

SHORT-TERM ANALYSIS OF GROSS DOMESTIC PRODUCT

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Abstract. This paper would provide a short-term measuring model of GDP on the basis of current macroeconomic statistics. At the considered model vectors are built separately for each of three group indexes of the world markets and outer-economic activity; indexes of a real sector.

By using this model one can receive measures of GDP for previous and current quartiles, which provides information about dynamics of economic release, additionally to measures of different models and experts' claims. Moreover, model enables to perform decomposition of quartile paces of GDP increase of different factors. At this work we will look through the method and its implementation in Russian economy.

Keywords: short-term measuring of GDP, nowcast, dynamic factor models.

Introduction

In 2015 Bank of Russia transferred to inflation targeting monetary policy. Bank of Russia makes a decision about monetary policy on the basis of evaluation of current situation and medium-term forecast.

Standard problem of macroeconomic forecast - logs of presented information by the statistic agencies. Thus, provisional marking of physical amount of GDP index is presented by Rosstat after 6 months after the end of the quartile, first marking criteria of produced GDP would appear after 2 and a half months, but a measure of used GDP is introduced at the end of the quartile, following after the reporting one.

Nevertheless, there are macro-estimates, by which Rosstat represent data before. Thus, data of industrial production is available by 12-14 date of a following month after a reporting one, by turnover of retail sales, amount of provided services for citizens, investments to a general capital, freight turnover, release of constructions and agriculture, unemployment and salary - 18-21 dates. [1]

There are different ways of using this and different monthly data, and better-quality indexes for measuring current dynamics, or nowcasting, release: for instance, it is possible to approximate an index of basic types of economic activity by using them. It is also possible on the basis of data of turnover retail sales, amount of provided services and balances of revenues and costs, provide a measure of current dynamic of costs on a final consumption, however, knowing investments in a general capital, closing inventories of produced products in organization of retail sales and crops, - trying to predict gross savings, Having a measure of paid balances, currency of ruble and oil prices, economists can measure an index of physical amount of export and import. Additionally, data of Federal Custom Services for import and export of goods, but they are represented with a considerable timing logs.

Besides above-named methods of measuring a current dynamic of release, there are also methods, which are based on econometric and mathematically-statistic models. For example, Russian School of Economics with a «Renaissance-Capital» company use methods of general com-

ponent and Kalman filters for measuring dynamics release. Employees of a Bank of Russia in their desertions introduce DFM on the basis of general variables that show condition of a real economic sector, financial market and outer-economic conditions, and also following indicators. On the bases of shown variables authors remake unobservable factors and build equations of connections for getting current measure of release. As a result authors receive very accurate measure of GDP, overlapping measures, received with a help of alternative models.

1. Methodology of research

The model of current GDP evaluation is based on usage of dynamical factor models. The following groups of macro variables have been analyzed: indicators of real sector, indicators of agent's contemplation and their evaluation of economy situation and index numbers of financial markets and external demand. A dynamical factor model based on Kalman's filter and principal components method has been separately constructed for each group of variables:

$$\begin{aligned}
 X_t^j &= A^j F_t^j + \varepsilon_t^j \\
 F_t^j &= B^j F_{t-1}^j + u_t^j \\
 E(\varepsilon_t^j) &= E(u_t^j) = 0 \\
 E(\varepsilon_t^j \varepsilon_t^{j'}) &= \Sigma^j \quad E(u_t^j u_t^{j'}) = \Omega^j
 \end{aligned}
 \tag{1}$$

X_t^j is like a vector of macro variables of a month t that are included in group J, F_t^j is a vector of factors eligible to the given group of variables. The number of factors for each group of indicators has been selected due to the part of the dispersion, explained by the factors of the groups of indexes to its overall index of dispersion. To avoid curse of dimensionality, the number of factors for each group was limited to 3.

