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Macroeconomic policy in Russia: nowcasting, communication policy and regional analysis

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Motivation

In recent years, many countries have developed their approaches to macroeconomic policy. The changes also affected Russia: about 8 years ago, the Bank of Russia officially switched to inflation targeting, and in 2017-2018 the fiscal rule was significantly modified. However, modern aspects of macroeconomic policy remain understudied in the domestic academic literature due to the gradual adaptation of the economy to changes in monetary and fiscal policies and ongoing shocks. Classical approaches of macroeconomic policy are losing their relevance due to rapidly changing external conditions and structural restructuring of the economy, so taking into account modern aspects remains critical for timely and high-quality decision-making, as well as for immediate policy adjustment. In the Western academic literature, the study of modern approaches to macroeconomic policy is a popular area of research: there is a wide range of studies in both developed and developing countries. However, there are certain gaps in the Russian academic literature on this topic.

This dissertation fills in these key gaps and consists of three chapters based on four separate articles devoted to modern aspects of the macroeconomic policy. The first chapter is about modern approaches to nowcasting, which are the most accurate tool for assessing the current economic situation and are especially relevant in the context of low data frequency, statistics release lags, and external and internal shocks in the economy. In the second chapter we discus modern approaches to assessing the regional inflation heterogeneity, which is critical for monetary policy decisions and reducing the economic regional differentiation. In the last chapter, we measure the effects of the communication policy of state authorities, in particular, verbal interventions by the Government of the Russian Federation, the Administration of the President of the Russian Federation and the Bank of Russia on inflation expectations of financial market participants.

In general, this thesis analyzes the most relevant modern aspects of macroeconomic policy, which are insufficiently studied in the domestic academic literature and first tested for Russian data in this dissertation research, which can significantly improve the current macroeconomic policy in Russia.

The aim and objectives of the research

The aim of this study is to test the applicability of modern approaches to macroeconomic policy in Russia, such as the nowcasting of economic activity, assessing the impact of regional heterogeneity and measuring the effect of communication policy on key macroeconomic

indicators. The object of the study is macroeconomic policy in Russia, and the subject of the study is the applicability of modern approaches to macroeconomic policy in Russia.

The following hypotheses are tested in the dissertation research:

1) The proposed new approach to nowcasting, including the use of several time series models with different indicators and frequencies within the method of forecast combination, significantly improves the estimates of the current economic situation;

2) There are structural factors that significantly deviate the level of regional inflation from the Russian average, and this can significantly affect the macroeconomic policy implementation;

3) Verbal interventions of monetary and fiscal authorities in Russia significantly affect the dynamics of inflation expectations of financial market participants, which confirms the effectiveness of the communication policy.

In order to achieve the goal, the following objectives were set:

1) To analyze the existing academic literature about methods of nowcasting current economic activity, regional economic effects and the implementation of communication policy;

2) To develop nowcast models of Russia's GDP;

3) To choose a best model combination in terms of the accuracy of pseudo-sample GDP forecasts;

4) To propose a methodology for assessing the structural factors of regional inflation in Russia;

5) Based on the chosen methodology, to systematize the main factors of regional inflation heterogeneity in Russia;

6) To develop an approach for assessing the effectiveness of the communication policy on the inflation expectations in the Russian financial markets;

7) To compare the effects of verbal interventions by individuals and by various groups on inflation expectations;

8) To draw a conclusion about the applicability of modern approaches of macroeconomic policy in Russia.

The choice of methodology is determined by the tasks and the existing academic literature and is presented in more detail below.

Nowcasting and assessment of the current economic situation

This chapter is an article published in 2021 in the journal "International economics" (Q1 Scopus) under the title "Nowcasting Russian GDP using forecast combination approach"[1]. The

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[1] Zhemkov M. Nowcasting Russian GDP using forecast combination approach //International Economics. – 2021. – T. 168. – p. 10-24.

issue raised in this article is related to the lags in the statistics release on certain macroeconomic indicators and their relatively low frequency, which is why economists have to estimate not only current and future economic activity, but also the recent past. In academic literature, this process is called nowcasting.

