BANKRUPTCY RISK ANALYSIS IN THE WINE SECTOR AT THE COMPANIES FROM REPUBLIC OF MOLDOVA

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Abstract
The bankruptcy risk is the most important risk faced by the entity. The purpose of this report is to introduce and expand the fundamental problems concerning bankruptcy risk assessment on the Moldavian entities. The last time the bankruptcy risk assessment issues in different branches of national economy, are the subject of scientists' research, a single model for estimating the level of bankruptcy risk for the Moldavian companies has not been developed yet. Under such conditions increases significantly the need for the quantitative measurement of this phenomenon. In the present article, we intended to present the methods of determining the rating of the entities that can be used to measure the bankruptcy risk, emphasizing at the same time the limits of each of these methods. This approach has helped us to demonstrate that there is no „best practice" for evaluation of the bankruptcy risk, but rather a complementarity of these techniques.

Keywords: bankruptcy risk, credit scoring method, methods of multidimensional rating, discriminant analysis.

JEL classification: C44, L25, M41, O21

1. Introduction

Every entity tending to meet the demands of the market economy, irrespective of the activity profile, legal form, dimension and socio-economic space where it activates, has to adapt all the time to the risky situations likely to appear both in the current activity, and in the perspective one. Thus, the

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problem of the risks of bankruptcy evaluation and analysis has a significant importance in the field of the management theory and practice, internal planning and control of the entity.

The goal of the article is to introduce and expand the fundamental problems concerning bankruptcy risk assessment on the Moldavian entities; to present the methods of determining the rating of the entities that can be used to measure the bankruptcy risk, emphasizing at the same time the limits of each of these methods.

During the research, the universal method of dialectics has been used, along with its principles: induction and deduction, analysis and synthesis, scientific abstraction, analogy, correlation, as well as the economic-mathematical, economic-statistical methods and those of economic analysis for information procession: comparison, grouping, etc. The theoretical and methodological basis of research are the primary works of the scientists from Moldova, Romania, USA, the CIS states, as well as from other states, etc.

In order to analyse the bankruptcy risk we selected 10 entities from the Republic of Moldova, namely the wine sector, for which we have processed the financial statements for a period of 5 years (2011-2015). Entities in the sample are dispersed throughout the national territory, are the entities that generated the highest sales revenue during this period. Thus, they fall into the category of the largest enterprises being representative of the sector they are part of.

The wine industry in the Republic of Moldova is one of the main branches of the country's economy, as practically 90 - 95% of the total volume of wine produced goes to export, thus constituting an important source of income for the state budget. The vineyards occupy an area of 148,500 hectares, of which 107,800 hectares are used for commercial production. The remaining 40,700 hectares are vineyards grown in the villages, on the fields near the houses, used to make homemade wine (https://ro.wikipedia.org/wiki/Industria_vinicol%C4%83_%C3%AEn_Republica_Moldova).

The grape wine sector included 293 companies at the end of 2015, of which 245 are active, with sales revenue higher than zero.

2. Literature review

The study of different approaches regarding the risk concept is characterised by a large variety of theoretical and applicative definitions. It is impossible to formulate some recommendations of risk of bankruptcy analysis

or/and assessment in entrepreneurial activity without knowing the justified essence of risk concept.

The risk theory in entrepreneurial activity was born in the countries with a developed market economy. P. Hizrici was saying, „The term risk in entrepreneurial activity spread over in the XVIIth century, when „entrepreneur" was named that person who signed a contract with the state for a service or labour" (Muntean, 2010). Nevertheless, definitions of the risk started being studied under different aspects in late XIXth – early XXth centuries. A number of theories appeared, elaborated on the principle of objective responsibility for contribution („integral risk", „the risk of usual actions", „the theory of the professional risk", etc.) (Muntean, 2016, p.147)

There are two risk theories in contemporary economic literature – classic and neoclassic.

According to the classic theory, the main representatives of which are John Stuart Mill and Senior, the structure of the entrepreneurial profit includes one percent of the invested capital, the salary of the capitalism and the risk payment (as compensation for the risk likely linked to the entrepreneurial activity). Such a unilateral approach of the risk caused the economists' harsh critique. By generalizing the opinions expressed in the classic theory, it can be said that the risk is identified with the probability of suffering material loss or damages, or with the mathematical expectation of the loss, likely to appear as a result of the decision and strategy selected. (Muntean, 2010).

The economists A. Marchall and A. Pigou elaborated the neoclassic theory in the 20es-30ies of the XXth century. These theory scholars think that the entity activating in uncertain conditions should take into consideration two elements: the amount of the expected profit and the amount of its possible deviations. The entrepreneur's behaviour, according to this theory, is identified with the concept of the maximal profit. It implies that if, for example, they need to select amongst two investment projects leading to the same profit, and they would choose the one that has less profit variations. In line with the neoclassic risk theory, the guaranteed profit has a higher value than the profit expected in the same amount, but cornered by possible variations. By completing the neoclassic theory, John M. Keynes drew his attention towards the term „inclination towards risk", meaning taking into consideration the satisfaction factor as a result of calling for the risk, which implies the following conclusion: to gain a high profit, the entrepreneur is likely to risk (Muntean, 2010).

