EUROPEAN CENTRAL BANK

EUROSYSTEM

RESULTS OF A SPECIAL QUESTIONNAIRE FOR PARTICIPANTS IN THE ECB SURVEY OF PROFESSIONAL FORECASTERS[1]

This document provides a summary of the aggregate results of a special questionnaire which was sent to the participants in the ECB Survey of Professional Forecasters (SPF) in autumn 2008, in the context of the ten-year anniversary of the SPF's launch in January 1999.[2]

There were 45 replies to the special questionnaire, which is approximately three-quarters of the average number of responses received in the regular survey rounds (around 60). The respondents were a broadly representative cross section of the SPF panel in terms of type of forecaster. The questionnaire contained questions on timeliness and methods of forecasting, in particular relating to the frequency of forecast updates, the models used, the importance of judgement, the generation of reported probability distributions and assumptions regarding other variables implicitly underlying the forecasts (see Annex 1).

It should be noted that on some occasions the percentages reported may add up to more than 100%, as some respondents indicated more than one category. Tables reporting the replies and the response rates for each question are available in Annex 2.

In summary, the results show that the SPF responses are quite timely and that the forecasts are based on heterogeneous assumptions that are predominantly generated in house. In addition, although both structural and time series models are widely used, judgement also plays a key role, in particular for the reported probability distributions. It is thus very important to consider the heterogeneity of the SPF forecasts when analysing and interpreting the results of the SPF.

1 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 (see Chart 1). Around one-third indicated that they update their forecasts following data releases or other events (such as the current financial market turmoil). In addition, a number of respondents commented that sometimes they may also update forecasts in the face of significant shocks. Taking these comments into account, it would seem that a substantial proportion of respondents (also around one-third) update
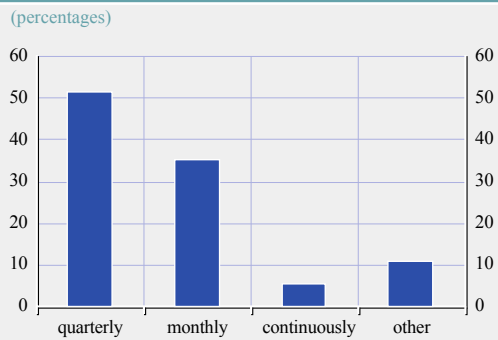
Chart 1 When do you update your forecasts?

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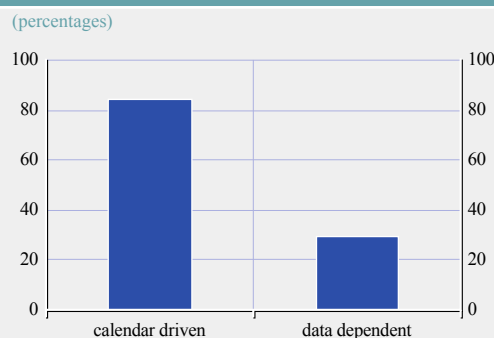
Source: ECB.
Note: Adds up to more than 100% as some respondents selected both categories.

(percentages)

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

their forecasts on a calendar basis and also on an event or data-driven basis, depending on the specific circumstances.

Of those respondents who update their forecasts regularly according to a calendar, over 50% reported that their forecasts are updated on a quarterly basis, with a slightly smaller share (35%) updating them on a monthly basis (see Chart 2). A small proportion (around 10%) reported that they update their forecasts less frequently (e.g. two or three times per year),

while two respondents reported that they update them "continuously".

Most respondents indicated that they provide their latest available forecast in each SPF round, with only a small proportion preparing a new forecast for the SPF (see Chart 3). However, a number of respondents (27%) said that they may partially update their forecasts when responding to the SPF. Overall, given the high frequency of regular updates and respondents' comments to the effect that they also adjust their forecasts or prepare new ones in exceptional circumstances, the replies suggest that the SPF responses are quite timely.

