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FINANCIAL MODELING OF BORROWERS' CREDITWORTHINESS

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K e y w o r d s: financial models, financial and economic activity, agricultural organization, estimate the borrowers' creditworthiness, Omsk region.

A b s t r a c t

The complex of financial models for agricultural organization of Omsk region is made on the basis of the method of Rosselkhozbank and of the method of Savings Bank technique to estimate the borrowers' creditworthiness.

MODELOWANIE FINANSOWEJ ZDOLNOŚCI KREDYTOWEJ KREDYTOBIORCY

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S ł o w a k l u c z o w e: modele finansowe, działalność gospodarcza i finansowa, zdolność kredytowa.

A b s t r a k t

Zespół modeli finansowych dla przedsiębiorstw rolnych z regionu Omska opracowano w ramach metodologii banków Rosselkhozbank oraz Saving Bank.

Introduction

Crisis in the financial markets of the USA and Europe has led the growth of rates of attraction of foreign means for banks in our country. It causes toughening of conditions at delivery of loans and requirements at an estimation of credit status of potential borrowers of bank. In connection with growth of the general instability of the markets and deepening of processes of globalization risks' level of bank activity as a whole increases.

The beginning of bank crisis: in February, 2008 the liquidity crisis was declared by the fifth savings and loan association in the Great Britain – Northern Rock. The bank management ascertained, that it could not solve the situation with its own forces and it requested help from the Central bank of the country. The Bank of England has taken an unprecedented step – it has given the state guarantees to all investors of the bank. The total sum of state guarantees exceeded USD 55 billion – about three quarters of the defensive budget of the country.

Then, in March 2008, the Government of the United Kingdom confirmed nationalization of the hypothecary business of a large British bank, Bradford & Bingley, while the retail business of the bank was sold to the Spanish bank group Santander. Bradford & Bingley became the second bank, which the state has been compelled to take under its wings under the conditions of the global financial crisis.

From March till September 2008 there was a radical change of the "financial landscape» in the USA. Investment giants – Bear Sterns & Meryll Lynch ceased their existence through absorption; Lehman Brothers went bankrupt; Indy Mac passed under the federal control with assets of USD 32 billion and deposits of USD 19 billion; at the beginning of September the White House took over the management of hypothecary companies Fannie Mae and Freddie Mac; on the verge of the crash also the insurance company AIG received the emergency credit from the State. The crash of Wa Mu, which had the assets of USD 307 billion, became as for today the last case in the unique series of absorptions and bankruptcies that have transformed the American financial landscape and caused the collapses in the global stock markets. Out of 8500 banks functioning in the USA, 117 are mentioned as possible bankrupts following the results of the first half of the year.

Hypothecary crisis in the USA began in 2006. Growth in non-performing housing loans to unreliable borrowers became its main cause. The crisis built up and started gaining international scales in the spring of 2007 when New Century Financial Corporation, the largest hypothecary company of the USA engaged in crediting unreliable borrowers, was removed from the New York stock exchange. Within next several months, ten similar companies suffered

losses or went bankrupt. In the summer, the crisis reached the investment funds of the largest financial companies, which engaged their means in hypothecary bonds: Bear Stearns, Goldman Sachs, BNP Paribas. In the international markets the liquidity crisis started developing. The Central Banks all over the world started pumping tens and hundreds billions dollars into the financial systems.

The primary goal of our research was to evaluate the available foreign and domestic techniques of financial standing analysis of organizations and to offer one on the basis of regulations of commercial banks. For construction of models the techniques of borrower credit status assessment applied by the Russian Agricultural Bank and the Savings Bank of the Russian Federation were used. The object of the study was 369 (350 – in 2007) agricultural organizations from Omsk area that according to the administrative-territorial division consists of 32 areas, which are broken into 4 zones. During the research regression and discriminant models for estimation of the financial condition have been constructed, which allow defining the level of credit status in case of agricultural commodity producers. Considering various natural-economic conditions of Omsk area, the model also considered the division into four zones: steppe, southern forest-steppe, northern forest-steppe and northern.

