RETURN VERSUS RISK. EVIDENCE FROM ROMANIA

Assoc. prof. Daniel Cîrciumaru Ph. D
Assoc. prof. Raluca Drăcea Ph. D
Assoc. prof. Anca Tănasie Ph. D
Prof. Marian Siminică Ph. D
University of Craiova
Faculty of Economics and Business Administration
Craiova, Romania

Abstract: : There should be a strong correlation between return and risk. Tools have been developed in order to assess both the return and risk. Yet, the analysis of risk-return correlation is not easy to perform, as the return usually regards the past performance of the business, while the risk regards the future. In order to answer these issues, a survey has been performed in this paper, on nine Romanian companies listed on Bucharest Stock Exchange. Three score functions have been used in order to assess the bankruptcy risk (Altman 1968, Conan and Holder, Anghel) and three ratios of return (return on sales, return on assets, return on equity). The period analyzed ranged from 2007 to 2013. The research allowed verifying the assumptions and highlighting the weaknesses of the tools used to evaluate the risk.

JEL classification: G01, F32, G33

Key words: bankruptcy risk, score function, return on sales, return on assets, return on equity

1. INTRODUCTION

The bankruptcy risk has become more and more important both for Romanian companies' managers and for investors in the recent years. The growths and drops of the stock exchange highlighted the necessity of using proper tools to assess the failure risk. In this respect, the score functions are among the simplest models the literature has created. They rely on accounting-based measures so that they are easy to use by investors.

Despite the fact they have been created in order to assess the probability of a company to go bankrupt, the score functions are more likely used as guidance to emphasize the overall financial health of a company or its global performance. That's why we consider it is important to analyze what score functions are appropriate in this respect and whether the scores are strongly or weakly correlated with the return of the companies.

In order to analyze the correlation return-risk, a survey has been done in this paper. Three score functions have been selected in this respect: Altman model (1968), Conan-Holder and Anghel. As well, the return was appreciated with the help of three ratios: return on sales (ROS) or profit margin, return on assets (ROA) and return on equity (ROE). The study comprised nine Romanian companies (Alumil, Albalact,

Armatura, Artego, TMK Artrom, Bermas, Condmag, Dafora, OMV Petrom) listed on Bucharest Stock Exchange. An empirical study was made and relevant conclusions were drawn.

2. LITERATURE REVIEW

Beaver and Altman are among the first to use the traditional ratio analysis to build score functions for analyzing the corporate bankruptcy risk.

Beaver's researches in this field were conducted in 1966-1967. Beaver found that several ratios could successfully differentiate a sample of bankrupt companies against a sample of healthy companies. Beaver carried out a one-dimensional analysis, by considering each ratio individually. The correlations between the ratios were ignored by Beaver.

Beaver's studies have made the ground for multidimensional analysis, conducted by Altman in 1968, and subsequently developed by other researchers. E. I. Altman conducted his survey on a sample of 66 enterprises, of which 33 healthy and 33 in distress. 22 financial ratios were tested, of which five have been combined into a single linear function, known as Z-score model. Altman (1968) found that „the bankruptcy prediction model is an accurate forecaster of failure up to two years prior to bankruptcy and that the accuracy diminishes substantially as the lead time increases".

After these researchers' works, in 1960's, multiple discriminant analysis has become the main technique to create other score functions, available for other economies than US.

In 2002, I. Anghel developed a score function for analyzing the bankruptcy risk of Romanian companies, based on a sample of 276 companies. The proportion of firms in the sample was 60% healthy and 40% bankrupt, belonging to 12 industries. Anghel classified the financial ratios tested into five groups: activity ratios, liquidity, indebtedness, return and other ratios. Four ratios were finally kept to build the score function.

Anghel notes that "bankruptcy is a process that begins in a financial matter and ends legally" and, for the bankruptcy risk analysis, the financial side prevails. This is justified by the fact that the deterioration of financial standing (the first step of bankruptcy) can be objectively observed by analyzing the financial ratios of firms in distress, while filing for bankruptcy is a legal process which depends on the willingness of creditors or company shareholders. Thus, the time the bankruptcy occurs is difficult to estimate. For financial analysis, it is important to define a limit of the degradation of financial position beyond which we can assume that the company has failed.

3. METHODOLOGY

The Altman model from 1968 takes the following form:

$$Z = 1.2\,X_1 + 1.4\,X_2 + 3.3\,X_3 + 0.6\,X_4 + X_5 \quad (1)$$

where:

Z = overall index;

X_1 = Working capital (WC) / Total assets;

X_2 = Retained earnings / Total assets;

X_3 = Earnings before interests and taxes (EBIT) / Total assets;

X_4 = Market value equity / Book value of total debt;

X_5 = Sales / Total assets.

The ranges of values of the function are:

- $Z < 1.81$ - the company is bankrupt;
- $1.81 < 2.99 \leq Z$ – zone of ignorance (incertitude);
- $Z > 2.99$ - the company may be considered healthy.

The Conan and Holder's score function for industrial companies is as follows:

$$Z = 0.24X_1 + 0.22X_2 + 0.16X_3 - 0.87X_4 - 0.10X_5 \quad (2)$$

where:

X_1 = EBITDA / Total liabilities;
X_2 = Long term capital / Total capital;
X_3 = (Cash + Receivables) / Total Assets;
X_4 = Financial expenses / Turnover;
X_5 = Wages / Value added.

According to this function, the businesses can fall into one of the following categories:

- good status, when $Z > 9$, and the probability of bankruptcy is less than 30%;
- caution, when $4 \leq Z < 9$, and the probability of failure is between 30% and 65%;
- danger, when $Z < 4$, and the probability of bankruptcy is more than 65%.

Anghel's model comprises four financial ratios:

$$A = 5.676 + 6.3718X_1 + 5.3932X_2 - 5.1427X_3 - 0.0105X_4 \quad (3)$$

X_1 = the return on revenue;
X_2 = the coverage of debts with cash-flow;
X_3 = the ratio of debts against the assets;
X_4 = the duration for payment the debts.

Depending on the level of the score, the companies can be classified into three groups:

- $A < 0$ - bankruptcy / failure;
- $A \in [0; 2.05]$ - zone of uncertainty;
- $A > 2.05$ - non-bankruptcy.

