FORECASTING ARUSSIAN CORPORATE BANKING BUSINESSON THE BASIS OF ECONOMIC AND MATHEMATICAL MODELING

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Abstract.Corporate lending in the banking activities is one of the most important places, since it gives banks the opportunity to receive the greatest return, provided a sound and rational credit policy, and is one of the ways of obtaining financial support from the legal entities.
The purpose of our work is to study and analyze the corporate lending sector to forecast the sales of credit banking products for corporate clients in the Russian Federation for the period until 2019. The object of our study is the activity of banks in lending to corporate clients. The subject of our study is the forecasting of credit relations of banks with corporate clients in the process of servicing their needs in the implementation of business development projects.
The article is devoted to the study of corporate credit portfolio of the banking system of the Russian Federation and to the forecasting based on the multiple correlation-regression analysis method of increasing the sales volume of credit banking products for corporate clients in the Russian Federation.

Key words: economy, corporate business, Russian banking sector, credit products, corporate clients.

1. INTRODUCTION

Corporate lending in the banking activities is one of the most important places, since it gives banks the opportunity to receive the greatest return, provided a sound and rational credit policy, and is one of the ways of obtaining financial support from the legal entities.

The volume of the joint credit portfolio of the Russian banking system reduced by 3 trillion roubles or 6.9% as of 2016, to 40.9 trillion roubles as of January 1, 2017.The aggregate corporate credit portfolio of the banking system decreased by 956 billion roubles or 2.9% in 2016 according to the banks reports under theRAS (*3 trillion roubles*, 2016). The volume of the credit portfolio to legal entities showed a decrease by 2.81% or 912 billion roubles according to one hundred "top" banks. It can be noted that 2016 was characterized by a high level of debt load, as well as by the relatively expensive price and non-priceterms of lending, but, in general, the dynamics of the large-sizedbusiness crediting versus small- and medium-sized business and retail lending can be described as a relatively stable in 2016.

The decrease in the volume of corporate loan portfolio was demonstrated by 66 credit institutions from the top 100 rating. In absolute terms, Sberbank of Russia became the leader in portfolio reduction, which reduced the volume of loans granted to the legal entities by 647.6 billion roubles. Of the top 100 banks, 34 credit institutions increased the volume of corporate loan portfolio. The most significant growth was shown by the portfolio of the National Clearing Center: plus 82.99% or 223 billion roubles. The corresponding indicator of Gazprombank increased by 3.5% or 108 billion roubles (*3 trillion roubles*, 2016).

The quality of loans to corporate borrowers practically stabilized in 2016. The share of overdue debt in the total amount of debts of the enterprises to the banks amounted to 7.1% in November 2016. This is slightly higher than at the beginning of the year - 6.8%. The share of overdue loans in large corporate clients amounted to 5.8% as of November 2016, reaching a maximum of 6.2% in 2016 (*Bank lending to corporate borrowers: stagnation continues*, .2017).

According to the Central Bank, further easing of monetary and credit conditions in 2017-2018, as well as a gradual recovery of incomes of economic agents and normalization of the debt load will determine the increase in demand for borrowed resources. The growth rate of lending will increase in 2017-2018, the regulator predicts (*The Central Bank of the Russian Federation raised the forecast for the real sectorlending to 5-8% from 3-6%*, 2016).

The relevance of the topic of this work is due to the need to increase the role of commercial banks in solving corporate customer development problems, hence, the real sector of the economy, as well as the lack of comprehensive studies of the commercial bank activities in the services market for corporate clients.

2. MATERIALS AND METHODS

The purpose of our work is to study and analyze the corporate lending sector to forecast the sales of credit banking products for corporate clients in the Russian Federation for the period until 2019. The object of study is the activity of banks in lending to corporate clients. The subject of study is the forecasting of credit relations of banks with corporate clients in the process of servicing their needs in the implementation of business development projects.