Methodology

Among all kinds of risk credit risk is the most essential for the Russian banking sector now. Credit risk, i.e. the danger that the debtor cannot carry out interest payments or pay the credit principal according to the conditions specified in the credit agreement is an integral part of bank activity. The credit risk means, that payments can be delayed or are not paid at all, which in turn can lead to problems in financial flows and can have adverse influence on the liquidity of the bank. Despite innovations in the financial services sector, credit risk remains the principal cause of bank problems. More than 80% of the maintenance of balance reports of banks is devoted usually to this aspect of risk management. There are three principal types of credit risk:

– Personal or consumer risk;
– Corporate risk or risk of the company;
– Sovereign or country risk.

Because of the potentially dangerous consequences of credit risk it is important to carry out the comprehensive analysis of bank possibilities by estimation, administration, supervision, control, realization and return of credits, advance payments, guarantees and other credit tools. The general

review of credit risks management includes the analysis of the policy and bank practice. Such an analysis should also determine the adequacy of the financial information received from the borrower used by the bank during taking the decision on award of credit.

The estimation of credit status of the borrower is most often done by applying the techniques based on the requirements specified in the positions of the Bank of Russia No 254-P «On establishment of provisions for possible loan losses, bad loans and equivalent by the credit organizations» of the 26th of March 2004 and No 28-P «On establishment of provisions for possible losses by credit organizations» of the 20th of March 2006. The main objective of the techniques given is minimization of the reserves established taking into account the statutory requirements.

The bank is given the independent right to make its choice of the techniques to apply. The structure of specific indicators and their criteria are set by the internal documents. Signs of deterioration of financial position (occurrence of a card file of not paid documents to accounts of the borrower, sharp reduction of size of pure actives, absence of the information on the borrower) or signs of deterioration of service of a debt – presence of back payments on percent or the sum of the basic debt, or loan re-structuring are legislatively defined only-.

The credit analysis or the analysis of credit status of the borrower is characterized by a number of features. First, there is a time distinction between credit status and solvency (credit status is the perspective solvency of the borrower, which estimation should cover the prospective period of using the credit. Second, concepts differ also in the "spatial" relation (solvency is possibility and ability in due time to extinguish all kinds of obligations and debts, and credit status is characterized only by firm possibility to extinguish credit debts). Third, during credit status estimation it is necessary to consider not only the ability of the client, but also decency, desire in due time to repay a debt.

According to the Technique of the analysis and estimation of the financial condition of borrowers of Open Society "Russian Agricultural Bank" taking into account their branch features and features of the organizational-legal form confirmed by the Decision of Board of Open Society "Russian Agricultural Bank" (the report No 65 from 25.11.2004), as criteria of an estimation of a financial condition of the borrower the following indicators are used:

– financial stability;
– liquidity (solvency);
– financial results (profit, loss);
– cash flow for the term of crediting.

The following three groups of indicators are used as estimated indicators of the current financial condition:

Indicators *of financial stability (independence):* factor of financial independence; security factor of own means;

Liquidity indicators*:* factor of current liquidity; factor of absolute liquidity; factor of urgent liquidity (or the critical estimation);

Indicators *of business activity*: indicators of turnover; indicators of profitability.

According to the present Technique factors share on:

– *obligatory* – factor of financial independence (K_1), security factor of own means (K_2), factor of current liquidity (K_3), factor of urgent liquidity (the critical estimation) (KK_4), factors of profitability (K_5), turnover of assets (K6);

– *recommended* (which are used for the estimation if necessary) – factor of absolute liquidity, factors, short-term liabilities and debts; sufficiency of turns in bank.

The financial condition of the borrower is estimated taking into account the points calculated using the obligatory factors. According to the given technique the allocated scores are:

Good financial condition – points scored equal to or more than 53 points.

The average financial condition – points scored from 25 to 52 inclusive.

The bad financial condition – quantity of the typed points makes less than 25 points.

The technique of the borrowers (legal entities) credit status estimation applied by the Savings Bank of Russia: Regulations on granting credits to legal entities and individual businessmen of the Savings Bank of the Russian Federation and its branches (confirmed by Committee for granting of credits and investments of the Savings Bank of Russia 30.06.2006, the report No 322).

