Economy Transdisciplinarity Cognition www.ugb.ro/etc	Vol. XIV, Issue 1/2011	248-259

Analysis models of the bankruptcy risk

GABRIELA-DANIELA BORDEIANU, FLORIN RADU,
MARIUS DUMITRU PARASCHIVESCU, WILLI PĂVĂLOAIA,
„George Bacovia" University
Bacău, Romania
gabriela.bordeianu@ugb.ro, florin.radu@ugb.ro

Abstract

All entities are subject to the bankruptcy risk. This risk can have negative consequences, with complex implications both on the entity's whole activity and on the other entities it comes into contact with.

The bankruptcy risk is the company's incapacity to face the due obligations resulting either from current operations, whose accomplishment conditions the continuity of the activity, or from obligatory samplings. The bankruptcy risk can also be defined as the impossibility of the companies to face a financial-banking transaction, respectively its incapacity to repay in time the borrowed amounts in the conditions established in agreement with third parties, in accordance with a loan agreement.

As a result, the process of bankruptcy risk diagnosis consists in evaluating the company's capacity to face the commitments assumed by third parties, therefore in evaluating the company's solvency.

The bankruptcy risk can be analysed from different points of view: the static analysis of the bankruptcy risk by means of the financial balance, the analysis of the bankruptcy risk by means of the functional balance and the analysis of the bankruptcy risk by means of the scoring method.

Over the last years, due to the inherent dynamism of the economic-financial activity of companies, it has become more than necessary to acquire accurate information on the bankruptcy risk in the future.

Keywords
bankruptcy risk, diagnosis, static analysis, functional analysis, scoring method, Z score

Introduction

In market economy conditions, risk [1] is an essential component of any economic agent, of management policy, of the strategy developed by this economic agent, strategy that depends almost entirely on the ability and capacity of each to anticipate and to exploit opportunities, assuming a so-called "risk of business failure."

Risk is manifest from the very moment of starting a business or investment, it continues with setting objectives and conditions for development, then attracting funding sources, with the implementation of management, finding markets, setting prices / tariffs, etc..

Thus, choosing a wrong target, taking wrong management decisions or the lack of correlation of output with the demand on the respective market, lead to a risk which will manifest as loss for the firm. So, the problem of detecting and avoiding possible situations likely to generate risk is a priority for the well-being of the company.

In the literature there are many definitions of risk that attempt to find new meanings and significance of its impact on economic activity:

- *risk is the probability of occurrence of an undesired event*; [2]
- *in a synthetic meaning, risk - inherent in any activity - means the variability of results under the pressure of the environment;* [3]
- *risk means the profit variability towards the average of profitability in the last financial years ... risk is simply the company's inability to adapt, in time and at the lowest cost, to the changing environmental conditions*; [4]
- *the risk produced under circumstances has an effect on the outcome of a business, implicitly on the operator who has developed the respective transaction / contract* [5]

- *the risks and uncertainties inevitably linked to many of the events and circumstances should be taken into account in determining the best estimate*. [6]

In a synthetic sense, the risk at the level of economic agents is assessed as *the variability of an activity result under the pressure of the environment*. The profitability of the economic activity is directly dependent on the risk borne: it can only be assessed according to the risk the economic agent bears.

Different economic agents assume a risk based only the profitability they anticipate. In this context it seems necessary to introduce the concept of "*risk management*". In a general sense, it requires minimizing losses, additional expenses in the event of risk.

Risk management focuses on two elements: risk assessment and taking precautionary measures to avoid them.

Risk assessment involves the application of analysis methods, statistical methods and techniques to enable the sizing of factors that can create risks, so that losses are minimal, while the second factor – protective measures – involves directing their transactions to areas with as low risks as possible, sometimes going as far as renouncing to such transactions and adopting insurance policies as a last resort when prevention measures are not sufficient.

Risk, often named by analysts as a exogenous variable to their models of computation and analysis, may be generated by a variety of internal and / or external factors:

- specificity of developed activities;
- managerial policy adopted for all hierarchical levels of organisational and functional structure;
- relations of the economic agent with suppliers, clients etc;
- political, juridical, legislative framework;
- other factors.

The classification of the risk concept at the enterprise level can be based on several characteristics, given that there is no standard classification of them. Different combinations of characteristics can generate different risk groups. In the literature, many authors of papers with topic on this subject consider the risk classification **according to their nature** as a very handy one for those who study or operate with the notion of risk.

