RESEARCH REGARDING THE USE OF DISCRIMINANT ANALYSIS FOR ASSESSING THE BANKRUPTCY RISK OF AGRICULTURAL COMPANIES

Agatha POPESCU

University of Agricultural Sciences and Veterinary Medicine Bucharest, 59 Marasti, District 1, Zip code 011464, Bucharest, Romania, Phone: +40 213182564/232, Fax:+40213182888, Email:agatha_popescu@yahoo.com

Corresponding author: agatha_popescu@yahoo.com

Abstract

The paper aimed to apply the discriminant analysis using Altman Z' Score model in order to predict bankruptcy risk of the agricultural companies, using a study case regarding three representative companies dealing with dairy farming in Ilfov County of Romania. The results discriminated the companies according to their financial statement and ratios and mainly Z Score values. The company F1 proved the most difficult financial statement being classified in the Distress zone every year (Z'=1.003 in the year 2011, 1.098 in the year 2012 and 0.971 in the year 2013). For this reason, this company is bankrupt. The company F2 was situated in the "Grey zone" every year, because the financial situation is not so good, but it i able to pay a part of its debts. However, it is in danger to fail in the future, if measures to recover are not taken in time. (Z'=1.436 in the year 2011, 1.269 in the year 2012 and 1.343 in the year 2013). The company F3 registered a different situation from a year to another. In the first two years, 2011 and 2012, it was facing a difficult financial statement being placed in the "Distress zone". In the year 2013, the financial statement has recovered due to the measures taken by managers and it passed in the "Safe zone", characterized by a good financial situation and solvency, enabling it to pay all its debts.(Z'=1.126 in the year 2011, 0.928 in the year 2012 and 3.189 in the year 2013). The agricultural companies dealing with dairy farming have a low profitability, and the degree of bankruptcy risk is high. For this reason, managers have to keep under control the financial indicators any moment and take urgent measures to recover by the end of the year as their company not to fail.

Key words: *agricultural companies, Altman model, bankruptcy risk, dairy farming*

INTRODUCTION

Linear Discriminant Analysis is the first statistical method used to analyze which company enter bankruptcy and which company survives. It is the fundamental method which supported the Scoring Method largely applied to predict the bankruptcy risk of an enterprise.

The scoring method allows the division of various companies into two categories: bankrupt and non bankrupt enterprises, based on a Z Score linear model including a range of financial ratios, weighted with specific percentage coefficients.

The Z Score function is represented as a linear model as given below:

$Z = a_1*X_1 + a_2*X_2 + ...a_i*X_i$, where: X_i=financial ratios taken into consideration, and a_i = percentage coefficient of each ratio.

The Z Score value discriminates the companies de decides which one is in danger to fail and which has a good or better financial situation. [4].

Z-score linear model is largely used to assess bankruptcy risk based on information provided by Balance Sheet and Profit and Loss Account and the calculation of several accounting ratios characterizing the financial "health" of a company.

Starting from Fisher Ronald Aylmer's multiple measurements used for various taxonomic problems (1936), [14] Edward Altman (1968) established a Z Score model which is still considered a leading model in practical applications. [2,4].

Since that time his models have been continuously improved in order to better correspond to various types of companies (manufacturing companies, financial firms,

crediting companies etc.), economic and financial situations, market evolution. [9].

Even thou Altman models were found to be 72-80 % accurate in predicting bankruptcy, since 1985, the Z-score models are largely used and accepted by accountants, auditors, managers etc for risk evaluation of a company [3].

Bankruptcy risk evaluation was approached by many researchers who established various mathematical and statistical models. Among them, a well known Z score model is the one established by Connan and Holder (1978) also used as a term of reference in the company financial assessment.

Heffernan (2005) suggested that banks should improve discriminant analysis, changing the ratios used in the financial assessment from time to time in order to increase the accuracy of risk prediction. [13]

In Romania, the prediction of bankruptcy risk started in the last decade and the most frequent applied models have been Altman and Connan and Holder models.

