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**Yuliya Gennadyevna Stratiychuk** – senior lecturer of the mathematical methods and information technologies chair of the Far-Eastern institute of administration – branch of RANEPA (Khabarovsk). *E-mail: stratijchuk.iulia@yandex.ru*

**Galina Vladimirovna Tsvetova** – Candidate of Economics, docent, head of the chair of economy and financial law of the Far-Eastern institute of management – branch of RANEPA (Khabarovsk). *E-mail: mgalin1008@mail.ru*

**Stratiychuk Yu. G.**

**Tsvetova G. V.**

**Assessment of a credit risk of physical persons’ portfolio of the credit institutions**

*In this article the modern approaches to a definition research "credit risk" are described. Classification of the external and internal factors of a business environment exerting impact on the indicator of credit risk is given. The overdue debt statistics on the credits at the level of the country caused by the economic crisis starting in 2014 is analyzed. In addition to the traditional methods of regulation of the indicator of credit risk at the level of credit institutions the instruments of correlation analysis allowing evaluate the connection’s narrowness between the credit risk and factorial signs exerting the impact on it are offered. The authors undertook a test of hypothesis of correlation of credit risk of the credit institutions and the level of unemployment, general coefficient of population shift and a consumer price index at the level of the Russian Federation. The exponential model of a trend for the forecast of credit risk of a portfolio of physical persons at the level of the country is made, and the forecast of economic indicator on its basis is performed.*

**Оценка кредитного риска портфеля физических лиц кредитных организаций**

*В статье описываются современные подходы к исследованию дефиниции «кредитный риск». Приводится классификация внешних и внутренних факторов деловой среды, оказывающих влияние на показатель кредитного риска. Проанализирована статистика просроченной задолженности по кредитам на уровне страны, обусловленная экономическим кризисом, стартовавшим в 2014 г. В дополнение к традиционным методам регулирования показателя кредитного риска на уровне кредитных организаций предложен инструментарий корреляционного анализа, позволяющий оценить тесноту связи между кредитным риском и факторными признаками, оказывающими влияние на него. Авторами предпринята проверка гипотезы о корреляции кредитного риска кредитных организаций и уровня безработицы, общего коэффициента миграции населения и индекса потребительских цен на уровне РФ. Построена экспоненциальная модель тренда для прогноза кредитного риска портфеля физических лиц на уровне страны, и осуществлён прогноз экономического показателя на его основе.*

***Keywords:*** *credit risk, credit portfolio, default, correlation, trend.*

***Ключевые слова:*** *кредитный риск, кредитный портфель, дефолт, корреляция, тренд.*

Successful functioning of the domestic market economy is impossible without the reliable bank system. Credit institutions accumulate financial resources of investors and open the wide opportunities of access to the sources of loan resources. At the same time they are intermediaries in redistribution of the equities by means of transfer of the temporarily available funds to the investments, thereby significantly increase overall effectiveness of the production.

Credit institutions are the subjects of difficult economic relations in economy of any country, region, municipalities, perform a number of key functions, among them:

- replenishment of budgets of all levels;

- improvement of welfare of the population by means of provision of the mortgage, purpose-oriented and consumer loans;

- mediation in payments between the separate independent accounting entities of the economy;

- stimulation of accumulatings in the economy.

Activities of credit institutions are the subject to a number of risks capable to cause failures in the work and bankruptcy. In the modern economic literature different approaches to a definition research "credit risk" meet. One of the approaches to determination of a credit risk is consideration of credit risk as the action leading to emergence of a certain event. Scientists - economists A.V. Mokhov, V.V. Kiselyov, B.S. Voyteshenko, V.K. Selyunov, G.V. Chernova, S.M. Vasin, L.I. Abalkin, S.E. Sarkisov, M.K. Ong, V. Platonova, P.P. Kovalyova who identify credit risk with the possible losses and loss of the income adhere to such look. This approach is closest to the official determination of the concept "credit risk".

In the works of scientists P. Rouz, S.N. Vorobyyov, A.N. Sinelnikov and J. Sinki the credit risk is considered as probability of approach of the event. According to these scientists, the credit risk is determined from the point of view of probability theory (success or failure).