According to them, risk can be classified as:

- *commercial risk* – refers to the development of the company's commercial activity (raw materials supply, sales of finished products, the orientation towards attractive markets);
- *contract risk* – related to the legal aspects of the conclusion and performance of economic contracts;
- *economic risk (operational or production risk)* – refers to the conditions of developing the business economic cycle, the optimal exploitation of resources, the development in good conditions of the production activity and how the company adapts to the changes of the economic environment;
- *financial risk* (*capital risk*) – is related to the financial structure of the company's capital;
- *currency risk* – appears as a consequence of changing the exchange rate for foreign currencies the analysed economic agent works with. It is quantified in losses due to exchange rate variations;
- *political risk* – is manifested in loss of the company due to the change of country's political regime or to the change of the legislative framework;
- *catastrophic risk* – is the potential loss due to natural disasters or human nature disasters;

Another classification, the most common one, is the one according to way of risk creation [7]. According to this classification, risks are:

- economic risks;
- financial risks;
- bankruptcy risks.

The profitability of operation, together with *the operating risk* conditions the level of other related risks and profitability: financial risk, total risk, bankruptcy risk.

Economic risk is the company's inability to adapt in due time, with minimal costs, to the economic environment changes. Economic risk is related to the operating cost structure (fixed and

variable risks) and depends directly on the higher or lower weight of *fixed costs* in the total expenditure.

Financial risk is related to the indebtedness of the economic agent under review and is highlighted by the evolution of result indicators at the company level, under its financial structure.

The risk of bankruptcy or insolvency, although it can be considered as a financial risk which is appropriate to study as a separate risk, because solvency is an important chapter in the economic and financial analysis of any economic unit. In general terms, *solvency* is the ability of the company, of the bank to meet falling due obligations, regardless of the fact that they come from previous, current or compulsory levies engagements (taxes, contributions to social funds).

Whatever the objectives of the users of financial diagnosis, there is a common basis of the relationship profitability – risk, meaning that profitability is an indicator of company's performance, regardless of its nature.

Profitability is also seen and determined differently according to the participants in the life of the company: managers, shareholders, bankers, employees.

Any activity involves the consumption of capital which is subject to certain risks that accompany profitability. When you create or develop a company, bringing capital, its owners expect a certain level of forecast profitability for a given activity level. If this level changes, the financial profitability will also suffer changes that will express the *capital risk.*

Invested capital will be even more risky as the profitability *sensitivity* to changes in workload is higher, as well as the expected *profitability* is higher, if the risk taken is higher.

The financial analysis aims both overall profitability, through the study of exploitation performances included in the income statement, as well as and the impact of financial resources used in relation to the means used.

The notion of risk has meaning only when presenting future and trying *to estimate* profitability rate fluctuations in developing forecasts.

1. Analysis of the bankruptcy risk

Every economic agent is at risk of bankruptcy. This may have negative consequences, with complex implications on the entire activity of the economic agent, as well as on other entities coming into contact with that agent.

The bankruptcy risk (insolvency) is the company's inability to meet maturing obligations resulting either from current operations, whose achievement conditions the continuation of activity, or from compulsory levies.

The bankruptcy risk can be analyzed in several aspects:

- *static analysis of the bankruptcy risk*, by means of the balance sheet. This approach is based on the inequality: Current assets < Short-term debts, which explains that the circulating assets as potential cash are not correlated with short-term debts as a potential chargeability.
- *functional analysis of the bankruptcy risk,* by means of the functional balance. This approach is based on the assumption that when the net treasury is negative (working capital < working capital requirements), and the company is financially vulnerable.
- *analysis of bankruptcy risk through the score method*. This method allows the assessment of risk under three aspects:
    - synthetic assessment of the financial situation in a spirit of forecasting, based on events and company performance in prior periods;
    - objective assessment of the financial situation through a set of rates effectively combined to forecast the company's difficulties;
    - developing a series of notes by which the bankruptcy risk is determined based on comparative testing, for a longer period of time, of the behaviour of the companies with or without financial difficulties.

1.1. Established models of the scoring method

In recent years, due to the inherent dynamism of economic and financial activities of companies, it has become necessary to know more precise information on the bankruptcy risk at a future time.

This has resulted in developing a method for predicting the bankruptcy risk called scoring method, which has seen significant development with the use of statistical methods for analyzing the financial situation, starting from a whole of ratios.

