

To increase the effectiveness of the mechanism for the implementation of the bank's financial product

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Abstract. In this paper, the authors are trying to get an answer to the question that is the main one in the activities of any organization - how to increase sales and profits. The improvement of the mechanism for the sale of financial products in one of the branches of JSC "Rosselkhozbank", which is a leader in the market of financing the agro-industrial complex, is being considered. Methods of horizontal and vertical analysis of accounting statements for 2021-2023 years, were used to study the activities of JSC "Rosselkhozbank". PEST and SWOT analysis were used to assess the impact of the macro environment on the organization. The problem is that when making a loan application, the data may be entered incorrectly, and, as a result, the application will take longer to be considered and, possibly, a negative decision will be made on it. The credit scoring procedure is being considered. Scoring is a system for assessing the creditworthiness of a client. The method of expert assessments was used to form a general opinion of the bank's specialists on which factors, when making a loan application, have the greatest influence on the decision to issue a loan to a consumer. A logistic regression model is constructed that is close to the bank's credit scoring model. The study of the model was carried out using econometric analysis methods, using the cross-platform Gretl software package. The maximum likelihood method was used to estimate the model parameters. To check the quality of the logistics model, the McFadden coefficient of determination was used. The influence of factors obtained by the method of expert assessments and by studying the logistics model on the decision to issue a loan is compared. Based on the study of many factors affecting the scoring procedure, recommendations are formulated to improve the efficiency of this process in the bank.

1 Introduction

At the present stage of socio-economic development in Russia, there is an increase in income of the population. This is largely due to the current political and social situation in the country. According to Engel's law: as income increases, its share spent on basic necessities decreases, while the share spent on luxury goods and spiritual development increases. With the growth of real incomes of the population, their needs are also growing, people are striving

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to improve their living conditions: for example, to buy real estate, a car or make repairs. However, such purchases require large expenses, even with above-average wages, it is not easy to do this. In such cases, the demand for credit banking products is growing.

In the scientific literature, there are several approaches to the definition of the concept of "financial/banking product" [1-3]. In this paper, this is understood as a bank loan. It is important for the client that the decision-making process on granting a loan is carried out as quickly as possible. It is important for the bank to retain the client, therefore, improving the effectiveness of the mechanism for implementing a financial product is relevant.

Scoring is a system for assessing a client's creditworthiness based on statistical methods [4]. It has become widespread in the banking sector and financial organizations [5, 6]. The need to implement scoring arose due to the desire of organizations to reduce the risks of non-repayment of loans [7, 8], as well as due to the large amount of information [9].

To identify the features that most influence the decision-making on a loan application, it is necessary to build a logistic model (logit model) close to the credit scoring model. The logit model has become widespread in engineering sciences [10], medicine [11-13], computer science [14], geology [15] and directly in logistics [16, 17].

The introduction of information technology in marketing and banking is very relevant and is used everywhere.

2 Materials and methods

One of the branches of JSC "Rosselkhozbank" (Rosselkhozbank) was considered as the object of the study. Rosselkhozbank is a multidisciplinary bank, while occupying a certain niche – interaction with rural areas, implementation of state programs for rural residents. The mission of JSC "Rosselkhozbank" is to achieve synergy between rural areas and megalopolises so that they enrich each other. In addition to actively supporting the agro-industrial sector, the bank also operates in the field of retail lending.

Of course, it is important which products the bank sells, its image, and marketing strategy. After comparing the products of competitors and JSC "Rosselkhozbank", it was concluded that its products are competitive and even more so – many of them are the most profitable on the market, having no analogues in terms of conditions and requirements. As for the image of the bank, the Rosselkhozbank is one of the oldest in our country, it is considered reliable and trusted. However, the bank does not have a clear marketing strategy, there is no advertising on the Internet, it is not so popular with urban youth.

In addition to the factors listed above, the improvement of the mechanism for the implementation of financial products is directly influenced by the process of interaction with the client on his loan application. An important role is played by the indicator "time through the eyes of the client", which literally means that the client is worried, waiting for the bank's decision.

Scoring is the stage at which the application is delayed the longest. As a rule, even bank employees are not informed about what is important for scoring, what factors affect the result and the speed of decision-making.