Three ratios of return were calculated and analyzed in this paper:

$$\text{Return on sales (Profit margin)} = \frac{\text{EBITDA}}{\text{Sales}} \quad (4)$$

$$\text{Return on assets} = \frac{\text{EBITDA}}{\text{Total assets}} \quad (5)$$

$$\text{Return on equity} = \frac{\text{Net income}}{\text{Equity}} \quad (6)$$

4. RESULTS AND DISCUSSIONS

The scores for Alumil are:

Table no. 1

Year	Altman	Conan and Holder	Anghel
2007	1.99	0.11	2.19
2008	1.56	0.11	1.13

Year	Altman	Conan and Holder	Anghel
2009	3.18	0.21	3.81
2010	2.91	0.07	4.41
2011	2.78	0.13	4.58
2012	2.09	-0.19	4.07
2013	1.54	0.02	3.43

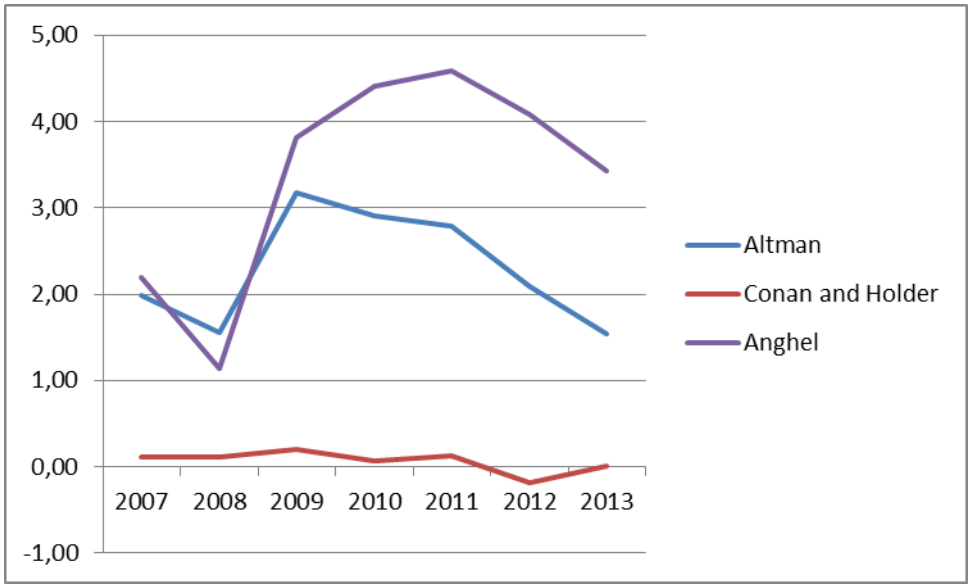

Figure no. 1 The scores for ALUMIL

Altman's score shows a high bankruptcy risk in 2008 and 2013 ($Z < 1.81$), an incertitude state in 2007, 2010, 2011 and 2012 ($1.81 \leq Z < 2.99$) and a non-bankrupt state in 2009 ($Z > 2.99$). After a downsizing in 2008, there is a rebound for the score in the coming years but after 2010 the situation gets worse, leading in 2013 to the lowest score of the whole period under review.

Conan and Holder model shows a good situation in 2007, 2008, 2009 and 2011, caution in 2010 and danger in 2012 and 2013. The situation is different from that shown by Altman model.

Anghel score indicates a situation of uncertainty in one year only (2008), while in the other years the situation is good. The lowest risk occurs in 2011 according to this model. Altman and Conan-Holder's scores show the lowest risk in 2011. However, overall, the dynamics of Anghel and Altman scores is quite similar.

The dynamics of the three ratios of return is as follows:

Table no. 2

Year	Profit margin	Return on assets	Return on equity
2007	-0.12%	-0.11%	25.43%
2008	-0.38%	-0.34%	17.59%
2009	4.76%	4.85%	13.02%
2010	-4.65%	-3.87%	3.17%
2011	-2.49%	-2.21%	5.47%

Year	Profit margin	Return on assets	Return on equity
2012	-9.58%	-6.89%	4.25%
2013	-6.45%	-4.30%	0.80%

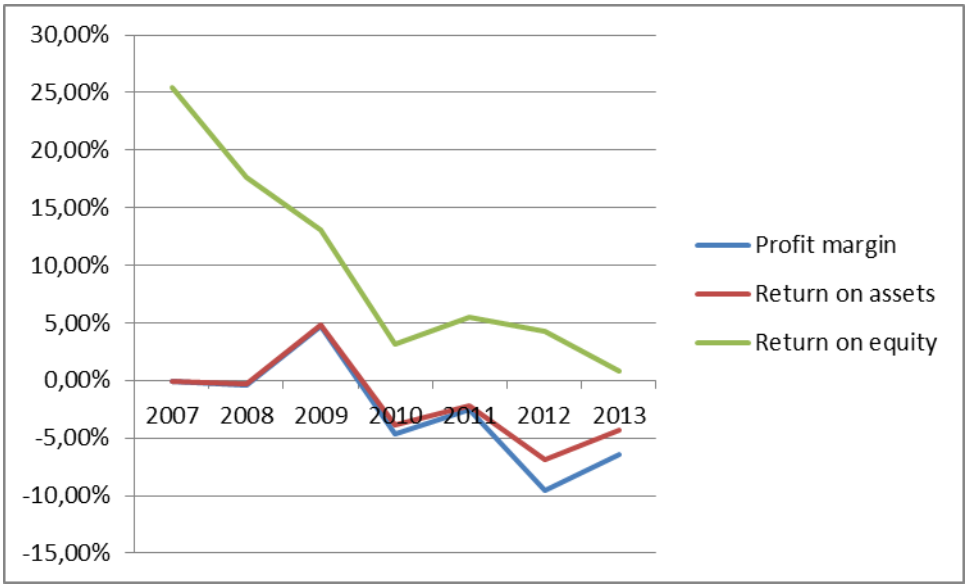

Figure no. 2 The ratios of return for ALUMIL

Profit margin and ROA have no relevance as they are negative (due to EBITDA). ROE is positive but downsizing as it drops from 25.43% in 2007 to 0.80% in 2013. We notice that ROE has a different evolution from the other two ratios of return, despite the fact that all the ratios decrease.

Comparing the evolution of the three scores with the evolution of profitability ratios, an empirical analysis shows a strong correlation between the scores of Altman and Conan-Holder, on one hand, and the profit margin and ROA, on the other hand.

For Albalact, the scores are:

Table no. 3

Year	Altman	Conan and Holder	Anghel
2007	1.37	0.20	3.57
2008	1.36	0.14	2.89
2009	2.61	0.15	2.67
2010	2.10	0.13	2.20
2011	2.14	0.11	2.21
2012	2.40	0.20	2.79
2013	2.46	0.17	2.14

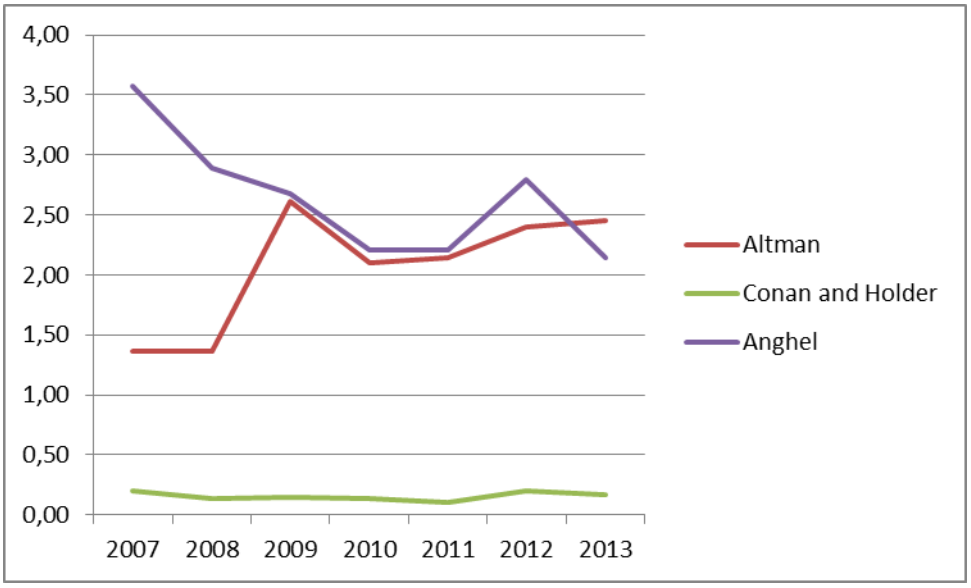

Figure no. 3 The scores of ALBALACT

The Altman model shows bankruptcy in the first two years and uncertainty in the next five years. Conan-Holder indicates a good situation for all the years analyzed, just as Anghel score. As a trend, the scores show a different situation, which means that the models regard differently the bankruptcy risk.