Studies in the 60s sought the differences between the values of indicators at successful companies and at bankrupt companies.

Studies have shown that certain financial indicators had significant differences in the two categories of companies.

The most common statistical technique used in studies on bankruptcy is the discriminant analysis. It is a statistical method to find certain forecast variables which are given some weights so that their sum gives an overall index which is the Z score (the Z score).

The scoring method is one of the ways of comprehensive investigation of the state of solvency of an economic agent in order to establish the possibility of bankruptcy risk event. This method occupies an important position in financial analysis and is based on the discriminant analysis. The "scoring technique" has its origins in the U.S., where, in the 50s, there was seeking to put in relation the causes and the ways of manifestation of some diseases in medical research. It is a statistical technique that helps to establish characteristics based on the observations made on an object, phenomenon, process, etc. The scoring method was taken by other subjects, as well, including the economic and financial analysis; thus, the Americans have used this method to assess the risk of a company belonging to a particular domain. The scoring method is an external diagnosis method, which aims to measure to risk of investors, creditors and the economic agent himself in future work.

In the context of financial analysis, observations were made on the basis of indicators, both by vulnerable and financially healthy companies. The significance of indicators and the way of combining them depend on the interest specific to each information user or to each analyst.

The scoring method calls for consideration of relevant economic and financial indicators, with great power of synthesis of economic phenomena both from a static and dynamic point of view and the importance weight of selected indicators. On this basis and on mathematical relationships between indicators there can be determined a total score, according to which the company in question is assessed in terms of its viability in the competitive environment.

The scoring method is intended to provide predictive models for assessing the bankruptcy risk of an enterprise. This method is based on statistical techniques of the discriminant analysis. Its application involves observing a group of companies formed of two distinct groups: a group of enterprises with financial difficulties and a group of companies without financial problems. For each of the two groups a set of ratios is established and then there is determined the best linear combination of ratios to distinguish between the two groups of companies.

Following the application of the discriminant analysis, the Z score is obtained for each firm, which is a linear function of a set of ratios. The distribution of different scores allows distinguishing between „healthy" enterprises from enterprises in difficulty.

Z score attributed to each enterprise is determined by means of the following function:

$Z = a_1*x_1 + a_2*x_2 = K = a_i*x_i$

where: *xi* – represents ratios involved in analysis;

ai – percentage coefficient of each ratio.

In fact the scoring method has evolved into two meanings, one was to use the function z (as shown above), and second assigning scores based on indicators characterizing the activity of the company that wants to be analysed.

In the banking methods of analysis, the function z is regarded as part of an overall assessment, the analysis being completed with the critical assessment of the following elements:

- management activity;
- financial administration;
- reports of Certified Public Accountants;
- relationships with creditors;
- press declarations;
- conditions in which the activity takes place;
- employees' satisfaction degree;

In the economic theory, there have been elaborated a series of models base don the scoring method, out of which the following are taken into consideration:

The financial risk analysis is performed using the scores method (Z) based on **Conan and M. J. Holder model**, to assess the risk of bankruptcy and it is based on the following formula:

$$Z = 0{,}24 \times X_1 + 0{,}22 \times X_2 + 0{,}16 \times X_3 - 0{,}87 \times X_4 - 0{,}1 \times X_5$$

In which the variables X_1.....X_5 are economic-financial indicators, and the constants with which they are amplified are statistic indicators, expressing the percentage of variables in evaluating the bankruptcy risk.

X_1	Gross operating surplus / Total debts Gross operating surplus = operating income – operating expenses
X_2	Permanent capital / Total assets Permanent capital = equity + debts > 1 year
X_3	Circulating assets – Stocks / Total assets
X_4	Financial expenses / Turnover
X_5	Staff expenses / Turnover

The interpretation of the bankruptcy risk will be realised as follows:

Score value	**Company's situation**	**Probability of bankruptcy risk**
$Z \geq 0{,}16$	Very good	Under 10%
$0{,}1 < Z \leq 0{,}16$	Good	10% - 30%
$0{,}04 < Z \leq 0{,}1$	Under observation	30% - 65%
$Z \leq 0{,}04$	Danger	65% - 90%

Altman Model

This model is mostly used in industrially developed countries and is based on the following function:

$$Z = 3{,}3 \times R_1 + 1{,}0 \times R_2 + 0{,}6 \times R_3 + 1{,}4 \times R_4 + 1{,}2 \times R_5$$