We used in our work the methods of comparative analysis, system approach, evaluation methods, the detailing, grouping and generalization methods, as well as the method of multiple correlation-regression analysis.

Let us consider the factors through which the banks can increase the volume of corporate portfolios. In this regard, we apply the methods of correlation-regression analysis with the determination of the most closely-influencing factors in this part of the study. As the main factors that influence the formation of the corporate lending portfolio, we choose:

– depreciationof the fixed assets of the Russian enterprises;

– number of Russian enterprises;

– inflation level;

– level of overdue debt of corporate lending.

3. RESULTS AND DISCUSSION

To determine the relationship between the volume of corporate portfolio of Russian banks and the market activity as a whole, we apply the economic-mathematical method of correlation-regression

analysis, where the volume of corporate lending to Russian banks will be an effective sign, and the factors determining the credit activity of the banks presented above will be the variable parameters.

The choice of the first two factors is due to the fact that they are indicators that characterize the market situation. Depreciation of fixed assets of Russian enterprises is the determining factor characterizing the dynamics of the domestic market of innovative development, which potentially induces the growth (decrease) in the demand for corporate loans, on the other hand, affects the ability of their timely repayment.

The correlation of inflation is obvious, since the level of inflation is regulated by the instruments and methods of monetary policy, one of the market indicators, which is commonly understood as an indirect method of regulating the inflation level in Russia.

The level of overdue corporate loans should also be taken into account when building a model, in order to determine the degree of its impact on the level of credit risk.

To find a more accurate connection tightness with the characteristics, it is necessary to increase the sample by factorial constituent elements. To construct the model, we took the data for the period of 2009-2016, which were reflected in Table 1.

Period	Volumes of crediting, million roubles, y	Number of organizations (legal entities), units, x1	Inflation, %, x2	Degree of depreciation of fixed assets in the Russian Federation, %, x3	The level of overdue debts on corporate loans, %, x4
2009	15759273	93707	8,8	45,3	3,8
2010	17966469	92007	8,78	47,1	3,6
2011	25436234	90745	6,1	47,9	2,9
2012	27531130	89868	6,58	47,7	3,0
2013	31582836	92242	6,45	48,2	2,7
2014	33241362	86471	11,36	49,4	3,4
2015	29995671	84222	12,91	47,7	5,6
2016	32395589	x	5,38	49,2	5,4

Table 1.Data for building the economic-mathematical model

To calculate the matrix of paired correlation coefficients, we can use the "Correlation" program of the "Data analysis" add-in menu of Excel. The matrix of paired coefficients shows correlation both between the effective indicator and each of the factor indicators, and between the factor indicators themselves. As a result of the "Correlation" program, a matrix of pair correlation coefficients is calculated.

Correlation matrix of the factor "Volume of corporate lending" with a selected set of independent factors is shown in Table 2.

	y	x1	x2	x3	x4
y	1				
x1	-0,663257257	1			
x2	0,189986725	-0,747774634	1		
x3	0,884781578	-0,589016022	0,13309235	1	
x4	-0,027051452	-0,632341337	0,848250078	-0,19597039	1

Table 2.Matrix of paired coefficients of factor correlation "Volume of corporate lending" with a selected set of independent factors

where: y – volume of corporate lending in roubles of the Russian Federation, million roubles;

x_1 – number of enterprises, units;

x_2– inflation, %;

– x_3 – depreciation of the fixed assets of the Russian enterprises, %;

– x_4 – level of overdue debt of corporate lending, %.

Based on the analysis of the matrix of paired correlation coefficients, the following conclusions can be drawn.

Small values of the correlation estimates between the remaining features indicate a relatively weak linear relationship between them. The following factors have the least dependence with the result factor y: x2 (0,19) - the inflation rate, and x4 (-0,03) - the level of overdue debt, as the closer the coefficient value to 1, the closer the connection is. And, conversely, the closer to 0, the smaller the connection is. Since the factors x2, x4 are of little significance, we exclude them from the model.