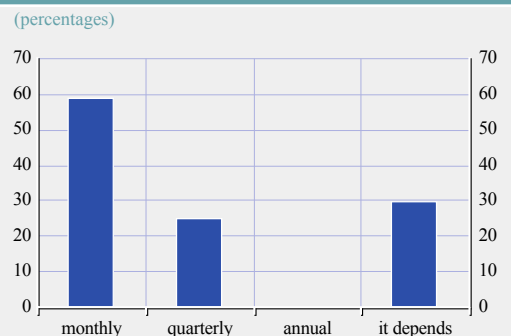## 2 FREQUENCY OF THE DATA BEING FORECAST

Most respondents generally follow the frequency of the data series they forecast. Hence, most panellists forecast HICP inflation at a monthly frequency, with GDP being forecast at a quarterly frequency (see Chart 4). The responses regarding unemployment forecasts were less homogenous, with some respondents forecasting at a monthly frequency and others forecasting at a quarterly frequency. A small number of respondents also reported that their longer-term forecasts are only at an annual frequency.

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

(percentages)
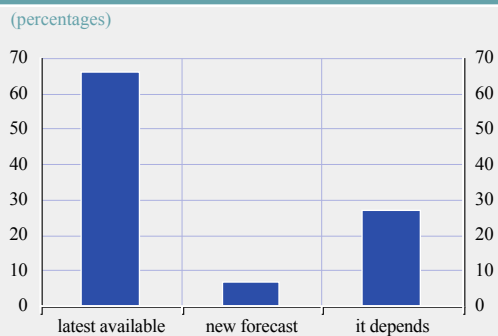
Source: ECB.
Note: Many of those providing qualitative information indicated that they may partially update their forecasts when responding to the SPF, if changes are significant enough to warrant it.

Chart 4 What is the highest frequency of data at which you model and forecast?

(percentages)

Source: ECB.
Note: Many respondents reported that they follow the frequency of the underlying variable being forecast (i.e. monthly for inflation and quarterly for GDP).

3 FORECASTING TECHNIQUES AND MODELS

3.1 RELATIVE WEIGHTS OF JUDGEMENT AND MODELS

SPF participants were asked to what extent their forecasts are based on a model and to what extent they are based on their judgement. The forecasters were encouraged to assign approximate weights (percentages) for the importance of models and of judgement. Regarding the use of models for forecasting, the questionnaire suggested time series models (including auto regressive integrated moving average (ARIMA), single equation, vector auto regression (VAR) or vector error correction (VEC), and factor models), traditional supply and demand-based macro models and dynamic stochastic general equilibrium (DSGE) models.

Some respondents indicated that their forecasts are 100% judgement-based (see Table 1). However, analysis of the qualitative answers suggests that there may be two types of behaviour behind these responses. First, there are forecasters who, for certain variables or forecast horizons, do not use models but report a forecast based on their judgment. Second, there are forecasters who use models, but report the final outcome as 100% judgement-based because their initial model-based forecast can be adjusted in any direction and to any extent.

It is not possible to distinguish between these two groups. Therefore, when considering the relative weights of model-based and judgement-based forecasts, one should keep in mind that the results may be skewed in favour of judgement.

Chart 5 Degree of judgement applied to forecasts

(percentages)

