents who reported that they use linear models allow for changes in constants.

Q6 If you use models for forecasting, did the 2008 crisis have an impact on their use?

Yes	34	94%
No	2	6%
Responses	36	

If yes, what was changed?

We complement with a higher degree of judgement	23	70%
We froze model parameters derived from the pre-crisis period	7	21%
We place more emphasis on the post-crisis model parameters	16	48%
We introduced more real financial linkages	11	33%
Other changes	7	21%
Responses	33	

Note: Percentages do not add up to 100% as most respondents reported that they had made various changes to their models.

Q7 How do you form the key assumptions?

Oil prices

Futures prices	19	43%
In-house forecast	25	57%
Average of recent prices	5	11%
Other	8	18%
<hr/>		
Responses	44	

Length of sample used for the average of recent prices: 2.8 years; 4 responses

Note: Percentages do not add up to 100% as some respondents reported that they had use multiple sources of information.

Out of the eight respondents who checked “other”, six use institutional or survey-based forecasts.

If your oil price assumptions are based on futures prices, which crude oil quotation do you use?

Brent	19	90%
West Texas Intermediate (WTI)	6	29%
Other	0	0%
<hr/>		
Responses	21	

Note: Percentages do not add up to 100% as five respondents reported that they had use both the Brent and the WTI quotations.

Exchange rates

Futures prices	5	12%
In-house forecast	29	66%
Average of recent rates	8	18%
Other	7	16%
<hr/>		
Responses	43	

Length of sample used for the average of recent rates: 1.8 years; 6 responses

Note: Percentages do not add up to 100% as some respondents reported that they use multiple sources of information.

Out of the seven respondents who checked “other”, three use institutional or survey-based forecasts. Two assume exchange rates to remain constant.

Interest rates

Futures prices	9	20%
In-house forecast	37	84%
Average of recent rates	3	7%
Other	2	5%
<hr/>		
Responses	44	

Length of sample used for the average of recent rates: 5.1 years; 2 responses

Note: Percentages do not add up to 100% as some respondents reported that they had used multiple sources of information.

Out of the two respondents who checked “other”, one uses European Commission forecasts and the other follows central bank guidance.

Wage growth

In-house forecast	35	90%
Average of recent rates	4	10%
Other	5	13%
<hr/>		
Responses	39	

Note: Percentages do not add up to 100% as some respondents reported that they had used multiple sources of information.

Out of the five respondents who checked “other”, two use institutional forecasts and two use automatic rules.

Q8 Does your reported point forecast refer to the mean, mode or median of your reported probability distribution in the SPF?

Mean	22	49%
Mode	7	16%
Median	8	18%
None of the above	0	0%
We do not calculate/report probability distributions	9	20%
<hr/>		
Responses	45	

Note: Percentages do not add up to 100% as one respondent checked both “Mean” and “Median”. In the comments he explained that the pure model results refer to the mean, but that after adjustments the estimates might move more towards the median.

Q9 Are your reported probability distributions model or judgement-based?

Q9a Short-term forecasts (one year or less)

	HICP	GDP	Unemployment
Essentially judgement-based	70%	72%	79%
Model-based with judgemental adjustments	15%	15%	11%
Essentially model-based	15%	13%	11%
	40	39	38

Q9b Medium-term forecasts (from one to three years)

	HICP	GDP	Unemployment
Essentially judgement-based	68%	68%	74%
Model-based with judgemental adjustments	15%	18%	13%
Essentially model-based	18%	15%	13%
Responses	40	40	39

Q9c Longer-term forecasts (five years ahead)

	HICP	GDP	Unemployment
Essentially judgement-based	71%	71%	74%
Model-based with judgemental adjustments	9%	14%	11%
Essentially model-based	20%	14%	14%
Responses	35	35	35

Q10 Do you compute the probability distributions only for the SPF or does your institution normally use them for other purposes (e.g. for internal/external reports)?

Only for the SPF	30	79%
Also for other purposes	8	21%
Responses	38	

Q11 Which of the following information do you typically use to form your longer-term (five years ahead) inflation expectations?