Thus, the neoclassic theory identifies the risk with the possibility of deviation from the proposed objective. Therefore, according to this theory, the entrepreneur that activates in uncertain conditions is obtaining profit, which is considered an unstable variable, and, when signing a contract, it leads to two criteria:

a) the amount of the planned profit;

b) the amount of the deviations from the profit of the last period.

Such an approach identifies, in the end, certain methodological approaches, which allow analysing the activity of the economic agents and determining the rules and criteria that the entrepreneurs and managers follow in their activity of entrepreneurship, in selecting and taking correct decisions in each of the created situations.

It is necessary to emphasize the conditional character while delimitating the approaches of the classic school, and the neoclassic one. If in the first case, the orientation implies the danger of suffering loss because of the deviations from the planned objective, in the second case, their essence is the objective, and the loss is the cause of the deviation from the planned objective.

Without a justified understanding of the risk essence, it is impossible to make recommendations for its analysis. By concluding the above said, we can say that the risk phenomenon emphasizes the following elements, the interconnection of which determines the risk content:

- The possibility to deviate from the expected objective, for which the chosen alternative is realized;
- The possibility to obtain the expected result;
- Lack of uncertainty in attaining the expected result;
- The possibility of negative consequences during the actions in uncertain conditions for the subject adhering to risk;
- The material or other loss related to the chosen alternative in conditions of uncertainty;
- Expectancy of danger, failure because of the selected alternative.

We think that these elements characterize exactly enough the essence of the risk. (Muntean, 2010).

3. Research methodology and sample

A stable financial situation, a non-risky situation is achieved when there is a qualitative asset management, a sufficient level of own equity,

profitability and liquidity, as well as stable sources of income and multiple possibilities of attracting borrowed sources.

Therefore, in order to ensure a low level of risk of bankruptcy, an entity must have a flexible capital structure, to be able to organize its movement to ensure a permanent revenue overrun on expenditure in order to preserve the solvency and ensure the necessary conditions for self-financing.

The risk of bankruptcy analysis represents an integral part of the risk analysis of the entity. The phenomenon of bankruptcy appear because of high economic and/or financial risk existence at the company. In turn, commensuration of risk of bankruptcy is difficult because of its multidimensional nature, making it almost impossible for its focus into a single indicator. Thus, taking into account the multitude of indicators for measuring the risk of bankruptcy, different ranges of safety thereof, as well as the difficulties encountered in this connection in the assessment of the degree of liquidity and solvency of the entity, the majority of specialists recommend that in assessing risk of bankruptcy there should be used the following models:

1) Models of multidimensional rating;
2) Scoring Models;
3) Discriminant Analysis.

A source of information for the analysis of the risk of bankruptcy can be the data of the Balance sheet or the data of the Trail Balance. Because the balance sheet is the most available and prevalent source of information, this analysis, is sometimes the only way of assessing the risk of the entity for a specified period. The information obtained from the analysis performed is relevant for both internal and external users.

3.1 Models of multidimensional rating

The methodology of models of multidimensional rating presumes the following steps:

Step 1. There is created a system of rates (e.g.: current liquidity, assets turnover, return on assets, global autonomy rate, the share of working capital in current assets) that will be used to assess the risk of bankruptcy of the entities subject to research. Then, the information on these rates is collected and the matrix of the original data is made.

Initial data can be presented both in absolute values that characterize the status of the entity at a given period, as well as in the form of indices that show trends in these rates. The simultaneous study is also possible: both in absolute values and relative values (Muntean, 2016, p.53).

Table 1. The matrix of the initial data

Entities	Current liquidity rate	The assets turnover, times	Return on assets	The global autonomy rate	The working capital share in current assets
Year 2012					
WINE 1	137,87	**0,79**	0,09	42,51	27,47
WINE 2	609,78	0,47	-0,76	21,41	83,60
WINE 3	283,12	0,48	-4,85	31,73	64,68
WINE 4	55,13	0,77	4,21	7,48	-81,39
WINE 5	**684,99**	0,57	-1,36	**95,54**	**85,40**
WINE 6	236,76	0,33	0,74	27,61	57,76
WINE 7	254,98	0,38	0,52	50,86	60,78
WINE 8	312,70	0,47	1,34	46,16	68,02
WINE 9	503,70	0,35	2,19	78,40	80,15
WINE 10	181,00	0,67	**4,25**	44,22	44,75
Year 2013					
WINE 1	314,46	1,01	0,77	44,46	68,20
WINE 2	326,86	0,65	-1,54	19,20	69,41
WINE 3	269,51	0,45	-6,74	24,21	62,90
WINE 4	48,99	**1,30**	4,05	11,36	-104,13
WINE 5	593,00	1,06	0,82	**91,78**	83,14
WINE 6	262,01	0,31	1,09	26,31	61,83
WINE 7	294,97	0,35	0,77	46,07	66,10
WINE 8	224,24	0,46	0,36	34,62	55,40
WINE 9	**779,60**	0,38	2,96	77,94	**87,17**
WINE 10	137,05	0,59	**8,63**	42,02	27,03
Year 2014					
WINE 1	264,43	0,73	0,62	43,85	62,18
WINE 2	876,60	0,51	-1,03	20,39	88,59
WINE 3	302,69	0,49	-2,39	27,02	66,96
WINE 4	60,76	**1,19**	5,10	14,26	-64,59
WINE 5	154,10	0,96	0,18	26,24	35,11
WINE 6	383,79	0,43	0,92	29,80	73,94
WINE 7	286,12	0,34	0,12	45,94	65,05
WINE 8	338,39	0,39	0,82	32,24	70,45
WINE 9	**1.315,58**	0,20	1,82	**80,98**	**92,40**
WINE 10	124,72	0,51	**9,84**	42,87	19,82
Year 2015					
WINE 1	392,85	0,73	1,28	47,80	74,55
WINE 2	964,20	0,70	0,64	20,66	89,63