The ratios of return have the values:

Table no. 4

Year	Profit margin	Return on assets	Return on equity
2007	9.69%	9.89%	3.81%
2008	8.21%	8.93%	0.71%
2009	10.05%	12.14%	3.04%
2010	6.54%	8.60%	0.68%
2011	1.03%	1.60%	6.41%
2012	10.63%	18.00%	7.52%
2013	8.55%	14.75%	14.80%

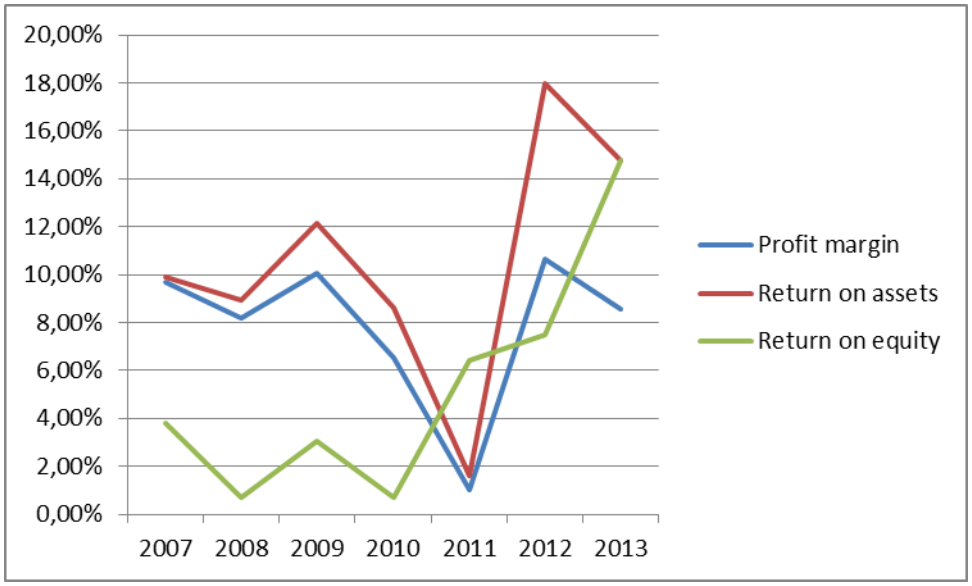

Figure no. 4 The ratios of return for ALBALACT

The ratios of return have a similar dynamics, except the years 2011 and 2013 when ROE evolves in a different manner than the other two ratios. As dynamics the correlation is quite good between the ratios of return and the scores. The best correlation is encountered between the score Altman and ROE. However, the Altman score does not show a good situation in any of the years, while the ratios of return are positive and even quite large in some years.

The company Armatura has the following levels of the score functions:

Table no. 5

Year	Altman	Conan and Holder	Anghel
2007	0.64	0.04	1.59
2008	1.04	0.07	1.73
2009	0.46	-0.06	-2.20
2010	0.21	-0.09	-1.61
2011	0.81	0.11	-0.54
2012	0.29	-0.03	-2.50
2013	0.74	0.03	-1.12

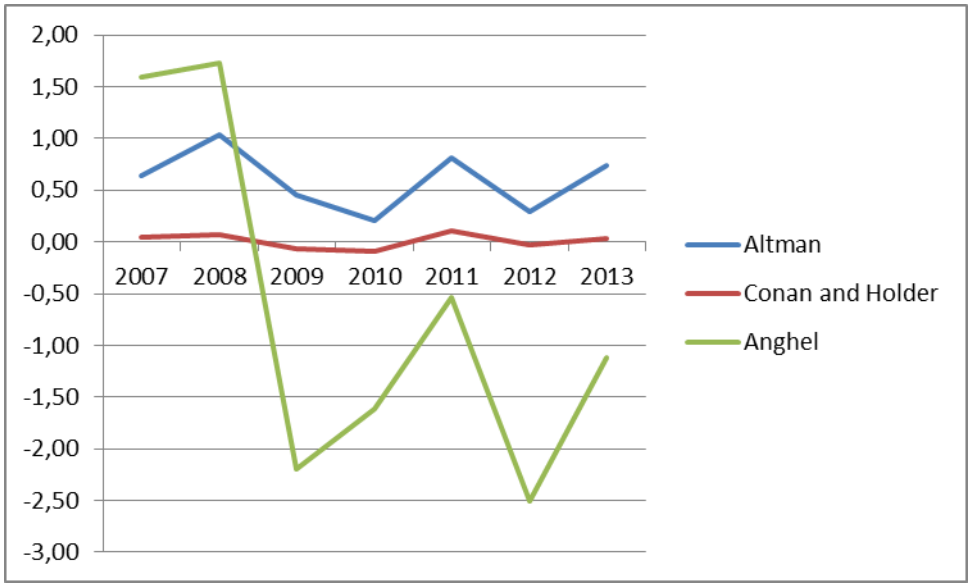

Figure no. 5 The scores of ARMATURA

The Altman model shows bankruptcy in all the years analyzed. Conan-Holder shows danger in 2009, 2010, 2012 and 2013, caution in 2007 and 2008 and a good situation, but barely, in 2011. Anghel function shows a situation of uncertainty in the first two years analyzed and bankruptcy in the last 5 years.