R_1 - economic profitability ratio	Gross result / Total assets
R_2 – assets rotation speed	Turnover / Total assets
R_3 – financial autonomy	Equity / Total debts
R_4 – reinvested profit ratio	Reinvested profit / Total assets
R_5 – circulating assets ratio	Circulating assets / Total assets

From the information content of indicators, there results that their levels are even better if they register a greater absolute value. Therefore, Z score is interpreted as follows:

- when Z is lower or equal to 1,8, the bankruptcy situation is imminent;
- when Z is higher than 3, the financial situation is good and the banker can trust the respective enterprise; it is solvent;
- when Z is between 1,8 and 3 the financial situation of the enterprise is difficult, with clearly diminished and close to the bankruptcy state performances. Being in this situation, the enterprise can restart its activity, if they adopt an appropriate financial activity,

The Model of the Balance Sheet Central of the Banque de France was elaborated based on the 3,000 industrial enterprises with 3 years before bankruptcy in the period 1975-1980.

The model forecasts the bankruptcy risk for a period of 3 years, it operates with a number of 8 variables (rates) and measures the degree of similarity of the enterprises with the normal ones or those in bankruptcy, having the following expression:

$Z = -1{,}255R_1 + 2{,}003R_2 - 0{,}824R_3 + 5{,}221R_4 - 0{,}689R_5 - 1{,}164R_6 + + 0{,}706R_7 + 1{,}408R_8 - 85{,}544,$

where:

$$R_1 = \frac{Financial\ \exp enses}{Gross\ operating\ surplus};$$

$$R_2 = \frac{Stable\ resources}{Invested\ capital} = \frac{Permanent\ capital}{Total\ assets};$$

$$R_3 = \frac{Self\ -\ financing\ capacity}{Total\ debts};$$

$$R_4 = \frac{Gross\ operating\ surplus}{Turnover};$$

$$R_5 = \frac{Commercial\ assets}{Supplies} \times T = \frac{Average\ balance\ \sup pliers}{Purchases} \times 360;$$

$$R_6 = \frac{\text{Modification of added value}}{Vad_0} \times 100 = \frac{Vad_1 - Vad_0}{Vad_0} \times 100;$$

$$R_7 = \frac{Average\ balance\ clients}{Turnover} \times 360;$$

$$R_8 = \frac{Corporal\ investments}{Added\ value}.$$

The sign (±) of Z score reflects the *probability* of normality (difficulty) and the bankruptcy risk, as follows:

a) Z > 0: normality probability = 76,1 % and difficulty probability = 23,9 %;

b) Z < 0: normality probability = 20,6 % and difficulty probability = 79,4 %.

Z score value	Company's situation	Bankruptcy risk (%)
Z > 0,125	Normal	10 ÷ 45 %
- 0,25 < Z < 0,125	Uncertain	45 ÷ 70 %
Z < - 0,25	Risky	70 ÷ 100 %

Taffler Model has the following calculus algorithm:

$$Z = 0{,}53 \times R_1 + 0{,}13 \times R_2 + 0{,}18 \times R_3 + 0{,}16 \times R_4$$

Where:

$$R_1 = \frac{Gross\ \text{profit}}{Current\ \text{debts}};$$

$$R_2 = \frac{Current\ assets}{Total\ debts};$$

$$R_3 = \frac{Current\ \text{debts}}{Total\ assets};$$

$$R_4 = \frac{Income\ from\ sales}{Total\ \text{assets}}.$$

Function values are interpreted as follows:

Z score value	*Bankruptcy risk*
$Z \leq 0{,}2$	High probability of bankruptcy risk
$Z \geq 0{,}3$	Low bankruptcy risk

We'll offer some examples for the bankruptcy risk analysis, Alman model, Conan-Holder model, Taffler model.

By applying Altman model, there have been obtained the following results, synthesised in Table 1.1.

The calculus of the bankruptcy risk by Altman model

Table 1.1.