A major challenge in nowcasting is the selection of the best model due to the huge range of various forecast techniques. The use of bridge equations is one of the most popular methods implemented by many central banks. The key idea of these equations is to bridge a target indicator with one or several key variables released without significant time lags, with the frequencies of these predictors converted into a single one. According to the majority of studies, such models often produce more accurate forecasts than simple ones (for instance, Baffigi, Golinelli, Parigi , 2004). However, the use of bridge equations involves a number of challenges. Firstly, analysts should have forecasts for all high-frequency exogenous indicators. These forecasts may rely on both simple (autoregressive, naive, etc.) and complex models, but in any case, this may increase forecast error due to the inaccurate prediction of exogenous indicators. Secondly, it is difficult to justify the choice of several important predictors for forecasting and economists often use the 'bridging with factors' approach (bridging with the common factors extracted from a dataset). The use of these factor models is currently a standard practice in most central banks and international organizations (Bernanke, Boivin, Eliasz, 2005; Giannone, Reichlin, Small, 2008; Schumacher, Breitung, 2006; Marcellino, Schumacher, 2010).

In practice, the use of factor models may involve certain challenges. Firstly, the selection of the optimal number of extracted factors remains a matter of dispute. Another restriction is that models should include indicators with the same frequency. However, this requirement may not always be met in practice. In particular, GDP is usually available at a lower frequency (generally, quarterly) than real economy indicators used for bridging (typically, monthly). For this reason, when higher-frequency predictors are included in models, analysts should aggregate them into a lower frequency, assuming a potential loss of information. This aggregation may be avoided by using a special type of mixed-frequency (MF) or mixed data sampling (MIDAS) models. Models of this class have been applied increasingly more often in the academic literature (e.g. by Clements and Galvao, 2008; Marcellino and Schumacher, 2010; Kuzin, Marcellino, and Schumacher, 2011). Thus, Clements and Galvao, 2008 discuss whether the mixed-frequency data may help improve the quality of economic growth forecasts.

Short-term forecasting of GDP growth is a popular research topic in Russia as well. There are currently several studies suggesting the use of factor models to estimate GDP growth in Russia

(Porshakov, Ponomarenko, and Sinyakov, 2016; Achkasov, 2016). The Russian academic community also employs mixed-frequency models (Mikosch and Solanko, 2019).

When analysts use different models with various sets of indicators, a next question may arise: which model is optimal for nowcasting in selected period and in a particular country. It is rather difficult to rank most of the models by forecasting quality, because in practice they sometimes have significantly varying results for different countries and samples. As long as it is hard to choose an optimal model, the focus of academic research in recent years has shifted towards combining multiple models and forecasts. Currently forecast combination method is a well-developed approach in the academic literature and can be applied to the majority of macroeconomic indicators (Timmermann, 2006; Kuzin, Marcellino, Schumacher, 2011; Pinkwart, 2018; Koop, Korobilis, 2012). As far as we know, forecast combination using mixed-frequency factor models has not been described in the Russian academic literature, which makes our research especially relevant.

Our method significantly expands the existing Russian academic literature and embraces most advanced nowcasting techniques. It is worth emphasizing that we use in our models only the demand-side components of GDP. This is primarily associated with the availability of time series (the supply-side components of GDP have a smaller sample, because the OKVED system (the Russian Classification of Economic Activities) was changed and certain series are incomparable). We get a forecast of every component of GDP by expenditure from the forecast combination of three main groups: models based on scenario indicators, mixed-frequency models and additional models. The indicators of the first group are used to make a scenario-based forecast enabling the Bank of Russia to make monetary policy decisions, and their usage in our model makes the GDP forecast consistent with the forecasts of other main macroeconomic indicators used by the Bank of Russia (inflation, the balance of payments, monetary conditions, etc.). We use oil prices, the real exchange rate, the growth rate of the global economy, and short- and long-term loan rates as the main scenario indicators in first group of models. The second group includes models with common unobservable factors extracted from high-frequency indicators. We use the MIDAS technique to include indicators with different frequencies. This technique offers a balance: on the one hand, high-frequency indicators are estimated with various weights in a model; on the other hand, mixed data sampling makes it possible to estimate a moderate number of unknown parameters. The last third group consists of simple models without exogenous indicators (autoregressive, random walk, and unobserved trend models). We suppose that such processes may sometimes give the best description of the movements of GDP by expenditure components.

