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ASSESSMENT THE BANKRUPTCY OF SECTORIAL COMPANIES: THE PRACTICE OF FOREIGN AND RUSSIAN MODELS

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The article is devoted to assessing the risk of bankruptcy of Russian sectorial companies based on the implementation of foreign and domestic models. Three large groups of models, such as logit, probit and MDA-models were considered as a methodological foundation of research. Calculations were made using sixteen special private methods developed on their basis. The purpose of this paper is to study the differences in the interpretation of the probability of bankruptcy of Russian companies in relation to a set of factors. These factors include: types of companies, sources of initial information (Russian or international standards), as well as the regional affiliation of the methods used (Russian or foreign). During the calculations, a number of external and internal restrictions related to the specifics of sectorial companies were introduced. Research veracity is confirmed by the use of generally recognized models and methods, as well as the practical implementation of the results obtained. These results are recommended for use in the scientific community when conducting further research on the applicability of existing predictive models of bankruptcy to the Russian market, as well as for business owners and investors when making strategic decisions.

Keywords: economic; bankruptcy; risk; sectorial company; modeling; logit-model; probit-model; MDA-model.

Introduction

Currently, the world practice of assessing the probability of companies' bankruptcy has accumulated many different mathematical models. They are based primarily on the study of financial statements, as well as a number of other qualitative indicators [1, 2]. Similar models are developed for various areas and types of business [2]. In this regard, the issue of differences in the interpretation of the results of foreign and domestic models directly for Russian companies is being updated. It also includes using initial data compiled on the principles of both Russian and international reporting. This problem is enormously significant not only for business owners, but also for investors. Thence, this challenge is essential not only from the scientific point of view, but also from the practical one.

1. Methodology and Initial Data of Sectorial Companies

The methodological foundation of this study is the logit, probit and MDA-models widely used in modern practice: logit-models of Chesser, Khaidarshina, Zhdanov, Joo-

Ha – Taehong and Altman – Sabato [2, 3]; probit-model of Zmijewski [2]; MDA-models of Altman, Lis, Springate, Taffler, Fulmer, Fedotova, Savitskaya and Belikov-Davydova [1, 2].

Two Russian sectorial companies were selected as objects of this research. They were conventionally designated as "A" and "B" to avoid conflicts of interest. Company "A" works in the fuel and energy sector; "B" – the transport industry. Tables 1–4 show the reporting of these companies in accordance with the requirements of Russian Accounting Standards (RAS) and International Financial Reporting Standards (IFRS) for four years.

Table 1

Company "A": data of RAS, thousand rubles

Indicators	Period, year			
	0	1	2	3
Non-current assets	-	520267387	390389796	401557163
Trade receivables	-	88128999	267690805	332674500
Cash and cash equivalents	-	21949639	10866 89	28850530
Current asset	-	208034376	360747099	439362594
Total assets	640392375	728301763	751136895	840919757
Equity capital	-	2326199	2326199	2326199
Fixed capital	4132102	3975217	2761417	2770918
Retained earnings	-	609147154	591617946	638788515
Capital reserves	-	624417269	606052934	654671151
Long term liabilities	-	40973087	48832161	46110554
Short term liabilities	-	62911407	96251800	140138052
Debt capital	-	4577953	32582379	16406104
Revenue	-	486176316	581536880	793237174
Cost of sales	-	312524760	369978929	474524138
Profit on sales	-	136603899	161353913	264790566
Interest paid	-	3451408	2667738	3094329
Earnings before interest and taxes	-	137015764	134470942	256974060
Net profit	-	104824049	100022216	197522814

Table 2

Company "A": data of IFRS, mln. rubles

Indicators	Period, year			
	0	1	2	3
Non-current assets	-	630054	705326	786983
Trade receivables	-	65707	65037	83692
Cash and cash equivalents	-	77106	42797	65489
Current asset	-	234015	216077	232688
Total assets	798691	1094597	1107454	1201288

end of Table 2

Indicators	Period, year			
	0	1	2	3
Equity capital	-	11767	11767	11767
Fixed capital	96937	96991	96204	96204
Retained earnings	-	615477	624254	683508
Capital reserves	-	703511	711859	771265
Long term liabilities	-	99330	82429	77687
Short term liabilities	-	286363	306296	346820
Debt capital	-	54130	46812	15037
Revenue	-	580127	681159	910534
Cost of sales	-	437077	520036	645759
Profit on sales	-	144084	162575	263421
Interest paid	-	3920	3095	3590
Earnings before interest and taxes	-	144891	166633	277379
Net profit	-	106130	123892	211548

