Nowcasting GDP for the Baltic States:

A comparative approach in support of quarterly GDP forecasts in official statistics

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Abstract

The purpose of this analysis is to make a contribution to GDP nowcasting and thereby to support DG ECFINs quarterly forecasting process for key macroeconomic variables such as most notably GDP.

This will be done by utilising and comparing different nowcasting procedures in an attempt to enhance existing forecasting techniques. Different econometric techniques will be used for this purpose. Within the established and well-documented “tool kit” for nowcasting, these techniques consist of an array of different econometric procedures, such as–but not exclusively—univariate procedures (ARIMA, sARIMA), structural VARs as well as mixed frequency models (MIDAS). The three Baltic States, Estonia, Latvia and Lithuania, serve as an empirical application.

Going forward, different nowcasting approach will be compared in terms of there predictive accuracy for forecasting GOD. Such techniques can then be used to support the quarterly forecasting process for GDP in a complementary manner as well in support of the forecasting work done within the respective country desks for the Baltic States within DG ECFIN.

JEL classification: E37, C53

Keywords: Nowcasting, mixed-frequency data, mixed data sampling regression, mixed-frequency vector autoregressive models

Background

Within Europe and the euro area, analysing and hence developing a deeper understanding of the economies of the Baltic States remains a key interest both for policy makers and from an academic perspective:

- Despite their similarities, structural differences among the three states exist.
- All three states are highly dependent on external financial flows, mainly from EU structural funds.
- The interdependences between three countries including lead-lag relationships are well established.
- GDP in the Baltic States is significantly affected by a long-term structural trend, seasonality, cyclicity as well as a decline and a deceleration and a rebound following the 2007/08 Global Financial Crisis (GFC).

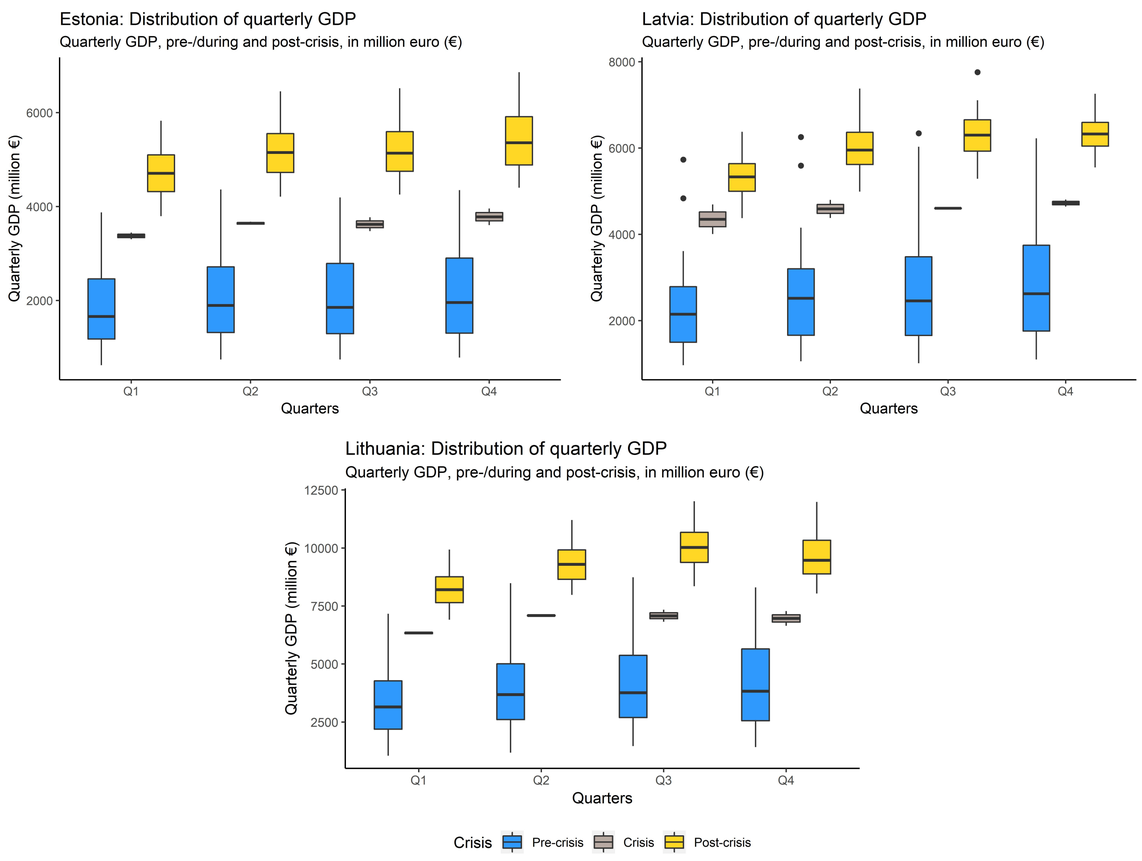

Table 1: Baltic States: GDP Boxplots pre- and post GFC

Fitting seasonal ARIMA and VAR based models

As a starting point, seasonal ARIMA and VAR based models have both been fitted for each of the three Balitc States and used for the purpose of generating GDP forecasts using data of the same frequency, but accounting for seasonality.