In order to verify the quality of our technique, we conduct a pseudo-real time accuracy estimation of the out-of-sample forecasts from our approach and several benchmark models with a rolling estimation window and for various forecast horizons. We select the most widespread benchmark models for the short-term prediction of GDP used in the academic literature: a dynamic factor model (DFM), a factor-augmented vector autoregressive (FAVAR) approach, dynamic model averaging/switching (DMA/DMS) and several standard simple models (ARMA, RW).

Our approach yields the best accuracy of out-of-sample GDP forecasts in Russia for the period from 2011 to 2020 in comparison with the benchmark models, but only over a short-term horizon. An important result is that our technique does not generate a systematic forecast error, which may confirm an adequate account of structural shifts in the economy and interdependencies between indicators. The findings of this research may be useful for the development of macroeconomic policy in Russia

Regional effects of heterogeneity and structural inflation rates in Russian regions

This chapter is an article published in 2019 in the journal "Voprosy Ekonomiki" (Q2 Scopus) under the title "Regional effects of inflation targeting in Russia: Factors of heterogeneity and structural inflation rates"[2]. In this article we discus an approach to assessing the regional heterogeneity of inflation in Russia. Inflation targeting in Russia implies maintaining stable low inflation at a level of 4% throughout the country. However, inflation in Russia in terms of regional disaggregation is a weighted average: there will always be regions whose price growth rates are lower or higher than the national one. With different regional inflation, real rates will also differ, and hence the impact of monetary policy. For regions with persistently high inflation, the monetary policy can be relatively loose, and for regions with low inflation, relatively tight. This will affect the dynamics of economic activity - accelerate it in regions with high inflation and slow it down in regions with low inflation. Therefore, this research is largely associated with an analysis of the regional heterogeneity and the convergence of main macroeconomic indicators, since a high level of heterogeneity can lead to opposite results of macroeconomic policy and worsen its effectiveness. It should be noted that the relevance of these studies historically remains at a high level: in the late 1990s regional effects were studied in the United States (Parsley, Wei 1996; Carlino, DeFina, 1998); after the adoption of the euro and the expansion of the European Union, the focus of research switched to European countries (Honohan, Lane 2003; Duarte, 2003; Weber,

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[2] Zhemkov M.I. Regional effects of inflation targeting in Russia: Factors of heterogeneity and structural inflation rates. Voprosy Ekonomiki. Vol 9, pp 70-89. – 2019.

Beck, 2005; Hofmann, Remsperger, 2005; Mihaljek, Klau, 2004). After that economists began to study some developing countries (Winkelried and Gutierrez, 2015; Marques et al, 2014). At the same time, the study of regional heterogeneity may give contradictory results even on identical samples. For example, in (Duarte, 2003; Weber, Beck, 2005; Rogers, 2007) price convergence across European countries was revealed, and in other studies (Cecchetti et al., 2002; Hofmann and Remsperger, 2005) it was not found. As for Russian economic research, many studies are also devoted to the analysis of price dynamics and their convergence (Glushchenko, 2010; Perevyshin, Egorov, 2016; Glushchenko, Karandashova, 2017; Perevyshin et al., 2017; Deryugina et al., 2018). Nevertheless, analysis of regional structural or long-term inflation levels are not presented in the Russian academic literature. This chapter fills this gap.

