

COULD THE INSOLVENCY RISK FOR COMPANIES TRADED ON BUCHAREST STOCK EXCHANGE HAVE BEEN IDENTIFIED? A CASE STUDY USING THE ALTMAN MODEL

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ABSTRACT

Insolvency represents the state of the debtor's patrimony characterized by insufficient funds available for the payment of certain, liquid and due debts. It may occur even in case of strong companies, for example, in case of listed companies, generating losses for investors. In economic theory, a series of insolvency risk prediction models were developed, based on the method of scores, the most known and used being the Altman model. At the present moment, five companies, traded at Bucharest Stock Exchange are insolvent. The aim of this paper is to establish if the Altman model can successfully be used for Romanian traded companies, to determine the risk of insolvency.

KEYWORDS: BSE, risk of insolvency, Altman model

1. Introduction

When financial performance continues to be a desideratum, insolvency prediction methods come to trigger an early warning of both the company's managers and the other partners: creditors, employees, trading partners and shareholders.

Article 4.29 of Law no. 85/2014 defines insolvency as the state of the debtor's patrimony characterized by insufficient funds available for the payment of certain, liquid and due debts, as follows:

a) the insolvency of the debtor is presumed when the debtor, after 60 days from maturity, has not paid his debt to the creditor; the assumption is relative;

b) insolvency is imminent when it is proved that the debtor will not be able to pay the due debts incurred at maturity with the funds available at maturity date.

There are special legal regulations regarding the solvency of credit institutions and insurance companies.

The complexity of the aspects involved in the concept of insolvency risk also explains the variety of diagnostic methods and tools, such as: liquidity – exigibility analysis, functional analysis, rate analysis, dynamic analysis. Classical investigation through these methods highlight the company's past performance, operating, financial, leverage risks, but to a lesser extent inform on the company's future business and generally underestimate the risk of insolvency (Balteş, 2010).

Researchers and international financial institutions have been concerned with developing a method of predicting insolvency risk, called the Score Method, wishing to separate the solvable companies from the insolvent companies, starting from the values recorded by different financial indicators calculated for them.

Assuming that the strongest companies are present on the capital market, we still see this facing insolvency.

This means suspending trading and losses for those who have invested in these companies. Therefore, the question is if the insolvency risk could have been foreseen, used the specific known indicators.

At the present moment, five companies, traded at Bucharest Stock Exchange are insolvent. For these companies we will determine the risk of insolvency, investigating whether the Altman model can successfully be used for Romanian traded companies.

2. Insolvency Risk Analysis

The Score method is based on the statistical techniques of discriminatory analysis of financial features, appearing as a linear function of several variables (rates, limited in number), characterized by weighting coefficients determined by the least squares method, following observations on representative companies and grouped from the beginning into healthy and deficient. Coefficients may be positive or negative, eventually degrading the score and thus contributing to increased insolvency risk (Balteş, 2010).

It is then found the best linear rate combination, which best differentiates between normal and failing companies, to obtain the so-called „Z” score, with the help of the function:

$$Z = a_1x_1 + a_2x_2 + a_3x_3 + \dots + a_nx_n$$

Symbol	Determination relation
X ₁	Working capital/Total assets
X ₂	Retained Earnings/Total assets
X ₃	Earnings before interest and taxes/Total assets
X ₄	Market value equity/Book value of total debt
X ₅	Sales/Total assets

And the equation is:

$$Z = 0.012X_1 + 0.014X_2 + 0.033X_3 + 0.006X_4 + 0.999X_5$$

The “Z” score is interpreted as follows:

Score value	Situation of the company
Z < 1,8	Distress Zone. The company is in imminent state of insolvency
1,8 < Z ≤ 3	Grey Zone. The company’s financial situation is deficient, with noticeably diminished performance but can re-launch its activity by adopting an appropriate strategy
Z > 3	Safe Zone. The insolvency risk is almost non-existent, with the company having a good financial situation.

Where:

x = represents the indicator involved in the analysis;

a = the weighting coefficient of each rate.

In economic theory, a series of insolvency risk prediction models were developed, based on the method of scores, among which: the Altman model, the Canon and Holder model, the model of the Romanian Commercial Bank, the model of the Central Bank of France (Balteş et al 2003), (Dragotă et al. 2003), (Bărbulescu, 2002). Regardless of the discriminating function model (with five to eight selected rates), there will generally be rates on the global net working capital, debt, short-term solvency, financial expenses, and personnel costs.