Birsan et al.(2007) applied Connan and Holder model and concluded that risk factors should be monitorized and prevention measures are required to prevent bankruptcy in order to avoid or diminish its effects.

Popescu Agatha (2007 a, b) applied Connan J. and Holder M. Model (1978) for determining the bankruptcy risk for a Fruit Tree Company in Romania and concluded that the risk coefficient was 80 % very high in this field of activity not justifying any measure for recover. [18, 19]

Mandru et al. (2010) applied Connan Holder and Altman model and concluded that when developing such models it is needed to take into consideration both non-financial and qualitative indicators significant for a specific economic sector which can influence the company performances and also the precision of forecast. [17]

Bordeianu et al.(2011) applied various models for evaluation of risk bankruptcy such as: Altman model, Connan and Holder model, Taffler model, The Model of the Balance Sheet Central of the Banque de France and the Romanian School models (Bailesteanu model,

Anghel model, Manecuta and Nicolae model, Paul Ivoniciu model). [8]

Vintila et al.(2011) used the discriminant analysis to substantiate a score function effective in bankruptcy risk prediction of enterprises in Romania. The discrimination between bankrupt and non-bankrupt enterprises was based on the financial ratios regarding activity, liquidity, leverage and profitability included in the Z Score model as follows: return on revenue, cash-flow to debt ratio, debt to assets ratio, total debt payment period. [21]

Achim et al. (2012) developed a statistical model for predicting bankruptcy risk of the Romanian manufacturing companies by a multidimensional analysis technique, namely Principal Component Analysis also including the global financial crisis impact. [1]

Armeanu et al. (2012) built a scoring function used to identify bankrupt companies, using a sample of 60 companies listed on Bucharest Stock Exchange taking into account a total of seven financial indicators: total assets, sales, operating profit, net cash flow from operating activities, net profit, total liabilities and average market value of equity. They concluded that the financial rates could be changed in time, according to market and business environment where the companies operate and the banks have also to improve the discriminant and risk models used in practice [5]

Tomescu-Dumitrescu et al.(2013) applied both Altman and Connan and Holder models for bankruptcy risk prediction [20].

Barbuta et al.(2014) made a comparative analysis of bankruptcy risk for companies in the field of buildings, using the both Conan & Holder, and Altman models, proving that the same company could be classified differently by these two models and it could be useful to assess companies from these two perspectives. [6]

Kulcsar Edina (2014) quantified the bankruptcy risk for the Romanian small and medium manufacturing and trading enterprises representing the backbone of the economy. They made a comparison between Altman's Z-score model, and Teti et. al model

(2012). The conclusion was that Teti model; can quickly detect the bankruptcy risk, being more recommended in case of SMEs and Altman model need more caution from analysts and managers. [16]

Condei et al.(2014) approached risk bankruptcy in agricultural companies in Romania using Connan and Holder model [12].

Choles (2014) affirmed how important is risk assessment in in project planning using FMEA and Critical Path Method [10].

Most of the studies carried out in Romania approached both the theoretical aspects and practical application of various models used in the prediction of risk bankruptcy on samples of enterprises (manufacturers, traders, creditors etc), but just a few studies are dealing with the risk of failure in agriculture where companies are working in a more risky environment.

In this context, the paper aimed to evaluate the risk of bankruptcy of the private companies operating in agriculture, considering a study case of private companies dealing with dairy farming, a field where financial statement is critical reflecting the lowest profitability compared to other branches of animal husbandry or agriculture.

MATERIALS AND METHODS

In order to fulfill the objective of the paper, a sample of three important agricultural companies dealing with dairy farming in Ilfov County, close to Bucharest, the capital of Romania was selected. It included F1-SC Agroindustriala Pantelimon SRL, F2- SC Agroindaf Afumati SA and F3-SC Agricola Berceni SRL.

The paper used the financial data registered in the Balance Sheets and Profit and Loss Accounts concluded in the year 2011, 2012 and 2013 by the three dairy farming companies [20,21,22].