The methodology for analyzing the regional inflation heterogeneity in Russia can be divided into two parts. In the first part, we examine historical data on the distribution of inflation, the degree of divergence in price growth rates in regions, and the dependence on the choice of weights for individual goods and services by the region. In the second part, we identify the factors of regional heterogeneity of inflation and calculate a "structural" inflation for individual macroregions based on chosen econometric models. The econometric approach in the study partially based on the concept of Balassa-Samuelson (Balassa, 1964; Samuelson, 1964), which develops earlier studies based on the law of one price. According to this concept, deviations in regional inflation depend on different productivity in the tradable and non-tradable sectors, as well as on exchange rate dynamics. In addition to these indicators, we added other variables to the model that may affect the heterogeneity of regional inflation in Russia: real income, price expectations and stocks of products at the end of the reporting period. The resulting model is a version of the panel error correction model and can be used to identify factors of deviation for both regional inflation and the price level. To evaluate non-stationary panels with heterogeneous parameters, two approaches are used in the academic literature: mean-group (MG) and pooled mean-group (PMG). The MG method is based on estimating N panel time series and averaging the coefficients, while PMG combines the averaging and estimation within the group. In our study, we use the PMG method as the most flexible method for assessing heterogeneous panels.

Our estimates confirm the presence of regional factors of inflation deviations from the all-Russian indicator, such as the difference in productivity growth of the tradable and non-tradable sectors (Balassa–Samuelson effect), effective exchange rates, real incomes and product stocks. Using the estimated model for the period from January 2015 to July 2018, we calculated structural inflation rates by macroregions and concluded in which regions the price growth rates may be higher (Central and North-Western), and lower (Volga, Urals, Siberian and Far East) than the

national ones. The results of this research can be used for the development of monetary and communication policies

Verbal interventions as a factor of inflation expectations in Russia

The last part of the dissertation is based on two articles: the first one was published in 2017 in the journal "Voprosy Ekonomiki" (Q2 Scopus) under the title "Measuring inflation expectations in Russia using stock market data"[3], and the second was published in 2019 in the "Journal of the New Economic association" (Q3 Scopus) titled "Verbal Interventions as a Factor of Inflation Expectations in Russia"[4]. In this Chapter, we measure the effectiveness of the communication policy, in particular, the impact of verbal interventions of the Government of the Russian Federation, the Administration of the President of the Russian Federation and the Bank of Russia on inflation expectations for the first time on Russian data. The implementation of macroeconomic policy involves using communication as one of the most important tools. By increasing transparency, the central bank seeks to reduce inflation expectations and keep them at a low level, increase the credibility and predictability of policy. However, the question of the effectiveness of the communication policy is still open. A lot of foreign academic studies are devoted to the assessment of these effects, but the results are quite contradictory: some researchers find the impact of verbal interventions on expectations, other studies claim that there is no effect of verbal interventions, or claim that this effect depends on the time period (Ulrich, 2008; Scharnagl, Stapf, 2015; Jansen, Haan, 2007; Beechey, Johannsen, Levin, 2011). Despite the fact that the impact of communication policy on inflation expectations in Russia has not been previously studied, the effectiveness of communication policy in Russia is increasingly becoming the subject of study. Thus, in the study (Kuznetsova, Ulyanova, 2016), the authors find a significant impact of verbal interventions of the Bank of Russia on the MICEX index. The same authors (Kuznetsova, Ulyanova, 2018) show that the statements of representatives of both monetary and fiscal authorities could significantly affect the exchange rate of the ruble. The next study (Merzlyakov, Khabibullin, 2017) is devoted to the impact of press releases after meetings of the Board of Directors of the Bank of Russia on the interbank rate: using an event analysis, the authors confirmed the presence of this effect. In our study, we contribute to the academic literature on communication policy in Russia by examining the effects of verbal interventions on inflation

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[3] Zhemkov M. et al. Measuring inflation expectations in Russia using stock market data //VOPROSY ECONOMIKI. – 2017. – T. 10.
[4] Zhemkov M. et al. Verbal interventions as a factor of inflation expectations in Russia //Journal of the New Economic Association. – 2019. – T. 42. – №. 2. – p. 49-69.

expectations. Due to the limited number of articles, our research makes a significant contribution to the literature about the effectiveness of verbal interventions.

