

Influence of Regional Factors on the Risk Level of Mortgage Pools

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Abstract—The article is devoted to determination of influence of regional factors on probability of default of borrowers of mortgage loans included in the structure of mortgage coverage. The established relationship demonstrates the necessity to take into account regional factors both in the process of granting mortgage loans and their further inclusion in the pool of mortgage coverage. Ignoring these influence can lead to increase in risks of mortgage loan pools, and, therefore, of issued bonds.

Keywords—Risk, Securitization, Mortgage Loans, Regional Factor, Default.

I. INTRODUCTION

Traditionally, the housing credit sector is one of the largest segments of the debt market of national economies. The size, quantity and characteristics of mortgage loans make them the most frequently securitized asset. Record-breaking volumes of provided mortgage loans, continuing support programs for this type of lending in the Russian Federation and limiting banks' access to foreign financial markets mean that securitization will become an increasingly important instrument of mortgage financing in the future [1]. At the same time, there may be a situation when in pursuit of profit banks will lower the requirements for borrowers, and then include such loans in the structure of mortgage coverage [2]. Thus, the structure of mortgage coverage directly determines the risk level of mortgage-backed bonds and the growing relevance of the study of risk factors. The study was based on statistical and econometric methods of studying the economic environment. Due to the method of graphic presentation and the comparative method it was possible to demonstrate interrelationship between selected economic variables.

II. RESULTS AND DISCUSSION

Within the framework of the study, in the process of determining the current state of mortgage coverage, information on mortgage coverage of non-convertible documentary interest – bearing owner bonds with mandatory deposit of series 2-IP of two classes (hereinafter—the issue) was used. This issue was registered on September 1, 2011, includes 1599 loans accumulated during the period from 2010 to 2011. The selected register of mortgage coverage contains impersonal data on the loan (the location of the collateral, the loan parameters, information on debt repayment and overdue payments). Based on the information about overdue payments, all loans can be ranked according to the level of credit risk from 0 – no arrears to 1 – full default. The level of the borrower's credit risk is influenced

by all the above variables to different extents. However, the analysis of the influence of regional factors on the probability of default of the borrower is of the greatest interest [3]. This criterion is multifactorial and includes several macroeconomic variables that influence the level of credit risk of the borrower. These factors include: the unemployment rate; real incomes of the population; the price index in the real estate market; purchasing capacity of the population.

For a start, all the loans, divided by the level of default, were structured according to the federal districts, so that the following results were obtained:

TABLE I. THE DISTRIBUTION OF DEFAULTED LOANS ACCORDING TO THE FEDERAL DISTRICTS

№	Federal district	Number of loans	Level of defaulted loans, in %
1.	Central Federal District	303	7,95
2.	North-Western Federal District	250	6,16
3.	Southern Federal District	106	8,87
4.	North Caucasian Federal District	16	8,13
5.	Volga Federal District	207	5,27
6.	Ural Federal District	278	7,99
7.	Siberian Federal District	387	7,29
8.	Far Eastern Federal District	52	4,42

As can be seen from Table 1, the highest level of defaulted loans is in the Southern Federal District, it is followed by the North Caucasus. The lowest level was demonstrated by the Far Eastern Federal District. More detailed understanding of the structure of loans in the Southern Federal District is possible with the help of statistical characteristics of issued loans: standard deviation, maximum and minimum values for the sample (Table 2).

As can be seen from Table 2, provided mortgage loans have the same interest rate, the average loan term is 16 years, and the average loan amount is 1.5 million rubles. The area of the object, the number of years left before repayment of the loan and the remaining amount of the principal debt demonstrate the largest spread in values.