No.	Specification	Symbol	U.M.	Analysed period		
				2008	2009	2010
1.	Total assets	At	lei	18215623	24839878	34451555
2.	Turnover	Ca	lei	35805353	58243912	59997015
3.	Reinvested profit	Pi	lei	0	0	0
4.	Equity	Cpr	lei	9843798	13943302	17533242
5.	Total debts	Dt	lei	7146721	8719390	15925945
6.	Gross profit	Pb	lei	3993182	5482452	2606123
7.	Circulating assets	Ac	lei	7237969	9652733	9617188
8.	R1	Pb/At	-	0.22	0.22	0.08
9.	R2	Ca/At	-	1.97	2.34	1.74
10.	R3	Cpr/Dt	-	1.38	1.60	1.10
11.	R4	Pi/At	-	0.00	0.00	0.00
12.	R5	Ac/At	-	0.40	0.39	0.28
13.	**Z=3,3*R1+1,0*R2+ +0,6*R3+1,4*R4+1,2*R5**	-	-	**3.99**	**4.50**	**2.99**

The analysis of the bankruptcy risk by using the Conan-Holder model has led to the following results (table 1.2.):

Determination of bankruptcy risk by Conan-Holder Model

Table 1.2 .

No.	Specification	Symbol	U.M.	Analysed period		
				2008	2009	2010
1.	Receivables	Cr	lei	2239700	3613272	3215467
2.	Cash	Db	lei	1824853	235360	1652405
3.	Permanent capital	Cpm	lei	16990519	22662692	33459187
4.	Total debts	Dt	lei	7146721	8719390	15925945
5.	Total liabilities (total assets)	Pt(At)	lei	18215623	24839878	34451555
6.	Financial expenses	Chf	lei	278178	534647	1549626
7.	Turnover	Ca	lei	35805353	58243912	59997015
8.	Total staff expenses	Chp	lei	1762461	2227669	3571308
9.	Added value	Va	lei	6304068	9208809	9723062
10.	Gross operating surplus	EBE	lei	4453630	6606956	5782725
11.	R1	(Cr+Db) /At	-	0.22	0.15	0.14
12.	R2	Cpm/Pt	-	0.93	0.91	0.97
13.	R3	Chf/Ca	-	0.01	0.01	0.03
14.	R4	Chp/Va		0.28	0.24	0.37
15.	R5	EBE/Dt		0.62	0.76	0.36
16.	**Z=0,16*R1+0,22*R2- -0,87*R3- -0,10*R4+0,24*R5**	**-**	**-**	**0.36**	**0.38**	**0.26**

In the analysed case, the score function calculated according to Taffler model has the values presented in Table 1.3.:

The calculus of Z score function –Taffler model

Table 1.3.

No.	Specification	Symbol	U.M.	Analysed period		
				2008	**2009**	**2010**
1.	Gross profit	Pb	lei	3993182	5482452	2606123
2.	Current debts	Dc	lei	3405109	3111640	3820300
3.	Current assets	Ac	lei	7237969	9652733	9617188
4.	Total debts	Dt	lei	7146721	8719390	15925945
5.	Total assets	At	lei	18215623	24839878	34451555
6.	Income from sales	Vv	lei	35805353	58243912	59997015
8.	R1	Pb/Dc	-	1.17	1.76	0.68
9.	R2	Ac/Dt	-	1.01	1.11	0.60
10.	R3	Dc/At	-	0.19	0.13	0.11
11.	R4	Vv/At	-	1.97	2.34	1.74
13.	**Z=0,53*R1+0,13*R2+ +0,18*R3+0,16*R4**	-	-	**1.10**	**1.48**	**0.74**

1.2. Romanian school models

Băileşteanu Model (1998) [8]

Starting from traditional studies, the author considers that bankruptcy is determined by the following factors:
- impossibility to pay current liabilities;
- lack of financial sources to repay credits;
- very late cashing of delivered products counter value;
- losses.

The author suggests the following variables:

G_1, *General current liquidity = current liabilities / current assets*

G_2, *solvency = net profit + amortization / rate of credit repayment + interest*

G_3, *recovery clients = turnover / clients*

G_4, *profitability of costs = profit / cost *100*

Parameters a and b are calculated according to the following calculus formula:

For the indicators optimised by minimum:

$$a = \frac{1}{x\max - x\min}$$

$$b = \frac{-x\min}{x\max - x\min}$$

For the indicators optimised by maximum:

$$a = \frac{1}{x\min - x\max}$$

$$b = \frac{-x\max}{x\min - x\max}$$, where:

Xmin = minimum value of indicator (bankruptcy state);

Xmax = the value of indicator when the bankruptcy risk is minimum.

Retained financial ratios:

Indicator	Symbol	Value		A	B
		min	**max**		
Current liquidity	G_1	0,75	3,0	0,444	-0,333

Solvency	G_2	0,9	2,0	0,909	-0,818
Rotation clients (no. rotations / year)	G_3	5	24	0,0526	-0,263
Profitability	G_4	0	30	0,0333	0

The function is:

B = 0,444 G1 + 0,909 G2 + 0,0526 G3 +0,0333 G4 +1,414

B has a maximum value equal to 4 and a minimum value equal to –1,4.

