METHODOLOGY OF ECONOMETRIC EVALUATION OF THE EFFECTIVENESS OF MORTGAGE LENDING SUPPORT PROGRAMS

Abstract: This article presents the developed model for assessing the effectiveness of mortgage lending support programs in Russia based on the use of the vector autoregression model using time series defragmentation.

Keywords: mortgage lending, methodology, lending, regression, analysis.

In order to evaluate the effectiveness of state programs to support mortgage lending we use econometric methods of research, in particular, we will test the hypothesis about the effectiveness of the use of state programs to support the mortgage lending market.
To carry out the research, first of all, it is necessary to determine the hypothesis of the study, to give its economic justification and determine the sample of the variables.

A hypothesis to be further verified, will be the thesis according to which the active support of the state mortgage lending allows to increase the availability of mortgage loans, reflected in the increase in the volume of mortgage loans and decrease (or a permanent state) in the level of overdue debt on these loans at the macroeconomic level. The methodology is presented on the example of Russia.

The economic justification of this hypothesis is related to the study of the elasticity (sensitivity) of the bank mortgage lending market to shocks in determined variables. As is known, the mortgage market, as a part of the national credit market, is subject to ceteris paribus all basic laws of of imperfect credit market dynamics. Accordingly, the demand and supply curves of mortgage loans are characterized by a varying degree of price and non-price elasticity. The introduction of support programs at the macroeconomic level should then lead to a decrease in the sensitivity (elasticity) of the supply of credit resources to the stated variables.

In the case of our study, the main variables of the sample should include:

- the volume of issued mortgage loans (the resulting variable);
- weighted average growth rate of mortgage loans;
- rate of inflation;
- real disposable income of the households;
- the refinancing rate (the key rate);
- the average level of prices for residential real estate in the country.

Data on sampled variables are obtained from official sources of the Bank of Russia and FSNS. Base period - 1 quarter. Sampling period: first quarter 2006 – second quarter 2017.

Since the study is related to determining the effectiveness of the implementation of the state support program, it is necessary to fragment the time series and determine the beginning of the time period to assess the implementation
of state support programs. Taking into account the issues discussed earlier, we will establish the first quarter of 2015 as a threshold point.

Then, to determine the impact of support programs and assess their effectiveness, we propose to build two regression models for two periods ("before reform" and "during reform"). If our assumptions are correct and the policy is effective, then: 1) the elasticity of the supply of mortgage loans should decrease and become less sensitive to changes in the sampled variables due to the support and expansion of the budget constraint of households, 2) the volume and quality of mortgage loans should increase in comparison with the pre-reform period.

During the regression analysis, it is possible to obtain unreliable results. Since time series analysis is often associated with non-stationary data, heteroscedasticity, and serial correlation, we will begin the study with statistical filtering to display stationary values for further research. [1-3]

To obtain the smoothed data series we propose to obtain filtered time-series using the Hodrick-Prescott filter, which calculates a smoothed time series $S_t$ of the time series $Y_t$ by minimizing the dispersion of the elements of the smoothed series around the initial time series. The resulting time series should consist of a set of elements that minimizes the following expression:

$$\sum_{t=1}^{T}(y_t - s_t)^2 + \mu \sum_{t=2}^{T-1}((s_{t+1} - s_t) - (s_t - s_{t-1}))^2 \rightarrow \text{min} \quad (1)$$

Further, to eliminate the nonstationarity of the data, it’s necessary to test all of the sampled data using the augmented Dickey-Fuller test for the presence of unit root. The null hypothesis (H0) in the application of this test is the presence of a single root, and the alternative hypothesis H1-the stationarity of the data. The Dickey-Fuller test is represented by the following formula:

$$\partial y_t = \delta + \beta_t + \pi y_t + \sum_{j=1}^{p} c_j \partial y_{t-j} + \epsilon_t \quad (2)$$

where: $\delta$ is the constant; $t$ is the trend value; $y_t$ is the investigated time series variable, $\epsilon_t$ is an error or "white noise".
P-probability means absence of a unit root (stationarity of time series). However, the null hypothesis of a unit root cannot be rejected if P-value is more than 5% of the critical value.

Therefore, to determine the possibility of further construction of models, we might need to differentiate the variables and check for stationarity of the time series differentiated by the first order.

The null hypothesis of a unit root can be rejected if P-value is less than the critical value of 5%. This proves the stationary nature of the variables and allows for further regression analysis.

To ensure that one can build the model further, we must also check the time series for partial correlation and autocorrelation. If the model reveal the presence of autocorrelation, as well as the presence of partial correlation in a number of periods, in case of detecting the presence of autocorrelation and partial correlation, the model is deemed inapplicable for regression analysis.

For a more accurate determination of the applicability of the model, one will have to check for autocorrelation and partial correlation in first-order differentiated time series. On the basis of calculation, it could be revealed that the values of partial correlation and autocorrelation of time series differentiated by the first order are close to zero, and P-value is more than 5%. Based on this, we can assume the hypothesis that there is no partial and autocorrelation of time series. [4,5]

After one resolves the issues of nonstationarity of the data and detecting presence of no autocorrelation and partial correlation of time series, one should identify the number of time lags, reflecting the advance or the lag of some of the indicators relative to the other, using the information criteria of Akaike and Schwartz. According to the results of the calculation, it can be seen that if the information criterion of Akaike and the final prediction error show that the model has the best qualities when choosing the optimal time lag in three quarters, then one could built a simple vector autoregression model (VAR) of the following type to test the extended hypothesis:
Using the vector autoregression model applies both the calculations from the values of individual variables and from the previous values of individual variables. The model of vector autoregression is used only in the absence of serial correlation and heteroscedasticity of residues and under the condition of stability.

References:


\[ Y_t = a_0 + a_1 Y_{t-1} + \ldots + a_p Y_{t-p} + b_1 X_{t-1} + \ldots + b_p X_{t-p} + c_1 Z_{t-1} + \ldots + c_p Z_{t-p} + u_t \] (3)