Entities	Current liquidity rate	The assets turnover, times	Return on assets	The global autonomy rate	The working capital share in current assets
WINE 3	358,35	0,60	2,79	22,49	72,09
WINE 4	83,80	**1,46**	4,18	14,33	-19,33
WINE 5	139,50	0,75	1,05	14,19	28,32
WINE 6	272,19	0,63	**5,45**	26,17	63,26
WINE 7	276,53	0,34	2,68	42,76	63,84
WINE 8	265,17	0,51	2,50	32,39	62,29
WINE 9	**1.551,77**	0,40	5,33	**86,62**	**93,56**
WINE 10	146,49	0,60	2,61	45,41	31,74

Source: Elaborated by authors.

Step 2. In the table containing the initial data, the element with a maximum level is determined for each column to whom is assigned the value 1. Then all the elements in this column (a_{ij}) are to be related to the value of the maximum element (max a_{ij}). As a result there is formed the matrix of the standardised coefficients (x_{ij}):

$$x_{ij} = \frac{a_{ij}}{\max a_{ij}} \tag{1}.$$

Table 2. The matrix of the standardised coefficients

Entities	Current liquidity rate	The assets turnover, times	Return on assets	The global autonomy rate	The working capital share in current assets
Year 2012					
WINE 1	0,20	1,00	0,02	0,44	0,32
WINE 2	0,89	0,60	-0,18	0,22	0,98
WINE 3	0,41	0,60	-1,14	0,33	0,76
WINE 4	0,08	0,97	0,99	0,08	-0,95
WINE 5	1,00	0,71	-0,32	1,00	1,00
WINE 6	0,35	0,42	0,17	0,29	0,68
WINE 7	0,37	0,47	0,12	0,53	0,71
WINE 8	0,46	0,59	0,32	0,48	0,80
WINE 9	0,74	0,44	0,51	0,82	0,94
WINE 10	0,26	0,85	1,00	0,46	0,52
Year 2013					
WINE 1	0,40	0,78	0,09	0,48	0,78
WINE 2	0,42	0,50	-0,18	0,21	0,80
WINE 3	0,35	0,35	-0,78	0,26	0,72
WINE 4	0,06	1,00	0,47	0,12	-1,19

Entities	Current liquidity rate	The assets turnover, times	Return on assets	The global autonomy rate	The working capital share in current assets
WINE 5	0,76	0,82	0,10	1,00	0,95
WINE 6	0,34	0,24	0,13	0,29	0,71
WINE 7	0,38	0,27	0,09	0,50	0,76
WINE 8	0,29	0,36	0,04	0,38	0,64
WINE 9	1,00	0,29	0,34	0,85	1,00
WINE 10	0,18	0,46	1,00	0,46	0,31
Year 2014					
WINE 1	0,20	0,61	0,06	0,54	0,67
WINE 2	0,67	0,43	-0,10	0,25	0,96
WINE 3	0,23	0,41	-0,24	0,33	0,72
WINE 4	0,05	1,00	0,52	0,18	-0,70
WINE 5	0,12	0,81	0,02	0,32	0,38
WINE 6	0,29	0,36	0,09	0,37	0,80
WINE 7	0,22	0,28	0,01	0,57	0,70
WINE 8	0,26	0,32	0,08	0,40	0,76
WINE 9	1,00	0,17	0,18	1,00	1,00
WINE 10	0,09	0,43	1,00	0,53	0,21
Year 2015					
WINE 1	0,25	0,50	0,23	0,55	0,80
WINE 2	0,62	0,48	0,12	0,24	0,96
WINE 3	0,23	0,41	0,51	0,26	0,77
WINE 4	0,05	1,00	0,77	0,17	-0,21
WINE 5	0,09	0,51	0,19	0,16	0,30
WINE 6	0,18	0,43	1,00	0,30	0,68
WINE 7	0,18	0,23	0,49	0,49	0,68
WINE 8	0,17	0,35	0,46	0,37	0,67
WINE 9	1,00	0,27	0,98	1,00	1,00
WINE 10	0,09	0,41	0,48	0,52	0,34

Source: Elaborated by authors.

Step 3. All the elements of the coordinating matrix stands at the square. If account is taken of the specific weight of each additional rate, the results are multiplied by the level of weight (K) corresponding to each rate, determined by the experts. Then, calculate the sum of the columns (Muntean, 2016, p.54):

$$R_j = K_1 x_{1j}^2 + K_2 x_{2j}^2 + \ldots\ldots + K_n x_{nj}^2 \qquad (2).$$

Step 4. Results of the rating analysis (R_{ij}) should be arranged in order of the size, this way bringing out the rating of each entity. First place is owned by

the entity with the maximum score, second place - the entity with the following result etc.