Then, using the "Regression" program of the "Data Analysis" Add-in menu in Microsoft Excel, we get the data and regression analysis coefficients. Conclusions of the analysisresults and calculations of regression statistics are presented in Table 3.

Multiple R	0,878655687
R-square	0,772035816
The normalized R-square	0,658053724
F	6,773308002
Significance F	0,051967669
Observations	7

y-intersection	246217979,8
x1	-2247,103811
x3	-5119833,81

Table 3.Regression analysis results

According to the table, the R-square value, also called a measure of certainty, characterizes the quality of regression line obtained. According to the analysisresults, the R-squarevalue is close to one and is 0.77, which means that the model constructed explains almost all the variability of the corresponding variables. Thus, the factors that make up the model explain the dependent variable by 77%.

Multiple R - coefficient of multiple correlation R - expresses the degree of dependence of independent variables (X) and the dependent variable (Y). Based on the calculation results, the multiple R is 0.88, that is, the relationship between the variables is very high. Analyzing the modelsignificance according to Fisher's F-criterion, we come to a conclusion based on the value of F = 6.77 (more than 1), that the model is significant at all significance levels as a whole.

The probability of p-values is greater than the significance level (6.77> 0.05), that is, the corresponding regression coefficients are statistically significant.

Let us create the regression equation from the presented analysis, which will have the following form:

$$y = 60005188,97+610,82x1+2120840,38x3 (1)$$

Equation 1 shows that an increase in the number of organizations by 1 percentage point leads to an increase in lending to the corporate sector by 610.82 million roubles. The growth of the level of overdue debt to corporate clients by 1 percentage point, leads to an increase in the result by 2120840.38 percentage points.

Further, by constructing the trend equation, we will find the predicted values of the factors: the number of organizations and the level of overdue debt to corporate clients.
The trend line is chosen taking into account the largest approximation coefficient ($R2 \sim 1$).
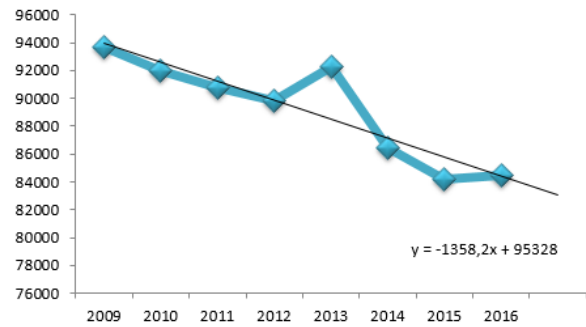

Figure 1.Linear trend of the forecast of the number of organizations

In accordance with the equation obtained, we obtain the following forecast values.

x1 2016 = -1358,2*8 + 95327 = 84461 (units)

x1 2017 = -1358,2*9 + 95327 = 83103 (units)

x1 2018 = -1358,2*10 + 95327 = 81745 (units)
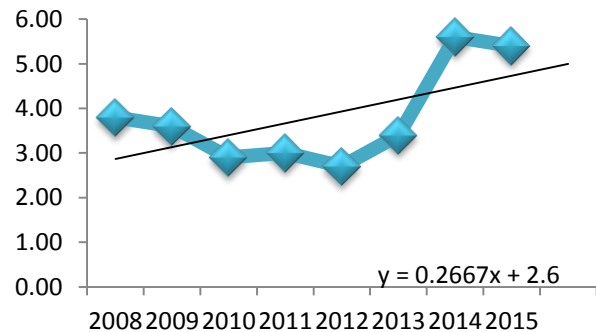
x1 2019 = -1358,2*9 + 95327 = 80387 (units)

Figure 2.Linear trend of the forecast of the level of overdue debt to corporate clients [compiled by the author]

In accordance with the equation obtained, we obtain the following forecast values.

x1 2017 = 0,2667*9 + 2,6 = 5 (%)

x1 2018 = 0,2667*10 + 2,6 = 5,3 (%)

x1 2019 = 0,2667*9 + 2,6 = 5,5 (%)

Substituting the data into the obtained trend equations, we will calculate the forecast values given

in Table 3.1.4.