TABLE II. STATISTICAL CHARACTERISTICS OF THE LOANS INCLUDED IN THE POOL

No	Amount of loan, in m.	Amount of interest rate	Object area	Market value of collateral, in m.	Years before repayment of obligations	Full term of loan	Amount of payment, in thou.	Discharged share of principal debt	Discharged share of interest debt	Loan/ Collateral
Mean	1,422	0,11	59,1	2,201	9,61	16,34	12,92	0,43	0,64	0,67
St. Dev.	0,552	0,00	34,9	0,899	4,89	4,95	6,52	0,24	0,17	0,16
Max	3,000	0,11	351	4,742	22,96	30,17	28,34	0,98	1,00	0,80
Min	0,400	0,11	24,3	1,052	0,63	7,15	0,25	0,05	0,31	0,17
Variance	306000	0,00	1216	809000	23,96	24,47	42507	0,06	0,03	0,03

At the beginning of 2018 the Southern Federal District includes 8 regions: the Republic of Adygea, the Astrakhan region, the Volgograd region, the Republic of Kalmykia, the Krasnodar territory, the Rostov region, the Republic of Crimea and the city of Sevastopol. However, the last two units were included in the district only in 2014 and, consequently, they are not included in the analyzed mortgage pool. As in any other federal district, the economic indicators of the regions vary greatly, and therefore, it is necessary to consider the indicators of each region separately.

When mortgage servicing occurs, the borrower can resort to the sale of housing to cover the mortgage debt, and the creditor, after collecting the subject of collateral, will tend to return the money by selling the collateral. Also general decline in real estate prices was noticeable in the third quarter of 2017. This is a negative trend not only for the borrower, but also for the originator, since in case of decrease in the cost of housing, the borrower or the creditor will not be able to refund the full amount of the loan with the aid of money made from the foreclosure sale [5].

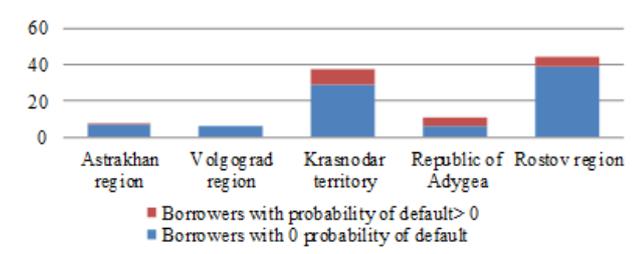


Fig. 1. Regional distribution of borrowers with different probabilities of default in the Southern Federal District.

The greatest attention is drawn to the data of the Republic of Adygea, where the half of the selected loans for the pool have overdue payments, and two borrowers are already recognized defaulted. It should also be noted that for the originator loans from the Krasnodar territory and Rostov region turned out to be more attractive [4]. This can be explained by the growth of mortgage lending in these regions and by overall favorable economic situation there. To confirm this hypothesis, we will compare the main macroeconomic indicators of the regions.

The only region, where the wages decreased over the past year according to Rosstat (Russian Federal State Statistics Service) was the Republic of Adygea. The largest wage growth was registered in the Rostov region and the Republic of Kalmykia. Unexpectedly, the Republic of Kalmykia took the first place in terms of open unemployment. The Republic of Adygea and the Astrakhan region are at the second place that is more expected.

One more important macroeconomic indicator is the cost of housing in the region, because, if any difficulties with mort-

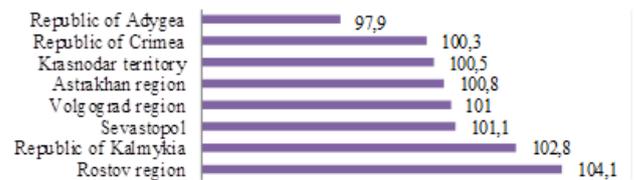


Fig. 2. Real average monthly salary of one employee in the regions of the Russian Federation located on the territory of the Southern Federal District in January–August 2017 (as a percentage of January–August 2016).

TABLE III. AVERAGE PRICES OF ONE SQUARE METER OF TOTAL AREA OF STANDARD APARTMENTS AT THE END OF THE 3RD QUARTER OF 2017 (ACCORDING TO RECENT DATA OF ROSSTAT)

Name of the region	RUB	in % by the end of the previous quarter
Southern Federal District	41560	99,8
Republic of Adygea	32836	97,3
Republic of Kalmykia	26501	98,6
Republic of Crimea	47827	98,9
Krasnodar territory	41762	99,2
Astrakhan region	36980	99,5
Volgograd region	36190	100,5
Rostov region	43332	101,4
City of Sevastopol	-	100,0

