PBO Model for Medium-Term Macroeconomic Forecasting

Key Messages

- To enhance its analytical capabilities to support Members with economic and budgetary analysis, the Parliamentary Budget Office (PBO) has developed a forecasting tool for the Irish economy, which generates medium-term forecasts for various macroeconomic indicators up to five years ahead.

- The model combines a suite of statistical and machine learning methods (each of which performs well in different contexts); it takes an average of the forecasts from these individual methods.

- The predictive performance of this "composite" model has almost always been found nearly as good as, and occasionally better than, the best performer among these individual methods across different contexts.

- Nonetheless, Irish macroeconomic indicators are often volatile and difficult to forecast accurately; therefore, the model also estimates how uncertain its predictions are.

The PBO has developed a forecasting model for the Irish economy, to enhance its analytical capabilities to support Members with economic and fiscal analysis. This note is a non-technical summary of the model, whose detail is published in a technical working paper.

The model can generate five-year forecasts of key macroeconomic indicators, such as gross domestic products (GDP), modified gross national income (GNI*), modified domestic demand (MDD), Harmonised Index of Consumer Prices (HICP), participation, employment and unemployment rates, and many more economic indicators depending on the availability of data.

The methodology combines a suite of well-established econometric techniques and machine learning algorithms. In other words, it is a "composite" model and does not rely on a single method. Different methods provide different predictions for the possible trajectories of the Irish economy, and the model combines them using a forecasting averaging approach.

Through the model development process, several key insights have been found, and based on these insights, the final composite model has been developed:

- Statistical tests during the model development showed that Irish macroeconomic indicators are often volatile and difficult to forecast accurately, particularly in the medium term such as a five-year period. This was the case, regardless of the forecasting approach tried during the model development process. The most significant issue was that certain methods worked well for certain economic indicators for certain time periods *only*, while performing less well in other cases. Put differently, no individual method was the best performer across various macroeconomic indicators and time periods. In other words, the stability of predictive performance across different contexts was an issue.

■ Then, it was found that averaging the forecasts from the different methods used generates forecasts that are almost always nearly as good as, and occasionally better than, the best performer among the individual methods used, across various macroeconomic indicators and time periods. In other words, it exhibited consistent performance across different contexts. Based on this finding, the composite model was developed – it takes an average of forecasts generated by individual econometric and machine learning methods.

■ Even though the composite model has promising potential, it also remains the case that it is difficult to forecast Irish macroeconomic indicators accurately in the medium term. Therefore, it is essential to understand and highlight the uncertainty inherent in forecasting. The model addresses this, by enabling the computation of uncertainty measures, such as an interval estimate and the probability of observing values beyond a certain threshold (e.g., the probability of GDP growth greater than 1%).

The developing of the new model marks a significant step in PBO capacity-building efforts. It is designed to enhance our ability to analyse the macroeconomic developments that impact on the public finances. This model will support the PBO policy costing service, as well as other internal models we utilise. The primary aim of this model is to enhance the PBO internal analytical capabilities, rather than to publish an alternative set of macroeconomic forecasts.

The PBO will keep developing this analytical tool to further improve its utility and informativeness. For the detail of the underlying methodology, the reader is encouraged to refer to the relevant working paper.[1]

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[1]   Akisato Suzuki, *Medium-Term Macroeconomic Forecasting in Ireland: A VAR Setup with Bayesian and Tree Ensemble Models and Forecast Averaging*, PBO Working Paper Series No. 2 of 2024, (February 2024).