Source: ECB.
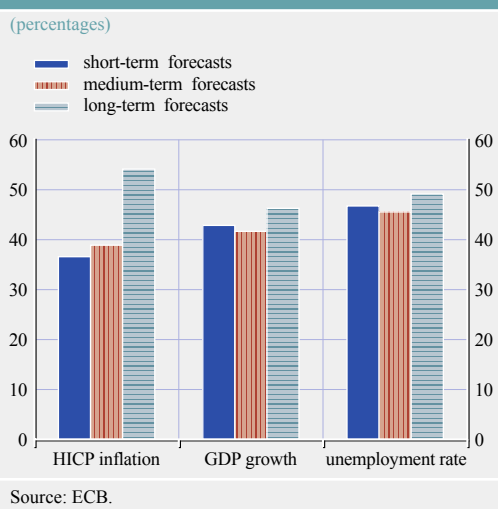
With respect to the overall importance of judgement in the forecasts of the SPF participants, the answers show that, on average, respondents consider their forecasts to be 40% judgement-based (see Chart 5).[3] There are no major differences across variables or horizons, with the exception of inflation. Judgement applied to short-term inflation forecasts (up to one year ahead) is indicated to be around 37%, increasing to 54% for longer-term forecasts (five years ahead). For real GDP forecasts, judgement, on average, has slightly less weight than for unemployment rate forecasts, and for both variables there are no significant differences across forecast horizons, although there is a small increase for the longer horizon.

3 Excluding those who report their forecasts to be 100% judgement-based, the percentage is 33%.

Table 1 Number of respondents reporting 100% judgement-based forecasting

	HICP inflation	GDP growth	Unemployment rate
Short-term forecasts	5	5	8
Medium-term forecasts	6	6	7
Long-term forecasts	10	8	9
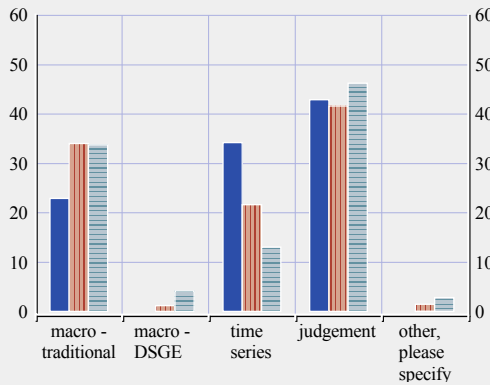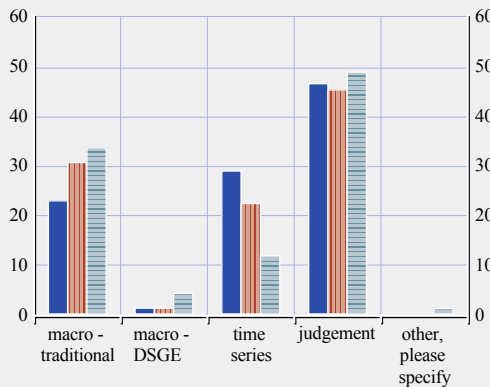
Source: ECB.

Chart 7 What types of model do you use for forecasting?

(percentages)

1 Time series (ARIMA)
2 Time series (single equation)
3 Time series (VAR/VEC)
4 Time series (other, e.g. factor models)
5 Macro (DSGE)
6 Macro (traditional or other)
7 Other, please specify

Source: ECB.

3.2 TYPES OF MODEL USED FOR FORECASTING

The responses indicated that the type of model preferred varies according to the forecast horizon and to the variable being forecast. A pattern emerged where the use of time series models is more common for shorter-term horizons and for inflation forecasts, whereas trad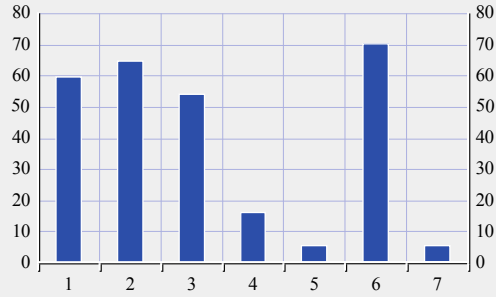itional supply and demand-based macro models are used more for longer-term horizons and slightly more for real GDP and unemployment rate forecasting (see Chart 6).

Considering in more detail the types of model used for forecasting, most respondents (around 85%) reported that they use at least one type of time series model. Three of these are relatively widely used: ARIMA, single equation, and VAR or VEC models (see Chart 7). A smaller proportion uses other time series models, such as factor models. Most respondents who use time series models reported that they use two or more types of such models. Almost 70% of respondents reported that they use traditional supply and demand-based macro models, while very few forecasters indicated that they use DSGE models or some other type of model not specified in the questionnaire.

