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Nowcasting GDP in Greece: The impact of data revisions and forecast origin on model selection and performance

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ABSTRACT

In this paper we consider ways to forecast and nowcast the evolution of the growth rate of the Greek Real Gross Domestic Product (GDP). We explore information in more timely indicators that are available at a higher frequency to improve the forecast of quarterly output growth and, more importantly, examine the effect of data revisions in model selection. In our analysis we focus on three kinds of models, benchmarks, bridge models and factor analysis models trying to understand the effect that the crisis had on both data, informational content of explanatory variables and predictive ability of various models. Our results suggest that not only do we observed large changes in the informational content due to data revisions but the models with highest predictive ability are varying based on both the predictive variables being used and the point in time of the forecast origin. It is therefore important to consider an array of models when nowcasting, especially under periods of higher volatility and data revisions, as in the case of Greece.

1. Introduction

In policy institutions such as Central Banks, business, government, financial markets and others, nowcasting GDP growth is an important task to inform decision makers about the current state of the economy. Nowcast models typically consider specific data irregularities: whereas GDP is sampled at quarterly frequency and with a considerable delay only, many business cycle indicators are available at a higher frequency and more timely, for example, monthly industrial production or high-frequency financial data. The accuracy of such quarterly or lower frequency forecasts can thus have important repercussions on the policy measures taken. GDP is, however, only available on a quarterly basis. In addition, first official estimations are only published after a time span of 2 or 3 months (around 45 days or later after the end of the reference quarter for the main European countries) and these first GDP estimations are often revised significantly.

The aim of this paper is to highlight the importance of the data revisions and changes in information content of predictive variables in nowcasting the Greek Real Growth Rate, by exploiting the particular structure of data on the Greek economy. Greek data are released routinely since 2000 that makes our data sample quite limited. Our work is potentially interesting because of the examination we make for the problems of the data themselves and the importance of growth assessments and forecasts during and after the context of the deep fiscal crisis faced by the Greek economy.

Nowcasting is a relatively new method whose main advantage is the use of new information as it comes in, and the generation of updates at a higher frequency than the frequency of observation of the variable of interest. Until recently, nowcasting had received very little attention in the academic literature, although it was routinely conducted in policy

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institutions either through a judgmental process or on the basis of simple models. It was first introduced by Evans (2005) for a limited number of time series and evolved by Giannone, Reichlin, and Small (2008) for a larger number of series to produce real-time GDP estimates, combining the idea of linking high-frequency indicators to low-frequency GDP data and the idea of using real-time data within a single statistical framework.

In recent years, there have been many applications of this method for several countries and variables thus enhancing and expanding this methodology. For example, Lahiri and Monokroussos (2013) in the United States, who study the role of survey data in nowcasting; Angelini, Camba-Mendez, Giannone, Reichlin, and Rünstler (2011); Banbura and Rünstler (2011); Camacho and Perez-Quiros (2010), in the euro area; Barhoumi, Darné, and Ferrara (2010) in France, who compare several factor extraction techniques; Marcellino and Schumacher (2008) in Germany, who proposed an approach that combines mixed-data sampling techniques with a factor model; D'Agostino, McQuinn, and O'Brien (2008) in Ireland, Yiu and Chow (2010) in China using a large data set, Urasawa (2014) in Japan and Bragoli, Metelli, and Modugno (2014) in Brazil . The current literature has provided several general findings which indicate a clear gain from developing a model to early assess the ongoing economic activities. A statistical model that does not include a judgment process performs as well as institutional forecasts that are allowed to incorporate their own judgment. Thus, nowcasting becomes progressively more accurate toward the end of the quarter, when the amount of relevant information increases, and timely data —which by definition are more promptly available— tend to improve forecast performance. In addition, exercises using factor models have been implemented in several institutions, including the European Central Bank (ECB, 2008) and the International Monetary Fund (Matheson, 2011).

Until recently, the approach used to obtain an early estimate of GDP was based on judgment combined with simple models called Bridge Models (BM), Baffigi, Golinelli, and Parigi (2004). BM are essentially regressions relating quarterly GDP growth to one or a few monthly variables aggregated to quarterly frequency. Since, only partial monthly information is available for the target quarter, the monthly variables are forecasted using auxiliary models. In order to exploit information from several monthly predictors BM are sometimes pooled, Kitchen and Monaco (2003). To the best of our knowledge, Banerjee, Marcellino, and Masten (2005), Banerjee and Marcellino (2006), Antipa, Barhoumi, Brunhes-Lesage, and Darne (2012) are the only studies that compare the forecasting performance of the automatically selected BM and the DFMs – for Eurozone, US and German GDP growth, respectively. These studies, however, only use factor models following Stock and Watson (2002a), (2002b), for which results are not conclusive in favor of one or the other.

In order to have better forecasts, factor models have proved to be a very useful tool for short-term forecasting of real activity. The use of dynamic factor models (DFM) has been further improved by recent advances in estimation techniques proposed by Stock and Watson (2002a), (2002b), Forni, Hallin, Lippi, and Reichlin (2003) or Giannone et al. (2008), who have put forward the advances in estimation techniques that allow improving their efficiency. This type of model is particularly appealing as it can be applied to large data sets as by Angelini et al. (2011), Barhoumi et al. (2010), Schumacher and Breitung (2008). The DFMs are based on static and dynamic principal components. The static principal components are obtained as in Stock and Watson (2002a), (2002b). The dynamic principal components are based on either time domain methods, as in Doz, Giannone and Reichlin (2011, 2012), or frequency domain methods, as in Forni et al. (2003). DFMs have so far never been used for forecasting Greek GDP growth rates.

Unlike DFMs, Time Series Factor Analysis (TSFA) Gilbert and Meijer (2005) obviates the need for explicitly modeling the process dynamics of the underlying phenomena. It also differs from standard factor models (FM) in important respects: the factor model has a non-trivial mean structure, the observations are allowed to be dependent over time, and the data does not need to be covariance stationary as long as differenced data satisfies a weak boundedness condition. TSFA is suitable for a relatively small number of series and therefore relies on somewhat stronger model assumptions. TSFA is useful when measurement and modeling are being used simultaneously, because specific assumptions about factor dynamics are usually much more fragile than the assumption that factors exist. What is important to note is that TSFA is very well suited for the data used in this paper.

The rest of the paper is organized as follows. In Section 2, we give a summary of the data set used in our paper, in Section 3, a brief presentation of the bridge and TSFA models. In Section 4, we discuss the results of our forecasting analysis and Section 5 offers some concluding remarks for future research.

2. Data set

Our dependent variable is obtained from the, seasonally adjusted, quarterly real GDP series expressed as annual growth rate. As explanatory variables we consider the quarterly Gross Capital Formation (GCF), the Gross Fixed Capital Formation (GFCF) and the Exports (EXP) and the monthly economic activity indicators, namely the index of industrial production (IPI), the total turnover of retail sales (RSTOT) and the volume of retail sales (RSVOL). All variables are from seasonally adjusted indices and expressed in real terms as annual growth rates. Additionally, we used aggregation of the variables (A-IPI, A-RSTOT, A-RSVOL) using the average of the three months of the quarter. All variables are obtained from the Greek Statistical Authority website (www.statistics.gr) and we consider two vintage series, a first and second revision from 2013 data, and the latest release as of the time of writing of this paper from 2015.