

CPB Memorandum

CPB Netherlands Bureau for Economic Policy Analysis



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Point estimates versus Confidence intervals

1 Introduction

Frequently, the question is raised what the best way to present short-term forecasts is: to provide point estimates or confidence intervals. In April 2003, a Review Committee chaired by Prof. Dr. Klaus Zimmermann assessed the CPB Netherlands Bureau for Economic Policy Analysis. In their report *CPB in Focus*¹, the Committee recommends, among other things, that the ‘*model forecasts be presented with ranges or high/low bounds indicated, rather than point estimates*’. Until now, CPB has preferred to present its short-term forecasts as point estimates (in quarters).

Do other economic forecasting institutes share CPB’s preference for point estimates? How do they present their projections and how do they motivate their choice?

This study aims at giving an overview of how other (inter)national economic forecasting institutes present their short-term forecasts: as point estimates or with confidence intervals. In order to make an inventory of motivations, we contacted 16 institutes in Europe and the United States, including the European Central Bank, the International Monetary Fund, the Organisation for Economic Co-operation and Development, the European Commission, the six German forecasting institutes, NIESR (London), the Bank of England (London), WIFO (Vienna), CEPII (Paris), the Federal Planning Bureau (Brussels), and De Nederlandsche Bank (Amsterdam)². With their help, the following lists their choices and motivations.

2 Most institutions present point estimates

The table below shows that most economic institutes in other countries have chosen to present their short-term forecasts of GDP in point estimates. ECB and the BoE are the only institutes giving only confidence intervals. CEPII and NIESR provide both point estimates and confidence intervals; IfW will join them shortly. The others prefer to provide their projections as point estimates. Below, motivations are listed in both categories.

¹ Quote from the Committee Report: *CPB in Focus: Report from the CPB Review Committee 2003*, http://www.cpb.nl/eng/general/org/cpb/selfassessment/cpb_in_focus.pdf

² A list of persons contacted during the course of the study may be obtained on request.

Table 2.1 Comparison (inter)national institutions

	Country	Point estimates	Confidence intervals
IMF		X	
ECB			X
OECD ^a		X	
EC		X	
DNB	The Netherlands	X	
DIW	Germany	X	
HWWA Germany	Germany	X	
Ifo (Germany)	Germany	X	
IfW (Germany)	Germany	X	X (future)
IWH (Germany)	Germany	X	
RWI (Germany)	Germany	X	
WIFO (Austria)	Austria	X	
FPB (Belgium)	Belgium	X	
CEPII (France)	France	X	X
NIESR ^b (United Kingdom)	United Kingdom	X	X
BoE	United Kingdom		X

^a The OECD also provides confidence interval short-term projections of real GDP for six countries.

^b NIESR only presents point forecasts for a number of macroeconomic variables on an annual basis and charts quarterly point forecasts for GDP growth and inflation.

3 Point estimates: motivations

Institutions prefer point estimates for several reasons. Three reasons stand out:

1. giving confidence intervals doesn't improve the practicability nor the accuracy of the forecasts;
2. providing point estimates is clearer for clients;
3. the method of forecasting does not allow confidence intervals to be estimated. Forecasts are expert-based or stem from different countries, each using other quantitative tools.

1. Giving confidence intervals doesn't improve the accuracy of the forecasts³

The first reason is underlined by DNB, IMF, FPB, IFO, IfW, HWWA, RWI, and IWH. IMF does not have an overall short-term global forecasting model, and even if they possessed one, they are not sure what value added producing ranges would give them. Generally, IMF finds it useful to discuss the risks, and provide quantification where needed. IWH wants their forecast to describe the most probable development and find this is done in the best way by point estimates. RWI finds that one third of their forecasting errors may be attributed to wrong assumptions, e.g. on world trade, oil prices. FPB even finds most of their forecasting errors stem from international shocks. These shocks are difficult, if not impossible, to foresee. Even if

³ Many institutions do perform simulations to clarify what the economic outcomes of different scenarios will be.

ranges were published, the deviation caused by a severe shock often would not fall within the range. WIFO has the same argument and states that deviations due to an international shock are often higher than possible intervals, and thus concludes giving confidence intervals doesn't improve the forecasts. IWH even considers interval estimates to be more risky than point estimates with regard to any critics of failing forecasts. If the interval forecast fails, your competence will suffer more than in the other case, IWH states.