The most common model of insolvency risk assessment is The Altman model, developed in the late 1960’s to assess insolvency risk. It was developed considering a sample consisted of 66 manufacturing corporations, spitted in two groups: in the “bankrupt group” there were thirty-three manufacturers firms that went bankruptcy during 1946-1965. In the second groups, the firms were chosen on a stratified random basis.

In the initial, classic version of the Z-score bankruptcy prediction model, Altman uses the following indicators (Altman, 1968):

Later, these patterns have been modified, as they became used in a variety of ways (Altman, 2018), and the variables X_1, X_2, X_3, X_4 and X_5 changed during the time (Dolejšová, 2014), replacing the Market value equity with the Book Value of

Equity, being adapted for not publicly-traded on capital markets

Another well-known model is The Canon and Holder insolvency risk model, based on the correlation between asset liquidity and debt eligibility, represented by the equation:

$$Z = 0,24 X_1 + 0,22 X_2 + 0,16 X_3 + 0,87 X_4 + 0,10 X_5$$

Where:

Symbol	Determination relation
X_1	= gross operating surplus / total debt
X_2	= committed capital / total capital
X_3	= current assets - current stocks / debts
X_4	= financial expenses / turnover;
X_5	= staff costs / added value

The insolvency risk depends on the value of the score, as follows:

Score value	Situation of the company	Insolvency risk
$Z > 0,16$	Very good	under 10 %
$0,1 < Z < 0,16$	Favorable (alert)	10 % – 30 %
$0,04 < Z < 0,1$	Uncertain (danger)	30 % – 65 %
$-0,05 < Z < 0,04$	Unfavorable	65 % – 90 %
$Z < -0,05$	Failure	over 90 %

The model of the Central Bank of France predicts the risk of insolvency using a score of 8 variables, according to the following equation (Stancu, 1997):

$$100Z = -1,25 X_1 + 2,003 X_2 + 0,824 X_3 + 5,221 X_4 + 0,689 X_5 - 1,164 X_6 + 0,706 X_7 + 1,408 X_8 - 85,544$$

Where:

Symbol	Name of indicator	Determination relation
X_1	The rate of deduction of financial expenses	Financial Expenses / Gross operating surplus
X_2	Incidence rate of invested capital	Permanent Equity / Equity)
X_3	Rate of debt repayment capacity	Self-financing capacity / Total debt
X_4	Rate of exploitation gross margin	Gross operating surplus / Turnover (excluding VAT)
X_5	Average loan provider duration	Commercial debt x 360 / Expenditure on inventories
X_6	Rate of value added increase	(Current added value – previous added value)/ previous added value
X_7	Speed of rotation of customer receivables	Customer Balance x 360 / Turnover
X_8	Physical investment rate	Tangible Investments / Added Value

Depending on the value recorded by Z score, the following areas are distinguished:

Score value	Situation of the company
$Z < -0,25$:	Unfavorable area, the situation being risky, the company experiencing serious financial difficulties;
$-0,25 \leq Z < 0,125$	Area of uncertainty, no definitive conclusion can be reached
$Z > 0,125$	Favorable area, the company's financial condition being normal, the probability of declaring its insolvency very low.

The case of Romanian it is well-known The Commercial Bank (BCR) Model, that uses a set of rates and performance indicators to determine the company's creditworthiness, based on a score grid with 6 criteria, namely liquidity, solvency, financial return, rotation of current assets, dependence on supply markets (A) and internal and external sales (D), guarantees (deposits in RON and bond

currency, bonds, mortgages, purchased goods from credits, assignment of receivables) (Petrescu, 2008).