Credit risk as the possible event existing regardless of actions and the creditor's purposes is considered in N.V. Khokhlov's work.

In V.G. Zolotogorov, A.N. Azriliyan and V.F. Korelskiy's researches credit risk is understood as a danger of undesirable actions of the borrower. At the same time, the authors don't specify the essence of undesirable actions of the borrower, and also the actual event which is caused these actions.

Credit risk is the object of state regulation from the Central bank of Russian Federation. According to the regulations of the Central bank[[1]](#footnote-2) of Russian Federation, credit risk according to the loan is a loss by the loan of cost owing to the non-execution or improper execution by the borrower of liabilities according to the loan to the credit institution, or existence of real threat of such non-execution (improper execution).

External and internal factors of business environment exert the impact on the credit risk. External factors are the macroeconomic, country, regional, social, industry, inflation, political factors, and also the risk of legislative changes. As internal factors of the credit risk it should be noted, first, the factors connected with the activities of creditor bank and, secondly, connected with the activities of the borrower. To the first the following factors are carried: type of a market strategy, management level, adequacy of the choice of credit policy, risk of a credit product, concentration risk of a credit portfolio. The second group is formed by such factors as a risk of change of financial position, risk of change of service quality of a debt, risk of change of the quality of providing, risk of depreciation of providing, inappropriate use of the credit [4].

Many Russian banks prior to the economic crisis of 2014 actively used credit policy in the sphere of crediting of physical persons. In the first half of 2013 the amount of the credits to physical persons grew by 13,7% (for the same period of 2012 growth of an indicator – for 18,4%). Now it is already difficult to provide life without the convenient banking products, among them: mortgage, car loans, overdrafts, credit cards, pos-credits (goods, vouchers, provision of medical services on credit etc.).

Demand of physical persons for the banking products was very high. At the same time, consumer crediting which amount in the first half of the year 2013 increased by 15,9% was the key direction of the retail credit market in 2013. During this period in the structure of retail credit portfolio[[2]](#footnote-3) more than 60% occupied the consumer loans, and the amount of the mortgage housing loans for January – May, 2013 increased by 10,8%.

Economic crisis of the Russian Federation entailed serious social and economic problems both the country macroeconomics, and economies at the level of territorial subjects of the Russian Federation: unemployment growth, migratory processes within the country, increase in the prices for products and housing and communal services. Sharp instability of financial position of the population caused inability of physical persons to accompany the earlier purchased credit products that caused sharp jump of delays and growth of defaults of the credit portfolio.

The analysts note that the peak of growth of the overdue debt on the credits for purchase of consumer goods, car loans and mortgage fell on January, 2016[[3]](#footnote-4). For 2015 Russians owed to the banks about 11 trillion rub, total quantity of debtors – about 40 million people, more than a half of the economically active population of the country is able to pay their debts – about 8 million rubles.

The highest growth rates of delay were shown by the mortgage segment differing in stability. Here an increase in delay for 2015 made 58% or 132 billion rubles.

The quantity of overdue loans in cash in 2015 grew by 9% (to 7,2 million loans) or to 709 billion rubles, car loans – for 5% (to 189 thousand loans) or to 68 billion rubles. The number of credit cards with the overdue loans increased by 11% (to 5,1 million pieces). The delay amount on credit cards grew in a year by 54% (to 242 billion rubles)[[4]](#footnote-5).

According to RIA News? The Central bank of the Russian Federation as of December 24, 2015 revoked the licenses from 93 banks and the non-bank institutions (against 86 in 2014)[[5]](#footnote-6).

As of January, 2016 the overdue debt amount on the retail portfolio at the level of the Russian Federation (the consumer credits, mortgage, car loans, debts on credit cards) in January, 2016 increased by 2,1%.

Data of the Central bank demonstrate that the specific weight of delay of physical persons in a total amount of credit portfolio reached 8,3%. An overdue debt on the corporate portfolio grew in January by 12,1%. Specific weight of the overdue debt on credits to business arouse in a month from 6,2% to 6,8%[[6]](#footnote-7).

In this regard, crash of many domestic banks in the conditions of economic crisis of the country which was promptly starting in 2014 against the background of input of the international sanctions revealed inefficiency of the policy of credit risk management of the credit institutions, including a lack of the complex analysis of all factors of credit risk.