Chart 8 How are your assumptions for oil prices derived?
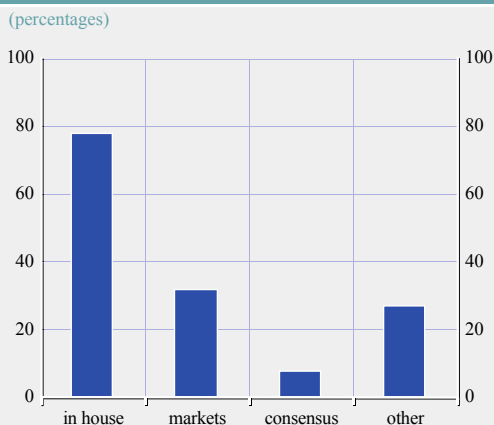
(percentages)

Source: ECB.
Note: Adds up to more than 100%, as some respondents selected more than one category.

Chart 10 How are your assumptions for interest rates derived?
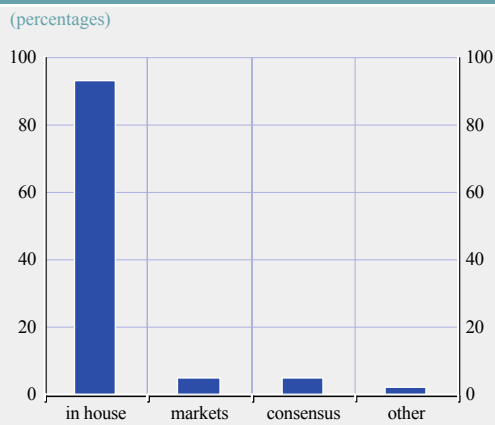
(percentages)

Source: ECB.
Note: Adds up to more than 100%, as some respondents selected more than one category.

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 Charts 8-11). In-house forecasts of oil prices are often complemented by market data, for example

futures or spot rates. A few respondents reported that they use external forecasts to complement and cross-check in-house forecasts. In terms of other sources, a small number of respondents use automatic rules (e.g. a random walk). These replies suggest that, as is always highlighted in the reporting of the SPF results, SPF responses reflect a relatively diverse set of views and assumptions.

Chart 9 How are your assumptions for exchange rates derived?

(percentages)

Source: ECB.
Note: Adds up to more than 100%, as some respondents selected more than one category.

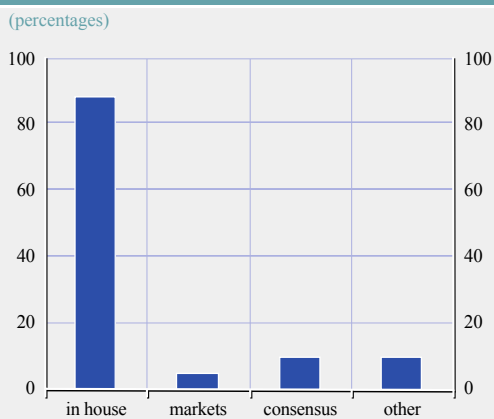**Chart 11 How are your assumptions for wage growth derived?**
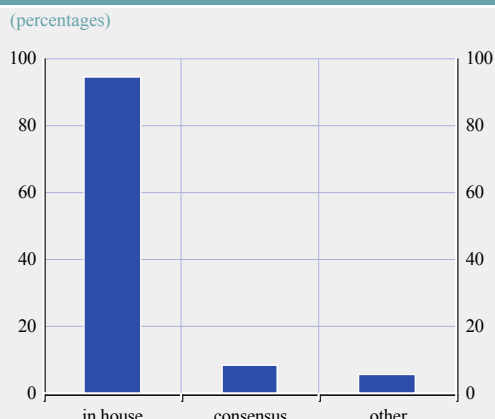
(percentages)

Source: ECB.
Note: Adds up to more than 100%, as some respondents selected more than one category.