The financial information regarded the following aspects: Total Assets (TA), Current Assets (CA), Book Value of Equity (BVE), Total Liabilities (TL), Current Liabilities (CL), Net Sales (S), Earnings Before Interest

and Taxes (EBIT) and Retained Earnings (RE).

In order to predict bankruptcy, it was used Altman Z-Score model, considered to be suitablke to private companies, as given below:

$Z' = 0.717\ T_1 + 0.847\ T_2 + 3.107\ T_3 + 0.420\ T_4 + 0.998\ T_5$, where:

T_1 = (Current Assets - Current Liabilities)/Total Assets
T_2 = Retained Earnings/Total Assets
T_3 = Earnings Before Interest and Taxes/Total Assets
T_4 = Book Value of Equity/Total Liabilities
T_5 = Sales/Total Assets

The ranking of the company was established using the Points Method, giving points from 1,2 3,...n for the decreasing value of Z Score.

The interpretation of the results was based on the zones of discrimination as established by Altman:

$Z' > 2.9$ -"Safe" Zone; $1.23 < Z' < 2.9$ -"Grey" Zone; $Z' < 1.23$ -"Distress" Zone. [2,3,4,13].

RESULTS AND DISCUSSIONS

Company F1.
Economic and Financial indicators.
In case of F1, Total assets/Liabilities remained relatively at the same level in the analyzed period. Thus, in 2013, they accounted for Lei 6,729,589, only by 0.87 % higher than in the year 2011.

The Current assets increased by 28.09 % from Lei 1,685,854 in the year 2011 to Lei 2,159,509 in 2013.

The Book value of Equity increased by 12.85 % in 2013, accounting for Lei 4,010,373.

Current liabilities declined by 8.69 % from Lei 2,585,759 in 2011 to Lei 2,361,141 in 2013.

Sales registered a slight increase of 1.41 % from Lei 4,342,081 in 2011 to Lei 4,403,307 in the year 2013.

Earnings Before Interest and Taxes registered a deep decline, by about 60% from Lei 402,123 in the year 2011 to Lei 163,405 in the year 2013.

Retained earnings also declined by about 60 % from Lei 337,977 in 2011 to Lei 133,541

in the year 2013.(Table 1).

Accounting ratios.

The $T_1 = (CA-CL)/TA$ registered a negative value and a decreasing trend in each of the analyzed years. In the year 2013, it accounted for 21.61 % of the level registered in the year 2011.

The $T_2 = RE/TA$ had positive values every year, but also registered a declining trend from 2011 to 2013. Thus, in 2013, it accounted for 38.00 % being by 62 % lower than in 2011.

The $T_3 = EBIT/TA$ registered a positive value every year and also with a decreasing trend so that in the year 2013 it accounted for 40.00 % of the level registered in 2011.

The $T_4 = BVE/TL$ had positive values and a continuous growth every year so that in the year 2013 its value was by 11.84 % higher than in the year 2011.

The $T_5 = S/TA$ had also positive values every year and a slight trend to increase, so that in 20133 it was by 0.61 % higher than in 2011.(Table 1).

Table 1.Primary data, Accounting ratios and Z' Scores for F1 in the period 2011-2013(Lei)

	2011	2012	2013	2013/2011 %
Primary Data				
1. Total Assets (TA),	6,671,158	6,660,036	6,729,589	100.87
Current Assets (CA),	1,685,854	1,865,876	2,159,509	128.09
Book Value of Equity (BVE)	3,553,532	3,876,574	4,010,373	112.85
Total Liabilities (TL),	6,671,158	6,660,036	6,729,589	100.87
Current Liabilities (CL),	2,585,759	2,334,047	2,361,141	91.31
Net Sales (S),	4,342,081	4,569,091	4,403,307	101.41
Earnings Before Interest and Taxes (EBIT)	402,123	389,890	163,405	40.63
Retained Earnings (RE)	337,977	323,043	133,541	39.51
Accounting Ratios				
$T_1 = (CA-CL)/TA$	- 0.134	- 0.070	- 0.029	21.61
$T_2 = RE/TA$	0.050	0.048	0.019	38.00
$T_3 = EBIT/TA$	0.060	0.058	0.024	40.00
$T_4 = BVE/TL$	0.532	0.582	0.595	111.84
$T_5 = S/TA$	0.650	0.686	0.654	100.61
Z' Score	**1.003**	**1.098**	**0.971**	**96.80**