Table 3

Company "B": data of RAS, thousand rubles

Indicators	Period, year			
	0	1	2	3
Non-current assets	-	38472007	107866379	122250559
Trade receivables	-	33392620	11729796	9392884
Cash and cash equivalents	-	1264546	360560	988664
Current asset	-	39665955	20996187	20030085
Total assets	66481456	78137963	128862566	142280644
Equity capital	-	1538	1538	1538
Fixed capital	1796	1769	1769	1769
Retained earnings	-	-32828449	-51677292	-60263460
Capital reserves	-	-29789492	14713745	13173951
Long term liabilities	-	20134685	29494840	21935476
Short term liabilities	-	87792769	84653981	107171216
Debt capital	-	50154342	65723777	67498918
Revenue	-	109691167	117313131	50420054
Cost of sales	-	112579409	109451785	50432881
Profit on sales	-	-12380791	-293339	-4972571
Interest paid	-	4600099	7827105	6432412
Earnings before interest and taxes	-	-11871202	-11731396	-2063899
Net profit	-	-16400306	-19322469	-8576599

Table 4

Company "B": data of IFRS, mln. rubles

Indicators	Period, year			
	0	1	2	3
Non-current assets	-	86810073	127314770	139818370
Trade receivables	-	4844570	4724080	5349189
Cash and cash equivalents	-	1359983	461581	1012611
Current asset	-	14661563	14726120	15692780
Total assets	92571709	101471636	142040890	155511150
Equity capital	-	7587	7587	7587
Fixed capital	9912651	8435196	33201709	38736438
Retained earnings	-	-29547783	-86903479	-89979180
Capital reserves	-	-19742704	-54426143	-52586824
Long term liabilities	-	59837933	99310829	81845672
Short term liabilities	-	61376407	97156202	126252301
Debt capital	-	50059760	78361423	78524002
Revenue	-	105449342	113761479	50675115
Cost of sales	-	111908389	109222516	55181323
Profit on sales	-	-6459047	4538963	-4506209
Interest paid	-	4600099	7827105	6432412
Earnings before interest and taxes	-	-13721677	-6809532	1282322
Net profit	-	-13341061	-14462986	-3178094

Some models have the following restrictions:
- the credit histories of "A" and "B" companies are positive;
- the age of each company are more than 10 years;
- the regional affiliation of "B" is Moscow; "A" – other city;
- the distribution of average key rate of the Bank of Russia is in Table 5.

Table 5

Average annual key rate of the Bank of Russia, shares

	Company "A"	Company "B"
1st year	0.10583	0.07677
2st year	0.09188	0.08145
3st year	0.07427	0.14167

2. Practical Assessment of the Bankruptcy of the Sectorial Companies

The evaluation results for foreign and Russian models are presented in Tables 6–9. The calculations showed that the assessment of companies' bankruptcy based on foreign and Russian methods generally coincides, both according to RAS and IFRS. The only

exception was the Chesser logit-model. The risk of bankruptcy of company "A" in all four cases is assessed as low; company "B" – high.

Table 6

Assessment of risk of bankruptcy of company "A": data of RAS

Models	**1st year**	**2nd year**	**3rd year**	**Risk's interpretation**
Chesser	0.9997	0.9996	0.9998	Critical
Khaidarshina	0	0	0	Minimal
Zhdanov	0.0009	0	0	Extremely low
Joo-Ha and Taehong	0.3465	0.4373	0.4305	Medium
Altman-Sabato	0	0	0	Low
Zmijewski	0	0	0	Minimal
Altman (2 factors)	-3.9342	-4.3864	-3.7424	Low
Altman (5 factors)	6.4165	5.4569	5.5162	Tends to 0% probability
Altman (do not trade on the exchange)	2.0491	1.8170	2.3517	35 - 50%
Lis	0.0830	0.0916	0.1043	Low
Taffler	1.5335	1.3587	1.4890	Highly improbable
Springate	2.5908	2.2869	3.0752	Highly improbable
Fulmer	13.441	14.784	18.159	Highly improbable
Fedotova	-3.938	-4.409	-3.753	No risk
Savitskaya	322.99	136.41	304.82	No risk
Belikov-Davydova	29.010	40.458	75.976	Less than 10%

Table 7

Assessment of risk of bankruptcy of company "A": data of IFRS

Models	**1st year**	**2nd year**	**3rd year**	**Risk's interpretation**
Chesser	0.9314	0.9258	0.956	Critical
Khaidarshina	->0	->0	->0	Minimal
Zhdanov	0.7566	0.7595	0.669	Extremely low
Joo-Ha and Taehong	0.2679	0.2326	0.2241	Medium
Altman-Sabato	->0	->0	->0	Low
Zmijewski	0	0	0	Minimal
Altman (2 factors)	-1.2364	-1.1206	-1.1008	Low
Altman (5 factors)	1.6305	1.6848	2.0269	Tends to 0% probability
Altman (do not trade on the exchange)	1.9244	2.094	4.2435	35 - 50%
Lis	0.0579	0.0585	0.0661	Low
Taffler	0.4774	0.5018	0.6471	Highly improbable
Springate	1.1835	1.2766	1.7486	Highly improbable

end of Table 7

Models	1st year	2nd year	3rd year	Risk's interpretation
Fulmer	6.6488	6.6994	7.0754	Highly improbable
Fedotova	-1.2622	-1.1426	-1.1073	No risk
Savitskaya	21.8048	21.453	29.381	No risk
Belikov-Davydova	3.0674	3.1061	4.0695	Less than 10%