The Bank offers the following credit products for individuals:

1. Preferential target loan for the improvement of rural housing.
2. Rural mortgage.
3. Consumer credit for any purpose.
4. The "Own" credit card.

Research problem.

The problem is that when making an application, not all customer data is entered correctly, in particular, not all fields in the template are filled in by employees. Having information about which signs are more important for making a decision, you can influence

the result of reviewing a loan application. To do this, it is necessary to bring to the attention of employees the importance of the correctness of filling in certain signs, otherwise the application will be considered longer and, perhaps, because of this, a negative decision will be made on it.

The aim of the study is to increase the effectiveness of the mechanism for the implementation of a financial (credit) product by increasing the speed of the credit scoring procedure.

To achieve the aim, it is necessary to solve the following tasks:

1. To analyze the activities of JSC "Rosselkhozbank" in the conditions of socio-economic conjuncture at the present stage of development.
2. Use the method of expert assessments to form a general opinion of the bank's specialists on which factors, when making a loan application, have the greatest impact on the decision to issue a loan to a consumer.
3. To build and investigate a logit model close to the credit scoring model in JSC "Rosselkhozbank".
4. To conduct a comparative analysis of the results obtained by the method of expert assessments and the logit model.
5. Formulate recommendations, the implementation of which will affect the improvement of the mechanism for the sale of financial products in the regional branch of JSC "Rosselkhozbank".

Research methods.

1. To assess the current results and dynamics of the performance of JSC "Rosselkhozbank", an analysis of the accounting statements for 2021-2023 years was carried out through the use of horizontal and vertical analysis methods. PEST and SWOT analysis of JSC "Rosselkhozbank" were used to assess the impact of the macro environment on the organization.
2. The method of expert assessments is applied, which consists of the opinion of a team of specialists based on professional, scientific and practical experience about which factors when making a loan application have the greatest influence on the decision to issue a loan to a consumer.
3. The construction of a logit regression model, which is close to the credit scoring model in JSC "Rosselkhozbank", allows us to identify the signs that most affect the decision on a loan application. Thus, it becomes possible to confirm or refute the assumptions obtained by the method of expert assessments. This model was chosen because it allows you to build a model with predictive ability and, most importantly, to determine the significant factors and the degree of their influence on the result. The parameters of the logit model were evaluated by the maximum likelihood (ML) method, and the McFadden coefficient of determination was considered to check the quality of the logit model. The logit model was built and studied using the Gretl statistical software package.

3 Results

1. A comparative analysis of the bank's activities at two levels was carried out: regional and country-level accounting statements for 2021-2023 years (horizontal and vertical analysis, respectively). When compared with competitors at the regional level, it is noticeable that the Rosselkhozbank has the lowest interest rates on consumer loans, this is achieved due to the condition associated with the need for life and health insurance.

This condition for obtaining a minimum interest rate, on the one hand, protects the client (his relatives) in the event of his death/disability, on the other hand, the bank is insured against non-payment of the loan. Due to this condition, other requirements for the borrower are more loyal, no collateral is required as collateral, unlike regional competitors. The interest

rate of the Rosselkhozbank cards is higher than that of competitors, but it wins in other aspects: the largest allowable credit limit, the longest grace period, UnionPay issuance is possible.

When comparing Rosselkhozbank with competitors at the country level, you can refer to the rating published on the "Banks.ru" platform. So, as of August 2024, in the top 10 banks of Russia (in terms of assets) Rosselkhozbank is in 6th place. It should be mentioned that the Rosselkhozbank is a multidisciplinary bank, while occupying a certain niche – interaction with rural areas, implementation of state programs for rural residents. In fact, he has no competitors in this field.

Table 1 shows data on interest rates among competing banks. It can be concluded that if we take the upper limit of the interval, then one of the lowest interest rates is offered for customers with Rosselkhozbank salary cards, as for rates for other groups of customers, it is the lowest.

Table 1. Analysis of the consumer lending market on 04/19/2024.