The ratios of return have the values:

Table no. 6

Year	Profit margin	Return on assets	Return on equity
2007	-2.49%	-2.02%	-23.37%
2008	7.56%	6.05%	-6.39%
2009	-1.58%	-0.92%	-37.27%
2010	-15.57%	-9.43%	-286.65%
2011	-4.23%	-3.01%	-12.98%
2012	-5.86%	-4.09%	925.15%
2013	1.69%	1.25%	61.00%

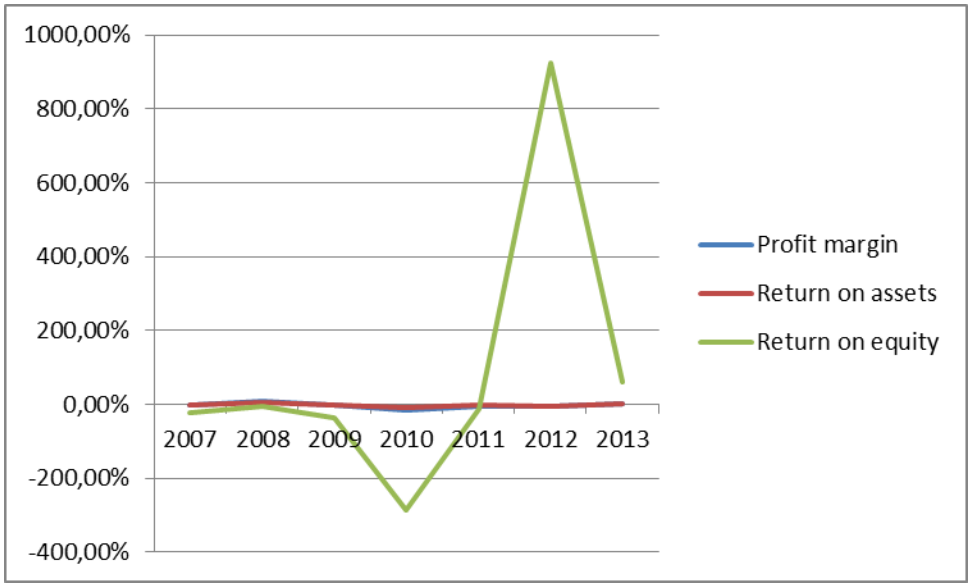

Figure no. 6 The ratios of return for ARMATURA

The profit margin and the return on assets have the highest values in 2008. For the rest of the interval, only in 2013 they have a positive value. The return on equity has extreme values, both positive (2012) and negative (2010). This is due to the drastic reduction of equity in 2010, followed by a large increase in 2011, after which it becomes negative in the last two years. The excessively high level of ROE in 2012 is not relevant, since the firm has both a negative net income and a negative equity. The bankruptcy risk has already occurred, affecting both the profitability and the equity. To a large extent, the three bankruptcy risk models emphasize these issues. The best results in this respect are given by Altman function.

In the case of Artego, the score functions take the values:

Table no. 7

Year	Altman	Conan and Holder	Anghel
2007	2.70	0.20	3.49
2008	2.08	0.07	2.51
2009	1.96	0.10	2.35
2010	1.95	0.11	2.47
2011	2.17	0.11	2.67
2012	3.21	0.20	3.43
2013	3.10	0.16	3.20

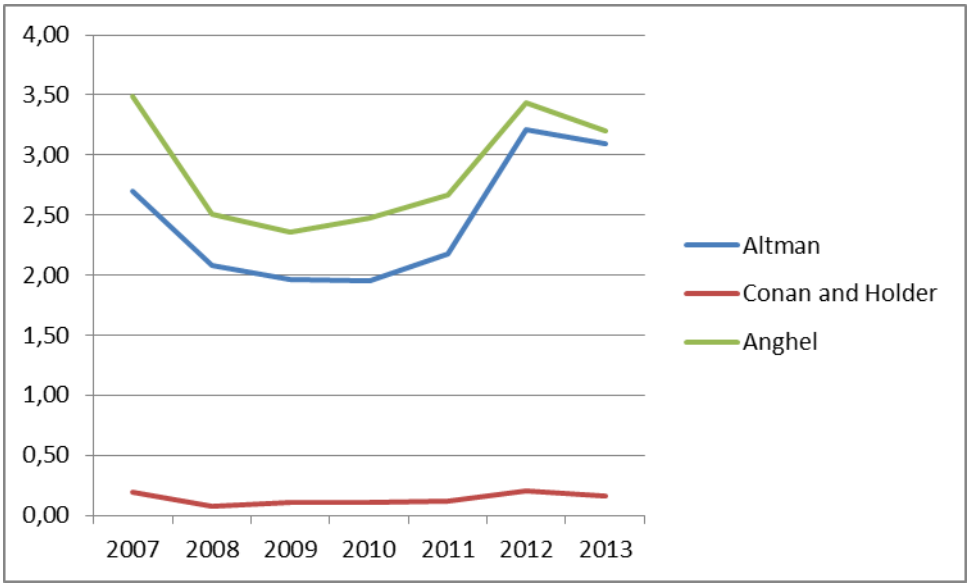

Figure no. 7 The scores of ARTEGO

Altman score shows a situation of uncertainty in the first five years and a good situation in the last two years. Conan - Holder model shows caution in 2008 and a good situation for the rest, while Anghel function indicates a good situation in all the years. We can see a heterogeneous state indicated by the three models. However, none of the functions shows imminent bankruptcy.

The profitability ratios have the levels:

Table no. 8

Year	Profit margin	Return on assets	Return on equity
2007	9.83%	16.78%	16.65%
2008	4.25%	6.12%	1.19%
2009	6.57%	7.03%	2.56%
2010	6.75%	7.28%	3.01%
2011	6.08%	7.95%	5.51%
2012	11.53%	15.36%	13.01%
2013	9.07%	9.76%	5.82%

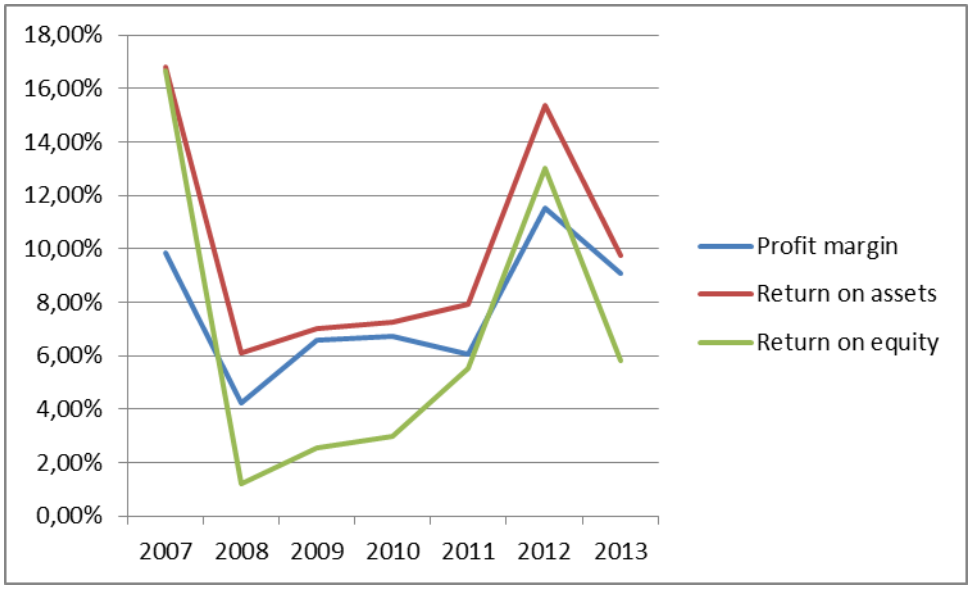

Figure no. 8 The ratios of return for ARTEGO

The three ratios get high levels in all the years, the best years being 2007 and 2012. Note that the ratios have about the same trend. At the same time, there is a strong correlation with the three score functions, which get the highest values in 2007 and 2013.