Source: Balance Sheet and Profit and Loss Account of F1 [22] , Own calculations

Z' Score was very small in all the analyzed years: 1.003 in the year 2011, 1.098 in the year 2012 and 0.971 in the year 2013, reflecting a slight declining trend. In 2013, it was by 3.20 % lower than in 2011. (Table 1)

Company F2.

Economic and Financial indicators.

In case of F2, Total assets/Liabilities increased by 15.41 % from Lei 7,012,037 in 2011 to Lei 8,092,869 in 2013.

The Current assets declined by 18.03 % from Lei 2,924,052 in 2011 to Lei 2,396,929 in 2013.

The Book value of Equity increased by 3.25 %, from Lei 5,528,406 in 2011 to Lei

5,708,615 in 2013 .

Current liabilities increased by 113.52 % , from Lei 874,944 in 2011 to Lei 1,868,181 in 2013.

Sales increased by 20,85 % from Lei 5,036,070 in the year 2011 to Lei 6,086,554 in the year 2013.

Earnings Before Interest and Taxes an increase 57.34 % from Lei 342,467 in the year 2011 to Lei 538,856 in the year 2013.

Retained earnings increased by 63.46 % from Lei 272,404 in the year 2011 to Lei 445,274 in the year 2013.

Accounting ratios.

The $T_1 = (CA-CL)/TA$ registered positive values every year, but also a decreasing trend from the year 2011 to 2013 so that in the last year of the analysis represented 22.26 % of the level registered in 2011.

The $T_2 = RE/TA$ recorded positive values every year and an increasing trend, so that in 2013 it was by 44.73 % higher than in 2011.

The $T_3 = EBIT/TA$ registered a positive value every year and increased by 37.50% in 2013 compared to 2011.

The $T_4 = BVE/TL$ had positive values, but in the year 2013 it represented 89.46 % from the level registered in the year 2011.

The $T_5 = S/TA$ had also positive values every year and a slight trend to increase, so that in 2013 it was by 4.73 % higher than in 2011.(Table 2).

Z' Score was 1.436 in the year 2011, 1.269 in the year 2012 and 1.343 in the year 2013, reflecting a slight declining trend. In 2013, it was by 6.48 % lower than in 2011. (Table 2)

Table 2.Primary data, Accounting ratios and Z' Scores for F2 in the period 2011-2013.

	2011	2012	2013	2013/2011 %
Primary Data				
Total Assets (TA),	7,012,037	6,714,891	8,092,869	115.41
Current Assets (CA),	2,924,052	2,430,249	2,396,929	81.97
Book Value of Equity (BVE)	5,528,406	5,323,342	5,708,615	103.25
Total Liabilities (TL),	7,012,037	6,714,891	8,092,869	115.41
Current Liabilities (CL),	874,944	829,171	1,868,181	213.52
Net Sales (S),	5,036,070	4,789,242	6,086,554	120.85
Earnings Before Interest and Taxes (EBIT)	342,467	108,976	538,856	157.34
Retained Earnings (RE)	272,404	65,450	445,274	163.46
Accounting Ratios				
$T_1 = (CA-CL)/TA$	0.292	0.238	0.065	22.26
$T_2 = RE/TA$	0.038	0.009	0.055	144.73
$T_3 = EBIT/TA$	0.048	0.016	0.066	137.50
$T_4 = BVE/TL$	0.788	0.792	0.705	89.46
$T_5 = S/TA$	0.718	0.713	0.752	104.73
Z' Score	**1.436**	**1.269**	**1.343**	**93.52**

Source: Balance Sheet and Profit and Loss Account of F2 [23], Own calculations

Company F3.
Economic and Financial indicators.
In case of F3, Total assets/Liabilities declined by 4.79 % from Lei 7,012,037 in 2011 to Lei 650,389 in 2013.