For the estimation of credit status of the borrower the Savings Bank uses three groups of estimated indicators:

– Liquidity factors – factor of absolute liquidity (K_1), factor of fast liquidity (K_2^1), factor of current liquidity (K_3);

– Factor of presence of own means (K_4);

– Indicators of turnover profitability – turnover of assets, turnover of debts, turnover of stocks, profitability of production (profitability of sales) K_5, profitability of enterprise activity (K_6), profitability of investments in the enterprise.

The basic estimated indicators are factors K_1, K_2, K_3, K_4, K_5 and K_6. The estimated results of calculations for the six factors result in category assignment for each of these indicators on the basis of the comparison of the values received with the values considered sufficient.

Table 1

Division of indicators into categories depending on their actual values

Factors	Category 1	Category 2	Category 3
K_1	0.1 and above	0.05–0.1	Lower than 0.05
K_1	0.8 and above	0.5–0.8	Lower than 0.5
K_1	1.5 and above	1.0–1.5	Lower than 1.0
K_1			
Except trade and leasing companies	0.4 and above	0.25–0.4	Lower than 0.25
For trade and leasing companies	0.25 and above	0.15–0.25	Lower than 0.15
K_5	0.1 and above	Lower than 0.10	Not applicable
K_1	0.06 and above	Lower than 0.06	Not applicable

$$S = 0.05 \times \text{Category } K_1 + 0.10 \times \text{Category } K_2 + 0.40 \times \text{Category } K_3 + 0.20 \times \\ \times \text{Category } K_4 + 0.15 \times \text{Category } K_5 + 0.10 \times \text{Category } K_6$$

In conformity with the given technique 3 classes of credit status of the organizations are established:

class 1: crediting raises no doubts, $S = 1.25$ and less;

class 2: crediting demands a weighed approach, S from 1.25 (not inclusive-) to 2.35 (inclusive);

3 class: crediting is connected with the raised risk, S is more than 2.35.

Results

Author's models for estimation of credit status of the borrowers (agricultural organizations)

The research covered 369 agricultural organizations (in 2007 – 350 agricultural organizations) from Omsk area, according to the administrative-territorial division into 32 areas which are divided into 4 natural-economic zones: steppe (9 areas; 86 organizations); southern forest-steppe (8 areas, 80 organizations); northern forest-steppe (9 areas, 121 organizations); northern (6 areas, 82 organizations).

By the Savings Bank technique: The annual financial reports of all the agricultural organizations from Omsk area for 2005–2007 were used for modeling the indicators. All of the 6 basic factors provided by a technique of the Savings Bank were calculated.

Applying the data substitution method, the limits of experimental classes within 100 points scoring system were defined taking the Design procedure of indicators for agricultural commodity producer's financial condition of (the Governmental order of the Russian Federation from January 30, 2003 No 52) as the baseline. The research results allowed formulating the following bands of credit status: class 1 – from 100 to 69 points; class 2 – from 69 to 42 points; class 3 – below 42 points.

Analysis of the financial condition of the organization and definition of the significant factors influencing the level of credit status allows the credit organizations defining the possibility of crediting the specific organization correctly, and the organization is given a chance to manage those factors to increase its potential for obtaining credit from the bank. It confirms the practical importance of econometrics based on multidimensional statistical analyses.

To design the regression equation it is necessary to generate the initial matrix. Data in the matrices are grouped according to the years, natural-economic zones and as a whole Omsk area. The data from the annual financial statements of the agricultural organizations from Omsk area for 2005–2007 was used. After the data input as presented in a matrix the following information is received. In Table 2, the general results of estimation of the six-factorial of regression are presented according to the model designed on the basis of data on Omsk area as a whole for 2007.

The following characteristics of the constructed regression equation resulted-: R – value of selective correlation factor; R_2 – value of determination factor; adjusted R_2 – value adjusted by the number of the determination factor freedom degrees; F – obtained value of Fisher's test, used for check of the hypothesis concerning the significance of the regression equation, r – significance level; Std. error of estimation – the standard error of estimation of the regression equation.