Bank	Min rate	The rate for clients with bank salary cards		Others clients		Last change
		min	max	min	max	
Sber	16.9%	16.9%	33.9%	17.9%	33.9%	10.01.2024
VTB	5.9%	15.9%	34.9%	16.9%	34.8%	05.03.2024
Alpha	13.5%	22.5%	35.0%	22.5%	35.0%	01.02.2024
GPB	4.9%	23.1%	30.9%	23.1%	32.9%	23.03.2024
Raiffeisenbank	9.99%	15.0%	29.0%	16.0%	30.0%	01.09.2023
Discovery	8.9%	20.9%	32.0%	20.9%	34.0%	10.02.2024
Mail	11.9%	22.9%	34.3%	22.9%	34.3%	01.02.2024
MTS Bank	5.9%	15.9%	30.9%	15.9%	32.9%	01.04.2023
Rosselkhozbank	16.9%	22.8%	29.3%	22.8%	31.3%	29.12.2023

As for the comparison of interest rates among competing banks in mortgage lending, it can be concluded that for customers with salary cards of the Rosselkhozbank, the lowest interest rates are offered for such facilities as housing and government-supported programs. For other types of facilities, the rates are also at the lower limit of the market, which makes the bank's products competitive.

Table 2 shows data on interest rates among competing banks in the context of credit cards.

Table 2. Analysis of the credit card market on 04/19/2024.

	POS purchases (goods and services)	Cash withdrawals and transfers	Last change
Sber	9.8% - 37.8%	37.8%	01.04.2024
VTB	9.9% - 39.9%	24.9%	07.04.2023
Alpha	or 11.99%*	69.99%	30.10.2023
GPB	24.9% - 39.9%	24.9% - 69.9%	12.10.2023
Raiffeisenbank	19% - 49%	49%	10.10.2023
Mail	39.9%	39.9%	01.04.2024
Rosselkhozbank	24.9% - 35.9%	24.9% - 35.9%	20.10.2023

It can be concluded that the Rosselkhozbank sets the average market rates for cards. This decision is justified by the fact that a credit card is, in principle, the most marginal product for banks.

To further characterize the activity, it is advisable to conduct a PEST and SWOT analysis of Rosselkhozbank.

PEST analysis is a marketing tool used to identify political, economic, social and technological aspects of the external environment that directly affect the company's activities (Table 3).

The social aspect includes consumer preferences, their level of trust, desire and opportunity to purchase a product, which has a direct impact on demand. The technological aspect is an important factor of competitiveness in the modern world, it includes the material and technical base, equipment, and technologies used in the company. The economic aspect includes an assessment of the financial condition of the company, the effectiveness of its activities in terms of profit and other economic results. The political aspect reflects, first of all, the internal policy of the state regulating the company's activities.

Table 3. STEP analysis of JSC "Rosselkhozbank".

The environmental factor	Description
Political	Rosselkhozbank is a part of the banking system of the Russian Federation. Auditing and consulting firms, magazines, newspapers (non-governmental control), as well as the Ministry of Internal Affairs, the Investigative Committee, the Ministry of Finance, and the Central Bank of the Russian Federation are engaged in tracking the bank's work. The Central Bank of Russia plays a key role in monitoring the activities of commercial banks. Banking control is carried out mainly on the basis of two federal laws - "On the Central Bank of the Russian Federation" and "On Banks and Banking activities".
Economic	At the moment, in order to reduce inflation, the Central Bank of the Russian Federation is pursuing a policy of "expensive money": it regularly raises the key rate, this measure leads to an increase in interest rates on loans from commercial banks, which affects the decline in demand for loans. At the same time, there is an increase in real incomes of the population, which leads to an increase in demand for loans.
Social	The state, through the Rosselkhozbank, provides subsidized products for residents of rural areas (rural mortgages, consumer loans for landscaping for residents of rural areas, etc.). The bank's employees regularly carry out activities to improve financial literacy of the population.
Technological	Technology plays an important role in the modern banking sector in Russia. The demand for certain services largely depends on the convenience of digital services.

Next, a SWOT analysis of JSC "Rosselkhozbank" was conducted (Table 4). This type of strategic analysis involves the identification of four characteristics of the organization: strengths and weaknesses, as well as threats to activity (threats) and opportunities for growth (opportunities).