Table 3. Results of the rating analysis

Entities	Current liquidity rate	The assets turnover, times	Return on assets	The global autonomy rate	The working capital share in current assets	The amount of the standardised coefficients	Place of the entity
Year 2012							
WINE 1	0,04	1,00	0,00	0,20	0,10	1,34	**VIII**
WINE 2	0,79	0,35	0,03	0,05	0,96	2,19	**VI**
WINE 3	0,17	0,36	1,30	0,11	0,57	2,52	**IV**
WINE 4	0,01	0,94	0,98	0,01	0,91	2,84	**II**
WINE 5	1,00	0,51	0,10	1,00	1,00	3,61	**I**
WINE 6	0,12	0,17	0,03	0,08	0,46	0,86	**X**
WINE 7	0,14	0,22	0,01	0,28	0,51	1,17	**IX**
WINE 8	0,21	0,35	0,10	0,23	0,63	1,53	**VII**
WINE 9	0,54	0,19	0,26	0,67	0,88	2,55	**III**
WINE 10	0,07	0,72	1,00	0,21	0,27	2,28	**V**
Year 2013							
WINE 1	0,16	0,61	0,01	0,23	0,61	1,63	**IV**
WINE 2	0,18	0,25	0,03	0,04	0,63	1,13	**VII**
WINE 3	0,12	0,12	0,61	0,07	0,52	1,44	**VI**
WINE 4	0,00	1,00	0,22	0,02	1,43	2,67	**III**
WINE 5	0,58	0,67	0,01	1,00	0,91	3,16	**I**
WINE 6	0,11	0,06	0,02	0,08	0,50	0,77	**IX**

Entities	Current liquidity rate	The assets turnover, times	Return on assets	The global autonomy rate	The working capital share in current assets	The amount of the standardised coefficients	Place of the entity
WINE 7	0,14	0,07	0,01	0,25	0,57	1,05	**VIII**
WINE 8	0,08	0,13	0,00	0,14	0,40	0,76	**X**
WINE 9	1,00	0,09	0,12	0,72	1,00	2,92	**II**
WINE 10	0,03	0,21	1,00	0,21	0,10	1,55	**V**
Year 2014							
WINE 1	0,04	0,38	0,00	0,29	0,45	1,17	**V**
WINE 2	0,44	0,18	0,01	0,06	0,92	1,62	**III**
WINE 3	0,05	0,17	0,06	0,11	0,53	0,92	**VIII**
WINE 4	0,00	1,00	0,27	0,03	0,49	1,79	**II**
WINE 5	0,01	0,65	0,00	0,11	0,14	0,91	**IX**
WINE 6	0,09	0,13	0,01	0,14	0,64	1,00	**VI**
WINE 7	0,05	0,08	0,00	0,32	0,50	0,95	**VII**
WINE 8	0,07	0,11	0,01	0,16	0,58	0,92	**VIII**
WINE 9	1,00	0,03	0,03	1,00	1,00	3,06	**I**
WINE 10	0,01	0,18	1,00	0,28	0,05	1,52	**IV**
Year 2015							
WINE 1	0,06	0,25	0,06	0,30	0,63	1,31	**V**
WINE 2	0,39	0,23	0,01	0,06	0,92	1,61	**IV**
WINE 3	0,05	0,17	0,26	0,07	0,59	1,14	**VI**
WINE 4	0,00	1,00	0,59	0,03	0,04	1,66	**III**

Entities	Current liquidity rate	The assets turnover, times	Return on assets	The global autonomy rate	The working capital share in current assets	The amount of the standardised coefficients	Place of the entity
WINE 5	0,01	0,26	0,04	0,03	0,09	0,43	**X**
WINE 6	0,03	0,19	1,00	0,09	0,46	1,77	**II**
WINE 7	0,03	0,05	0,24	0,24	0,47	1,03	**VII**
WINE 8	0,03	0,12	0,21	0,14	0,44	0,95	**VIII**
WINE 9	1,00	0,07	0,95	1,00	1,00	4,03	**I**
WINE 10	0,01	0,17	0,23	0,27	0,12	0,80	**IX**

Source: Elaborated by authors.

3.2 Credit scoring method

The American Economist D. Durand first proposed credit scoring method in the early 1940s.

The essence of this method consists in grouping entities, depending on the level of risk, based on the actual amount of indicators and rating of each indicator expressed in score points assigned following the assessment of the experts.

Table 4. Grouping of the entities by their categories depending on the level of solvency

Indicators	Limits of the categories according to criteria				
	Category I	**Category II**	**Category III**	**Category IV**	**Category V**
Return on assets	over 30 (50 score points)	29,9 - 20 (49.9-35 score points)	19.9 - 10 (34.9-20 score points)	9,9 - 1 (19.9-5 score points)	under 1 (0 score points)
Current liquidity rate	over 200 (30 score points)	199 - 170 (29.9-20 score points)	169 - 140 (19.9-10 score points)	139 - 110 (9.9-1 score points)	under 100 (0 score points)

The global autonomy rate	over 70 (20 score points)	69 - 45 (19.9-10 score points)	44 - 30 (9.9-5 score points)	29 - 20 (5-1 score points)	under 20 (0 score points)
Limits of the categories	**over 100 score points**	**99-65 score points**	**64-35 score points**	**34-6 score points**	**0 score points**

Source: adapted according to Savitskaya G.V., 2016

Category I – entities in this category have a high level of financial stability and have excellent credit, and there is no any irregularities upon payment of debts. Consequent risk exposure for lenders to this category of entities is at minimum level.