The most credit institutions within the departments of product risk management develop the own methods of management of credit risks. It is necessary to carry the following instruments to a number of traditional methods:

- credit scoring;

- questionnaire of the credit expert;

- collection of problem debt;

- credit committees on the issue of credit products;

- vintage analysis of credit portfolio;

- development of risk cards;

- techniques of assessment of a financial position of the borrower and the others.

In addition to them the author recommends to accept modeling of a size of credit risk of the credit institutions by means of correlation analysis. The correlation analysis will allow estimate narrowness of connection between the credit risk and factorial signs exerting the impact on it.

In the domestic banking legislation the concept of default is partially determined in the Letter of the Central bank of the Russian Federation No. 192-T: "… the default is considered occurred since the moment when any of the next events took place: according to internal documents the bank determines that the debtor isn't able to extinguish completely the credit liabilities to the bank without using of special measures, for example, such as implementation of providing and/or the debtor is declared bankrupt by a court decision, and/or the debtor delayed settlement of any essential credit liabilities to the bank more than for 90 days. At the same time, the bank can use the more strict determination of default, entering additional amendments for the different classes of credit requirements" [the Letter of the Central bank of the Russian Federation No. 192-T, 2012].

In the Russian legislation the terms "default" and "bankruptcy" are often equated. So, according to the article 2 of the Federal law "About Insolvency (Bankruptcy)" of 27.09.2002 No. 127-FL and the article 65 of the Civil code of the Russian Federation, is understood as "bankruptcy" inability of the debtor recognized by the arbitration tribunal in full to meet the requirements of creditors for the monetary commitments and (or) to fulfill a duty on payment of the obligatory payments [The bankruptcy law, 2002].

For the credit institutions special relevance get monitoring of the credit portfolio of the corresponding product divisions in the terms of delay, share of the default credits (delay 90+) in the structure of portfolio, the region of issue, and also the adoption of operational decisions on stabilization of a situation.

The analysis of the chart in the figure 1 shows that the share of default credits in the structure of credit portfolio of physical persons about the country in general has the tends growth (in the last two years the indicator grew by size about 5%).

Questions of development of the evaluation methods of credit risks are urgent and requiring a careful research now. Forecasting of losses on the loan portfolio can be made in different aspects and with different extent of detailing. In this article the authors make a loss estimate of credit portfolio of physical persons of the credit institutions by a method of multiple correlation analysis.

*Fig. 1. Dynamics of loans with the overdue payments over 90 days in the structure of credit portfolio of physical persons, %[[7]](#footnote-8)*

The research hypothesis is as follows: credit risk of the credit institutions correlates with the level of unemployment, general coefficient of population shift and a consumer price index.

Let's describe the input parameters (productive variable and factorial signs) for carrying out this analysis type at the level of the Russian Federation: y- a share of loans with the overdue payments over 90 days in a total amount of loans, % (credit risk); $x\_{1}$- the level of unemployment (on methodology of ILO), %; $x\_{2} $-migration surplus (person); $x\_{3} $- consumer price index on goods and services.

Statistics of the input parameters from 2013 for 2015 participating in the calculation are given in the figure 2.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| y |   | x1 |   | x2 |   | x3 |   |
| Valid N | 10 | Valid N | 10 | Valid N | 10 | Valid N | 10 |
| Mean | 6,72 | Mean | 5,38 | Mean | 20202,9 | Mean | 100,85 |
| Median | 6,45 | Median | 5,45 | Median | 19881,7 | Median | 100,59 |
| Mode | Multiple | Mode | 5,2 | Mode | Multiple | Mode | Multiple |
| Sum | 67,19 | Sum | 53,8 | Sum | 202029 | Sum | 1008,46 |
| Minimum | 4,73 | Minimum | 4,9 | Minimum | 13543 | Minimum | 100,33 |
| Maximum | 9,59 | Maximum | 5,8 | Maximum | 29280 | Maximum | 102,43 |
| Range | 4,86 | Range | 0,9 | Range | 15737 | Range | 2,09 |
| Variance | 2,57 | Variance | 0,09 | Variance | 21020832,6 | Variance | 0,43 |
| Std. Dev. | 1,6 | Std. Dev. | 0,3 | Std. Dev. | 4584,8 | Std. Dev. | 0,66 |
| Skewness | 0,48 | Skewness | -0,3 | Skewness | 0,4 | Skewness | 1,94 |
| Std. Err. | 0,51 | Std. Err. | 0,09 | Std. Err. | 1449,9 | Std. Err. | 0,21 |
| Kurtosis | -0,8 | Kurtosis | -0,98 | Kurtosis | 0,7 | Kurtosis | 3,45 |