According to the registered value we consider that:

- B < 0,5 – imminent bankruptcy;
- 0,5 < B < 1,1 – limited area;
- 1,1 < B <2,0 – intermediary area;
- B >2,0 – favourable area.

Anghel Model (2002) [9]

The creation of a score was based on a sample of 276 enterprises belonging to a number of 12 branches of the national economy.

It is based on the following function:

$A = 5,676 + 6,63718*X_1 + 5,3932*X_2 – 5,1427*X_3 – 0,0105*X_4$, where:

- X_1 – ratio of income net profitability;
- X_2 – debts coverage rate with cash flow ;
- X_3 – assets indebtedness ratio;
- X_4 – period of obligation payment

The point of inflexion that minimizes the error rate is Z=0, with an interval of uncertainty between 0 and 2,05.

The assessment of a company's viability is based on the following classification:

(Failure/Bankruptcy) 0,0 > Z < 2,05 (Favourable situation).

Mânecuţă and Nicolae Model (1996) [10]

This first model was created for the iron and steel industry and was developed by Mânecuţă and Nicolae, two specialists at the National Forecasting Commission. This model is based on a solving matrix necessary for the construction of a score function, using the empiric coefficient of Pearson for chosing the discriminating financial ratios. The considered financial variables are presented in the following table:

Retained variables

Table 1.4.

No.	Retained variable
1.	Ratio of financial expenses
2.	Invested capital coverage ratio
3.	Ratio of debt payment capacity
4.	Ratio of gross operating margin
5.	Average duration of supplier's credit
6.	Global indebtedness value
7.	Term indebtedness ratio
8.	Commercial receivables ratio
9.	Corporal investments ratio
10.	Average duration of credit
11.	The influence of working capital need
12.	Stocks ratio

The determination of weighting coefficients base don the correlation between the established variable and the function objective was based on the solving of a system of equations with 14 unknown quantities.

After solving the system by Gauss method, there were obtained the solutions, that is the coefficients of the considered economic ratios. Z function results for the Romanian companies in the field of the iron and steel industry and it has the form:

100Z = - 0.02395R1 - 0.54604R2 + 0.01263R3 +0.33901R4 + 0.04745R5 + 0.01752R6 + 0.02194R7 + 0.71249R8 - 1.15459R9 - 0.09855R10 + 0.02751R11 - 0,48437R12 - 0.08536R13 + 0.03609R14

In order to delimitate the favourable and unfavourable areas, there was taken into account the level of the obtained score function in the conditions of a sample of 59 companies, respectively – 1.56.

Thus, the authors succeed in establishing a decision rule of the score function:

- Z > -1.56 companies without financial problems ;
- Z > -1.56 inefficient companies.

Model I - Paul Ivoniciu (1998) [11]

Starting form the studies on over 50 enterprises of different sizes and different sectors of activity in the country, he suggests a new score function, I function.

Registered in the first group of score functions, the one based on financial ratios, I function of P. Ivoniciu is based on the following hypotheses:

a) The company's financial environment is in a relatively normal state.

b) The company's insolvency state is manifested when, in a smaller or greater measure, there are found certain types of symptoms:

- there is a low fructification of the economic means involved in activity;
- Reduced profitability of the developed activity;
- Late cashing of receivables;
- The reduction of the possibility to repay debts in due time;
- The increase of due debts by the non-payment of current obligations;
- The diminution of long-term financial stability.

c) The symptoms are interdependent. They are constituted in diagnosis criteria that have the same importance coefficients and can be quantified according to indicators.

d) The values registered by indicators will diagnose the state of bankruptcy.

e) The use of a diagnosis model according to the grouping of chosen indicators allows a certain linearity in their evolution and limit that will be able to take over the state of insolvency of the enterprise.

The proposed indicators as well as their minimum and maximum limits are presented in the table below:

Retained Financial Ratios (Ivonciu model)

Table 1.5.