Category II – entities in this category may record small irregularities upon payment of debts. Consequent risk exposure for lenders to this category of entities is considered low.

Category III – problematic entities.

Category IV – entities with a high level of risk of bankruptcy even after the use of financial recovery methods. Consequent risk of exposure for this category is great.

Category V – entities with a maximum level of risk, basically insolvent entities (Muntean, 2016, p.55).

Next, we will determine in which class each of the 10 entities fall during this period. The following information is available:

Table 5. The level of risk assessment using Credit scoring method

Indicators	Year 2011		Year 2012		Year 2013		Year 2014		Year 2015	
	The actual level of rate	The number of score points	The actual level of rate	The number of score points	The actual level of rate	The number of score points	The actual level of rate	The number of score points	The actual level of rate	The number of score points
WINE 1										
Return on assets	0,12	0	0,09	0	0,77	0	0,62	0	1,28	5,47
Current liquidity rate	158,03	16,16	137,87	9,55	314,46	30	264,43	30	392,85	30
The autonomy rate	45,05	10,02	42,51	9,38	44,46	10,00	43,85	9,85	47,80	11,155
Total number of score points	C IV	26,18	C IV	18,93	C III	40,00	C III	39,85	C III	46,62
WINE 2										
Return on assets	-0,57	0	-0,76	0	-1,54	0	-1,03	0	0,64	0

Indicators	Year 2011		Year 2012		Year 2013		Year 2014		Year 2015	
	The actual level of rate	The number of score points	The actual level of rate	The number of score points	The actual level of rate	The number of score points	The actual level of rate	The number of score points	The actual level of rate	The number of score points
Current liquidity rate	292,96	30	609,78	30	326,86	30	876,60	30	964,20	30
The autonomy rate	20,27	1,12	21,41	1,63	19,20	0	20,39	1,17	20,66	1,29
Total number of score points	C IV	31,12	C IV	31,63	C IV	30,00	C IV	31,17	C IV	31,29
WINE 3										
Return on assets	1,30	5,50	-4,85	0	-6,74	0	-2,39	0	2,79	8,00
Current liquidity rate	378,30	30	283,12	30	269,51	30	60,76	0	358,35	30
The autonomy rate	36,14	7,15	31,73	5,61	24,21	2,87	14,26	0	22,49	2,11
Total number of score points	C III	42,65	C III	35,61	C IV	32,87	C V	0,00	C III	40,10
WINE 4										
Return on assets	4,10	10,19	4,21	10,37	4,05	10,11	5,10	11,86	4,18	10,32
Current liquidity rate	49,72	0	55,13	0	48,99	0	60,76	0	83,80	0
The autonomy rate	8,65	0	7,48	0	11,36	0	14,26	0	14,33	0
Total number of score points	C IV	10,19	C IV	10,37	C IV	10,11	C IV	11,86	C IV	10,32
WINE 5										
Return on assets	2,30	7,18	-1,36	0	0,82	0	0,18	0	1,05	5,08
Current liquidity rate	1.394,62	30	684,99	30	593,00	30	154,10	14,81	139,50	10
The autonomy rate	96,58	20	95,54	20	91,78	20	26,24	3,77	14,19	0
Total number of score points	C III	57,18	C III	50,00	C III	50,00	C IV	18,59	C IV	15,08
WINE 6										
Return on assets	0,67	0	0,74	0	1,09	6,51	0,92	0	5,45	12,45
Current liquidity rate	266,41	30	236,76	30	262,01	30	383,79	30	272,19	30
The autonomy rate	26,17	3,74	27,61	4,38	26,31	3,80	29,80	5,36	26,17	3,74

Indicators	Year 2011		Year 2012		Year 2013		Year 2014		Year 2015	
	The actual level of rate	The number of score points	The actual level of rate	The number of score points	The actual level of rate	The number of score points	The actual level of rate	The number of score points	The actual level of rate	The number of score points
Total number of score points	C IV	33,74	C III	34,38	C III	40,31	C III	35,36	C III	46,19
WINE 7										
Return on assets	0,09	0	0,52	0	0,77	0	0,12	0	2,68	7,81
Current liquidity rate	124,64	5,49	254,98	30	294,97	30	286,12	30	276,53	30
The autonomy rate	58,15	15,42	50,86	12,42	46,07	10,44	45,94	10,39	42,76	9,47
Total number of score points	C IV	20,92	C III	42,42	C III	40,44	C III	40,39	C III	47,28
WINE 8										
Return on assets	0,65	0	1,34	5,57	0,36	0	0,82	0	2,50	7,51
Current liquidity rate	145,04	11,75	312,70	30	224,24	30	338,39	30	265,17	30
The autonomy rate	9,32	0	46,16	10,48	34,62	6,617	32,24	5,78	32,39	5,84
Total number of score points	C IV	11,75	C III	46,05	C III	36,62	C III	35,78	C III	43,35
WINE 9										
Return on assets	0,74	0	2,19	6,99	2,96	8,28	1,82	6,37	5,33	12,25
Current liquidity rate	287,55	30	503,70	30	779,60	30	1.315,58	30	1.551,77	30
The autonomy rate	76,27	20	78,40	20	77,94	20	80,98	20	86,62	20
Total number of score points	C III	50,00	C III	56,99	C III	58,28	C III	56,37	C III	62,25
WINE 10										
Return on assets	9,89	19,88	4,25	10,44	8,63	17,77	9,84	19,80	2,61	7,70
Current liquidity rate	217,39	30	181,00	23,76	137,05	9,30	124,72	5,52	146,49	12,22
The autonomy rate	54,00	13,71	44,22	10	42,02	9,21	42,87	9,50	45,41	10,17
Total number of score points	C III	63,60	C III	44,20	C III	36,28	C III	34,82	C IV	30,08

Source: Elaborated by authors.