Long-term inflation expectations from other surveys (e.g. Consensus Economics, Euro Zone Barometer)	14	38%
Long-term inflation expectations from financial markets (e.g. break-even inflation rates, inflation-linked swaps)	16	43%
Trends in actual inflation	20	54%
Trends in monetary aggregates	14	38%
Trends in wages	14	38%
Fiscal variables (e.g. debt-to-GDP ratios)	7	19%
The ECB's inflation objective	30	81%
Other variables	5	14%
Responses	37	

Note: Percentages do not add up to 100% as most respondents reported that they use multiple sources of information.

Q12 Relationships between forecasts of different variables

Q12a Are changes in your *inflation* and GDP growth forecasts dependent on one another (e.g. according to a Phillips Curve relationship)?

in the short-term (up to one year)

Yes	24	56%
No	19	44%
Responses	43	

in the medium-term (from one to three years)

Yes	28	70%
No	12	30%
Responses	40	

in the longer-term (five years ahead)

Yes	17	46%
No	20	54%
Responses	37	

Q12b Are changes in your unemployment and GDP growth forecasts dependent on one another (e.g. according to an Okun's Law relationship)?

in the short-term (up to one year)

Yes	31	74%
No	11	26%
Responses	42	

in the medium-term (from one to three years)

Yes	33	83%
No	7	18%
Responses	40	

in the longer-term (five years ahead)

Yes	23	62%
No	14	38%
Responses	37	

Q13 How do you compute your forecasts for the euro area?

Directly for the euro area as a whole	33	73%
By aggregating country/regional forecasts	24	53%
Responses	37	

Note: The majority of respondents who use country bottom-up approaches mainly do this for the variables GDP growth and inflation and then only use the four largest euro area countries. Most of the twelve respondents who use both approaches take one as a cross-check of the other.

Q14 Do you publish externally the forecasts that you send to the ECB?

Yes, all of the forecasts	20	45%
Yes, but only some of them	18	41%
No, none of the forecasts	6	14%
Responses	44	

Note: Two respondents who reported that they publish all of their forecasts commented that these would only be accessible to their clients.

Q15 Do you conduct dedicated evaluations of the accuracy of your forecasts?

Yes	32	74%
No	11	26%
<hr/>		
Responses	43	

Q15a If yes, at what frequency?

Yearly	14	44%
Quarterly	11	34%
Other	8	25%
<hr/>		
Responses	32	

Note: Percentages do not add up to 100% as one respondent checked both “Yearly” and “Quarterly”.

Q15b If yes, how do you conduct the evaluation?

Formally (e.g. computing forecast error statistics)	20	65%
Informally	11	35%
<hr/>		
Responses	31	

Q16 Do you use the aggregate results of the ECB SPF for your own purposes?**Q16a Do you use the aggregate point forecasts?**

No	19	43%
Yes, previous results provide input to my own SPF forecasts	18	41%
Yes, I use them for other purposes such as internal or external reports	19	43%
<hr/>		
Responses	44	

Note: Percentages do not add up to 100% as two respondents reported that they use the point forecasts both for the SPF and for other purposes.

Q16b Do you use the aggregate probability distributions?

No	32	73%
Yes, previous results provide input to my own SPF forecasts	5	11%
Yes, I use them for other purposes such as internal or external reports	8	18%
<hr/>		
Responses	44	

Note: Percentages do not add up to 100% as one respondent reported that he uses the probability distributions both for the SPF and for other purposes.

Q17 Would you be able to provide forecasts for the following HICP exclusion measures?

HICP excluding food and energy

Yes	27	64%
No	15	36%
Responses	42	

HICP excluding energy

Yes	22	56%
No	17	44%
Responses	39	

Other exclusion measures

Yes	6	23%
No	20	77%
Responses	26	

Note: The two most-mentioned other exclusion measures (twice each) were HICP excluding food, energy, alcohol and tobacco and HICP excluding changes in administered prices and indirect taxes.

Q18 Interpretation of longer-term forecasts

Q18a Can your longer-term forecast (five years ahead) of real GDP growth be interpreted as your estimate of potential output growth?

Yes	25	68%
No	12	32%
Responses	37	

Q18b Can your longer-term forecast (five years ahead) of the unemployment rate be interpreted as your estimate of the non-accelerating inflation rate of unemployment (NAIRU) or an otherwise defined structural unemployment rate?

Yes	19	53%
No	17	47%
Responses	36	

Note: Most of the respondents who replied “No” commented that the forecast horizon of five years ahead is too short for a steady state to be reached.

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