5 PROBABILITY DISTRIBUTIONS AND CORRESPONDING POINT ESTIMATES

The respondents were also asked how they generate their reported probability distributions for HICP inflation, GDP growth and the unemployment rate. A large majority of respondents (79%) said that these probability distributions are estimated on the basis of judgement, while 17% generate them from models (see Chart 12). A small number reported that the probability distributions provided in the SPF are based on a functional form (usually the standard normal distribution).

Forecasters were also asked whether they report their mean, modal or median forecast.[4] The replies to this question revealed that a clear majority of respondents (75%) provide the point estimate which corresponds to the mean of their reported probability distribution (see Chart 13). Almost 20% reported that their point forecast corresponds to the median, while a small proportion (7%) indicated that it corresponds to the mode of their reported probability distribution. A few respondents indicated that they may deviate from the measure that they usually report – using the mode or median

instead of the mean, for example – if warranted in the light of the economic environment.

The answers to the question about the interpretation of the intervals for the probability distributions in the SPF have important implications for assessing the balance of risks to the point forecast. It also has implications for fitting a continuous probability distribution to the discrete distributions provided by the respondents and the interpretation of the results. To the question on how the SPF panellists interpret the interval from 1.5% to 1.9%, a majority (76%) indicated that they use a standard rounding convention, i.e. the interval is assumed to be 1.45% to 1.95%, while 17% of the respondents reported that they interpret it to be from 1.50% to 1.99% (or to 2.0% with the end point not included;

4 The mean is the weighted average of all possible outcomes, where the weights are the respondents' assessments of the probability associated with each outcome. The mode is the forecast that is assessed to be 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 12 How do you generate your reported probability distribution? From...

(percentages)
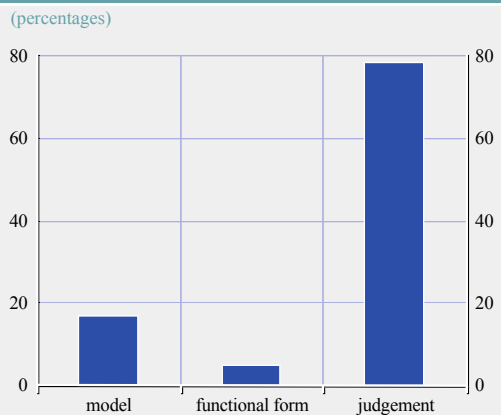
Source: ECB.
Note: Adds up to more than 100%, as one respondent selected more than one category.

Chart 13 Does your reported forecast refer to the mean, mode or median of your reported probability distribution?
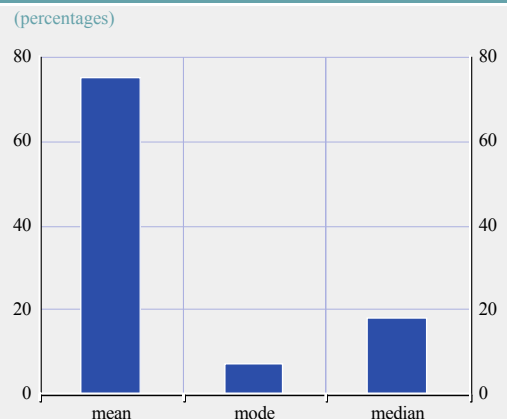
(percentages)

Source: ECB.
Note: Adds up to more than 100%, as some respondents selected more than one category.

Chart 14 How do you interpret the interval of 1.5% - 1.9%?