Criteria for assessing financial creditworthiness according to the B.C.R. are marked with points that, together, serve to classify companies in 5 categories (from A to E), depending on their credibility. The rating grid based on the BCR model is (Balteş, 2010):

Evaluation criterion	Values limits	Points
Liquidity L = Current assets / Short-term liabilities	< 80 %	- 2
	80 ÷ 100 %	- 1
	100 ÷ 120 %	+ 1
	120 ÷ 140 %	+ 2
	140 ÷ 160 %	+ 3
Creditworthiness S = Total Equity / Total Liabilities	> 160 %	+ 4
	< 30 %	0
	30 ÷ 40 %	1
	40 ÷ 50 %	2
	50 ÷ 60 %	3
	60 ÷ 70 %	4
Financial profitability Rf = Net Profit / Equity	70 ÷ 80 %	5
	> 80 %	6
	< 0	0
Rotation of circulating assets Nac = Turnover / Current assets	0 ÷ 10 %	3
	10 ÷ 30 %	4
	< 5	1
Dependence on markets (Supply-sale) Supply: from the country (At); of import (Ai) Sale: in the country (Dt); at export (De)	5 ÷ 10	2
	> 10	4
	At > 50 %; De > 50 %	4
	Ai > 50 %; De > 50 %	3
Guarantees	At > 50 %; Dt > 50 %	2
	Ai > 50 %; Dt > 50 %	1
	Pledged deposits	4
	Bonds, mortgages	3
	Acquisitions from credits	2
	Assignment of receivables	1

Depending on the score made, the financial situation and the degree of company insolvency risk can be determined. The companies can be

classified in one of the five categories of creditworthiness, which allows it or not to get bank credits.

Category	Total points	Economic - financial situation - the degree of risk	Significations
A	> 20	Very good - credit can be granted	These companies have a corresponding financial status and creditworthiness to qualify for bank loans
B	16 ÷ 20	Hi - credit can be granted	
C	11 ÷ 15	Oscillating - poses high risk	These companies have a high degree of creditworthiness to get credit by charging a relatively high risk premium. Such companies should be monitored for the evolution of solvency, in view of the possibility for the bank to recover the receivables
D	6 ÷ 10	Exceptional risk - does not provide sufficient guarantees for granting credits	These companies in categories record levels of indicators that do not guarantee the repayment of bank loans.
E	0 ÷ 5	Particularly precarious - without guarantees for lending	

3. Case Study

At the present moment (October 2018), five companies, traded on the main

segment of the Bucharest Stock Exchange are insolvent, entering this procedure at different times, namely:

Current No.	Company	Insolvency procedure started at
1	COS TARGOVISTE S.A.	22.02.2013
2	DAFORA SA	19.06.2015
3	ROMCAB SA	20.02.2017
4	PETROLEXPORTIMPORT S.A.	16.10.2018
5	UCM RESITA S.A.	06.12.2011

From the insolvency risk model presented above, classic Altman model was selected, considering that this is the most widely used. Because the model is considered to give a very accurate prediction of the risk of bankruptcy, two years before it can occur, Altman scores had been computed for the previous two years before the insolvency procedure started.

4. Methodology

The Altman insolvency risk model was computed based on financial statements published of each company website and also available on www.bvb.ro, for the previous three years before insolvency procedure started. For the Market value equity was considered the value for the last trading day in every year.

The Altman model, assessing insolvency risk, is represented by the equation:

$$Z = 3,3 X_1 + 1,4 X_2 + 1,2 X_3 + 1,0 X_4 + 0,6 X_5$$

Where:

Symbol	Determination relation
X ₁	profit before tax and deduction of total interest / asset (economic profitability);
X ₂	reinvested earnings / total assets (reinvested earnings);
X ₃	current net assets / total assets (current assets ratio);
X ₄	total turnover / assets (rotation speed of the asset);
X ₅	Market value equity / total liabilities (financial autonomy).

5. Data Analysis

The Z score values, computed for the previous two years before the insolvency

procedure started for each company, are presented in Table no. 1.

Table no. 1

Z score values

Company	Insolvency procedure started at	Period	Z one year before insolvency	Z two years before insolvency	Conclusions
COS TARGOVISTE S.A.	22.02.2013	2011-2012	0.67	0.60	Distress Zone. The company is in imminent state of insolvency
DAFORA SA	19.06.2015	2013-2014	-1.55	0.09	Distress Zone. The company is in imminent state of insolvency
ROMCAB SA	20.02.2017	2015-2016	1.15	0.21	Distress Zone. The company is in imminent state of insolvency
PETROLEXPORTIMPORT S.A.	16.10.2018	2016-2017	0.17	-0,13	Distress Zone. The company is in imminent state of insolvency
UCM RESITA S.A.	06.12.2011	2008-2009	-0.42	-0,86	Distress Zone. The company is in imminent state of insolvency

All Z score values, for each company, recorded values well below the threshold of 1.8. Based on these results, all companies could be placed in the Distress Zone category, being in imminent state of insolvency.

