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ACCOUNTING AND BALANCED BUSINESS ANALYSIS OF THE INSOLVENCY (BANKRUPTCY) RISK AND OF THE COMPANY COMPETITIVENESS IN TIME OF GLOBAL ECONOMIC CRISIS

Abstract

The article presents interesting and improved methods of business analysis, emphasizing on the bankruptcy risk prediction and comparative competitiveness estimation. The paper handles strategic, current and operative financial business analysis, such as "SWOT - Analysis", "Balanced Scorecard Method of Analysis", "Z-Score Analysis", and business metrics. The author presents a real life practical example of the engine production industry. The presented tools can be widely used for different industries, thus being highly valued especially in times of economic and financial crisis. The balanced scorecard analysis (BSc) has emerged as a decision support tool at the strategic management level. Many business leaders now evaluate corporate performance by supplementing financial data of Accounting Analysis with goal-related measures from the following perspectives: customers, internal business processes, learning and growth. It is argued that the BSc concept can be adapted to assist those managing business functions, organizational units and projects.

Keywords: *balanced scorecard analysis, Accounting analysis, Bankruptcy risk analysis, insolvency, competitiveness, balanced scorecard; Performance measurement and evaluation; Strategic decision-making; Multidimensional metrics; Cluster analysis; Performance management*

One of the main objectives of the Financial Business Analysis in time of financial and economic crisis in the phase of recession is the risk estimation and protection of the company from insolvency. One of the ways to do that is through discriminant analysis.

The integration of the financial pattern in the balanced system of indexes for efficiency analysis "**Balanced Scorecard Method Analysis**" with the strategic "**SWOT Method of Analysis**" gives the company opportunities for good positioning on the market, clear assessment of its strengths and weaknesses, sustainable development and ensuring marketing and financial stability.

Financial Business Analysis must methodically imply the "discriminant analysis", which gives the ability for development of powerful protection set of resources and methods of anti-crisis management of the enterprise.

Some methods for discriminant analysis and evaluation of the financial stability and the risk of insolvency(bankruptcy) have proven to be very useful and with great practical implications, such as:

1. "Z-Score Method of Analysis" - developed by Professor Edward Altman
2. "Scoring Risk's Methods of Analysis" - methods for discriminant analysis of the insolvency risk - developed by Fulmer, Springate, Taffler and others.

The base method "Security Financial Method of Analysis" by Professor Altman, E. (USA) uses the following groups of indexes: Liquidity indexes; Indexes of the capital structure; Profitability ratio; Business activity ratio; Indexes for the effectiveness of investment decisions.

Research shows that the meaning of each index in the process of discriminant analysis can vary:

Liquidity indexes

- Absolute Liquidity ratio

Absolute Liquidity ratio= Absolute Liquid Assets : Current Liabilities

Critical range: (0.2 - 0.5)

- Acid test ratio/Quick Liquidity ratio
Quick Ratio= (Cash&Equivalents + Short-term Investments + Accounts Receivable) / (Current Liabilities)
Critical range: (0.3 – 1.0)
 - Current Ratio
Current Ratio = (Current Assets) : (Current Liabilities)
Critical Range: (1.0 – 2.0)
 - Net working capital
Nwc = (Current Assets) – (Current Liabilities)
Critical range:(> 0)
- Indexes of the capital structure (indexes for financial stability)
- Financial autonomy (independence) ratio (Equity to Total Assets)
Financial autonomy ratio = (Equity) : (Total Assets)
Critical range: (0.5 - 0.8)
 - Total debt to total assets
Total debt to total assets = (Debts : Total Assets)
Critical range:(0.2 - 0.5)
 - Long-term debt to total assets
Long-term debt to total assets = (Long-term debt) : (Total Assets)
 - Total debt to equity
Total debt to equity = (Total debt) : (Equity)
Critical range:(0.25 – 1.0)
 - Long-term debt to fixed assets
Long-term debt to fixed assets= (Long-term debt) : (Long-term assets)
 - Earned interest Ratio
Earned interest ratio = (EBIT) : (Net Interest Expense)
Critical range:(> 1)
- Profitability ratios
- Return on sales, %
Kros = (Net Profit) : (Net Sales)
 - Return on shareholders' equity, %
Kroe = (Net Profit) : (Equity)
 - Return on current assets, %
Krca = (Net Profit) : (Current Assets)
 - Return on fixed assets
Krfa = (Net Profit) : (Fixed assets)
 - Return on investements
Kroi = (Net Profit) : (Equity + Long Term Debts)
 - Net working capital turnover
Ktrn = (Net Sales) : (Net Turnover Capital)
- Professor Edward Altman has developed and has been constantly improving the methodology of discriminant analysis with high sensitivity on the basis of a specific functional relation:

$$Z = 0,012T1 + 0,014T2 + 0,033T3 + 0,006T4 + 0,999T5 \quad (1)$$

where: T1 – Working Capital to Total assets ratio, Measures liquid assets in relation to the size of the company;