In the case of TMK-Artrom, the levels of score are:

Table no. 9

Year	Altman	Conan and Holder	Anghel
2007	0.97	-0.03	-0.22
2008	0.94	-0.08	-0.24
2009	1.22	-0.11	1.80
2010	1.71	0.01	3.25
2011	2.02	0.14	4.05
2012	2.04	0.21	3.64
2013	1.88	0.15	2.51

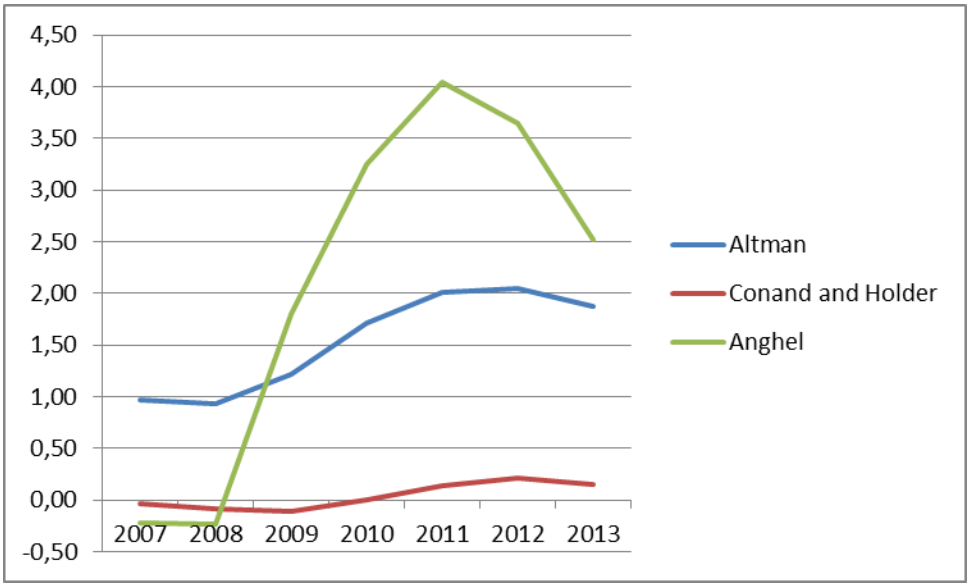

Figure no. 9 The scores of TMK-ARTROM

Altman score shows bankruptcy in the first four years and uncertainty in the last three. In any given year is not achieved a low risk situation. The Conan-Holder model indicates danger in 2007-2010 and a good situation in 2011-2013. Anghel score shows failure in the first two years, uncertainty in 2009 and a regular state in 2010-2013. Except for the first two years, the three models do not assess the default risk in a unitary way.

The ratios of return have the values:

Table no. 10

Year	Profit margin	Return on assets	Return on equity
2007	12.05%	14.90%	9.78%
2008	8.10%	28.26%	-38.98%
2009	5.78%	37.02%	-10.71%
2010	11.99%	41.33%	-3.69%
2011	15.06%	33.68%	15.46%
2012	12.23%	38.61%	9.87%
2013	7.29%	24.96%	2.67%

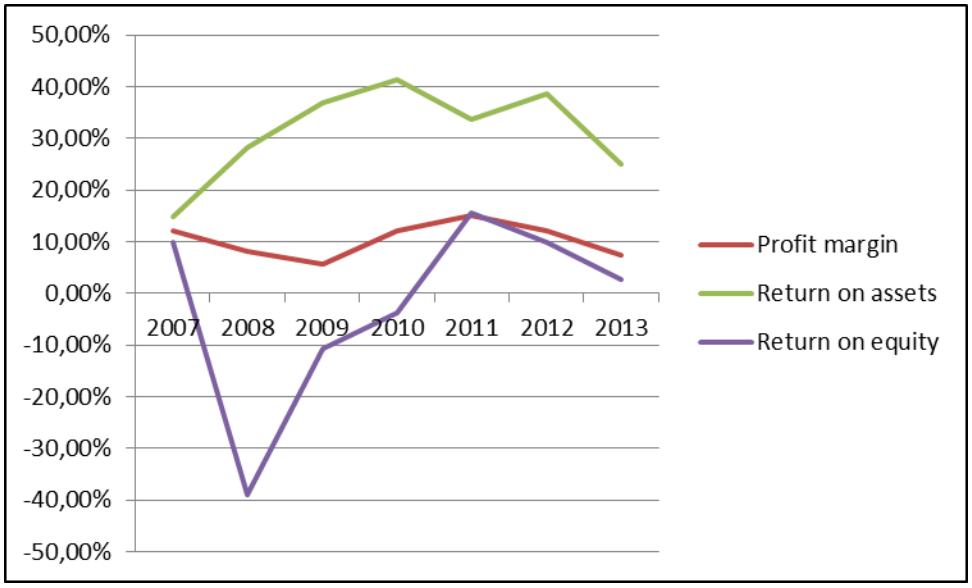

Figure no. 10 The ratios of return for TMK-ARTROM

Profit margin and return on assets are acceptable as values. Instead, the net income is negative in 2008-2010, making the return on equity to get negative values. In the rest of the period, the best result for ROE is gotten in 2011.

Comparing the scores with the ratios of return, the best correlation seems to be between the return on equity and the scores Altman and Conan-Holder.

For Bermas, the levels of the three score functions are:

Table no. 11

Year	Altman	Conan and Holder	Anghel
2007	1.77	0.31	4.32
2008	1.31	0.20	2.74
2009	2.36	0.28	3.82
2010	3.40	0.34	4.59
2011	3.34	0.24	4.27
2012	4.45	0.25	4.04
2013	2.70	0.16	3.04

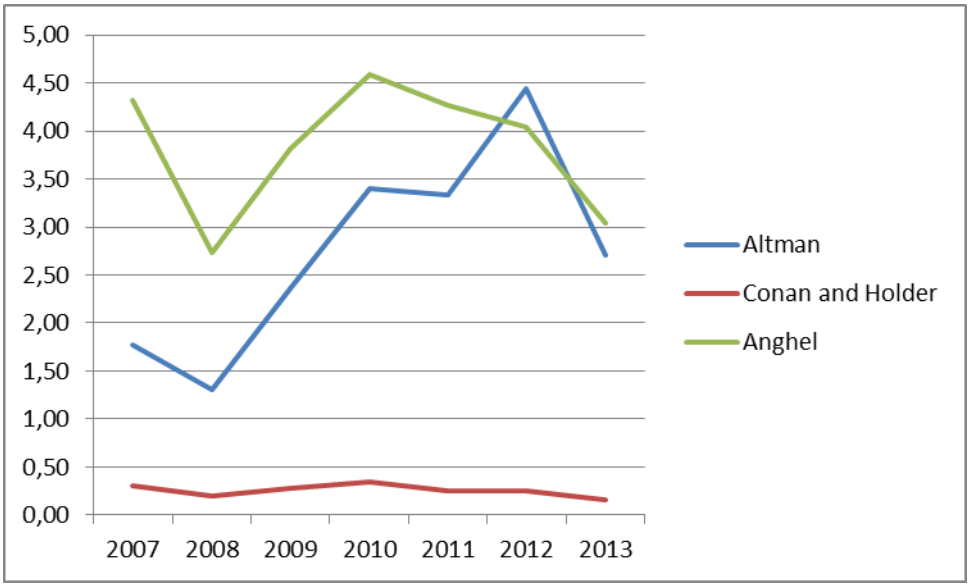

Figure no. 11 The scores of BERMAS

Conan-Holder and Anghel models show a good situation for the company in all years. Instead, Altman model shows a low bankruptcy risk in 2010-2012 only, while in rest of the years indicates bankruptcy (2007 and 2008) or uncertainty (2009 and 2013).

