Seasonal adjustment and forecasting of quarterly gross domestic product: Estonian experience

Mihkel Täht
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Mihkel Täht

e-mail: mihkel.taht@stat.ee

Statistics Estonia
Methodology Department

Abstract

This paper summarizes experiences with forecasting of quarterly gross domestic product (GDP) using seasonal adjustment methods, regression and ARIMA models. Statistics Estonia started with seasonal adjustment of GDP and its components at the end of 1998. The main reason why we did this was to create a simple tool to do short term forecast of GDP for our internal use. Later we used the forecast as a possible concurrent approach for FLASH estimation of GDP. The GDP by institutional sectors (five institutional sectors plus net taxes on production – all together six time series) was the source data for seasonal adjustment and forecasting in this task. We made the forecasts on the basis of a trend (or seasonally adjusted time series) and a seasonal component using regression methods. To choose the best approximation we used criteria $R^2$ and Akaike Information Criteria ($AIC$), which is based on the sum of squared residuals. For calculation the forecast we assumed that the expected value of the irregular components is equal to zero for the additive model and one for the multiplicative model.

Since the end of 2000 we used the interface DEMETRA for seasonal adjustment. At the same time it was possible to do additional forecasting of GDP using ARIMA models. Two methods for forecasting were used: direct ARIMA model for GDP and indirect model as sum of ARIMA models for components of GDP by institutional sectors. From 2005 we decided to formalize the process of choosing the best forecast. We made trials using four econometric criteria: RMSE (Root Mean Squared Error), MAE (Mean Absolute Error), MAPE (Means Absolute Percent Error) and TIC (Theil Inequality Coefficient). In such a case we have multi-criterion problem and we don’t know its compromise solution. After testing we finally decided to use two criteria only: RMSE, as most used criteria, and TIC, which shows the fit quality. In case of ideal solution values for both criteria are minimal. Otherwise we could find solution using no more than 3-5 possible pretenders using criteria RMSE and then choose expert solution using criteria TIC but considering RMSE. In that case the values for both criteria may not be minimal.

Calculated forecasts for the second and the third quarter for 2005 were not so good (the discrepancy from the flash estimated GDP was greater than 1%). The forecast of GDP for the 4$^{th}$ quarter 2005 was close to flash estimate, but the discrepancy from the really calculated GDP was quite big. Therefore in this year we decided to develop a new, simple (one equation) model using econometric methods.

Keywords: GDP, seasonal adjustment, forecasting, ARIMA model, regression, econometric model.