T2 – Retained Earnings to Total Assets ratio, Measures profitability that reflects the company's age and earning power;

T3 – EBIT to Total Assets ratio, Measures operating efficiency before tax and leveraging costs;
T4 – Market Value of Equity to Book Value of Total Liabilities ratio;
T5 – Sales to Total Assets ratio.

The transformation of the discriminant function of Professor Altman looks like this:

$$Z = 1,2T1 + 1,4T2 + 3,3T3 + 0,6T4 + T5 \quad (2)$$

However the fundamental methodology of “Z-Score Method of Analysis” has its weakness that reflects the certainty of the bankruptcy prediction in time

This weakness could be overcome and does not lessen the qualities of the discriminant analysis in the pursuit for effective anti-crisis management and bankruptcy prevention.

Professor Edward Altman studied and implied a series of more sophisticated methods. He developed the widely known „ZETA Model of Analysis”. In this method the period of analysis is increased during which the predictions could be validated to a high extent.

The performed research has confirmed with a high level of certainty that an interval with “Z-Score” indexes, equal or higher than 2,99, could be treated as “financially stable”. On the other hand companies with „ Z-Score ” indexes lower than 1,81 could be characterized as high level of insolvency risk (financial collapse). The optimal point of the “Z-Score ” index minimum is 2,675.

The higher the minimum point of „Z – Score”, the lower the bankruptcy risk and the higher the degree of certainty for the prediction.

The British Prof. Lis gives an alternative model of discriminant analysis of the insolvency risk:

$$Z = 0,063x_1 + 0,092x_2 + 0,057x_3 + 0,001x_4, \quad (3)$$

where: x_1 – Working capital / Total Assets;

x_2 – Sales / Total Assets;

x_3 – Retained earnings / Total Assets;

x_4 – Owner’s Equity / Total Liabilities.

The marginal minimum of The Z-score index, that shows the insolvency risk according to Prof. Lis is 0.0347.

The discriminant model of risk analysis, provided by Prof. Fulmer is expressed by the following functional relation:

$$H = 5,528x_1 + 0,212x_2 + 0,073x_3 + 1,270x_4 - 0,120x_5 + 2,335x_6 + 0,575x_7 + 1,083x_8 + 0,894x_9 - 3,075 \quad (4)$$

where : x_1 – Retained earnings from previous years/ Total Assets;

x_2 – Sales / Total Assets;

x_3 – Gross profit / Owner’s Equity;

x_4 – Cash flow / Total liabilities;

x_5 – Long-term liabilities / Total Assets;

x_6 – Short-term liabilities / Total Assets;

x_7 – log (current assets);

x_8 – Working capital /Total Liabilities;

x_9 – log [(Gross profit + taxes) / (taxes)];

The accuracy of predicting the risk of financial insolvency of a company when using the methodology of Prof. Fulmer for the period of one year is 98% and for period of two years is 81%.

When $H < 0$, it is assumed that bankruptcy will occur with certainty.

The British Prof. Gordon Spingate offers the following model of analysis, evaluation and prediction of the risk of financial insolvency of the company:

$$Z = 1,03x_1 + 3,07x_2 + 0,66x_3 + 0,4x_4, \quad (5)$$

where: x_1 – Working capital / Total Assets;
 x_2 – (Gross profit + taxes) / Total assets;
 x_3 – Gross profit / Current liabilities;
 x_4 – Sales / Total Assets.

The interpretation of the discriminant model of prof. Gordon Springate shows that if $Z < 0,862$ the company will most probably go bankrupt. The accuracy level of the prediction is estimated at 92.5% for the period of one year.

The British scientists Prof. Taffler and Prof. Tishow imply the method of Prof. Edward Altman, modelling their own four-factor equation:

$$Z = 0,53x_1 + 0,13x_2 + 0,18x_3 + 0,16x_4, \quad (6)$$

where: x_1 – Sales / Current liabilities;
 x_2 – Current Assets / Liabilities;
 x_3 – Current liabilities / Total assets;
 x_4 – Net sales / Total Assets.