Further on the basis of DFM unsupervised factors have been evaluated and prediction till the end of the current quarter has been made. So examined variables have monthly frequencies while the predicted index (GDP) has a quarter one. Achieved indexes have been averaged. The next stage was constructing a bridge equation between GDP and indexes. We used a simple model of linear regression. [2]

$$\begin{aligned}
 y_\tau &= \mu + \alpha y_{\tau-1} + \beta_{f1} f_\tau^f + \beta_{f2} f_{\tau-1}^f + \beta_{e1} f_\tau^e + \\
 &+ \beta_{e2} f_{\tau-1}^e + \beta_{r1} f_\tau^r + \beta_{r2} f_{\tau-1}^r + \omega_\tau
 \end{aligned}
 \tag{2}$$

Seasonal corrected rate of GDP growth in real prices related to the previous index is used as y_τ f_j is a factor resulted from 1 for the group of j indexes (where f stands for financial variables, e-predictions and evaluation of current situation in economy, r-indexes of real sector). [3] As factor 1 couldn't explain a necessary part of indexes dispersion for financial market indexes and real sector, several indexes have been constructed and the chosen one was that providing better quality of data adjustment to the equation 2 in terms of information Shvarts's criterion on

the overall data extract. So factor 1 and its lag have been used for the indexes of the real sector, factor 3 and its lagged effect have been used for the indexes of financial market. In case of variables showing predictions of economic agents, factor 1 was enough for explanation of a huge part of indexes dispersion. All indexes from equation 2 have been 1 less than they were at first. It was done to let us interpret them as growth indexes. Auto regression component Y_{t-1} has been added to the model as GDP shows a definite inertia, connected with habits of consumption and formation of agents savings based on the previous periods. [4]

2. Quality of prognosis model

The quality of the prognosis model has been checked on an interval - starting with I quarter of 2012 till the IV quarter of 2014. The quality check was performed at pseudo-real time: for the prognosis at the moment m only the already existed by the time information was used. Thus at every month m the process of prognosis was as following:

Data that was available at the 20th day of each month t (in other words data for the period starting from January 2002 till the month $t-1$ was seasonally edited and was fitted into the growth rates).

Based on (1) monthly factors were determined and were afterwards averaged in order to receive the quarterly data. The relations equation (2) was estimated using the data starting from the II quarter of 2003 till the last quarter when the GDP data was available.

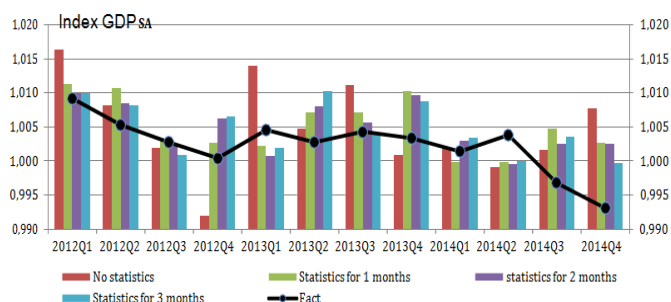


Fig. 1. Index prognosis of the physical value of GDP at the different time moments and its factual meaning. [1]



Fig. 2. RMSE estimates depending on the information availability

As an indicator of the prognosis quality we used RMSE. As we can see on picture 2 the accuracy of the estimates grow when there is extra statistical information available. The fall in RMSE is especially seen when there is statistics from the first month of the quarter strengthened by the GDP data from the previous quarter.

During the II-IV quarters of 2015 the model was used in order to get an extra estimate of the GDP growth rates. When we had the data from the whole quarter, the estimate was extremely accurate. In case we only have the information from one or two months of the considered period, the quality of the estimate has been experiencing a significant downgrade, possibly due to the huge volatility of the economic indicators in 2015. [5]

3. Conclusion

The considered model of the current GDP estimation allows aggregation of monthly statistics in order to receive the GDP prognosis for the next quarter. The accuracy of an estimate growth only when the volume of the statistical information increases. On the 20th day of the month that follows the month of reporting quarter, when the statistics of the final month of quarter is released, RMSE hits its lowest value. This model can be used as a subsidiary method of the estimation of the GDP growth rates together with the models which help to restore the goods and services production using the basic types of economic activity, and models which use information about the exogenous parameters.

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