Table 2

The general results of the estimation regression models for Omsk area for 2007

Intercept	Beta	Std. Err.	B	Std. Err.	$t(343)$	p-level
			28.88420	1.365349	21.15518	0.000000
K_1	0.027762	0.052598	0.27591	0.522750	0.52781	0.597975
K_2	-0.014748	0.049176	-0.05948	0.198316	-0.29991	0.764427
K_3	0.225652	0.053319	0.22629	0.053469	4.23212	0.000030
K_4	0.694109	0.03464	-38.21893	1.907740	20.03361	0.000000
K_5	-0.044456	0.033853	-2.39926	1.82698	-1.31323	0.189982
K_6	0.046040	0.033586	0.35563	0.259432	1.37081	0.171331

Where K_1 – factor of absolute liquidity; K_2 – intermediate factor of coverage; K_3 – factor of current liquidity; K_4 – factor of presence of own means; K_5 – profitability of sales; K_6 – profitability of activity of the organization.

Regression Summary for Dependent Variable: B
R = , 92730491, R_2 = , 81984902, Adjusted R_2 = , 81319915
F (6.343 = 93.212, p < 0.0000 Std. Error of estimate: 5.854

Thus, the correlation factor in 2007 is equal to 0.9273, which indicates a rather high correlation between degree of credit status and the factors included in model.

In 2007 the determination factor is equal to 0.8132. It means, that the constructed regression equation in approximately 81% of cases reproduces the dependence on factors ($K_1 – K_6$), i.e. the productive indicator -depends 81% on these factors. The other 19% represent the share of casual and not considered factors. The value of the Fisher's test for the degrees of freedom (6.343) is equal to 93.212, which is above its tabular (theoretical) value for confidentiality level $R = (1 – 0.05) = 0.95$, and this in turn corresponds to the significance value of less than 0.0000. Hence, the received regression equation is significant, instead of the results of casual selection by the supervision.

The results of the analysis provided by the results of the regression equation present the economic situation of the entire Omsk area divided according to the natural-economic zones in 2007:

Regional area:

$$B = 28.88 + 0.27K_1 – 0.05K_2 + 0.22K_3 + 38.21K_4 – 2.39K_5 + 0.35K_6$$

Steppe zone:

$$B = 7.30 – 2.96K_1 + 0.22K_2^1 + 0.55K_3 + 70.84K_4 – 6.82K_5^1 + 10.64K_6$$

Southern forest-steppe:

$$B = 22.70 + 1.61K_1 + 0.34K_2^1 + 0.02K_3 + 48.96K_4 – 4.61K_5 – 0.78K_6$$

Northern forest-steppe:

$$B = 33.62 + 3.36K_1 – 0.13K_2 + 0.33K_3 + 26.23K_4 + 3.83K_5 – 0.25K_6$$

Northern zone:

$$B = 14.52 + 6.93K_1 – 2.54K_2 + 0.33K_3 + 57.50K_4 + 3.85K_5 + 0.21K_6$$

The results of the analyses indicated that despite the importance of each equation as a whole, not all the factors are significant. So, if p-level exceeds the set significance value (α) of 0.05 the named factors are -insignificant in the regress equation. The significant factors, with the greatest impact on credit status level, were those with the greatest significance value (p-level < 0.05).

Conducting the step-by-step correlation, i.e. consistently excluding from the models the factors of the least importance, the following results were obtained (Tab. 3).

Table 3

The general results of an estimation of four-factor model for Omsk area for 2007

Intercept	Beta	Std. Err.	B	Std. Err.	$t(345)$	p-level
			28.82849	1.356994	21.2443	0.000000
K_4	0.693766	0.034468	38.20003	1.897875	20.12778	0.000000
K_3	0.235861	0.034310	0.23653	0.034406	6.87448	0.000000
K_6	0.045907	0.033502	0.35460	0.258781	1.37027	0.171493
K_5	-0.042866	0.033621	-2.31344	1.814517	-1.27496	0.203180

Regression Summary for Dependent Variable: B
R =, 92710060, R_2 =, 81952735, Adjusted R_2 =, 81511608,
F (4.345 = 140.44, p < 0,0000 Std. Error of estimate: 5.815