3.3 Discriminant Analysis

(*Discriminant Analysis – DA*) or Multiple Discriminant Analysis (*Multiple Discriminant Analysis – MDA*) have been used in a number of disciplines, beginning with the first applications in the 1930s in biology and the natural sciences (e.g. causes and manifestations of various ailments). Subsequently they have been successfully applied in economic issues as well. In the `60s and `70s, applications within the financial field have increased interest in the discriminant analysis. It is about Breaver's studies (1966) and Altman (1968), considered the pioneers of bankruptcy prediction models.

In case of the analysis of financial stability, DA apply towards financial indicators to create a model that would enable future solvency crisis matters of entities in different fields. This method also allows identifying accurately the financial indicators that signal the emergence of a financial imbalance.

Internationally there were developed a string of scoring functions. Among the best-known models: Altman model, Canon & Holder model, the model of the Central Bank Balance Sheet in France, Taffer model and Robertson model.

So far in the specialty literature have been developed models of this kind in many countries. Research supports the idea that almost unanimously the applicability of a score function is limited to the period and the economic zone on the basis of which it was developed the model and therefore is a questionable use of idea for decision of some other score functions belonging to other economic or temporal spaces.

Lately, problems of bankruptcy risk assessment in various branches of the national economy are the subject of the Moldavian scientists' research, but a single model for risk of bankruptcy estimating at the RM level has not yet been developed (Muntean, 2016, p.55) .

Under such circumstances, to estimate the bankruptcy risk through MDA, we will use Professor Altman's bifactorial model.

Altman Model

"Z" model is a model of mathematical and statistical forecasting of bankruptcy, being developed in U.S.A. in 1968. "Z" model comprises 2 variables considered to be most representative of a company's financial substatus. With the help of this model, the professor Altman succeeded to foresee about 75 percent of the bankruptcies of some companies with approximately two years prior to their production.

The coefficients of the variables selected were established from the analysis of the economic and financial condition of a large number of entities, some of which became bankrupt.

"Z" model subsequently developed, is given as follows:

Z = -0,3877 - 1,0736X1 + 0,0579X2, (3).

where:

- X1 variable is the measure of the liquidity of the entity and is determined as the ratio between current assets and current liabilities.
- X2 variable represents the rate of self-financing of the total assets, and is determined as the ratio between non-distributed benefits (reinvested), and total assets.

According to the score achieved the entities are set out on three levels, and namely:

- level I: if Z = 0, the bankruptcy probability is 50% .
- level II: if Z < 0, the bankruptcy probability is lower than 50%, and it decreases corresponding to the level of the Z decrease;
- level III: if Z > 0, the bankruptcy probability is more than 50% and it increases according to the level of the Z increase.

We will determine the level of Z function for each of the 10 entities. The following information is available:

Table 6. The level of risk assessment using MDA

Indicators	Year 2011	Year 2012	Year 2013	Year 2014	Year 2015
WINE 1					
Current liquidity rate	158,03	137,87	314,46	264,43	392,85
The autonomy rate	45,05	42,51	44,46	43,85	47,80
Z	-2,06	-1,84	-3,74	-3,20	-4,58
WINE 2					
Current liquidity rate	292,96	609,78	326,86	876,60	964,20
The autonomy rate	20,27	21,41	19,20	20,39	20,66
Z	-3,52	-6,92	-3,89	-9,79	-10,73
WINE 3					
Current liquidity rate	378,30	283,12	269,51	60,76	358,35
The autonomy rate	36,14	31,73	24,21	14,26	22,49
Z	-4,43	-3,41	-3,27	-1,03	-4,22
WINE 4					
Current liquidity rate	49,72	55,13	48,99	60,76	83,80
The autonomy rate	8,65	7,48	11,36	14,26	14,33

Z	-0,92	-0,98	-0,91	-1,03	-1,28
WINE 5					
Current liquidity rate	1.394,62	684,99	593,00	154,10	139,50
The autonomy rate	96,58	95,54	91,78	26,24	14,19
Z	-15,30	-7,69	-6,70	-2,03	-1,88
WINE 6					
Current liquidity rate	266,41	236,76	262,01	383,79	272,19
The autonomy rate	26,17	27,61	26,31	29,80	26,17
Z	-3,23	-2,91	-3,19	-4,49	-3,29
WINE 7					
Current liquidity rate	124,64	254,98	294,97	286,12	276,53
The autonomy rate	58,15	50,86	46,07	45,94	42,76
Z	-1,69	-3,10	-3,53	-3,43	-3,33
WINE 8					
Current liquidity rate	145,04	312,70	224,24	338,39	265,17
The autonomy rate	9,32	46,16	34,62	32,24	32,39
Z	-1,94	-3,72	-2,78	-4,00	-3,22
WINE 9					
Current liquidity rate	287,55	503,70	779,60	1.315,58	1.551,77
The autonomy rate	76,27	78,40	77,94	80,98	86,62
Z	-3,43	-5,75	-8,71	-14,46	-17,00
WINE 10					
Current liquidity rate	217,39	181,00	137,05	124,72	146,49
The autonomy rate	54,00	44,22	42,02	42,87	45,41
Z	-2,69	-2,31	-1,83	-1,70	-1,93