When $Z > 0,3$ the probability of bankruptcy is small, when $Z < 0,2$ it is high.

The following conclusion can be made:

When analyzing and evaluating the risk of financial insolvency (bankruptcy) the application of the discriminant function dominates and is confined to the common model:

$$Z = a_0 + \sum_{i=1}^n a_i \times f_i, \quad (7)$$

where: a_0 and a_i – are regression ratios;

f_i – indexes, defining the financial condition of the company.

In times of financial and economic crisis, it is very important that companies manage and control the effectiveness of their own financial business activities.

This could be done through the balanced system of indexes for effectiveness analysis „Balanced Scorecard Method of Analysis” (BSc). This internationally recognized has been developed by the American Professors David Norton and Robert Kaplan.

BSc is one of the instruments for analysis of the internal company's business processes. The basic idea of BSc is to use business metrics, in which non-financial indexes dominate over the financial ones.

According to Prod. Kaplan all factors that matter to the company's management need to be measured. Otherwise they cannot be controlled.

The methodology of BSc has proposed for the first time the simultaneous use of financial and nonfinancial indexes for measuring effectiveness, such as employees, clients, internal business procedures, etc. All indexes are connected into a complete balanced system, that motivates the management and the human resources for the accomplishment of a unified concept and motivated business strategy.

In times of financial and economic crisis it is vital importance to not only analysis and management of the effectiveness, but also look for relevant measures and methods for evaluation and maintenance of the company's competitiveness.

Competitiveness analysis should comply with the principles „Balanced Scorecard Method of Analysis”(BSc), as suggested by Norton and Kaplan.

The philosophy of the balanced business analysis not only evaluates the key role of the financial, but also highlights the need for their obligatory interpretation in parallel with the nonfinancial indexes.

The business metrics for analysis and evaluation of the bankruptcy risk show that it is not appropriate to only rely on nonfinancial indexes when using. Furthermore it is necessary to set certain limits to the financial directions, which will be accomplished through the nonfinancial indexes.

The main goal is to analyze the mutual connection and determination between the key aspects of the company's activities, corresponding to the four main questions. (See Figure 1).

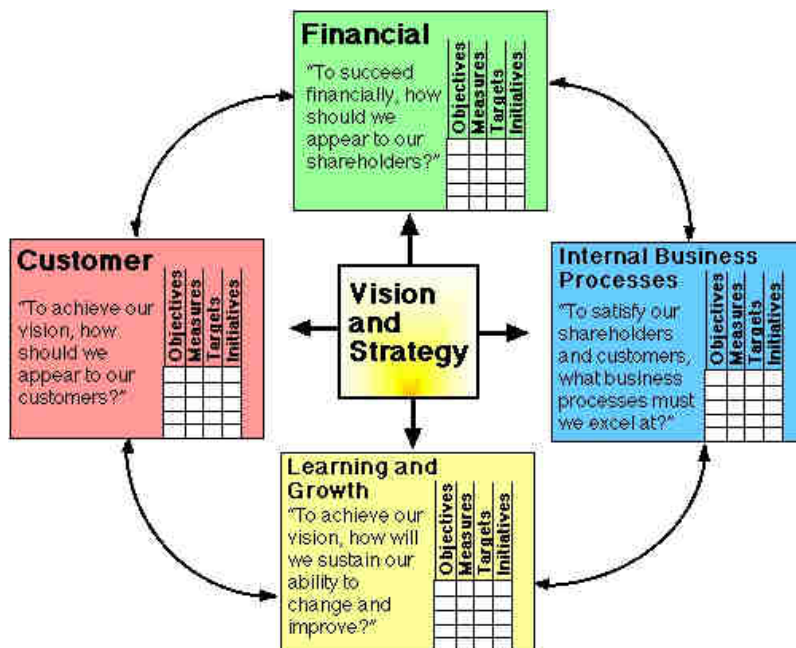


Figure 1: „Balanced Scorecard Business Analysis” (Source: Norton, D.; Kaplan, R.)

The Balanced Business analysis could be performed through different quantitive methods- conventional and untraditional.

The contemporary econometrics give a wide set of resources. In terms of market competitiveness the multi-indexes (cluster) methods of comparative analysis are very interesting. Cluster methods can be applied to multidimensional analysis of the relations between the competing objects.