1. Strengths represent competitive advantages, successes in certain aspects that favorably distinguish this organization from competitors.
2. Weaknesses are associated with the lack of necessary resources for a more efficient functioning of the organization, which negatively distinguishes it from competitors.
3. Opportunities represent favorable possible developments that can benefit the company and that it can take advantage of.
4. Threats are adverse possible developments that may have a negative impact on the company's activities.

Table 4. SWOT analysis of JSC "Rosselkhozbank".

Strengths	Weaknesses
1) the use of current technologies in interaction with customers; 2) interest rates on loans – at the lower limit of the market, on deposits – at the upper; 3) a large number of products for rural residents, including those subsidized at preferential interest rates; 4) large branch network, additional offices in cities and rural areas; 5) a large number of products for pensioners and citizens who run a private household; 6) a high level of trust in the bank.	1) lack of a clear marketing strategy for development; 2) lack of advertising on the Internet; 3)strict requirements for customer documents; 4) targeting products and marketing mainly to a more mature audience; very little interaction with young people; 5) a long complicated process of reviewing applications for credit products.
Opportunities	Threats
1) growing demand for the bank's credit products, increasing market share; 2) increase in benefits and subsidies from the state; 3)development of new subsidized products.	1) a decrease in the pace of development of the industry; 2) the intensification of the financial crisis and the decline in economic activity of consumers of banking services; 3) the Central Bank's increase in the key rate.

The analysis allows us to conclude that at the present stage of socio-economic development in Russia, improving the mechanism for the sale of financial products leads to an increase in the efficiency of the bank's credit department.

2. Information about the specifics of the functioning of credit scoring in each bank is a trade secret, none of the employees has an official list of which parameters are decisive. In this case, it is only possible to come to any conclusions empirically. In this regard, employees with more than three years of experience were interviewed, and their assumptions were ordered by the method of expert assessments. The essence of this method lies precisely in the fact that the forecast is based on the opinion of a specialist or a team of specialists based on professional, scientific and practical experience.

In this case, the opinions of experts have been processed, and the following statements have been identified, which is an important factor for making a decision:

- client's income;
- client's age: the older the client, the more reliable the client;
- number of children: the more children there are, the more expenses the client has, which negatively affects the ability to pay;
- the level of education: the higher it is, the more highly paid, stable job a client can apply for, which has a positive effect on solvency;
- the amount of the client's expenses: the higher it is, the lower the client's net income, the lower the solvency;
- gender of the client: there are opinions that men have higher wages on average, respectively, higher solvency;
- marital status;
- the client has a valid mortgage loan.

3. Building a model. Logit regression is a statistical model that is used to predict the occurrence of a certain event by comparing it with a logistic curve.

In this case, the dependent variable y_i is binary, it should take only two values: 0 – the event did not occur, 1 – the event occurred. As in the multiple regression model, independent variables (features, regressors) are also present in this model $X = (1, X_1, ..., X_{m-1})$, on which the value taken by the variable y_i depends. It is assumed that there is a hidden unobservable variable y^*_i (1):

$$y_i = \begin{cases} 0, y_i^* \geq 0 \\ 1, y_i^* < 0 \end{cases} \quad (1)$$

The model is not built for y_i , but for a hidden unobservable variable $-y_i^*$. The model has the form:

$$y_i^* = \beta_1 + \beta_2 x_i + \varepsilon_i \quad (2)$$

In this model (2), the random component ε_i has a logistic distribution:

$$F(z_i) = \frac{1}{1+e^{-z_i}} \quad (3)$$

This function takes values ranging from zero to one. It not only allows you to assess how important a feature is (the size of the coefficient), but also the direction of its relationship (positive or negative). The coefficients of the model can be interpreted as indicators of the importance of features. Logistic regression requires average multicollinearity between independent variables or lack thereof.

The maximum likelihood (ML) method is used to evaluate the parameters of binary choice models.

To check the quality of the logit model, the McFadden coefficient of determination is used, it gives an assessment of the degree to which the logistic regression model corresponds to real data. This indicator is measured in the range from 0 to 1, moreover, the closer its value is to 1, the better the quality of the model is evaluated.