1.40% - 1.90%
(7%)

1.45% - 1.95%
(17%)

1.50% - 2.00%
(76%)
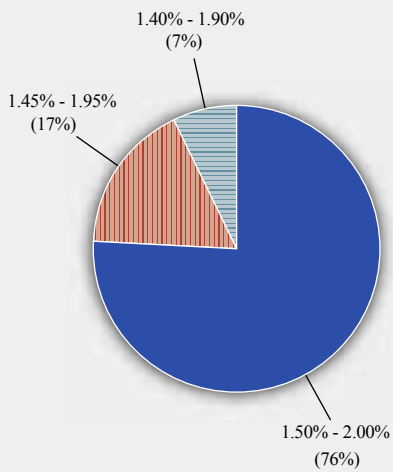
Source: ECB.

see Chart 14). A few respondents indicated that they treat the interval as being from 1.40% to 1.90%.

6 EXTERNAL USE OF THE FORECASTS

Approximately two-thirds of respondents (65%) stated that they publish externally the forecasts they send to the ECB when replying to the SPF.

ANNEX I

SPECIAL QUESTIONNAIRE FOR PARTICIPANTS IN THE ECB SURVEY OF PROFESSIONAL FORECASTERS[1]

A) QUESTIONS ON FORECASTING

1a. **When do you update your forecasts?** Do you always follow a regular calendar schedule or do you sometimes update in the light of *significant shocks (e.g. food / oil price)* or *new data releases*?

Calendar-driven ☐   Data dependent ☐   Other (please explain) ☐

1b. **If it is calendar driven, how often do you update your forecasts?**

Quarterly ☐   Monthly ☐   Continuously ☐   Other (please explain) ☐

1c. **When responding to the SPF do you…**

provide your latest available forecast?   ☐
prepare a new forecast?   ☐
it depends on the timing   ☐

Additional comments: _____

---

2. **What is the highest frequency of data at which you model/forecast?** *If this varies systematically across forecast variables or horizons please elaborate.*

a) monthly   ☐
b) quarterly   ☐
c) annual   ☐
d) depends on the variable/horizon ☐

Additional comments: _____

---

1 The questionnaire was sent out on 18 September 2008 and the SPF participants were asked to return the form by 15 October. Some replies were received after the deadline. 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.

3. **To what extent (percentage) are your forecasts model- or judgement-based?** *If this varies systematically across forecast variables and horizons please elaborate below. We recognise that this can just be an approximation and may vary over time; nonetheless it is of interest to know how forecasts are generated. Note: time series models include ARIMA, single equation, VAR, factor, etc. models.*

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

		HICP	GDP	Unemployment
Macro-Model	Traditional			
	DSGE			
Time series				
Judgement				
Other, please specify				
		100%	100%	100%

3b. **Medium-term (up to two years)**

		HICP	GDP	Unemployment
Macro-Model	Traditional			
	DSGE			
Time series				
Judgement				
Other, please specify				
		100%	100%	100%

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

		HICP	GDP	Unemployment
Macro-Model	Traditional			
	DSGE			
Time series				
Judgement				
Other, please specify				
		100%	100%	100%

Additional comments: _____

_____

_____

_____

_____

_____

_____

4. **What type of models do you use and what weight do you attach to them?**
   E.g. Single-equation, Macro model, VAR, DSGE, etc. If this varies systematically across forecast variables and horizons please elaborate. We recognise that this can just be an approximation;

Time series   -   ARIMA _____ ☐ _____ %

Single equation _____ ☐ _____ %

VAR/VEC _____ ☐ _____ %

Other (e.g. factor models) ___ ☐ _____ %

Macro-Economic   -   DSGE _____ ☐ _____ %

Traditional, other _____ ☐ _____ %

Other, please specify   - _____ ☐ _____ %

Additional comments: _____

_____

5. **If you provide information on the external assumptions (i.e. oil prices, exchange rates, interest rates and wage growth), how do you form these?**