The Current assets increased by 27.35 % from Lei 165,138 in 2011 to Lei 210,310 in 2013.

The Book value of Equity increased 5.19 times from Lei 64,113 in 2011 to Lei 332,968 in 2013.

Current liabilities declined by 48.72 %, from Lei 618,963 in 2011 to Lei 317,421 in 2013.

Sales increased by 50.17 % from Lei 777,725 in the year 2011 to Lei 1,167,980 in the year 2013.

Earnings Before Interest and Taxes increased 3 times from Lei 74,055 in the year 2011 to Lei 222,208 in the year 2013.

Retained earnings also increased by 3 times from Lei 62,199 in the year 2011 to Lei 186,558 in the year 2013.

Accounting ratios.
The $T_1 = (CA-CL)/TA$ registered negative values every year, but also a decreasing trend from the year 2011 to 2013 so that in the last year of the analysis represented 24.69 % of the level registered in 2011.

The $T_2 = RE/TA$ recorded positive values every year and an increasing trend, so that in 2013 it was by 3.14 times higher than in 2011.

The T_3 = EBIT/TA registered a positive value every year and increased 3.15 times in 2013 compared to 2011.

The T_4 = BVE/TL had positive values, and in the year 2013 it increased 5.49 times than in the year 2011.

The T_5 = S/TA had also positive values every year and increased by 57.73 % in 2013 compared to 2011.(Table 2).

Z' Score was 1.126 in the year 2011, 0.928 in the year 2012 and 3.189 in the year 2013, reflecting a slight declining towards the year 2012 but a string increasing trend towards the year 2013, when it reached a value 2.83 times higher than in 2011.(Table 3)

Table 3.Primary data, Accounting ratios and Z' Scores for F3 in the period 2011-2013

	2011	2012	2013	2013/2011 %
Primary Data				
Total Assets (TA),	683,076	142,775	650,389	95.21
Current Assets (CA),	165,138	403,854	210,310	127.35
Book Value of Equity (BVE)	64,113	146,410	332,968	519.34
Total Liabilities (TL),	683,076	142,775	650,389	95.21
Current Liabilities (CL),	618,963	796,365	317,421	51.28
Net Sales (S),	777,725	726,570	1,167,980	150.17
Earnings Before Interest and Taxes (EBIT)	74,055	97,973	222,208	300.05
Retained Earnings (RE)	62,199	82,297	186,558	299.93
Accounting Ratios				
T_1 = (CA-CL)/TA	- 0.664	- 0.416	- 0.164	24.69
T_2 = RE/TA	0.091	0.087	0.286	314.28
T_3 = EBIT/TA	0.108	0.103	0.341	315.74
T_4 = BVE/TL	0.093	0.155	0.511	549.46
T_5 = S/TA	1.138	0.770	1.795	157.73
Z' Score	**1.126**	**0.928**	**3.189**	**283.21**

Source: Balance Sheet and Profit and Loss Account of F3 [24], Own calculations

Company ranking based on the Z Scores and number of points.

Analyzing the scores obtained by each company, one can notice that there are differences between them. In the year 2011, on the 1st position came F2 with highest Z Score, 1.436, while F1 was positioned on the 3rd position with the lowest score, 1.003. In the year 2012, F2 remained on the 1st position, even thou its score was only 1.269, and the lowest score was registered by F3, 0.928. In the year 2013, F3 passed on the 1st position with the highest score, 3.189, and on the last position came F1 with 0.971.