Table no. 12

Year	Profit margin	Return on assets	Return on equity
2007	21.19%	18.02%	12.80%
2008	20.00%	13.91%	4.52%
2009	24.30%	19.30%	7.27%
2010	20.39%	17.98%	8.98%
2011	16.88%	13.30%	9.85%
2012	15.31%	12.69%	7.16%
2013	12.07%	8.75%	5.79%

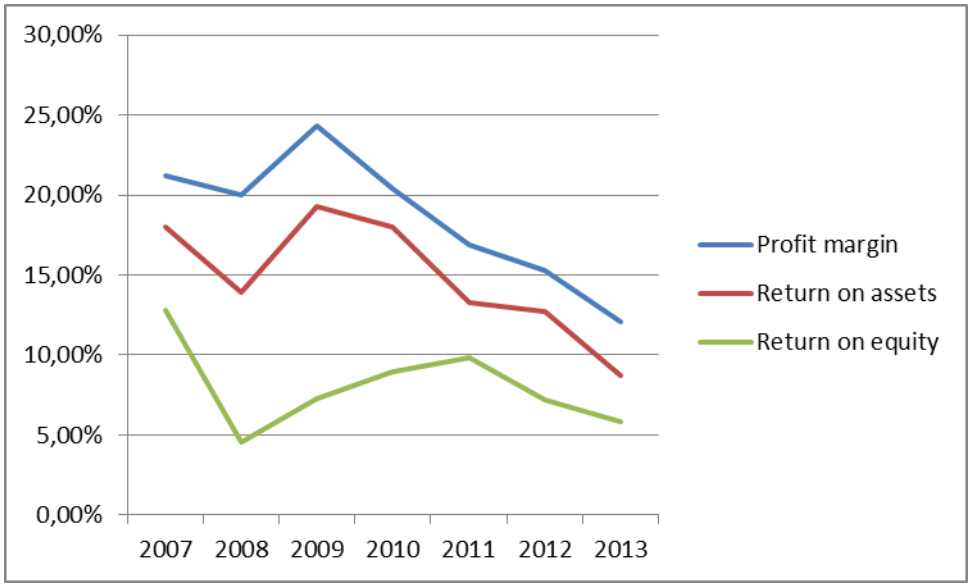

Figure no. 12 The ratios of return for BERMAS

The ratios of return show a good situation overall. A lower level is gotten in 2013 only. Profit margin and return on assets get a downward trend over the period, while return on equity alternates periods of declining and growing. Conan-Holder and Anghel functions are most appropriate to emphasize the correlation bankruptcy risk – performance.

Condmag has the following values of the score functions:

Table no. 13

Year	Altman	Conan and Holder	Anghel
2007	1.97	0.15	2.95
2008	1.82	0.22	3.78
2009	3.05	0.28	3.78
2010	2.40	0.23	3.41
2011	1.53	0.18	3.17
2012	0.22	0.00	-1.57
2013	0.10	0.04	-3.58

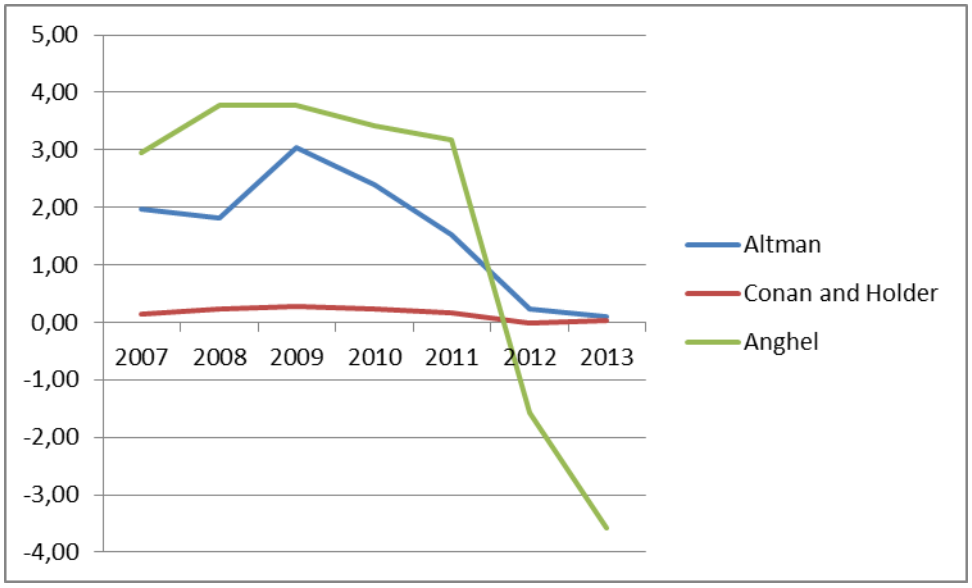

Figure no. 13 The scores of CONDMAG

Altman model reflects an improvement in the bankruptcy risk in the first years, but the situation changes afterwards. Thus, from a score of 1.97 in 2007 (zone of incertitude) a peak of 3.05 is reached in 2009 (good situation), after which the score drops to 1.53 in 2011 (bankruptcy) and further down to 0.10 in 2013. Conan-Holder shows a risk-free situation in 2007-2011, then goes in 2012 directly in the danger zone. The situation is improving in 2013, when it points out a zone of caution. Anghel model indicates a non-bankruptcy situation in the first five years, and bankruptcy for the last two years.

