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A MODEL COMPLEX FOR DIAGNOSTICS OF THE FINANCIAL CONDITION FOR DEBT RESTRUCTURING OF RUSSIAN FARMS

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ABSTRACT

This study analyses the insolvency diagnostics of farms in Russia using a regression and discriminant models. The models are based on a dataset of the yearly accounting statements of farms of Omsk region of Russia. It has been chosen for the express analysis 2 coefficients (of current liquidity and of autonomy) to determine the relevant category of a farm and, correspondingly, conditions for debt restructuring as implied by the Russian legislation.

Keywords: *indicators of financial and economic activities, financial monitoring, enterprise restructuring, debt repayment, diagnostics of insolvency*

MODEL DESCRIPTION AND MAIN RESULTS

The financial-economic results of implementing the Law of Russian Federation "On financial recovery of agribusiness enterprises" in 2004 show that the debts of farms have decreased with 33,8%. Approximately 60% of farms (12,5 thousands) have participated in the program of financial recovering and further 45% of this number have made agreements on debts restructuring on the total amount of about 80 bn roubles. By 2005, debts for the previous three years were restructured on the total amount of 54 bn roubles. In addition, fines accrued on the unpaid debts by farms have been written off on the total amount of 28 bn roubles.

The model being developed is highly demanded by the anti-crises managers. Thus, from the methodological standpoint we had to account, firstly, for the specific industry characteristics, namely that a significant share of farms have been showing negative financial results. Secondly, despite that the approach from the economist-analyst standpoint is possible, for practical purposes it is

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more important to base ourselves on the normative grounds. A methodological difficulty in discriminant analysis emerges when criteria for farms categorization into different groups based on financial solvency have to be selected. It is reasonable to use the following two criteria: the current liquidity ratio and the coefficient of financial independence (autonomy). In the discriminate analysis shown below, a preliminary partition was made using a grading system, taking into account all six ratios of this methodology.

The objective was to estimate the groups of farms that participated in the program of financial recovering, based on the yearly accounting statements of 416 farms for the period of 2001-2003 (408 enterprises by 01.01.2004) of Omsk region. We also performed analysis for different zones of Omsk province: the *steppe* zone (9 regions, 102 farms), Southern *lesosteppe* (forest/steppe) (8 regions, 100 farms), Northern *lesosteppe* (9 regions, 102 farms), and Northern Zone (9 regions, 78 farms). Based on the results of the analysis of the farms and regions of Omsk region, for the purposes realized in a short period of time we obtained regression equations and graphs:

$$\mathbf{B = 4{,}358 + 26{,}5X_1 + 2{,}19\ X_2 + 3{,}96\ X_3 + 3{,}13\ X_4 + 55{,}4\ X_5 - 0{,}43\ X_6;}$$

where

X1 –cash ratio;

X_2 – acid-ratio test;

X3 - current ratio;

X_4 – equity ratio;

X_5 - coefficient of financial independence;

X_6 - coefficient of financial independence in recourses and expenses

Our research suggests that the fact of insolvency can be established based on the values of two ratios that have the largest impact on financial position of the company: current ratio, which characterizes the repayment ability of the debtor (its estimated coefficient had a p-value of 0,010464 and a low standard error of 0,010464) and coefficient of financial independence that defines the financial solvency of the company (the estimated coefficient had the lowest p-value of 0,007954). Other things being equal, the probability of insolvency is minimized when the current ratio is increasing and coefficient of financial independence is decreasing. When these ratios are moving in the opposite direction, the company may become insolvent. The equation with two ratios is non-linear:

$$\mathbf{B = -9{,}19 + 1{,}45\ X3 + 103{,}6\ X5 - 3{,}05\ X32 + 25{,}13\ X3\ X5 - 69{,}66\ X5\ 2}$$

Based on the results of analysis of the farms on 01.01.2004, we obtained the following regression equations for different climatic zones:

Zone 1 - Steppe zone of Omsk region

B = 44,0+ 23,7X1 +1,06 X2 + 0,26 X3 + 5,84 X4 - 2,61 X5 + 1,80 X6

Zone 2 – Southern lesosteppe zone of Omsk region

B = 27,6+ 59,1X1 – 41,2 X2 + 0,37 X3 + 0,61 X4 + 29,6 X5 – 0,22 X6

Zone 3 – Northern lesosteppe zone of Omsk region

B = 26,6 -12,0X1 + 9,47 X2 + 2,01 X3 + 0,21 X4 + 19,2 X5 – 0,01 X6

Zone 4 – Northern zone of Omsk region

B = 21,9 -30,8X1 + 13,3 X2 + 1,70 X3 + 0,55 X4 + 32,4 X5.

Graphical representation for different zones looks as follows:

Figure 1: Steppe zone of Omsk province

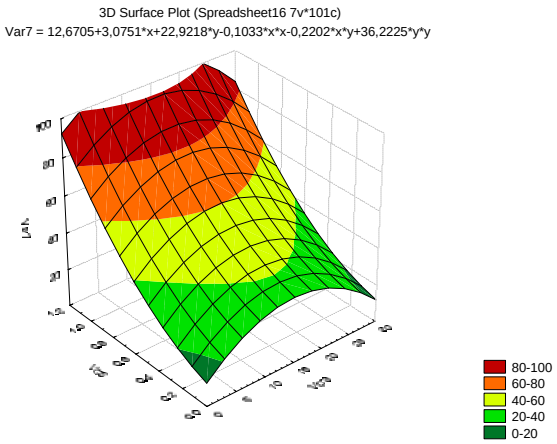


Figure 2: Southern lesosteppe zone of Omsk province

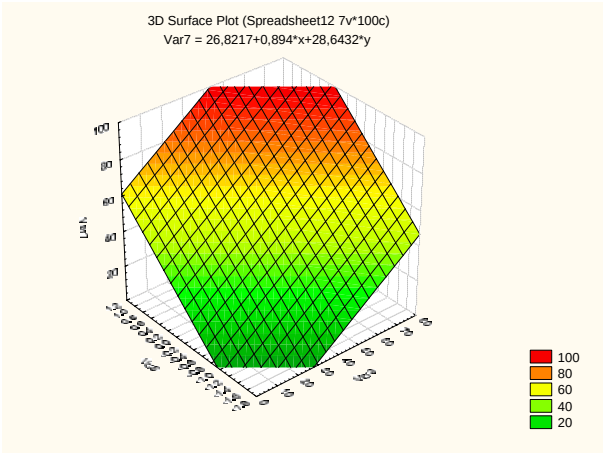


Figure 3: Northern lesosteppe zone of Omsk province

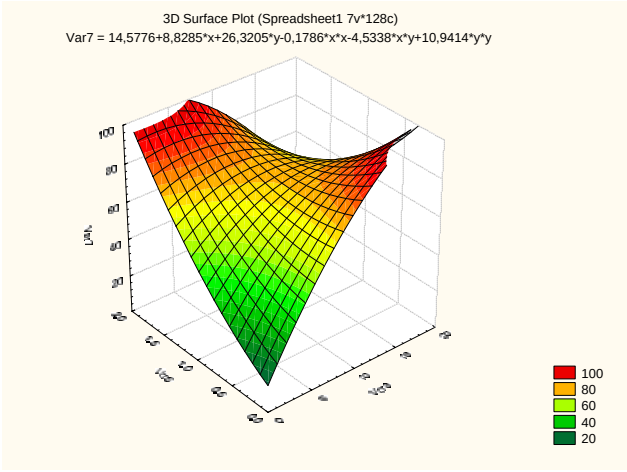
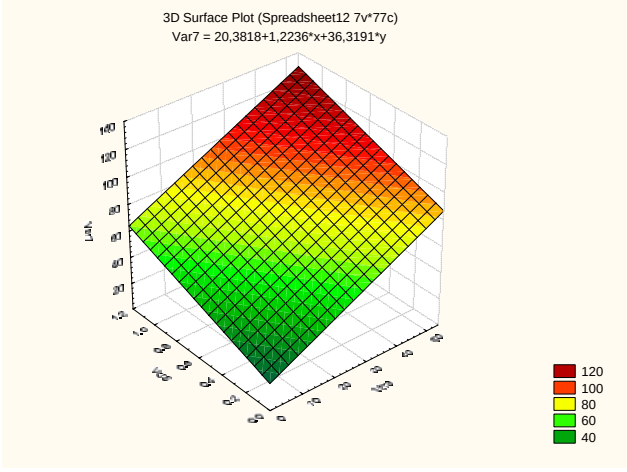