The methodology presented in this Chapter can be divided into two blocks: the assessment of high-frequency inflation expectations and the analysis of the effectiveness of verbal interventions on them. The assessment of inflation expectations is based on the Fisher equation, which describes the dependence between nominal interest rate, real interest rate and the level of inflation expectations. However, in practice, investors cannot observe the exact value of risk-free rates in the economy, but only nominal and real bond yields. The difference between the yields of nominal and inflation-indexed government bonds in the academic literature is called the breakeven inflation rate (BEI). BEI is an indicator of inflation expectations; however, this indicator includes an inflation risk and a liquidity risk premium. The inflation risk premium refers for possible unexpected changes in inflation, which is estimated based on a satellite model and generally depends on the volatility of inflation in a country. The liquidity risk premium arises from the inflation-indexed bonds: such bonds have less liquidity than nominal one. The market for inflation-indexed securities began to develop much later than the market for non-indexed securities (for example, in Russia only since mid-2015). Therefore, holders of inflation-indexed government bonds require an additional premium for the difference in liquidity. In our study, we use the "on-off-the-run" indicator as a liquidity risk premium.

The second part is devoted to the analysis of verbal interventions. By verbal interventions, we mean signals from the monetary and fiscal authorities about the macroeconomic policy and indicators. Despite the fact that the formation of inflation expectations is the task of the central bank, we also include representatives of the fiscal authorities in our analysis, suspecting that their statements may also influence the dynamics of inflation expectations in Russia, even if they are more political than economic in nature. Verbal interventions in our analysis are binary variables with a value of one if the official spoke on a certain topic and a value of zero if the official did not speak on this topic. We aggregate verbal interventions by individual groups (by person, by source, by content, etc.) and assess the impact of individual groups on inflation expectations. High-frequency financial market data very often contain the effect of conditional heteroscedasticity. Therefore, to analyze the impact of verbal interventions on inflation expectations in Russia, we evaluate the GARCH model. In addition to the standard structure, in this model we also describe the main characteristics of inflation expectations in Russia — the presence of an adaptive component of inflation expectations, as well as the contribution of imported inflation.

Our study shows that the hypothesis about the impact of verbal interventions on the dynamics of inflation expectations is not rejected for the period from July 2015 to December 2016.

The key verbal interventions are statements about reducing the state budget deficit for the fiscal authorities and statements about a future decrease in inflation for the monetary authorities. We assess the impact of both positive and negative news, but significant results are obtained only for positive. In our opinion, this is largely due to the rather small number of negative verbal interventions, and the extension of the study period may help to solve this problem in future. The results can be used to develop the information policy tools in future.

Contribution

This dissertation research makes a significant contribution to the academic literature about modern approaches of macroeconomic policy in Russia. New approaches to nowcasting GDP, assessment of structural levels of inflation in the regions and analysis of the effectiveness of communication policy were tested for the first time on Russian data. Thus, in Chapter 1, we assess the accuracy of the forecast combination of Russia's GDP. A key feature was the usage of both factor and scenario indicators in the models, which is necessary for macroeconomic policy. The total number of models is about 500, which means that we use a large set of data. The presented approach significantly develops the existing academic literature and combines the most modern nowcast practices.

In Chapter 2, we estimate the structural levels of inflation by regions for the first time in the domestic academic literature. We combine several approaches: a statistical analysis of the regional inflation, identification of heterogeneity factors based on the developed model, and calculation of structural levels of inflation by regions. It was confirmed that the structural factors of the regions, the relative change in effective exchange rates, the dynamics of income and stocks of products could determine deviations of inflation from the national average. These results can be useful in the development and implementation of macroeconomic policy in Russia.