Table no. 14

Year	Profit margin	Return on assets	Return on equity
2007	3.52%	5.70%	6.73%
2008	12.05%	13.41%	11.37%
2009	13.14%	17.45%	17.44%
2010	10.30%	10.79%	10.00%
2011	7.07%	4.25%	0.64%
2012	-12.53%	-6.25%	-27.70%
2013	-2.22%	-1.14%	-39.40%

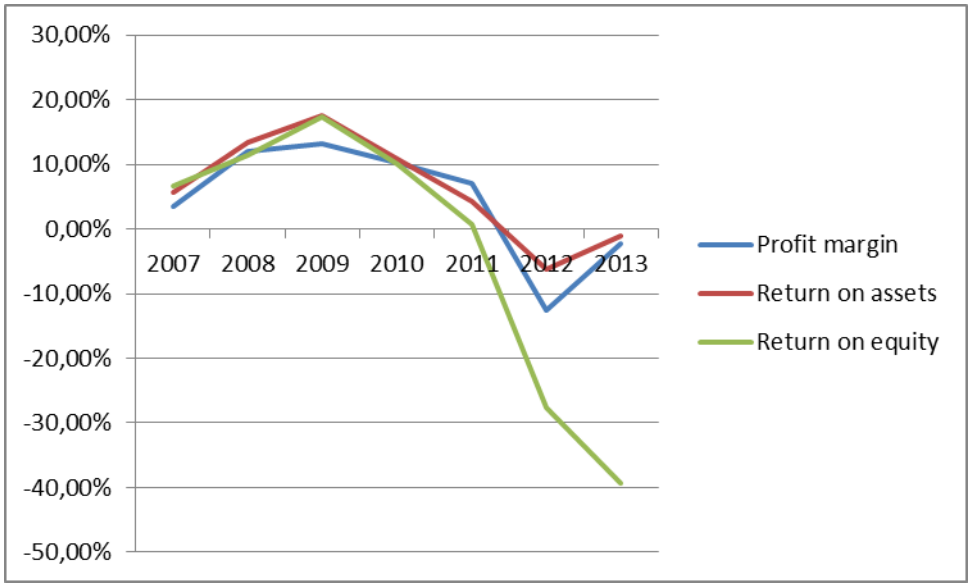

Figure no. 14 The ratios of return for CONDMAG

After a lower level in 2007, the ratios of return point out a good performance in 2008-2010. Since 2011, the profitability begins to decrease and becomes negative (for all the three ratios of return) in 2012 and 2013. Among the models for analyzing the bankruptcy risk, Anghel score is the best correlated with the profitability both as level and dynamics.

For Dafora, the levels of the scores are:

Table no. 15

Year	Altman	Conan and Holder	Anghel
2007	1.28	0.15	1.63
2008	1.05	0.12	1.47
2009	0.92	0.07	0.20
2010	1.04	0.07	0.81
2011	0.83	0.03	0.38
2012	0.69	0.03	-0.70
2013	-1.55	0.23	-10.90

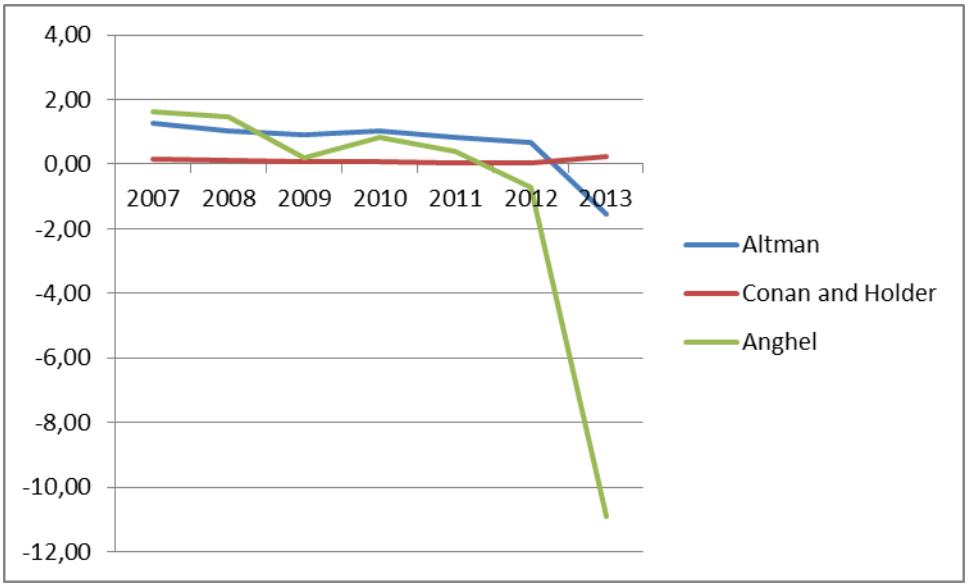

Figure no. 15 The scores of DAFORA

Altman model indicates a high bankruptcy risk in all the years. Conan-Holder function alternates the years with a good situation (2007, 2008, and 2013) to those with a worsen situation (2009, 2010) or at high bankruptcy risk (2011, 2012). Anghel score indicates an average bankruptcy risk in the period 2007-2011 and a high risk in 2012 and 2013. Note the extreme value (-10.90) in the last year.

Table no. 16

Year	Profit margin	Return on assets	Return on equity
2007	10.78%	10.23%	11.56%
2008	14.76%	10.23%	0.64%
2009	20.75%	8.03%	0.89%
2010	25.80%	11.09%	5.08%
2011	19.44%	7.16%	1.27%
2012	10.21%	4.85%	-20.23%
2013	-26.63%	-12.23%	285.88%

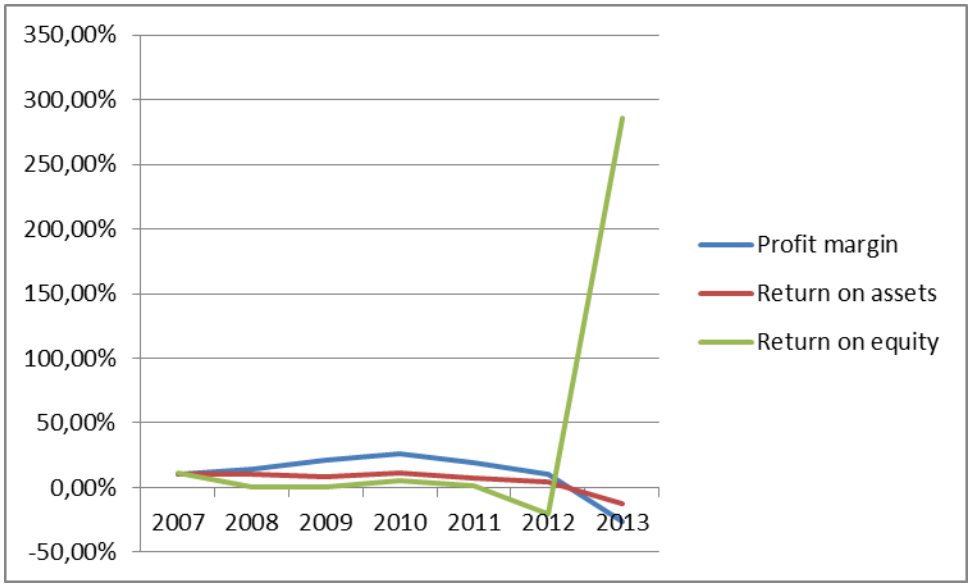

Figure no. 16 The ratios of return for DAFORA

Profit margin and return on assets have an acceptable level in 2007-2012. In 2013, both ratios are negative. ROE is satisfactory in 2007 only, after which it decreases in all subsequent years. In 2012 it becomes negative (-20.23%) while in 2013 the equity also becomes negative, so that ROE has no economic relevance. The disastrous situation which is reached in the last year is best highlighted by Anghel score, which points out even since 2012 a deterioration of the financial situation (the score drops from 0.38 in 2011 to -0.70 in 2012). As well, Anghel score succeeds to fairly indicate the overall performance during the period 2007-2011. Altman score, although decreases while the situation is worsening, classifies over all the period the company as being bankrupt, which is not true.