Source: Elaborated by authors

3. Results and discussions

The sales revenues of all these entities have tended to increase in the period under review, with the average annual growth of 13.19%, recording a significant improvement in 2015. Additionally, can be remarked the increase of the Assets value, with the average annual growth of 7.50%, reflecting a high level of efficiency. The only indicator that recorded a decrease in the analysed period is the average number of employees, reducing its level by an average of 4.37%, thus highlighting a modernization of the production technology. We can say that the decrease of the number of employees has taken place simultaneously with the increase of the level of technology of the sector.

Table 7. Evolution of sales, assets and employees

Indicators	Year 2011	Year 2012	Year 2013	Year 2014	Year 2015	Annual average
Total Sales Revenues (million lei)	846,09	957,36	1122,06	1074,63	1360,64	
Dynamic of Sales Revenues		13,15%	17,20%	-4,23%	26,61%	13,19%
Total Assets (million lei)	1786,82	1972,79	2153,18	2256,2	2384,13	
Dynamic of Assets		10,41%	9,14%	4,78%	5,67%	7,50%
Average number of employees	2072	1982	2390	1966	1652	
Dynamic of employees		-4,34%	20,59%	-17,74%	-15,97%	-4,37%

Source: Elaborated by authors

Analysing the evolution of all these 10 Moldavian companies from the wine industry, we can remark an average increase of 13%. The economy growth in the last three years (2012-2015) was on average by 3%. Thus, can be remarked a correlation of the evolution between the sector and the economy national level, this fact denotes that the government of RM emphasis the development of the winemaking sector.

Table 8. The evolution of the economy as a whole in correlation with the indicators of the analysed entities

Indicators	Year 2012	Year 2013	Year 2014	Year 2015	Annual average
GDP Dynamic	-0,70%	8,90%	4,60%	-0,50%	3,08%
Dynamics of Sales Revenues	13,15%	17,20%	-4,23%	26,61%	13,19%
Dynamic of Assets	10,41%	9,14%	4,78%	5,67%	7,50%
Dynamic of Average number of employees	-4,34%	20,59%	-17,74%	-15,97%	-4,37%

Source: Elaborated by the authors

Preforming the bankruptcy risk analysis of the 10 largest enterprises from the Republic of Moldova, from the wine sector, by using methods of determining the rating of the entities, we have come to the following results that can be seen in the table 9 and figure 1 and 2.

Thus, according to the multidimensional rating model, the average level of standardized coefficients for the 10 entities in the sample is shown in Table 9.

Table 9. Average results of rating analysis according to multidimensional rating model

Companies	Year 2012		Year 2013		Year 2014		Year 2015		Average	
	amount	Place	amount	Place	amount	Place	amount	Place	amount	Place
WINE 1	1,34	VIII	1,63	IV	1,17	V	1,31	V	1,35	VII
WINE 2	2,19	VI	1,13	VII	1,62	III	1,61	IV	1,63	IV
WINE 3	2,52	IV	1,44	VI	0,92	VIII	1,14	VI	1,42	VI
WINE 4	2,84	II	2,67	III	1,79	II	1,66	III	2,24	III
WINE 5	3,61	I	3,16	I	0,91	IX	0,43	X	2,27	II
WINE 6	0,86	X	0,77	IX	1,00	VI	1,77	II	1,02	VIII
WINE 7	1,17	IX	1,05	VIII	0,95	VII	1,03	VII	0,99	IX
WINE 8	1,53	VII	0,76	X	0,92	VIII	0,95	VIII	0,91	X
WINE 9	2,55	III	2,92	II	3,06	I	4,03	I	2,77	I
WINE 10	2,28	V	1,55	V	1,52	IV	0,80	IX	1,48	V

Source: Elaborated by authors

From the table above we can remark that the company WINE 9 is the most stable one, not risky, accumulating an average score of 2,77 points. This is largely due to the high level of liquidity, the global autonomy rate and the high share of the working capital in the current assets. In this context, we can say that these rates reflect a low level of bankruptcy risk and a high degree of financial stability, a continuous consolidation of that entity (Achim, 2014).

The company WINE 5 was the less risky one during the 2011 – 2013 period, according to the obtained results. However, it became the riskiest one in the last 2 years; the principal cause was the low level of assets profitability. The value of assets increased considerably, by 85,79% as an annual average. At the same time, can be remarked a major decrease of the global autonomy rate, as well as the liquidity ratio during the last 2 years.

The entity WINE 10, which place is 5 in the rating, recorded a medium level of performances and of risk during the analysed period, despite of the fact that, the sales revenues of this company increased considerably during this period, being the highest ones in comparison with the others nine

companies. This situation was due to a concomitant growth in the assets value and liabilities value. On the one hand, it contributed to the technology modernisation and production quality increase, but on the other hand to the maintenance of almost the same level of all the ratios during the entire analysed period. Simultaneously, can be seen the increase of the average number of employees, demonstrating a growth of business and risk reduction.