2. Providing point estimates is clearer for clients, often policymakers or journalists

The second reason is supported by DNB, FPB, WIFO, DIW and IFO. In the past, IFO has offered intervals but changed this policy due to specific demand of their clients. FPB states that their forecasts are used as input for the government's budget. As the budget does not leave room for intervals, intervals are of no avail to policymakers. WIFO simply states policymakers are not used to handle intervals. DIW finds intervals useful for econometricians who are interested in calculating methods but not suitable for publications meant for their public: policymakers and journalists. HWWA, which previously rounded their forecasts to half or quarter percent points, changed to giving point estimates as all other institutions had also changed to this trend and journalists interpreted rounded figures as 'not-knowing it'. DNB refers to the fate of ranges published by the ECB; the media present the average of the range as the point estimate. IfW has drawn another conclusion and opts for a combination of point estimates and intervals. Presently giving only point estimates, IfW will provide both in the near future since they find this more informative. IfW does not see the advantage in publishing point estimates only, and prefers to let their clients choose. CEPII also prefers to provide both point estimates and confidence intervals. Their motivation is to make policy makers and journalists aware of the underlying difficulties in any forecasting exercise.

3. The method of forecasting does not allow confidence intervals to be estimated

The third reason is given by DNB, OECD, IMF, DIW, and IWH. OECD mostly presents its projections as point estimates. One important reason for using point estimates is that the Economic Outlook is based on the assessment of Country Desk economists. In these circumstances, confidence intervals would not be relevant.

Whereas the desks of many (in particular large) countries do run their own short-term models, some countries do not run models. IMF does not have an overall short-term global forecasting model for their World Economic Outlook projections. Since IMF's World Economic Outlook exercise is a bottom up exercise, where the forecasts for 180 individual countries are aggregated up to regional and world aggregates, confidence intervals cannot be generated.

DIW and IWH have a similar reason as the OECD for not giving intervals. DIW's forecasts are not produced with econometric models. Econometric models are used to check the forecasts which are based on short term indicators and which are produced by a NAS consistency

framework model. There is no direct need to look at the intervals of forecasts. The main approach applied by IWH to forecast GDP-growth does not allow deriving confidence bands.

The European Commission's choice for point estimates has a practical reason: in the early 1960s the EC needed to compare national forecasts of member states with its own forecasts. At that time, the member states provided point estimates so the Commission also chose to present their short-term forecasts with point estimates in order to make comparisons easier.

A possible reason to turn down the use of confidence intervals could be the view that intervals that are derived from estimated equations in the past are not necessarily a valid indicator for future intervals. This reason is dismissed by IfW, which states that this is true for all model-based forecasts. DNB also agrees that past confidence intervals do provide an indication for future uncertainty, but adds that uncertainty seems to be more extreme around business cycle turning points.

4 Confidence intervals: motivations

Institutions publishing intervals around their projections have different reasons for doing so. Below, motivations per institute are given, with a short explanation of how intervals are calculated.

ECB

To take into account the uncertainty surrounding macroeconomic projections, ECB's Governing Council has decided to publish the projections in the form of projection ranges. ECB: *'Constructing projections is a difficult undertaking: the longer the horizon, the more uncertain the outcome of the statistical exercise. In view of this, the ECB will publish ranges of the staff projection figures, which are based upon the average absolute errors made in previous NCB and Eurosystem projections. The adoption of ranges is in accord with the best practices in use among central banks and reflects our realistic and honest admission that future developments are uncertain'*

ECB states their projections are conditional on a number of technical assumptions, e.g. of constant exchange rates. Therefore, they are not necessarily meant to represent the best predictor of future developments. In light of this, ECB stresses they do not publish forecasts, but projections. ECB places emphasis on this distinction since the forward-looking exercises are undertaken upon the assumption of 'unchanged monetary policy'. The publication of conditional projections is intended to provide a purely counterfactual scenario, and the Bank

stresses that it should not be understood as a predictor of the most likely macroeconomic outcome, still less a benchmark for expectations.⁴

The technique the ECB uses to produce projection ranges is simple. For each variable, a range is applied with a size equal to twice the average absolute value of the differences between actual outcomes and previous macroeconomic projections carried out over a number of years by euro area central banks. In general, the ranges differ depending on the variables and the time horizons involved. They reflect both the different degrees of difficulty in projecting individual variables at different horizons and the effects of discrepancies between the assumptions made for conditioning variables and their subsequent actual values. It should be noted that the tendency of most ranges to widen over the projection horizon reflects the increased uncertainty surrounding projections for the later years. In addition, the ranges tend to be greater for variables with greater intrinsic volatility, such as the growth of gross fixed capital formation. In addition, to further quantify the impact of various sources of uncertainty, the Eurosystem staff may also present scenario exercises to the Governing Council.⁵

CEPII

CEPII has chosen on a collective basis with the EFN framework to provide both point estimates and confidence intervals, in order to make policy makers and journalists aware of the underlying difficulties in any forecasting exercise.

Details on the way in which confidence intervals are calculated were not provided.