Table 8

Assessment of risk of bankruptcy of company "B": data of RAS

Models	1st year	2nd year	3rd year	Risk's interpretation
Chesser	0.0058	->0	0.0901	Critical
Khaidarshina	1	1	1	Minimal
Zhdanov	-*	-	-	Extremely low
Joo-Ha and Taehong	0.3982	0.0185	0.3211	Medium
Altman-Sabato	0.0224	0.0197	0.0158	Low
Zmijewski	1	1	1	Minimal
Altman (2 factors)	-0.5011	-0.3587	-0.3137	Low
Altman (5 factors)	-0.6388	-0.6686	-0.5069	Tends to 0% probability
Altman (do not trade on the exchange)	-0.6216	-0.508	-0.3376	35 - 50%
Lis	-0.0059	-0.0209	-0.0167	Low
Taffler	0.3999	0.286	0.1879	Highly improbable
Springate	0.7095	0.3475	0.3683	Highly improbable
Fulmer	-	-	181.35	Highly improbable
Fedotova	-0.8356	-0.6245	-0.5609	No risk
Savitskaya	12.699	5.6695	4.4867	No risk
Belikov-Davydova	-9266.7	-10921	-4847.2	Less than 10%

* This model doesn't give results

Table 9

Assessment of risk of bankruptcy of company "B": data of IFRS

Models	1st year	2nd year	3rd year	Risk's interpretation
Chesser	1	1	1	Critical
Khaidarshina	1	1	0.9454	Minimal
Zhdanov	0.9203	0.9742	0.949	Extremely low
Joo-Ha and Taehong	0.0722	0.0718	0.2261	Medium
Altman-Sabato	0.0239	0.0161	0.0129	Low
Zmijewski	1	1	1	Minimal
Altman (2 factors)	-0.3585	-0.231	-0.2288	Low

end of Table 9

Models	1st year	2nd year	3rd year	Risk's interpretation
Altman (5 factors)	-0.7442	-0.8584	-0.6907	Tends to 0% probability
Altman (do not trade on the exchange)	-0.5558	-0.3831	-0.2138	35 - 50%
Lis	-0.0199	-0.0326	-0.0257	Low
Taffler	0.2351	0.2858	0.1892	Highly improbable
Springate	0.141	0.4029	0.3933	Highly improbable
Fulmer	-	-0.6928	0.5565	Highly improbable
Fedotova	-0.6156	-0.5185	-0.4919	No risk
Savitskaya	5.3636	4.1699	3.5248	No risk
Belikov-Davydova	-0.3898	0.393	0.7449	Less than 10%

Conclusions

1. The relevant problem of assessment of the bankruptcy of Russian companies on the basis of foreign and Russian models is solved.

2. Similarities and differences in the interpretation of the probability of bankruptcy of companies depending on the types of models and source information are studied.

3. The results are recommended to be used in further research on the applicability of existing predictive models of bankruptcy to the Russian market.

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ОЦЕНКА БАНКРОТСТВА ОТРАСЛЕВЫХ КОМПАНИЙ: ПРАКТИКА ЗАРУБЕЖНЫХ И РОССИЙСКИХ МОДЕЛЕЙ

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Статья посвящена оценке риска банкротства российских отраслевых компаний на основе применения зарубежных и отечественных моделей. В качестве методологической базы рассмотрены три крупные группы таких моделей, как logit, probit и MDA-модели, а расчеты произведены по шестнадцати частным методикам, разработанным на их основе. Целью работы является изучение различий в интерпретации вероятности банкротства российских компаний в зависимости от совокупности факторов. В их число входят: виды компаний, способы предоставления исходной информации (российские или международные стандарты), а также региональная принадлежность используемых моделей (российские или зарубежные). В ходе расчетов введены ряд внешних и внутренних ограничений, связанных со спецификой деятельности отраслевых компаний. Достоверность полученных выводов подтверждена применением общепризнанных моделей и методов, а также практической реализацией полученных результатов. Данные результаты рекомендуется использовать в научном сообществе при проведении последующих исследований в части применимости существующих прогнозных моделей банкротства к российскому рынку, а также собственникам бизнеса и инвесторам при принятии стратегических решений.

Ключевые слова: экономика; банкротство; риск; отраслевая компания; моделирование; logit-модели; probit-модели; MDA-модели.

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