The main stages of building a logistic regression include the following:

1. selection of the dependent variable and the features that affect it;
2. checking the features of the model for the absence of multicollinearity;
3. building a model;
4. analysis for the presence of insignificant signs;
5. elimination of insignificant features and construction of a new model;
6. evaluation of the quality of the received model;
7. interpretation of the model results.

Credit scoring data, which is publicly available on the Kaggle resource, served as a database. Due to the existence of trade secrets, data on clients of JSC "Rosselkhozbank" are in private access. Logistic regression is implemented in the cross-platform software package for econometric analysis Gretl. The observations were made by the bank's customers (400 people), the dependent variable y is the bank's decision to issue a loan (0 is negative, 1 is positive), the independent variables are as follows:

- salary in thousand rubles;
- age;
- number of children;
- education level: 1- vocational education, 2 – bachelor's degree, 3 – master's degree;
- expenses in thousand rubles;
- gender: 1 – female, 2- male;
- marital status: 0 – single, 1 – married;
- availability/absence of a mortgage loan: 0 – absence of a mortgage loan, 1 – availability of a mortgage loan.

During the check of signs for the presence of multicollinearity, a correlation matrix was constructed (Fig. 1), and the following was revealed: there is no absolute multicollinearity, the strongest relationship is present between salary and children indicators (based on this, it can be assumed that people with higher incomes are less likely to have many children). There

is a direct strong relationship between the number of children and the amount of expenses, which is quite logical and confirms one of the assumptions. (the more children there are, the more expenses the client has).

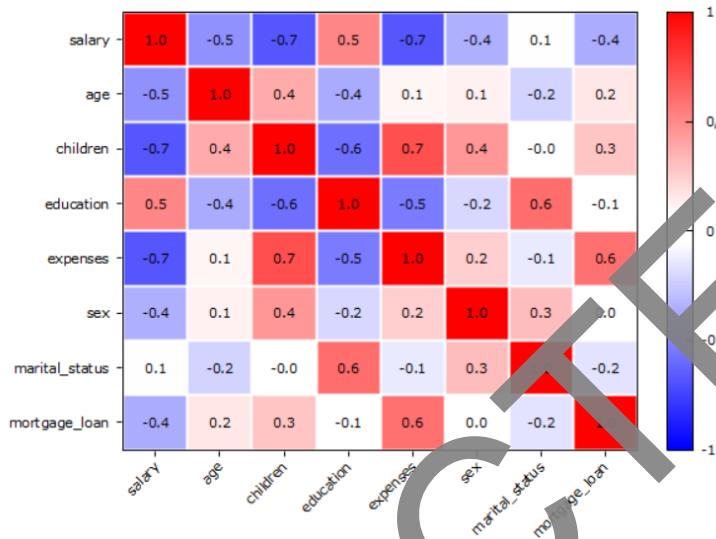


Fig. 1. Correlation matrix of features.

In addition to the above, the following can be seen: there is a direct relationship of average strength between the level of education and the amount of income, an inverse relationship of average strength between the age of the client and the amount of his income, a direct relationship of average strength between age and the number of children, an inverse relationship of average strength between the level of education and the number of children. The conclusions are logical, consistent with our assumptions and the socio-economic situation in modern society.

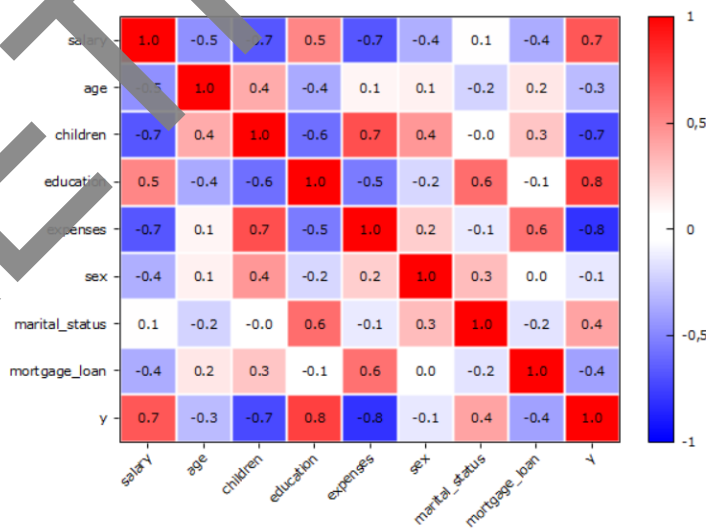


Fig. 2. Correlation matrix between dependent y and independent variables.