Based on the presented data, it is possible to identify general trends in the development of regions, but to confirm the relationship of these variables with the level of defaulted loans in the region, it is necessary to check the significance of the difference between the means in the selected groups of values by comparing the variances of these groups. For such kind of a check, the separate ability test - ANOVA-test (abbr. ANalysis Of Variance) is used. Unlike the t-test, ANOVA-test makes it possible to compare the mean values of three or more groups, and in our case, 5 groups, i.e. indicators of 5 regions of the

Southern Federal District. The testable hypothesis is that there is no difference between the groups. If the null hypothesis is true, the variance estimate associated with intra-group variability should be close to the inter-group variance estimate. And if it is false, then this variance estimate should significantly deviate. To use this test, we formed the mean values of financial indicators into groups of credit worthy and defaulted borrowers. The main purpose of the ANOVA test is to identify those financial variables for which mean values of two groups of borrowers are statistically different. Then among the variables with high separate ability there were identified and eliminated those for which there is insufficient or no uniform number of observations over a period of 2011-2017. The results of this test are given in Table 4.

The null hypothesis in the analysis of variance is the statement of the equality of mean values: $H_0 : \mu_1 = \mu_k$ (all are equal) (or $X_1 = x_2 = \dots = HC$)

The alternative hypothesis states that at least two mean values are not equal to each other. $H_1 : \mu_1 \neq \mu_k$ (at least two are not equal) (or $X_1 \neq X_k$)

The F – test consists of calculating the F – statistic and comparing it with the tabular value (by analogy with t-test).

Since the f-statistics (column "F") for the factor "Region" is greater than the critical level of F-distribution (column "F-critical"), this factor has an impact on the analyzed parameter (borrower default). This rejects the null hypothesis about equality of mean values and, consequently, about lack of dependence between location of collateralized property and probability of the borrower default.

TABLE IV. RESULTS OF THE ANOVA-TEST №1

Source of variation	df	MS	F	F critical
Rows	105	356000000000,0	2,832171	1,251548
Columns	11	5580000000000,0	443,6031	1,796926
Error	1155	126000000000,0		
Total	1271			

The next hypothesis is a null hypothesis about the equality of means of macroeconomic indicators of each region. If this hypothesis is true, it follows that the previously considered indicators of the region do not affect the number of default borrowers.

TABLE V. RESULTS OF THE ANOVA-TEST №2

Source of variation	df	MS	F	F critical
Rows	5	66665476,0	3,804669	2,71089
Columns	4	2270000000,0	129,6355	2,866081
Error	20	17522017,0		
Total	29			

As a result of the ANOVA test the null hypothesis is rejected, which confirms the dependence of such macroeconomic

indicators as the average monthly salary of one employee in the subjects of the Russian Federation, the level of open unemployment, putting into service total area of residential buildings per capita and the average prices of one square meter of the total area of standard apartments (in the primary and secondary markets) per number of defaulted borrowers in the region. The identified trends change one way or another every year. It is important to monitor the direction of these factors in risk management of mortgage-backed securities, both from the originator's point of view and from the point of view of investors in these securities. Organizing risk management of high quality should be based on steady monitoring of regional indicators of provided mortgage loans. Collecting pool of mortgage assets from several regions allows diversifying the risks of such securities, but only if to take into account the degree and direction of the impact of regional factors on general condition of the pool.

III. CONCLUSION

Thus, the study identified two groups of factors that influence the risk level of the pool of mortgage borrowers: factors characterizing the loan (loan amount; amount of interest rate; object area; market value of collateral; number of years left to discharge the obligation; full term of the loan; amount of payment; share of principal debt; proportion of active debt; index of correlation of loan amount and value of collateral) and regional factors (real average monthly earnings; unemployment rate; amount of the areas of commissioning residential buildings per capita; price of a square meter in the primary and secondary housing market). The revealed connections confirm the significant influence of both groups of factors on the risk level of mortgage loan pool. After a similar study of the mortgage loan pool of his interest, the investor will be able to correlate the current level of risk with the expected profitability and to complete his investment portfolio with necessary assets. On this basis, the originators of mortgage-backed securities should consider these factors in the diversification of the pool of loans. Ignoring these influences can lead to an increase in the risks of the pool of mortgage loans, and, therefore, of issued bonds.

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