One highly relative method of balanced business analysis of the competitiveness, the financial stability and the market position of the company is the so-called – „**Multi-indexes method of the ranges**”. The method of the ranges is associated with defining of marginal range to predefined “reference object “. The reference object could be a competitive product, a competing company, a functional unit - e.g. a centre of internal business processes, etc. The object, defined as “reference” shows the best, the optimal values of the competing indexes.

The basic relation, that defines the methodology of the multi-indexes business analysis of the competitiveness, has the following mathematical formula expression:

$$Ret = \sqrt{\left(\sum_{i=1}^m 1 - k \cdot \frac{P(i)}{Pm(i)} \right)^2} \quad (8)$$

where:

Ret – marginal mathematical distance to the object-“reference”, that possesses the best (optimal) values of the comparing indexes.

k – index of significance of the analyzed object from the comparing business analysis.

P(i) – numerical value of the “i” compared index from the set of indexes, that are objects of the

cluster comparative business analysis.

$P_m(i)$ – maximal numerical value of the “i” compared index from the set of indexes, that are objects of the cluster comparative business analysis.

$i = 1 \dots m$ – number of indexes (Value characteristics) of the compared objects of the business analysis.

The Balanced Business Analysis of the effectiveness and financial stability of a company is orientated towards a result that should define the complex vision of the competitive company – the quality of the production (products, services, etc.), the effectiveness of the internal processes, the financial results, the financial stability, profitability and insolvency and bankruptcy risk. The competitiveness analysis of the production is connected to defining the difference between technical and economic indexes, that define the quality of the products. Using the mathematical estimation through the cluster method of the ranges, the distance to the “object- reference” could be defined in various competitive companies from a certain market branch.

An example for analyzing the competitiveness of the production of a company producing electrical engines:

Data regarding the technical and economic parameters of "Asinhronel" electric engines type „ASF/MO – 400”, produced by „ELPROM-ENERGO-BG” and the company's main competitors, producing similar engines on the international market (see table 1):

Table 1

Data for electric engines produced by "Elprom-Energo-BG" and its competitors

Indexes	Significance index	Republic of	Production of competitive companies from:				Object "Reference"
		Bulgaria	Japan	Sweden	Germany	France	
1. Sustainability of export, in thousand of switches							
a) mechanical	0.80	520	500	1000	700	1000	
b) electrical	1.00	200	320	150	200	320	
2. Number of switches during lifetime, in thousand of switches	0.90	60	60	70	65	60	70
3. Thermostability	0.60	14	9	7	10	12	14
4. Dynamic stability	0.60	39	20	11	25	38	39

When using the upper formula for defining the marginal mathematical distance (range) (Ret) to the object (in this case to the marginal Object- Reference), based on the information about the production of competitive companies-producers, the following alignment of the competitors results (see table 2):

Based on the data for the marginal distance to the “object- Reference” (Ret), defined by the best (optimal) values of the indexes, the individual index of competitiveness - (K_i) can be calculated:

$$K_i = \frac{1}{1 + Ret} \quad \text{The optimal value of } K_i \text{ is } 1.00 \quad (9)$$

Table 2

Marginal range to "object-reference" calculation

Indexes	Competing companies from:				
	Bulgaria	Japan	Sweden	Germany	France
Complex evaluation of the marginal distance to the “object-reference” (Ret)	0.84	1.13	1.48	1.31	0.89

The values of the individual indexes of competitiveness of the companies is shown in table 3:

Table 3

Individual indexes of competitiveness

Indexes	Competing companies from:				
	Bulgaria	Japan	Sweden	Germany	France
Individual index of competitiveness (K _i)	0.54	0.46	0.40	0.43	0.53

A graphic interpretation of the results is shown in Figure 2 and Figure 3.

In real life this is possible when for each of the competing companies the individual and respectively for the A,B,C centers of responsibility - the average competitiveness index is econometrically defined – **K(av)**:

$$K(av) = \frac{\sum K(k_i)}{N} \quad (10)$$

Where: **K(av)** – average competitiveness index;

$\sum K(k_i)$ – sum of individual indexes of competitiveness of the different A,B, C – centers of responsibility – subsidiaries, divisions, resulting from different business combinations.

N - number of the subsidiaries A,B, C – centers of responsibility.