Figure 4: Northern zone of Omsk province



In comparison to regression model which is defined by the two most significant coefficients, the discriminant model takes account of all 6 ratios and allows for more precise estimation of the probability of insolvency based on 5 criteria: 1 group- risk of insolvency is absent or small; 2 group- small risk of insolvency; 3 group- medium risk of insolvency; 4 group- large risk of insolvency; 5 group- actual insolvency. To position a farm into a certain group based on financial solvency, a system of equations shown below is used. A value of the coefficient **G** indicates to which group a given farm belongs to. Based on combined accounting statements of 32 regions of Omsk province, the following results of discriminant analysis have been obtained: 3 groups for restructuring were defined; groups 1 and 5 were not selected by the program. This was the case because based on the accumulated grade by 01.01.2003, none of the regions was observed in any of these two groups and by 01.01.2004 only Kormilovskii region was observed in the 5th group while in the 1st group none of the regions was observed. A part of the results of data analysis:

$$G_2 = -133{,}73 - 28X_1 + 110{,}41\,X_2 + 4{,}4\,X_3 - 60{,}9\,X_4 + 409\,X_5 - 20{,}95\,X_6$$
$$G_3 = -106{,}27 - 4{,}29X_1 + 88{,}12\,X_2 - 2{,}02\,X_3 - 63{,}73\,X_4 + 400{,}05\,X_5 - 22{,}06\,X_6$$
$$G_4 = -78{,}99 - 62{,}39\,X_1 + 136{,}49\,X_2 - 1{,}86\,X_3 - 62{,}65\,X_4 + 345{,}32\,X_5 - 21{,}99\,X_6.$$

Discriminant functions for different zones are given by:

Steppe zone of Omsk province:

$$G_1 = -18{,}5 + 24{,}3X_1 - 0{,}2\,X_2 + 0{,}19\,X_3 - 0{,}54\,X_4 + 1{,}01\,X_5 - 0{,}09\,X_6$$
$$G_2 = -1{,}67 + 1{,}09X_1 + 0{,}07\,X_2 - 0{,}05\,X_3 + 0{,}3\,X_4 + 0{,}08\,X_5 - 1{,}67\,X_6$$
$$G_3 = -1{,}85 + 0{,}74X_1 - 0{,}03\,X_2 + 0{,}03\,X_3 - 0{,}59\,X_4 + 0{,}75\,X_5 - 0{,}05\,X_6$$
$$G_4 = -2{,}51 + 0{,}73X_1 + 0{,}12\,X_2 + 0{,}07\,X_3 - 1{,}08\,X_4 + 0{,}04\,X_5 - 2{,}51\,X_6$$
$$G_5 = -3{,}64 + 1{,}19X_1 - 0{,}18\,X_2 + 0{,}02\,X_3 - 1{,}28\,X_4 + 0{,}53\,X_5 - 0{,}15\,X_6$$