Finally, in Chapter 3 we analyze the impact of communication policy on inflation expectations in Russia. This study makes a significant contribution to the academic literature about communication policy, given the small number of academic papers assessing the communication policy of individuals, especially in developing countries and in Russia in particular. It should be clarified that even measuring inflation expectations is a rather complicated process. Therefore, we apply a new approach to measuring inflation expectations using government bond yields. After that, we built a model of conditional heteroscedasticity based on the calculated indicator of inflation expectations and the collected database of verbal interventions. One of the main features of our approach is the analysis of verbal interventions of individual representatives of monetary

and fiscal authorities. In addition, we test several alternative models to analyze the impact of the regularity and source of interventions on the dynamics of inflation expectations.

Main findings

The goal of the dissertation was achieved, and the tasks were completed. We confirmed the applicability of modern approaches for macroeconomic policy in Russia and showed that these approaches can improve the design of macroeconomic policy.

We received the following results:

1. The proposed new approach to assessing the current economic situation (nowcasting) has the best accuracy of out-of-sample forecasts compared to a large set of alternative benchmark models;
2. Structural factors in the regions, the relative change in effective exchange rates, the dynamics of income and stocks of products can determine the deviations of regional inflation from the national average. Structural inflation was also calculated for the federal districts and it was determined in which regions the price growth rates can be consistently higher than the national ones, and in which - lower;
3. The hypothesis about the impact of verbal interventions of Russian monetary and fiscal authorities on the dynamics of inflation expectations is not rejected. The key verbal interventions are statements about reducing the state budget deficit for the fiscal authorities and statements about a future decrease in inflation for the monetary authorities.

Approbation of dissertation results

The results were published in leading domestic and foreign peer-reviewed academic journals:

- Zhemkov M. Assessment of Monthly GDP Growth Using Temporal Disaggregation Methods // Russian Journal of Money and Finance. – 2022. – Vol. 81 (2). – pp. 79-104.
- Zhemkov M. Nowcasting Russian GDP using forecast combination approach // International Economics. – 2021. – Vol. 168. – pp. 10-24.
- Zhemkov M. Regional effects of inflation targeting in Russia: Factors of heterogeneity and structural inflation rates //Voprosy Ekonomiki. – 2019. – №. 9. – pp. 70-89.
- Zhemkov M., Kuznetsova O. Verbal interventions as a factor of inflation expectations in Russia //Journal of the New Economic Association. – 2019. – Vol. 42. – №. 2. – pp. 49-69.

- Zhemkov M., Kuznetsova O. Measuring inflation expectations in Russia using stock market data // Voprosy Ekonomiki. – 2017. – Vol. 10.
- Zhemkov M. Nowcasting Russian GDP using forecast combination approach // Bank of Russia working paper series. – 2021.
- Zhemkov M., Kuznetsova O. Measuring inflation expectations in Russia using stock market data // HSE Working paper series WP12. – 2017

The main findings of the study were presented at scientific seminars and international conferences:

- XXIII Yasin (April) International Academic Conference on Economic and Social Development. Topic: Assessment of monthly GDP growth using temporal disaggregation methods. Moscow, 05.04.2022
- XXII April International Academic Conference on Economic and Social Development. Topic: Nowcasting Russian GDP using forecast combination approach. Moscow, 15.04.2021
- XXI April International Academic Conference on Economic and Social Development. Topic: Regional effects of inflation targeting in Russia: Factors of heterogeneity and structural inflation rates. Moscow, 18.05.2020
- II scientific conference of the North-Western Main Branch of the Bank of Russia. Topic: Regional effects of inflation targeting in Russia: Factors of heterogeneity and structural inflation rates. Saint Petersburg, 28.11.2019
- XIX April International Academic Conference on Economic and Social Development. Topic: Verbal interventions as a factor of inflation expectations in Russia. Moscow, 12.04.2018.
- Third Russian Economic Congress. Topic: The impact of verbal interventions from the Central Bank on inflation expectations: the case of Brazil. Moscow, 19.12.2016
- Scientific seminar of the HSE Department of Theoretical Economics. Topic: Nowcasting Russian GDP using forecast combination approach. Moscow, 08.12.2020
- Research seminars at the HSE Postgraduate School of Economics

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