Thus, we have received the complex of the equations containing the most significant factors, influencing the credit status:
In 2007 area: $B = 28.82 + 0.23K_3 + 38.20K_4 - 2.31K_5 + 0.35K_6$
Steppe zone: $B = 6.69 - 2.61K_1 + 0.56K_3 + 70.98K_4 + 6.70K_6$
Southern forest-steppe: $B = 22.80 + 2.35K_3 + 49.71K_4 - 5.44K_5$
Northern forest-steppe: $B = 33.49 + 4.75K_1 + 0.24K_3 + 26.64K_4$
Northern zone: $B = 13.78 + 6.99K_1 - 2.52K_2 + 0.35K_3 + 57.09K_4 + 0.20K_6$

By the Russian Agricultural Bank technique: The 6 basic factors provided by technique of the Russian Agricultural Bank were used for modeling indicators of the annual financial statements of all agricultural organizations from Omsk area for 2005–2007. Applying the data substitution method, the limits of experimental classes within 100 points scoring system were defined taking the Design procedure of indicators for agricultural commodity producer's financial condition (the Governmental order of the Russian Federation from January 30, 2003 No 52) as the baseline. The research results allowed formulating the following bands of credit status: class 1 – from 100 to 42 points; class 2 – from 42 to 26 points; class 3 – below 26 points.

Table 4

The general results of the estimation regression models for Omsk area for 2007

Intercept	Beta	Std. Err.	*B*	Std. Err.	*t*(343)	*p*-level
			29.57775	1.384764	21.35942	0.000000
K_1	0.685505	0.034189	37.80690	1.885584	20.05050	0.000000
K_2	0.061420	0.033320	0.17393	0.094354	1.84336	0.066139
K_3	0.233361	0.046195	0.23402	0.046325	5.05165	0.000001
K_4	0.012488	0.045083	0.05036	0.181809	0.27700	0.781946
K_5	-0.048720	0.033090	-0.23071	0.156694	-1.47237	0.141837
K_6	0.036888	0.033157	0.28494	0.256119	1.11251	0.266697

Where: K_1 – factor of financial independence, K_2 – security factor of own means, K_3 – factor of current liquidity, K_4 – factor of urgent liquidity, K_5 – profitability factor, K_6 – factor of turnover on activities.

Regression Summary for Dependent Variable: *B*
R =, 89176679, R_2 =, 82689464, Adjusted R_2 =, 82036802,
F (6.343 = 96.052, $p < 0$, 0000, Std. Error of estimate: 15.706

Estimating the received results, it is possible to draw the conclusion on high narrowness of communication between degree of credit status and the factors included in model (the correlation factor is equal to 0.8917), and also that the received equation of regression is significant, instead of the result of casual selection of supervision (the determination factor is equal 0.82 and settlement size of criterion of Fisher above tabular value).

The analysis results led to obtaining the following regression equations.
In 2007 area:
$B = 29.57 + 37.80K_1 + 0.17K_2 + 0.23K_3 + 0.05K_4 - 0.23K_5 + 0.28K_6$
The steppe:
$B = 8.91 + 70.66K_1 + 1.47K_2 + 0.37K_3 - 0.53K_4 - 0.32K_5^1 + 4.91K_6$
Southern forest-steppe:
$B = 19.63 + 50.11K_1 + 1.17K_2 + 0.08K_3 + 0.61K_4 + 2.07K_5 - 6.21K_6$
Northern forest-steppe:
$B = 33.52 + 26.04K_1 + 0.11K_2 + 0.45K_3 - 0.30K_4 - 0.06K_5 - 1.03K_6$
Northern zone:
$B = 16.71 + 53.77K_1 + 1.83K_2 + 0.28K_3 - 0.36K_4 - 0.02K_5 + 0.19K_6$

The research showed that the estimation could be focused on two indicators making the most essential impact on the financial condition of agricultural commodity producers:

– Factor of presence of own means (K_4) for which the indicator of probability of an error (p-level) is equal to 0.0000,

– Factor of current liquidity (K_3) for which the p-level is also equal to 0.0000.