Oil prices:

in-house forecast   ☐   futures/market prices   ☐   consensus/average forecast   ☐

other (please explain)   ☐ _____

Exchange rates:

in-house forecast   ☐   futures/market prices   ☐   consensus/average forecast   ☐

other (please explain)   ☐ _____

Interest rates:

in-house forecast   ☐   futures/market prices   ☐   consensus/average forecast   ☐

other (please explain)   ☐ _____

Wage growth:

in-house forecast   ☐   consensus/average forecast   ☐

other (please explain)   ☐ _____

_____

_____

_____

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

Mean ☐   Mode ☐   Median ☐   Other ☐
We do not estimate probability distributions ☐

Additional comments: _____

_____

7. **How do you calculate your reported probability distributions?** *If this varies systematically across forecast variables and horizons please elaborate.*

a) Derived from a model ☐

If they are derived from the standard errors of a model are they based on a specific assumption about the functional form of the distribution? If yes, then what is this form?

_____

b) Based on a functional form (normal, skew, etc.) with key parameters (e.g. standard deviation, skew) selected outside the model framework ☐
If yes, then what is this form?

_____

c) Judgement-based ☐

Additional comments: _____

_____

_____

8. *In the ECB SPF respondents are asked to assign probabilities associated with an outcome occurring within given ranges (e.g. 1.5%-1.9%, 2.0%-2.4%, etc.). These ranges are open to interpretation which sometimes makes it difficult to assess the balance of risks to the point forecast.* **How do you interpret the interval of 1.5%-1.9%?**

i) 1.40%-1.90% ☐
ii) 1.45%-1.95% ☐
iii) 1.50%-2.00% ☐

9. **Do you publish externally the forecasts you send to us?**

Yes ☐   No ☐

Additional comments: _____

_____

ANNEX 2

SPECIAL QUESTIONNAIRE FOR PARTICIPANTS IN THE ECB SURVEY OF PROFESSIONAL FORECASTERS

SUMMARY OF THE ANSWERS AND THE RESPONSE RATES[1]

Q1a   When do you update your forecasts?
Do you always follow a regular calendar schedule or do you sometimes update them in the light of significant shocks (e.g. food or oil price shocks) or new data releases?

Calendar driven	37	*84%*
Data dependent	13	*30%*
Responses	44	

Note: A closer reading of the 16 qualitative responses would suggest that an additional nine responses that were provided could also be classified as data dependent – as forecasters commented that they would update their forecasts in the face of significant shocks – which would bring the number to 22. Based on both the explicit and the qualitative answers of respondents, 15 forecasts (or one-third) appear to be both calendar and data driven.

Q1b   If it is calendar driven, how often do you update your forecasts?

Quarterly	19	*51%*
Monthly	13	*35%*
Continuously	2	*5%*
Other, please explain	4	*11%*
Responses	37	

Note: One respondent indicated both quarterly and monthly. Four respondents indicated that their forecast updates are less frequent than quarterly – normally two to three times per year.

Q1c   When responding to the SPF do you…

provide your latest available forecast	29	*66%*
prepare a new forecast	3	*7%*
it depends on the timing	12	*27%*
Responses	44	

Q2   What is the highest frequency of data at which you model/forecast?
If this varies systematically across forecast variables and/or horizons please elaborate.

Monthly	26	*59%*
Quarterly	11	*25%*
Annual basis	0	*0%*
Depends on the variable/horizon	13	*30%*
Responses	44	

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

Q3 **To what extent (percentage) are your forecasts model-based or judgement-based?**
If this varies systematically across forecast variables and/or horizons please elaborate below. We recognise that this can only be an approximation and the extent may vary over time; nonetheless, it is of interest to know how forecasts are generated. Note: Time series models include ARIMA, single equation, VAR and factor models.