The last place in rating is occupied by the company WINE 8, that accumulated only 0,91 points. It means that this entity is the riskiest one. One of the indicators that signalled this dramatic situation was the sharp drop in the number of employees in 2014 from 151 persons to 89.

Using the credit scoring method, the obtained results which can be seen in the below figure. We can observe that almost all the companies are placed in the third and fourth categories during the analysed period. It means that these 10 Moldavian companies from the wine industry, entities that generated the highest sales revenue during this period, are problematic entities, are entities with a high level of risk of bankruptcy even after the use of financial recovery methods. The worst situation was remarked for the company WINE 3 in 2014. Thus, although according to the previous model the situation of some of the companies looks nice, not risky, this method clearly show that the analysed entities meet a high level of bankruptcy risk and their activity depends on the government regulations. In this connection, the assessed firms must determine the causes of the reduction of the indicators and take action on its growth.

Figure 1. Results of rating analysis according to scoring method
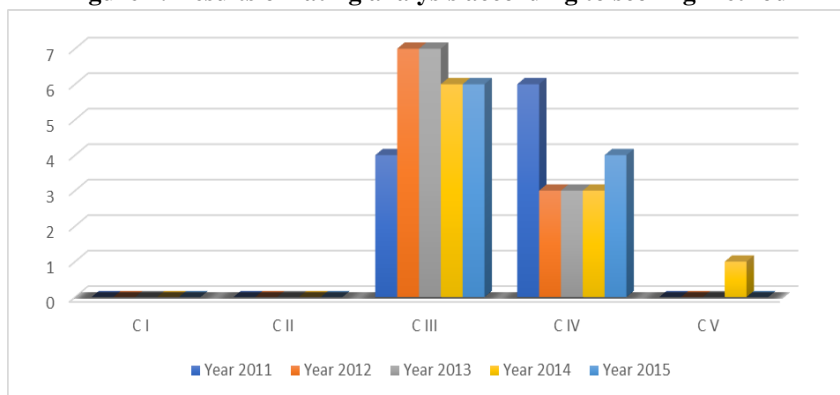
Source: Elaborated by authors

Estimating the bankruptcy risk through MDA, by using the Professor Altman's bifactorial model, can be remarked that all the analysed companies are placed on the second level during these 5 years. This level is characterised by a bankruptcy probability lower than 50%. According to this method, the analyst cannot see or distinguish any particularities of the companies.

Figure 2. Results of rating analysis according to MDA method
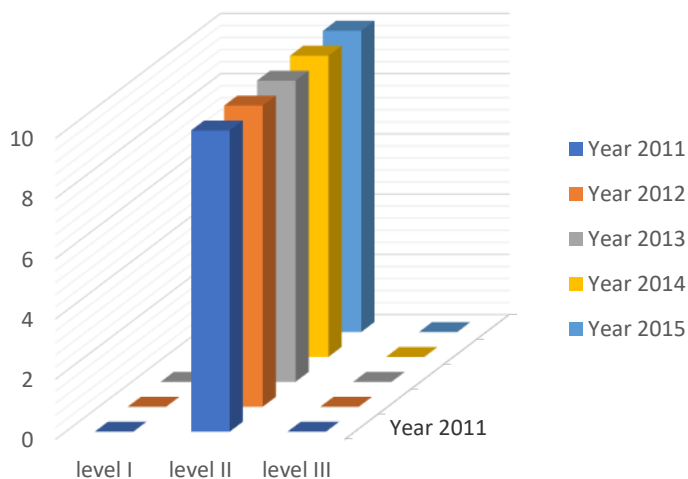
Source: Elaborated by authors

The disadvantages of the MDA method are the following:
• The use of historical information;
• Different accounting of the heritage.
In such conditions, significantly increase the need to develop a predictive model of bankruptcy risk for entities of Moldova.

4. Conclusions

In the present article, were presented three methods of determining the bankruptcy risk of the entities: Scoring Models; Models of multidimensional rating; Discriminant Analysis. The results of this study show that no method of those presented may not fully grasp altogether the aspects, which characterize the risk of bankruptcy. Moreover, each of these techniques

presents advantages and limits, which recommends their use as complementary methods of assessment of risk of bankruptcy.

This analysis can be considered as very efficient and relevant because it enables the assessment of bankruptcy risk, the possibility of tracing causes of adverse changes in financial stability of the entity, as well as reaching a rational account between equity and borrowed capital, and their efficient use.

The information obtained, following the analysis provided, is relevant both for internal and external users. In this connection, we can say that our research has important implications, first for corporate governance, for internal users interested to find out in what area of bankruptcy risk is situated the entity in order to see if the financial balance is ensured, and in order to identify improvement mechanisms for the activity. Secondly, our results are useful for investors that wish to obtain the best profitability rate for their investments. They shall consider the level of financial bankruptcy risk of the entity as a very good predictor for the best profitability rate of their investments, aiming at investing capital or withdrawal of capital previously invested. In addition, our results have implications for decision-makers of financial lenders for granting, limiting or cutting off lending (Muntean, 2016, p.57).

So, after using this information all listed users have the equal possibility to conclude regarding the entity level of risk and its potential for development.

Thus, as limits to this study, we can conjure up the fact that our conclusions could be interpreted because of using almost the same indicators in all three methods. For a better fundament of obtained results, it is necessary to add and analyse other models of analysis for bankruptcy risk in future research, and expand the number of entities analysed and the period of study.

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