During research discriminant models for estimation of credit status of borrowers based on the database of agricultural organizations from Omsk area have been constructed. Design procedure of indicators for agricultural commodity producer's financial condition (the Governmental order of the Russian Federation from January 30, 2003 No 52) was also used as the baseline for the design of the discriminant factorial model. Use of scoring estimation allowed classification of the research objects to one of three groups of credit status (representing the financial condition).

According to the Savings Bank technique:

Table 5

Results of the analysis of discriminant functions for the whole Omsk area for 2007

	Wilks' Lambda	Partial Lambda	F-remove	p-level	Toler.	1-Toler. (R-Sqr.)
K_1	0.412334	0.995209	0.8232	0.439884	0.415680	0.584320
K_2	0.415740	0.987054	2.2427	0.107727	0.466326	0.533674
K_3	0.428441	0.957794	7.5352	0.000627	0.420867	0.579133
K_4	0.855155	0.479864	185.3508	0.000000	0.971287	0.028713
K_5	0.418419	0.980736	3.3588	0.035926	0.958499	0.041501
K_6	0.415083	0.988616	1.9691	0.141158	0.982213	0.017788

Discriminant Function Analysis Summary
No. of variables in model: 6; Grouping: Var9 (3 groups)
Wilks' Lambda:, 41036 approx. F (12.684 = 31.980, $p < 0.0000$

Table 6

Initial data for the equations on groups for the whole Omsk area for 2007

	*G*_1:1	*G*_2:2	*G*_3:3
K_1	-0.15632	-0.16826	-0.03101
K_2	0.03173	0.08752	0.01328
K_3	0.03289	-0.00081	0.00095
K_4	8.97384	7.16354	0.91444
K_5	-0.68149	-0.98190	0.01090
K_6	0.05198	0.03599	-0.05807
Constant	-5.04716	-3.89890	-1.20227

Classification Functions; grouping: *G*

Thus, the system of the equations is:

Area:

$G_1 = -5.05 - 0.16K_1 + 0.03K_2 + 0.03K_3 + 8.97K_4 - 0.68K_5 + 0.05K_6$

$G_2 = -3.89 - 0.17K_1 + 0.09K_2 - 0.001K_3 + 7.16K_4 - 0.04K_5 + 0.04K_6$

$G_3 = -1.20 - 0.03K_1 + 0.01K_2 - 0.001K_3 + 0.91K_4 + 0.01K_5 - 0.06K_6$

Steppe zone:

$G_1 = -15.42 - 0.59K_1 + 0.14K_2 + 0.04K_3 + 34.03K_4 + 6.92K_5 - 2.51K_6$

$G_2 = -11.08 - 0.06K_1 + 0.04K_2 - 0.04K_3 + 28.23K_4 + 8.01K_5 - 2.82K_6$

$G_3 = -3.28 + 0.09K_1 - 0.05K_2 - 0.02K_3 + 12.4K_4 + 7.23K_5 - 3.79K_6$

Southern forest-steppe:

$G_1 = -1.67 + 0.07K_1 - 0.03K_2 - 0.002K_3 + 2.93K_4 - 0.36K_5 + 0.13K_6$

$G_2 = -2.75 - 0.07K_1 - 0.001K_2 - 0.006K_3 + 4.10K_4 + 0.30K_5 - 0.45K_6$

$G_3 = -1.96 - 0.19K_1 + 0.09K_2 + 0.004K_3 + 3.09K_4 - 0.03K_5 - 0.57K_6$

Northern forest-steppe:

$G_1 = -3.29 - 0.92K_1 - 0.10K_2 + 0.11K_3 + 3.88K_4 - 0.51K_5 - 0.10K_6$

$G_2 = -2.68 - 0.51K_1 + 0.04K_2 + 0.03K_3 + 3.15K_4 - 0.57K_5 - 0.32K_6$

$G_3 = -0.97 - 0.05K_1 - 0.01K_2 + 0.008K_3 - 0.45K_4 - 0.61K_5 - 0.31K_6$

The northern:

$G_1 = -32.93 - 0.16K_1 + 0.08K_2 - 0.03K_3 + 71.09K_4 + 1.17K_5 + 0.23K_6$

$G_2 = -24.05 - 0.24K_1 + 0.15K_2 - 0.06K_3 + 58.26K_4 - 2.22K_5 + 0.18K_6$

$G_3 = -5.05 - 0.13K_1 + 0.13K_2 - 0.02K_3 + 18.62K_4 - 1.05K_5 - 0.09K_6$

Table 7

Statistics of errors for the whole Omsk area for 2007

	Observed	1	2	3	Highest	Second	Third
1	1	0.593849	0.368347	0.037803	1	2	3
2	1	0.745449	0.241932	0.012620	1	2	3
3	1	0.629958	0.346817	0.023225	1	2	3
4	1	0.897464	0.094120	0.008416	1	2	3
5	3	0.154512	0.262337	0.583152	3	2	1
6	3	0.142467	0.244370	0.613163	3	2	1
7	1	0.591174	0.375289	0.033536	1	2	3
8	3	0.110079	0.206023	0.683898	3	2	1
*9	3	0.394454	0.404863	0.200684	2	1	3
*10	2	0.548031	0.390896	0.061073	1	2	3
	etc.						
348	2	0.291505	0.383828	0.324667	2	3	1
349	3	0.018692	0.062457	0.918851	3	2	1
350	1	0.730353	0.261720	0.007927	1	2	3

Statistics for Each Case
Incorrect classifications are marked with *
Analysis sample $N = 350$

Table 8

Results of the analysis of discriminant functions for the whole Omsk area for 2007

	Wilks' Lambda	Partial Lambda	F-remove	p-level	Toler.	1-Toler. (R-Sqr.)
K_1	0.863778	0.437144	220.1754	0.000000	0.972505	0.027495
K_2	0.392288	0.962546	6.6539	0.001462	0.995686	0.004314
K_3	0.378736	0.996989	0.5163	0.597161	0.538042	0.461958
K_4	0.380443	0.992516	1.2894	0.276761	0.543796	0.456204
K_5	0.385852	0.978601	3.7392	0.024750	0.993623	0.006377
K_6	0.384719	0.981484	3.2260	0.040930	0.994793	0.005207

According to the technique of the Russian Agricultural Bank:
Discriminant Function Analysis Summary
No. of variables in the model: 6; Grouping: G (3 groups)
Wilks' Lambda:, 37760 approx. F (12.684 = 35.760 $p < 0.0000$

Table 9

Initial data for the equations on groups for the whole Omsk area for 2007

	1	2	3
Intercept	-4.04859	-3.50311	-1.69006
K_1	8.90478	4.14748	-0.87928
K_2	0.00755	-0.07138	-0.01675
K_3	0.00007	-0.00812	0.00334
K_4	0.06836	0.03775	-0.00420
K_5	0.02896	0.12736	0.06012
K_6	-0.01276	-0.15009	-0.01466