*Fig. 2. Descriptive statistics of the input parameters received*

*by the means of MSEXCEL[[8]](#footnote-9)*

The average level of credit risk for the considered period on this portfolio of the uniform loans makes about 6,72% with a deviation on average of ±1,6%. The maximum credit risk was observed about 10%. As the member of the Head Council of Roseksimbank Artyom Konstandyan notes, crisis of 2012 showed that "… the Russian bank system could sustain the delay level of 6 – 8% (if to look at the official data[[9]](#footnote-10)). At the same time, in the crisis of 1998 the delay was twice higher, the mass of banks went bankrupt". It is obvious that the average level of credit risk of the portfolio of physical persons countrywide remains at the level of 2012.

The average level of unemployment at the level of the Russian Federation – about 5,38% with a deviation on average 0,3%. The maximum level of unemployment made 5,8%. The value of a median exceeds the average level that speaks about the right-hand asymmetry of selective data. It means that in selection data big in comparison with the average size prevail.

The average migratory surplus about the country for this period of time was made by 20202,9 persons. Positive value of an excess in the $x\_{2}$ column demonstrates the distribution of selective data. Therefore, in the selection data the rather average value are stretched (aren't concentrated around it).

The average consumer price index on the goods and services made about 100,85 with a deviation plus or minus 0,66.

The figure 3 contains the correlation analysis of data in the format of matrix of pair coefficients of correlation. The analysis of matrix allows formulate the following conclusions:

The greatest value with the overdue payments in a total amount of loans of the credit portfolio of physical persons over 90 days renders a consumer price index on a share of loans (coefficient of correlation of $r\_{yx\_{1}}$= 0,79, on the Cheddok's scale the connection is estimated as high). Connection between the migratory population growth and a resultant variable is weak, and between the credit risk and the level of unemployment – direct and noticeable. The multi-collinearity of factors is absent.



*Fig. 3. Matrix of the pair coefficients of correlation*

*of the basic data by means of MSEXCEL*

Let's perform the forecast of credit risk of the credit portfolio of physical persons of the commercial organizations of the Russian Federation for the 3rd quarter of 2016 by the means of exponential model of a trend.

Equation of the exponent is as follows: $y=4,27∙e^{0,077t}$ (fig. 4), coefficient of determination $R^{2}=99\%$. Thus, a change of dependent variable for 99% is caused by a change of the factor entering the equation – t time variable. According to the trend model, the share of loans with the overdue payments over 90 days in a total amount of loans of the credit portfolio of physical persons of the credit institutions in the third quarter 2016 will make 11,63%.

It is obvious that during the economic crisis the role of macroeconomic, industry and regional factors of credit risk of the credit portfolio of physical persons increases. The share of the default credits increases in the structure of portfolio that leads to reduction of the own means, the loss of solvency and bankruptcy.

*Fig. 4. Exponential trend for the forecast of credit risk in*

MSEXCEL

The conducted research allows formulate a number of conclusions:

- the credit risk has high correlation dependence with a consumer price index, weak correlation with a migratory population growth and noticeable connection with the level of unemployment (hypothesis of the research proved to be true partially);

- the forecast of a share of loans with the overdue payments over 90 days in a total amount of loans of the credit portfolio of physical persons of the credit institutions in the third quarter 2016 at the level of the Russian Federation will make 11,63%.

From the commercial organizations special relevance is acquired by a search of new drivers of decrease in the level of credit risk. In this regard, both the instruments of forecasting of the indicator and the methods of collection of problem debt, including the standard and legislative regulators find broad application.

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