The obtained correlation coefficients (Fig. 2) indicate that there is a strong direct relationship between the bank's decision and the amount of income, as well as between the bank's decision and the level of education, a strong inverse relationship between the bank's decision and the number of children, as well as between the level of expenses and the bank's decision (this is explained by the following: in isolation from all others (the amount of expenses does not mean anything, because a small amount of expenses may indicate both a lack of obligations and a small amount of income). It is assumed that some of the indicators during the construction of the model will be insignificant (amount of expenses, gender, etc.). Creating a logit model in Gretl software looks like this (Fig. 3).

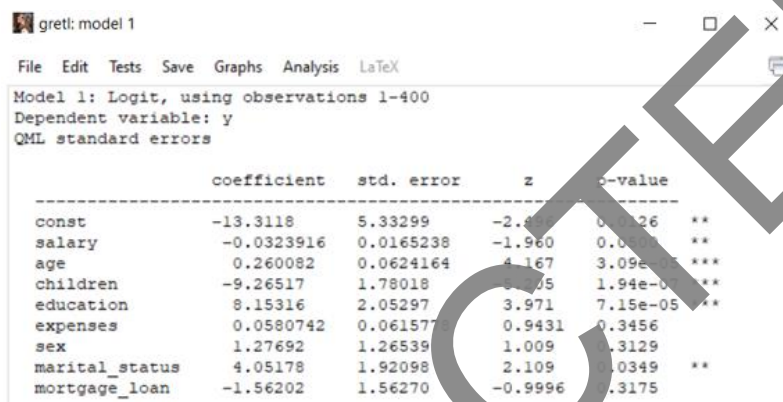


Fig. 3. Building the initial logit model in Gretl.
These models can be presented in tabular form (Table 5).

Table 5. Results of building the logit model 1.

	Coefficient	The standard error	z	p-value
const	-13.3118	5.33299	-2.496	0.0126
salary	-0.0323916	0.0165238	1.960	0.0500
age	0.260082	0.0624164	4.167	<0.0001
children	-9.26517	1.78018	-5.205	<0.0001
education	8.15316	2.05297	3.971	<0.0001
expenses	0.0580742	0.0615778	0.9431	0.3456
sex	1.27692	1.26539	1.009	0.3129
marital_status	4.05178	1.92098	2.109	0.0349
mortgage_loan	-1.56202	1.56270	-0.9996	0.3175

Evaluating the resulting model (Table 5) it can be seen that some of the variables really turned out to be insignificant: the amount of expenses, gender and the availability of a mortgage. The reasons for the possible insignificance of the expenses variable were discussed earlier. As the model showed, gender is not an important factor for credit scoring, men and women have the same opportunities to fulfill obligations. The presence of a mortgage is initially an ambiguous sign, as the model showed, it does not have any unambiguous effect on the result of the bank's decision.

Table 6. Quality indicators of model 1.

The average of the dependent variables	0.520000	The standard deviation of the dependent variable	0.500226
Mcfadden's R-square	0.884859	The corrected R-square	0.852361
Log. plausibility	-31.88698	The Akaike Criterion	81.77395

The Schwartz criterion	117.6971	The Hennan-Quinn criterion	96.00000
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The McFadden’s R-square and the corrected R-square have high values, which indicates good model quality. The criteria of Schwartz, Akaike, Hennan-Quinn are informational, they should be evaluated if there are several models to assess which model has the best fit quality (Table 6). The number of correctly predicted cases by the model is 1: 392 out of 400, i.e. 98.0%, which is an excellent indicator for the model.

However, it is necessary to exclude insignificant variables and see how this affects the model (Table 7).

Table 7. Results of building the logit model 2.