Considering these results, we can conclude that Altman insolvency risk model offers a good satisfactory risk prediction, offering a correct diagnostic in all cases of the companies that faced insolvency.

Furthermore, the Z score had been computed for the rest of the period, starting with the moment of insolvency to present. This was possible for the companies that start insolvency procedure before 2017: COS TARGOVISTE S.A., DAFORA SA and UCM RESITA S.A. Considering that these companies have been suspended since insolvency, Book value of equity has been used instead of Market value equity. The results are presented in Figures no. 1, 2 and 3.

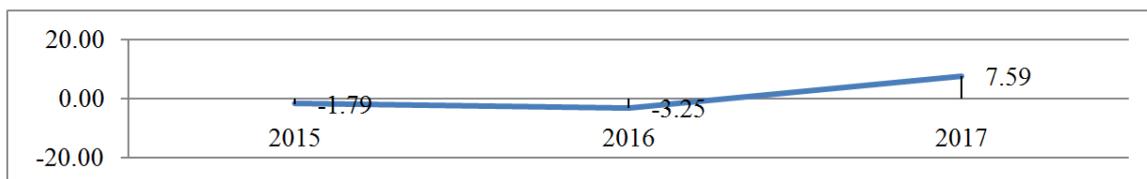


Figure no. 1: The evolution of Altman Z-score bankruptcy prediction model for DAFORA S.A.

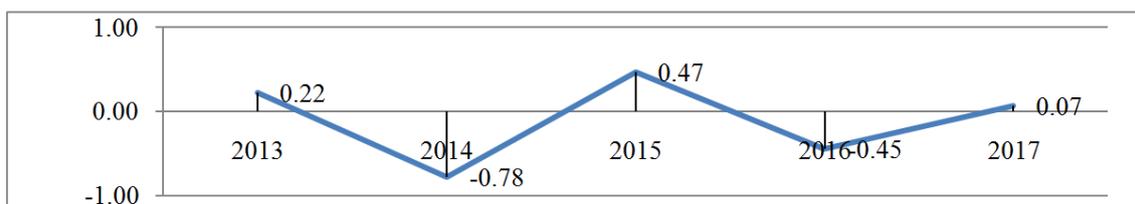


Figure no. 2: The evolution of Altman Z-score bankruptcy prediction model for COS TARGOVISTE S.A.

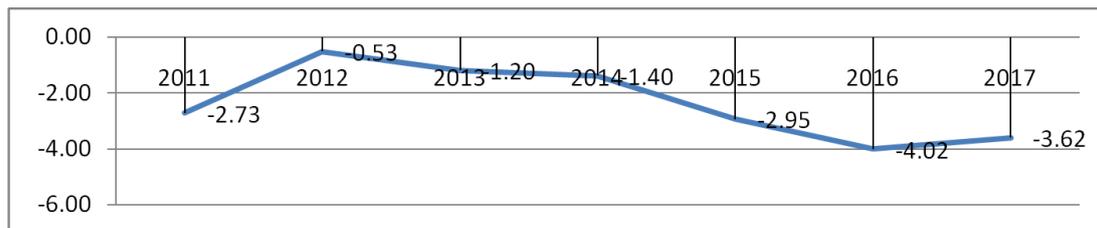


Figure no. 3: The evolution of Altman Z-score bankruptcy prediction model for UCM REȘIȚA S.A.

All Z score values, for each company, recorded values well below the threshold of 1.8, these companies still remaining in imminent state of insolvency.

6. Conclusions

Even if it is a classic, old insolvency risk model, the Altman model has been able to predict in all cases the risk of insolvency

in case of Romanian traded companies, so it could be successfully used by investors. However, caution must be maintained, when formulating the conclusions, the applicability of the model being limited, considering that it was developed in the late 1960s, for the manufacturing sector in U.S. The extrapolation of the model should be made by adapting it to each activity sector.

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