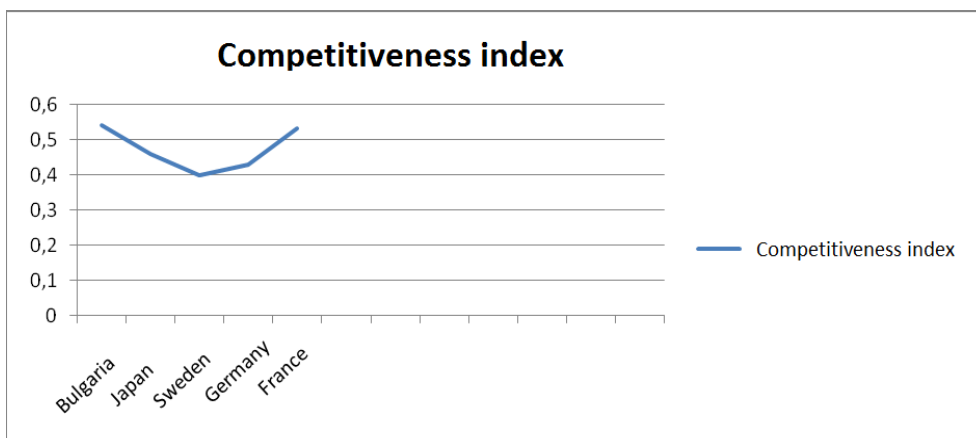


Figure 2: Individual indexes of competitiveness

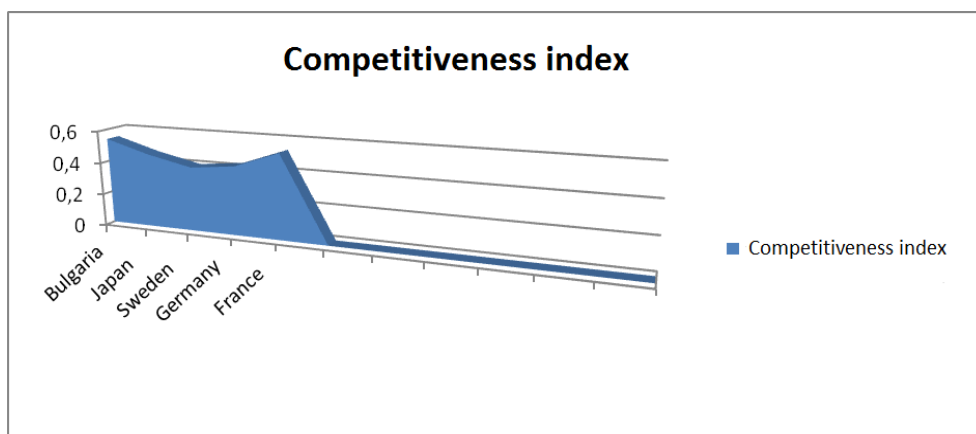


Figure 3: Competitiveness indexes

The above shown indexes and graphical models for analysis could be used in one-product as well as in multi-product structure of the production and the sales of products, services and other main activities.

- The competitiveness of a company should be reviewed not only in specific (product) terms, but also in general. Indexes, that characterize the business effectiveness, financial results, financial stability, profitability and the risk of insolvency and bankruptcy can also be included in the system of analysis objects.

- Indexes connected to the key ideas of the „**Balanced Scorecard Method of Business Analysis**” should also be included among the analyzed objects.

The philosophy of the balanced system for business analysis suggests a thorough study of the relations and the connections between a wide range of financial and nonfinancial indexes, with a priority of those of interest to the consumers. The role of the “Customer orientation” has become a main objective in the methodology and methods of the „**Balanced Scorecard Business Analysis**”.

Therefore the American scientists Norton and Kaplan have formed the following groups of indexes:

P1 = economic indexes.

P2 = Customer relationship indexes.

P3 = internal business processes indexes.

P4 = Indexes of innovations, progress and learning.

The tendencies in the modern “**Financial Business Analysis**” are of great importance for the company’s stability management, the competitiveness and the market positioning of the firm.

The constantly changing and very dynamic business life sets different objectives ahead of the methodology and the methods of the “Financial Business Analysis”.

The analysis of the risk of financial destabilization and insolvency „Security Financial Business Analysis” is a reliable tool for protection of the sustainable development of the companies in time of market ambiguity, competitive risk and global financial-economic crisis.

Under the conditions of a heavy international financial and economic crisis the accountancy and the financial business analysis should be well integrated into the system for financial management and controlling of the company.

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