	Coefficient	The standard error	z	p-value
const	−5.24346	4.91452	−1.06	0.2860
salary	0.0836541	0.0639403	1.308	0.0508
age	0.252159	0.0752211	3.352	0.0003
children	−10.6460	3.03853	−3.504	0.0005
education	6.86376	1.66898	4.113	<0.0001
marital status	6.48429	1.94925	3.322	0.0009

The McFadden’s R-square and corrected R-square indicators increased (Table 8). The Schwartz, Akaike, and Hennan-Quinn information criteria improved, which shows that Model 2 has a better fit quality (Table 8). The number of correctly predicted cases by the model is 2: 392 out of 400, i.e. 98.0%, which is an excellent indicator for the model.

Table 8. Quality indicators of the model 2.

The average of the dependent variables	0.520000	The standard deviation of the dependent variable	0.500226
McFadden's R-square	0.881876	The corrected R-square	0.860210
Log. plausibility	−22.71316	The Akaike Criterion	77.42633
The Schwartz criterion	101.3731	The Hennan-Quinn criterion	86.91036

In order to interpret the coefficients of the model, the median angular coefficients were calculated (Table. 9), which display the marginal effect of each of the independent variables on the dependent one, when the remaining independent variables are equal to their average value in a given sample. Based on the values of the median angular coefficients of the parameters of this model 2, it is noticeable:

- with an increase in the amount of income by 1 thousand rubles, the probability of a positive decision increases by 0.0012%;
- with an increase in the age of the client of 1 year, the probability of a positive decision increases by 0.0036%;
- with an increase in the number of children by 1 unit, the probability of a positive decision decreases by 0.15%;
- with an increase in the level of education by 1 step, the probability of a positive decision increases by 0.098%.

Table 9. Median angular coefficients of the parameters of the resulting model.

	Coefficient	The angular coefficient
Const	−5.24346	
Salary	0.0836541	0.00120401
Age	0.252159	0.00362927
Children	−10.6460	−0.153226

Education	6.86376	0.0987885
marital_status	6.48429	0.419319

Thus, a working model was obtained that predicts the result with a probability of 98%, significant signs were also identified, and the directions of the influence of variables among themselves were considered.

4. It was revealed that the following characteristics are significant, really important variables affecting the outcome of making a decision on a loan application: amount of income, age, number of children, level of education, marital status. This result confirms most of the hypotheses developed on the basis of opinions classified by the method of expert assessments. Nevertheless, several hypotheses were rejected during the implementation of the logistic regression, the following turned out to be insignificant: the amount of expenses, gender and the availability of a mortgage. The reasons for the possible insignificance of the expenses variable: in isolation from all other signs, the amount of expenses does not mean anything, because a small amount of expenses may indicate both a lack of obligations and a small amount of income. As the model showed, gender is not an important factor for credit scoring, men and women have the same opportunities to fulfill obligations. The presence of a mortgage is initially an ambiguous sign, as the model showed, it does not have any unambiguous effect on the result of the bank's decision.

5. A recommendation was put forward: to inform employees about the results of the conducted econometric analysis in order to make the application more qualitative. Having information about which signs are more important for making a decision, you can influence the result of reviewing a loan application. To do this, it is necessary to bring to the attention of employees the importance of the correctness of filling in these signs, otherwise the application will be considered longer and, perhaps, because of this, a negative decision will be made on it.

4 Conclusions

Summing up the above analysis, it can be concluded that as a result of the study, it turned out to be closer to a more accurate understanding of the patterns of functioning of the credit scoring model. A comparison of the influence of factors on the decision to issue a loan obtained by the method of expert assessments and the result of the study of the logit model is carried out. It turned out that even employees with extensive work experience are subject to stereotypes. Being guided solely by the experience and opinions of experts, as it is happening now, is less effective than working, given the information about the importance of features obtained during the implementation of the logit model analysis. Following the recommendation, we receive not only correct customer data, but the application is subject to a faster review procedure. Increasing the speed of the credit scoring procedure stimulates an increase in the efficiency of the mechanism for the implementation of a financial (credit) product. The probability of a positive decision increases with the same level of credit risk, zero costs for the implementation of the initiative. In addition, additional income is possible, which is not amenable to correct calculations, associated with a reduction in the approval time and due to this choice of the client in favor of this bank. An increase in the percentage of conversion from applications to issues is also predicted. You can advise other branches of the Rosselkhozbank to use this recommendation, as well as to take note of other banks.

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