Table 4.Z' Score by company and year and company ranking

Company	2011		2012		2013		Total points
	Z Score	Points	Z Score	Points	Z Score	Points	
F1	1.003	3	1.098	2	0.971	3	8
F2	1.436	1	1.269	1	1.343	2	4
F3	1.126	2	0.928	3	3.189	1	6

Source: Own calculations

As results, after allowing points to each company, the final classification was the following one: on the 1st position came F2 with 4 points, on the 2nd position F3 with 6 points and on the 3rd position F3 with 8 points.(Table 4).

Interpretation of Z Score value, the results of the discriminant analysis

The company F1 has been in the Distress zone every year, because of the low value of Z Score. Its financial statement is very risky,

and as a result it is expecting to fail in the near future.

The company F2 was situated in the "Grey zone" every year. It is in a difficult financial situation. The performances are deeply diminished and the company is in danger to fail.

The company F3 was placed in the "Distress zone" in the year 2011 and 2012, but after the measures taken by the managers of the enterprise, in the year 2013 it passed in the "Safe zone", having a good financial situation and solvency, enabling it to pay all its debts.(Table 5).

Table 5.Interpretation of the results by company and year

Company	2011	2012	2013
F1	"Distress zone" The company is going to fail.	"Distress zone" The company is going to fail.	"Distress zone" The company is going to fail.
F2	"Grey zone" The company has a difficult financial situation. The performances are deeply diminished and the company is in danger to fail.	"Grey zone" The company has a difficult financial situation. The performances are deeply diminished and the company is in danger to fail.	"Grey zone" The company has a difficult financial situation. The performances are deeply diminished and the company is in danger to fail.
F3	"Distress zone" The company is going to fail.	"Distress zone" The company is going to fail.	"Safe zone" The company has a good financial situation and solvency, enabling it to pay all its debts.

Source: Own interpretations

CONCLUSIONS

The analysis of risk bankruptcy based of Altman model allowed to discriminate the three companies dealing with dairy farming and establish which one is going to fail and which one has a "healthy: financial statement.

The company F1 had the most difficult financial statement with a negative impact on the accounting ratios and finally on the Z Score values, which were very small and situated the company in the Distress zone every year.

For this reason, it is considered, that this company is bankrupt.

The company F2 was situated in the "Grey zone" every year, because the financial situation is not good, the company is not able to pay all its debts and could be in danger to fail in the future.

The company F3 registered a different situation from a year to another. In the first two years, 2011 and 2012, it was facing a difficult financial statement being placed in the "Distress zone".

In the year 2013, the financial statement has received due to the measures taken by managers and it passed in the "Safe zone", characterized by a good financial situation and solvency, enabling it to pay all its debts.

Because, the three companies dealing with dairy farming are at the limit of surviving, a very low profitability, the managers have to keep under control the financial indicators any moment and take urgent measures to recover.

Managers have to know every moment the degree of bankruptcy risk, not only at the end of the year after concluding the financial statement when usually it is too late.

They have to be informed, for instance at the end of June, which is the financial situation of the company and to have time to take measures to improve it by the end of the year as their company not to fail.

interest in the result of their company evaluation regarding the bankruptcy risk.

REFERENCES

[1]Achim Monica Violeta, Mare Codruta, Borlea Sorin Nicolae, 2012, A Statistical Model of Financial Risk Bankrupcy Applied for Romanian Manufacturing Industry , Procedia Economics and Finance, Volume 3:132–137

[2]Altman, E.I., 1968, Financial ratios, discriminant analysis and the prediction of corporate bankruptcy, Journal of Finance, 23 (4) (1968), pp. 589–610

[3]Altman, Edward I., 2000, Predicting Financial Distress of Companies. Retrieved on September 4th, 2009 from http://pages.stern.nyu.edu/~ealtman/Zscores.pdf: 15–22.