For OMV Petrom, the evolution of the three scores is shown below:

Table no. 17

Year	Altman	Conan and Holder	Anghel
2007	1.08	0.42	5.77
2008	0.95	0.26	6.00
2009	2.12	0.18	4.53
2010	2.21	0.15	4.98
2011	2.57	0.31	5.84
2012	3.65	0.37	5.61
2013	4.40	0.47	6.28

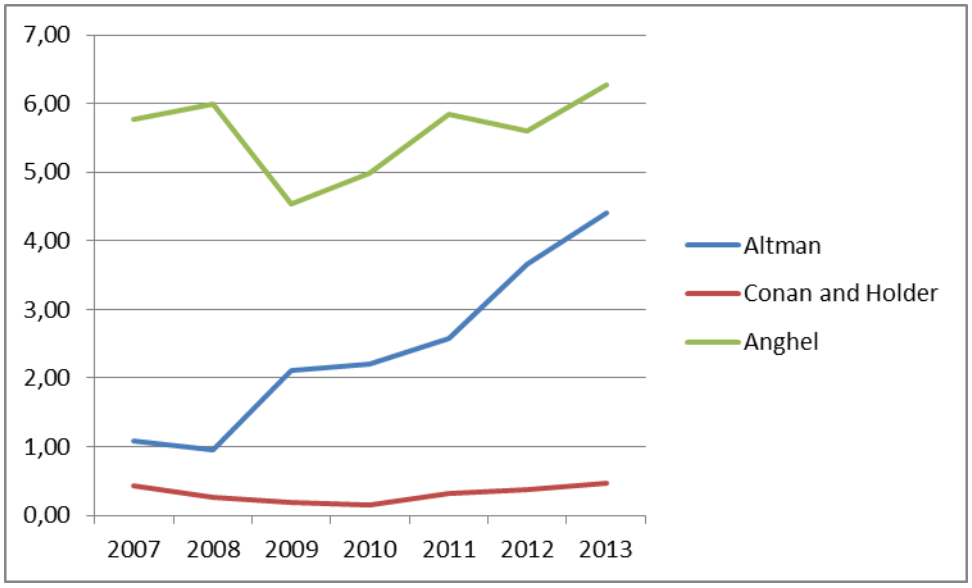

Figure no. 17 The scores of OMV Petrom

It is noted that the three models do not reflect a similar situation. Conan-Holder and Anghel reflect a low bankruptcy risk for the entire period. Altman shows a gradual improvement of the situation, from bankruptcy in the first two years to a state of uncertainty in 2009-2011 and to a good situation in 2012- 2013. Nor as dynamics the three models do not reveal a similar situation. Altman score decreases in 2008 and afterwards it grows continuously until 2013. The other two models show a worsening situation till the middle of the range, then the scores increase at the end.

Table no. 18

Year	Profit margin	Return on assets	Return on equity
2007	27.20%	15.79%	13.49%
2008	27.12%	18.22%	7.53%
2009	21.26%	10.22%	9.73%
2010	33.38%	14.54%	11.26%
2011	41.83%	20.50%	19.51%
2012	38.45%	20.05%	16.34%
2013	42.16%	21.23%	18.50%

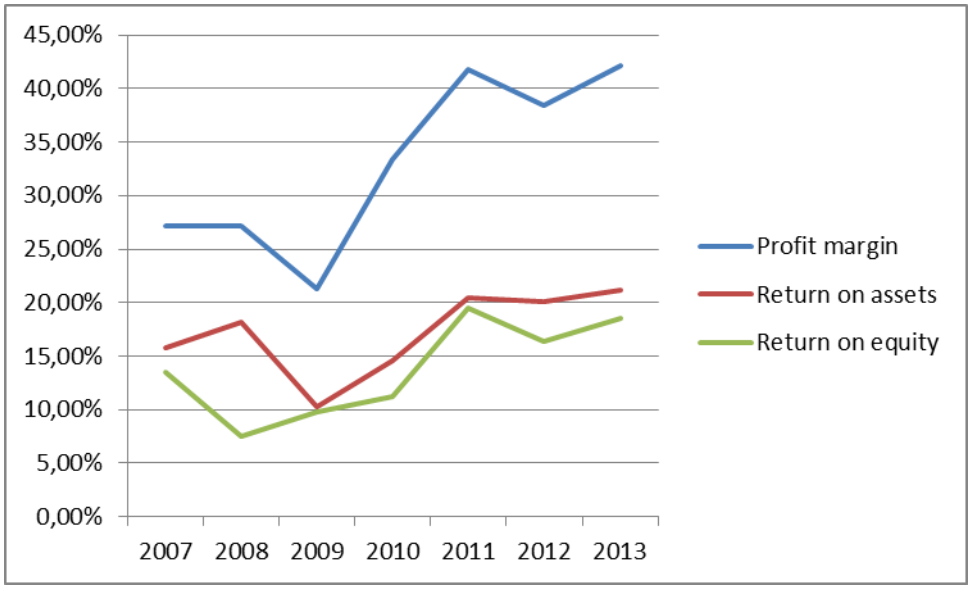

Figure no. 18 The ratios of return for OMV Petrom

The ratios of return are quite high on the period under review which means they were not affected by significant risks. The ratios show an upward trend that started in the second half of the period studied. As compared to the scores, it appears that Conan-Holder and Anghel models are better correlated with the company's profitability.

5. CONCLUSIONS

In this article, three models were used for the analysis of the bankruptcy risk and three ratios of return for the analysis of profitability. Two of the three models (Altman and Conan-Holder) were not created for the Romanian economy, but the practice has proven that they can sometimes give equally good results.

The study set as a goal to study the empirical correlation between the default risk and the performance of Romanian companies by calculating and comparing the level and dynamics of the three scores and of the three ratios of return. Although the bankruptcy risk models based on discriminant analysis assess the probability that the company will go bankrupt in the near future in this paper the comparative analysis with the performance was done within the same year for which both the scores and the ratios of return were calculated.

The study showed that the three models don't evaluate similarly the bankruptcy risk of the companies analyzed. For the same year, one company is framed by a model into a class of risk, while another model classifies it into another category. Also, according to the principles of construction, the risk assessment models should predict the filing for bankruptcy of a company. In this case, even though many companies have low scores, indicating an impending bankruptcy situation, the reality of coming years showed that none of the companies surveyed went bankrupt. This spectrum was somehow denied by the ratios of return analyzed, which often had positive and high values in contrast to the poor scores of the models, indicating bankruptcy.

None of the models managed to reflect the true situation of the companies analyzed. This can be justified by the fact that the score functions comprise, besides

ratios of return, debt ratios, financial balance, turnover etc. A deterioration of their level may not affect as well the profitability.

As a tool for assessing the bankruptcy risk, the score functions have rather intended to draw a warning signal about the worsening financial situation, which precedes the bankruptcy several years before. Following this study, we consider that it's necessary to use multiple scoring functions along with the analysis of other financial issues of the company, in order to select those models that accurately reflect the current state and evolution of the financial situation of a company.

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