HICP inflation	Short term	Medium term	Long term	Average
Macro – traditional	18%	28%	26%	*24%*
Macro – DSGE	1%	1%	1%	*1%*
Time series	45%	32%	17%	*31%*
Judgment	37%	39%	54%	*43%*
Other, please specify	0%	0%	1%	*0%*
	100%	100%	100%	
Responses	41	40	42	

GDP growth	Short term	Medium term	Long term	Average
Macro – traditional	23%	34%	34%	*30%*
Macro – DSGE	0%	1%	4%	*2%*
Time series	34%	22%	13%	*23%*
Judgment	43%	42%	46%	*44%*
Other, please specify	0%	1%	3%	*1%*
	100%	100%	100%	
Responses	42	42	41	

Unemployment rate	Short term	Medium term	Long term	Average
Macro – traditional	23%	31%	34%	*29%*
Macro – DSGE	1%	1%	4%	*2%*
Time series	29%	22%	12%	*21%*
Judgment	47%	46%	49%	*47%*
Other, please specify	0%	0%	1%	*0%*
	100%	100%	100%	
Responses	35	36	36	

Note: A number of forecasters did not provide relative weights for the models and judgment applied, or the weights did not add up to 100%. Their answers were excluded from the calculations. The response rate comprises the number of replies used for calculations.

Q4   What types of models do you use and what weights do you attach to them?
E.g. single equation, macro model, VAR, DSGE, etc. If this varies systematically across forecast variables and/or horizons please elaborate. We recognise that this can only be an approximation.

	Models used		Relative weights reported
Time series – ARIMA	22	*59%*	19%
Time series – single equation	24	*65%*	24%
Time series – VAR/VEC	20	*54%*	13%
Time series – other (e.g. factor models)	6	*16%*	2%
Macro-economic – DSGE	2	*5%*	1%
Macro-economic – traditional or other	26	*70%*	37%
Other, please specify	2	*5%*	3%
			100%
Responses	37		25

Note: A number of forecasters provided relative weights that did not add up to 100% or only indicated the types of models used without assigning weights. These replies were included in the "models used" calculations. Calculations concerning the relative weights attached only take into account answers with weights that added up to 100%, therefore, the response rate reported is lower.

Q5 **If you provide information on the external assumptions (i.e. oil prices, exchange rates, interest rates and wage growth), how do you form such assumptions?**

Oil prices

In-house forecast	32	*78%*
Futures/market prices	13	*32%*
Consensus/average forecasts	3	*7%*
Other please explain	11	*27%*
Responses	41	

Exchange rates

In-house forecast	36	*88%*
Futures/market prices	2	*5%*
Consensus/average forecasts	4	*10%*
Other please explain	4	*10%*
Responses	41	

Interest rates

In-house forecast	41	*93%*
Futures/market prices	2	*5%*
Consensus/average forecasts	2	*5%*
Other please explain	1	*2%*
Responses	44	

Wage growth

In-house forecast	35	*95%*
Consensus/average forecasts	3	*8%*
Other please explain	2	*5%*
Responses	37	

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

Q6   **Does your reported point forecast refer to the mean, mode or median of your reported probability distribution in the SPF?**

Mean	21	*75%*
Mode	2	*7%*
Median	5	*18%*
	28	
Do not "estimate" probability distributions	18	
Responses	43	

Note: Three respondents indicated both "mean" and that they "do not estimate" probability distributions.

Q7   **How do you calculate your reported probability distributions?**
If this varies systematically across forecast variables and horizons please elaborate.

Derived from a model	7	*17%*
Based on a functional form	2	*5%*
Judgement-based	33	*79%*
Responses	42	

Q8   **How do you interpret the interval of 1.5%-1.9%?**
In the ECB SPF respondents are asked to assign probabilities associated with an outcome occurring within given ranges (e.g. 1.5%-1.9%, 2.0%-2.4%, etc.). These ranges are open to interpretation which sometimes makes it difficult to assess the balance of risks to the point forecast.

1.40%-1.90%	3	*7%*
1.45%-1.95%	31	*76%*
1.50%-2.00%	7	*17%*
Responses	41	

Q9   **Do you publish externally the forecasts you send to us?**

Yes	28	*65%*
No	15	*35%*
Responses	43	