NIESR

Since 1993, NIESR has presented confidence intervals around its central forecasts for GDP and inflation. The intervals for GDP are based on past forecast errors drawn from an appropriate historical sample. The institute calculates the root mean square error of the forecast from past forecast errors. Assuming that the forecast errors are normally distributed and unbiased, NIESR uses the normal cumulative density function to evaluate the likelihood of GDP growth and inflation falling within designated bands. For GDP growth NIESR assesses uncertainty based on errors from 1989 to present. The choice of sample period reflects the dual aims of wanting to use relatively up to date errors and the need to include the last major recession.

In recognition that past forecast errors do not always provide the best description of the risks to the current forecast NIESR discusses and quantifies the risks to the current forecast. By means of model simulations NIESR indicates how the growth and inflation forecast might change under relevant scenarios. More recently these include discussions of how different assumptions

⁴ Source: Speech by Professor Otmar Issing, Member of the Executive Board of the European Central Bank, at the CES-IFO Conference on Issues of Monetary Integration in Europe, Munich, December 1st 2000. Quotes in italics.

⁵ Source: A guide to Eurosystem staff macroeconomic projection exercises -Chapter 2: The techniques and projection tools used in Eurosystem staff macroeconomic projection exercises, European Central Bank, 2001.

about developments in house prices, oil prices and fiscal policy would affect main macroeconomic variables.

NIESR regularly publishes confidence intervals for the fiscal balance derived from stochastic simulations using their world economy model. The shocks employed in these stochastic simulations are drawn from past shocks to the structural equations of the model. The benefit of this approach over using historical forecast errors to generate confidence intervals is that changes in the fiscal and monetary environment can be taken into account- i.e. the error bands generated by this method vary according to the present structure of the economy. Since it is too resource intensive, NIESR only occasionally publishes confidence intervals for GDP growth and inflation forecasts based on stochastic simulations.

BoE

The Bank of England presents its forecasts of GDP growth and inflation as probability distributions, in so-called fan charts.⁶ The Bank introduced this fan chart to convey to the reader a more accurate representation of the Bank's best collective assessment of the most likely paths for output and inflation, without suggesting a degree of precision that would be spurious. In its latest projections, BoE states the central projection is only one of many possible outcomes, and the likelihood of it being realised is negligible, the main risks being the prospects for domestic spending, the evolution of wages, the development of productivity, the behaviour of import prices, and the outlook for the world economy.⁷ The Bank hoped presenting their projections in a fan chart would promote better economic analysis of the underlying issues, and a necessary focus on the shocks hitting the economy, instead of considering just a single possible outcome for the economy.

The initial calibration of uncertainty is based on experience of forecast errors from the previous ten years. The average absolute value of past forecast errors is added to and subtracted from the central projection. Subsequently, the Bank's Monetary Policy Committee, concerned with the projections, forms a view as to whether or not uncertainty looking forward is greater or less than in the past. Consequently, the Committee adjusts both the size and the balance of risks accordingly. Thus, past forecast errors, combined with judgment of the MPC, determine the uncertainty. In times of perceived increase in uncertainty, the fans can be made wider, illustrating the broader range of possible outcomes. Similarly, the fans can be skewed up or down if the MPC finds the risks to be unbalanced around the central projection. The Bank uses a variance measure to estimate the degree of uncertainty (the degree of dispersion in the

⁶ Sveriges Riksbanken (the Swedish Central Bank) also provides fan charts.

⁷ Source: The Inflation Report, February 2005, Bank of England.

distribution) and to balance the risks to get a measure of the skew. The latter is expressed as the difference between the mode and the mean of the fan chart in percentage points.⁸

⁸ Source: The Inflation Report projections: understanding the fan chart. By E. Britton, P. Fisher and J. Whitley. In: The Quarterly Bulletin, February 1998, Bank of England.

Appendix: Institutions

	Institutions
IMF	International Monetary Fund
ECB	European Central Bank
OECD	Organisation for Economic Co-operation and Development
EC	European Commission
DNB	De Nederlandsche Bank
FPB	Federal Planning Bureau
DIW	Deutsches Institut für Wirtschaftsforschung
HWWA	Hamburgischen Welt-Wirtschafts-Archiv
IFO	Institut für Wirtschaftsforschung an der Universität München
IfW	Institut für Weltwirtschaft Kiel
IWH	Das Institut für Wirtschaftsforschung Halle
RWI	Rheinisch-Westfälisches Institut für Wirtschaftsforschung
WIFO	Österreichisch Institut für Wirtschaftsforschung
CEPII	Centre d'Etudes Prospectives et d'Informations Internationales
NIESR	National Institute of Economic and Social Research
BoE	Bank of England