Classification Functions for G
Sigma-restricted parameterization

Thus, the system of the equations is:
Area:
$G_1 = -4.05 + 8.90K_1 + 0.01K_2 + 0.001K_3 + 0.07K_4 + 0.03K_5 - 0.01K_6$
$G_2 = -3.50 + 4.15K_1 - 0.07K_2 - 0.01K_3 + 0.04K_4 + 0.13K_5 - 0.15K_6$
$G_3 = -1.69 - 0.88K_1 - 0.02K_2 + 0.003K_3 - 0.004K_4 + 0.06K_5 - 0.01K_6$
The steppe:
$G_1 = -15.66 + 40.82K_1 - 0.39K_2 - 0.19K_3 + 0.54K_4 - 0.19K_5 + 4.94K_6$
$G_2 = -7.98 + 24.02K_1 - 0.46K_2 - 0.15K_3 + 0.42K_4 - 0.03K_5 + 4.09K_6$
$G_3 = -3.05 + 9.83K_1 - 0.73K_2 - 0.04K_3 + 0.10K_4 - 0.05K_5 - 0.19K_6$
Southern forest-steppe:
$G_1 = -10.75 + 22.42K_1 + 0.59K_2 + 0.004K_3 - 0.16K_4 + 2.13K_5 - 2.99K_6$
$G_2 = -4.80 + 11.04K_1 + 0.18K_2 + 0.001K_3 - 0.12K_4 + 1.31K_5 - 1.36K_6$
$G_3 = -2.80 - 1.00K_1 + 0.19K_2 + 0.01K_3 - 0.04K_4 + 1.32K_5 - 0.19K_6$
Northern forest-steppe:
$G_1 = -2.84 + 4.26K_1 + 0.03K_2 + 0.05K_3 + 0.01K_4 + 0.54K_5 - 0.64K_6$
$G_2 = -3.36 + 1.56K_1 - 0.05K_2 + 0.005K_3 + 0.01K_4 + 0.49K_5 - 0.33K_6$
$G_3 = -1.72 - 0.81K_1 + 0.01K_2 + 0.01K_3 - 0.02K_4 + 0.46K_5 - 0.25K_6$
The northern:
$G_1 = -29.26 + 62.70K_1 + 1.64K_2 - 0.10K_3 + 0.22K_4 + 1.99K_5 + 0.06K_6$
$G_2 = -11.51 + 21.98K_1 + 0.51K_2 - 0.05K_3 + 0.12K_4 + 0.69K_5 - 0.47K_6$
$G_3 = - 5.17 + 13.12K_1 - 0.66K_2 - 0.02K_3 + 0.07K_4 + 0.26K_5 + 0.02K_6$

Table 10

Statistics of errors for the whole Omsk area for 2007

	Observed	1	2	3	Highest	Second	Third
1	1	0.961004	0.035578	0.003419	1	2	3
2	1	0.981859	0.016702	0.001440	1	2	3
3	1	0.972165	0.025803	0.002032	1	2	3
4	1	0.979272	0.018116	0.002612	1	2	3
*5	2	0.532218	0.216568	0.251214	1	3	2
*6	3	0.479990	0.238672	0.281338	1	3	2
7	1	0.962986	0.033553	0.003462	1	2	3
*8	2	0.397159	0.250741	0.352100	1	3	2
*9	2	0.861896	0.103902	0.034202	1	2	3
10	1	0.939756	0.054205	0.006038	1	2	3
	etc.						
348	1	0.706537	0.165445	0.128018	1	2	3
349	3	0.056942	0.138546	0.804511	3	2	1
350	1	0.985607	0.013601	0.000792	1	2	3

Statistics for Each Case
Incorrect classifications are marked with *
Analysis sample $N = 350$

Conclusions

Thus, the complex of the models is created, allowing analysis of the financial condition of agricultural organization and drawing substantiated conclusion concerning its credit position with the Russian Agricultural Bank.

The offered methods of analysis of the financial condition of the borrower are comprehensible to the Russian conditions, they are adapted for agrarian sector.

Models are created on regional data file and presented in the division according to the natural-economic zones of the area that allows better consideration of their specificity and developing the model allowing more precise estimation of the credit status of agricultural organizations situated in different zones.

The offered models can be applied not only for the estimation of credit status of the borrower, but also for the express analysis of the financial position of agricultural organizations; monitoring of the financial position of the agricultural organizations and the internal audit.

According to the annual financial statements of 350 agricultural organizations registered in the territory of Omsk area in 2007 the following results of the discriminant analysis were received: division into 3 groups of credit status (financial condition), creation of the system of equations for classification of the organization to a certain group of financial stability.

For classification of the organization to a group with a specific financial position the above obtained system of equations helping in defining the greatest G – value is applied, which classifies the organization accessory one of the financial stability groups. In that equation, where the result exceeds the total value means, that the tested organization belongs to that group.

In the tables containing the information on errors (Tabs. 7 and 10) incorrectly classified organizations are marked with an asterisk (*).

The positive aspect of the provided toolkit is that it demonstrates the probability of classification of the organization to a specific financial stability group, although the asterisks in the first row mean errors of the original prospective splitting into groups. If additional data on new organizations is added to the matrix for testing the program will automatically classify them to corresponding financial stability groups.

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