Southern *lesosteppe* zone of Omsk province:

$$G_1 = -43{,}26 + 141{,}87X_1 - 114{,}13\,X_2 + 1{,}48\,X_3 - 0{,}24\,X_4 + 5{,}27\,X_5 + 0{,}25\,X_6$$
$$G_2 = -6{,}52 + 15{,}0X_1 - 12{,}2\,X_2 + 0{,}04\,X_3 - 0{,}28\,X_4 + 12{,}71\,X_5 - 0{,}17\,X_6$$
$$G_3 = -4{,}18 + 9{,}36X_1 - 7{,}31\,X_2 - 0{,}06\,X_3 - 0{,}46\,X_4 + 7{,}11\,X_5 - 0{,}11\,X_6$$
$$G_4 = -3{,}24 + 4{,}82X_1 - 3{,}454\,X_2 - 0{,}07\,X_3 - 1{,}28\,X_4 + 0{,}53\,X_5 - 3{,}64\,X_6$$
$$G_5 = -2{,}59 + 2{,}13X_1 - 2{,}15\,X_2 + 0{,}07\,X_3 - 0{,}34\,X_4 - 2{,}24\,X_5 - 2{,}59\,X_6$$

Northern *lesosteppe* of Omsk province:

$$G_1 = -11{,}85 - 10{,}6X_1 + 7{,}75\,X_2 + 1{,}50\,X_3 - 0{,}15\,X_4 + 9{,}49\,X_5 + 0{,}03\,X_6$$
$$G_2 = -3{,}71 - 3{,}98X_1 + 3{,}46\,X_2 + 0{,}28\,X_3 - 0{,}15\,X_4 + 7{,}60\,X_5 + 0{,}04\,X_6$$
$$G_3 = -2{,}84 - 2{,}79X_1 + 2{,}46\,X_2 + 0{,}18\,X_3 - 0{,}28\,X_4 + 4{,}39\,X_5 + 0{,}03\,X_6$$
$$G_4 = -3{,}18 + 0{,}28X_1 - 0{,}97\,X_2 + 0{,}12\,X_3 - 0{,}07\,X_4 - 4{,}27\,X_5 - 0{,}05\,X_6$$

Northern zone of Omsk province:

$$G_1 = -3600{,}8 + 3352{,}4X_1 - 494{,}6X_2 + 11{,}55\,X_3 - 0{,}32X_4 + 37{,}4\,X_5 + 0{,}46\,X_6$$

$$G_2 = -14{,}89 + 13{,}8X_1 + 1{,}84\,X_2 + 0{,}85\,X_3 + 0{,}11\,X_4 + 24{,}3\,X_5 + 0{,}02\,X_6$$
$$G_3 = -8{,}93 + 12{,}9X_1 - 2{,}13\,X_2 + 0{,}01\,X_3 + 0{,}07\,X_4 + 21{,}15\,X_5 + 0{,}02\,X_6$$
$$G_4 = -5{,}68 + 11{,}32X_1 - 1{,}85\,X_2 + 0{,}008\,X_3 - 0{,}26\,X_4 + 11{,}99\,X_5 + 0{,}02\,X_6$$
$$G_5 = -2{,}59 + 17{,}41X_1 - 1{,}99\,X_2 + 0{,}16\,X_3 - 0{,}15\,X_4 - 2{,}66\,X_5 - 0{,}004\,X_6$$

SUMMARY

The proposed methods for diagnostics of the probability of insolvency are 1) applicable for Russian conditions 2) adapted to agricultural production and 3) based on a provincial dataset. Financial situations of the farms are adequately represented by the current liquidity ratio (ratio of the current assets to current liabilities) and the coefficient of financial independence in terms of resources and expenses. The official methods of analysis of financial condition have a disadvantage- they are oriented to the past, because conclusions are based only on the accounting statements where the farm life-cycle is not considered. Moreover, the future financial condition is not forecasted. For making managerial decisions it is important to take a due account of the business environment and a human factor.