Дата	Number of organizati ons, units	Level of corporate debt to corporate clients, %
2017	83103	5,0
2018	81745	5,3
2019	80387	5,5

Table 4.Forecast values of factors

Substituting the forecast data into the regression equation presented above, we obtain the following data on the lending volumes of the bank under study.

y_{2017}= 60005188,97+610,82*83103 + 2120840,38 *5= 33875757 (million roubles)

y_{2018} = 60005188,97+610,82 *81745 + 2120840,38 *5,3= 35562314(million roubles)

y_{2019} = 60005188,97+610,82 *80387 + 2120840,38 *5,5= 37248871 (million roubles)

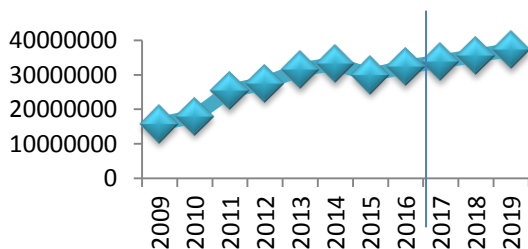We represent the corporate sector lending dynamics in Figure 3.

Figure 3.Projected values of the volume of corporate lending in the Russian Federation, million rubles.

Figure 3 shows that under the conditions prevailing in 2009-2016, the volume of the corporate loan portfolio of Russian banks will grow at a small pace.

4. CONCLUSIONS

Summing up this analysis, it can be concluded that the change in the index of the corporate credit portfolio volume of Russian banks depends to a varying degree on a large number of factors, on the market conditions and external factors, such as the number of registered enterprises, the degree of depreciation of their fixed assets, inflation, the level of overdue corporate debt.

As a result of the implementation of economic and mathematical modeling by the method of correlation-regression analysis, the growth of the corporate credit portfolio of Russian banks was forecastedin 2017-2019. The forecasted decline rate was 15% in 2019 compared to 2016.

5. SUMMARY

So, in order to preserve the competitive positions, the Russian banks need to develop new banking products for corporate clients or toimprove the marketing needs of customers based on marketing analysis. For the future development of the corporate products market, it is important to focus on the leading Russian and foreign banks to make the innovation content for multiple products for corporate clients.

Despite the decline in the volume of corporate lending in 2014-2016, as a result of the economic and mathematical modeling by the method of correlation-regression analysis, it was forecasted the growth of the corporate credit portfolio of Russian banks in 2017-2018. The forecasted level of growth was 15% in 2019 compared to 2016. The greatest impact on the growth of bank lending is provided by a high degree of depreciation of fixed assets of Russian enterprises and a reduction in the level of overdue debts on bank loans to corporate clients.

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REFERENCES

Bank lending to corporate borrowers: stagnation continues [Electronic resource] URL:http://economytimes.ru/?q=starshiy-ekonomist/bankovskoe-kreditovanie-korporativnyh-zaemshchikov-stagnaciya-prodolzhaetsya (access date 18.03.2017)

KrolivetskayaV.E., TikhomirovaE.V. / Banks in the system of investment financing of the real sector

of economy of Russia // Money and credit. — 2008. — No. 11. — P. 22-28.

The aggregate credit portfolio of the banking system of the Russian Federation was reduced by 3 trillion roubles in 2016 [Electronic resource]URL:http://www.banki.ru/news/lenta/?id=9505213(access date 19.04.2017)

The Central Bank of the Russian Federation raised the forecast for the real sectorlending to 5-8% from 3-6% in 2016 [Electronic resource]URL:http://www.finanz.ru/novosti/aktsii/cb-rf-povysil-prognoz-po-rostu-kreditovaniya-realnogo-sektora-v-2016-g-do-5-8percent-s-3-6percent-1001248711(access date 15.04.2017)