Indicator	Symbol	Value	
		Min.	Max.
Rotation speed of total assets	R1	1,00	4,00
Profitability of total income	R2	0,07	0,25
Rotation speed of total receivables	R3	6,00	36,00
Repayment capacity of total debts	R4	0,10	1,50
Rapid liquidity	R5	0,50	1,25
Relative margin of financial stability	R6	0,00	0,25

As it can be observed, the I function model is based on 6 indicators with minimum and maximum values, and according to them utilities have been determined. Therefore, the proposed function is :

***I* = 0.0.33*R1*+5.555*R2*+0.0333*R3*+0.71729*R4*+1.333*R5*+4*R6*-1.66032**

I function has a maximum value equal to 6 and a minimum value equal to -1.66032. The intervals corresponding to insolvency status for *I* function are:

- $I < 0.0$ – imminent bankruptcy;
- $0.0 \leq I < 1.5$ – high bankruptcy risk;
- $1.5 \leq I < 3.0$ – uncertainty area;

- $3.0 \leq I < 4.5$ – average bankruptcy risk;
- $4.5 \leq I < 6.0$ – low bankruptcy risk;
- $I \geq 6.0$ – very low bankruptcy risk.

We'll offer some examples for the bankruptcy risk analysis , Anghel 2002 model:

The calculus of Z score function –Anghel model (2002)

Table1.6.

No.	Specification	Symbol	U.M.	Analysed period		
				2008	**2009**	**2010**
1.	Net profit	Pn	lei	3372605	4639962	2174761
2.	Income	Vt	lei	36690760	58387372	60176130
3.	Cash-flow	Cf	lei	1824853	235360	1652405
4.	Debts	Dt	lei	7146721	8719390	15925945
5.	Assets	At	lei	18215623	24839878	34451555
6.	Liabilities	Ob	lei	3405109	3111640	3820300
7.	Turnover	Ca	lei	35805353	58243912	59997015
8.	X1	Net profit/income	-	0.09	0.08	0.04
9.	X2	Cash-flow/Assets	-	0.10	0.01	0.05
10.	X3	Debts/Assets	-	0.39	0.35	0.46
11.	X4	(Liabilities/Turnover) x 360	-	0.10	0.05	0.06
12.	**$Z=5,676 + 6,63718*X_1 + 5,3932*X_2 – 5,1427*X_3 – 0,0105*X_4$**	-	-	**4.81**	**4.45**	**3.80**

Conclusions

From the analysis of the obtained scores, there results that during the period 2008-2010, Z score function registered values superior to the threshold of 2,6, emphasising a good financial situation and an inexistent bankruptcy risk. (Table 1.1)

In the analysed period the score function determined in accordance with the model Conan-Holder registered values between 0,36 in 2008 and 0,26 in 2010, superior to the threshold of 0,16, showing a very good financial situation and an insignificant bankruptcy risk, under 10%. (Table 1.2)

The data from Table 1.3. show that the score value superior to the minimum limit of 0,3 places the company in a *normality* area with a low bankruptcy risk.

The data from Table 1.6. show that the score value is superior to the minimum limit of 2,05, meaning that the company is in a favourable situation, with no bankruptcy risk.

References

[1] Roman, M., *Financial and banking Statistics*, digital course, ASE, Bucureşti.

[2] Giurgiu, I., (1995), *The Financial Mechanism of the Entrepreneur*, Dacia Publishing House, Cluj Napoca, p. 175.

[3] Niculescu, M., (1997), *Strategic Global Diagnosis*, Economic Publishing House, Bucureşti, p. 234.

[4] Stancu, I., (1994), *Financial Management*, Economic Publishing House, Bucureşti, p. 236.

[5] Pxino, D.O., (2003), *Foreign Exchange Policy and Risk Management in International Transactions*, Economic Publishing House, Bucureşti, 182.

[6] International Accounting Standards, (2001), Economic Publishing House, Bucureşti, p. 124.

[7] Stancu, I., (1997), *Finance*, Second Edition, Economic Publishing House, Bucureşti.

[8] Băileşteanu, Gh., (1998), *Diagnosis, Risk and Efficiency in Business*, Mirton Publishing House, Timişoara, 1998, p. 103.

[9] Vâlceanu, Gh., Robu, V., Georgescu, N., (2005), Economic-Financial Analysis, Economic Publishing House, Bucureşti, p. 383.

[10] Anghel, I., (2002), *Bankruptcy Radiography and Predilection*, Economic Publishing House, Bucureşti, p. 87.
[11] Ivonciu, P., (1998), *The Analysis of the Bankruptcy Risk Using Score Method*, Finanţe-Bănci-Asigurări Journal, p. 17-19.