Prior to fitting the ARIMA model, series have been tested for stationary using both ACF and PACF plots to determine order of differencing needed. Model selection has been carried out based on the conventional model selection criteria (AIC, BIC). *Ex-post* diagnostics of the residuals has been carried out to ensure there is no patterns and that they are normally distributed. Initial results demonstrate that extending the conventional ARIMA models by explicitly accounting for seasonality captures the specificities of GDP pattern well for the Baltic States. For the VAR specification, GDP growth, price inflation, the unemployment rate and real unit labour cost have been used in the usual formulation of the VAR.

In the case of Estonia, illustrative results are as follows:

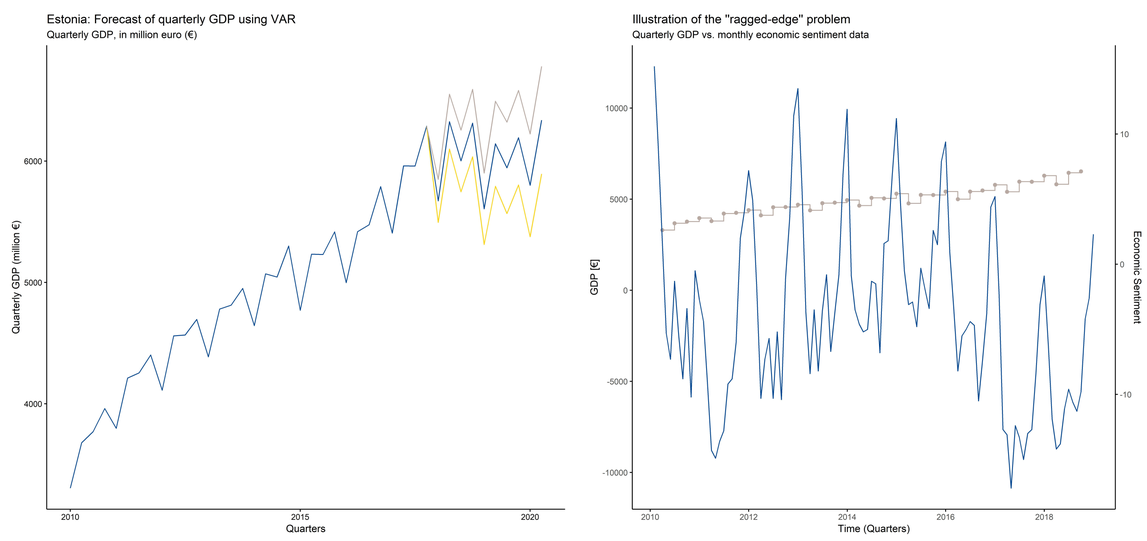

Table 2: GDP estimation using conventional VAR (LHS) and “ragged-edge problem” (RHS)

Nowcasting GDP: “ragged-edge” data and different periodicities

Applying VAR based approach allows several variables to be taken into account, but does neither capture their interdependencies in the same way behavioural models and hence more sophisticated models do nor does it reflect different periodicities as it assumes that all variables are occurring at the same frequency. However, in reality, granularity of available data differs:

Macroeconomic data are typically incomplete for today and the immediate past and subject to revision. The so-called “ragged edge” problem arises due to differences in publication lags among the variables (See Wallis 1986, for an early description of this problem). GDP growth is typically observed on a quarterly basis, whereas a range of other data is available on a monthly basis. In this context, nowcasting means that in a particular calender month, GDP for the current quarter cannot be determined directly, but needs to be estimated on the basis of different available hard and soft data, such as:

- **Hard Data:** Industrial production index, Production in construction, Real exports, Retail trades, etc.
- **Soft Data:** Industrial production expectations, Sentiment indicators, Households’ opinions, Construction confidence indicator, Industrial order book positions, etc.

Enhancing the analysis: Mixed-frequency VAR and mixed-data sampling models

In the literature, two model specifications that are well-established to address the “ragged-edge” problem and that allow use of data of different periodicity to be made are **mixed-data sampling models (MIDAS)** and **mixed-frequency (MF) VAR**.

MIDAS is a single-equation approach, where quarterly GDP is explained by specifically weighted observations of monthly predictors. By taking into account autoregressive terms and lags of the indicators, MIDAS allows for a complicated dynamic relationship between the indicator and GDP. Distributed lags imply a parsimonious specification of the model. Using a Kalman filter can tackle missing values at the end of the sample, and take into account the mixed-frequency nature of the data.

Compared to single-equation MIDAS, **MF-VAR** is a system approach that jointly explains indicators without imposing *a-priori* restrictions on the dynamics. In the current literature, both approaches are considered to be complementary than substitutes, since MF-VAR tends to perform better for longer horizons, whereas MIDAS for shorter horizons. The performance of the models can be assessed by splitting the full sample into an evaluation sample and an estimation sample, which is recursively expanded over time.

Preliminary findings

This is still work in progress. A MIDAS model is being fitted to the Estonian case using the R package provided by Ghysels et al. (2016) and based on previous work done by Kuzin et al. (2011) in this field.

- The results obtained from the aforementioned techniques are promising.
- From a methodological perspective, the work can be taken forward e.g. by using a Markov-switching approach and by proposing a new Markov-switching MIDAS model, based on a Principle Component Analysis to determine key determinants that impact GDP growth.
- Going forward, further refinements and improvements will be considered, such as eg. investigating the use of state space forms for nowcasting using different filtering/interpolation techniques and by undergoing a review of the ‘soft’ variables used for estimation purposes.

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