[4]Altman Z-Score, Wikipedia-http://en.wikipedia.org/wiki/Altman_Z-score

[5]Armeanu Ştefan Daniel, Vintila Georgeta, Moscalu Maricica, Lazar Paula, Filipescu Maria-Oana, Lazar Paula, 2012, Using Quantitative Data Analysis Techniques for Bankruptcy Risk Estimation for Corporations, Theoretical and Applied Economics Volume XIX (1)(566): 97-112

[6]Bărbuţă-Mişu Nicoleta, Codreanu Elena-Silvia, 2014, Analysis and prediction of the bankruptcy risk in Romanian building sector companies, Ekonomika, Vol. 93(2):131-147

[7]Birsan Mihaela, Şusu Stefanita, Balan Alina, 2007, Methods of Analysis and Evaluation of the Bankruptcy Risk, The Annals of "Dunarea de Jos" University of Galati, Fascicle I – 2007. Economics and Applied Informatics. Years XIII, pp.29-38

[8]Bordeianu Gabriela Daniela, Radu Florin, Paraschivescu Marius Dumitru, Pavaloaia Willi, 2011, Analysis models of the bankruptcy risk, Economy Transdisciplinarity Cognition, www.ugb.ro,Vol.14(1):248-259

[9]Caouette John, B., Altman, Edward I., Narayanan Paul, 1998, Managing Credit Risk - the Next Great Financial Challenge, John Wiley & Sons: New York

[10]Choles Sandra Milena,2014, Risk assessment in project planning using FMEA and Critical Path Method, Scientific Papers. Series Management, Economic Engineering in Agriculture and rural development, Vol. 14(3):42-57

[11]Conan, J., Holder,M., 1979, Variables explicatives de performance et controle de gestion dans les P.M.I., These d'Etat, CERG, Universite Paris Dauphine

[12]Condei Reta, Niculae Ioana, Costaiche Georgiana Melania, Agatha Popescu, 2014, The management of risks in business and the management of human resources, Scientific Papers. Series Management, Economic Engineering in Agriculture and rural development, Vol. 14(3): 58-65

[13]Eidleman Gregory J., 1995, Z-Scores-A guide to Failure Prediction, The CPA Journal Online.

[14]Fisher Ronald Aylmer, 1936, The use of multiple measurements in taxonomic problems, Annals of Eugenics 7:179

[15]Heffernan, S. (2005). Modern Banking, Wiley

[16]Kulcsár Edina, Analysis of Romanian Small and Medium Enterprises' Bankruptcy Risk, Oradea University, 928-937

[17]Mandru Lidia, Khashman Adnan, Carstea Claudia, David Nicoleta, Patrascu Lucian, The Diagnosis of Bankruptcy Risk Using Score Function, Recent Advances in Artificial Intelligence, Knowledge Engineering and Data Bases, http://www.academia.edu/1342976/The_Diagnosis_of_Bankruptcy_Risk_Using_Score_Function

[18]Popescu Agatha, 2007a, The role of risk analysis in bankruptcy evaluation, Scientific Papers, Series I, Agricultural Management, Vol.IX(2):343-346

[19]Popescu Agatha, 2007b, Financial Analsis, Dominor Publishing House, Bucharest, p.141-142, pp.224-228

[20]Tomescu-Dumitrescu Cornelia, Holt Alina Georgiana, Evaluation of bankruptcy risk using econometric modelling, Advances in Accounting, Auditing and Risk Management, pp.97-101

[21]Vintila Georgeta, Toroapa Maria Georgia, 2011, Building a Scoring Model for Bankruptcy Risk Prediction on Multiple Discriminant Analysis, Ovidius University Annals, Economic Sciences Series, Volume XI (1):2283-2288

[22]SC Agroindustriala Pantelimon SRL, Ilfov, Balance Sheet and Profit and Loss Account, 2011, 2012, 2013

[23]SC Agroindaf Afumati SA, Ilfov, Balance Sheet and Profit and Loss Account, 2011, 2012, 2013

[24]SC Agricola Berceni SRL, Ilfov, Balance Sheet and Profit and Loss Account, 2011, 2012, 2013