

---

## SELECTION OF THE ENTITIES - A BUSINESS INTELLIGENCE APPROACH

**Prof. Constantin Anghelache PhD**

*Academy of Economic Studies Bucharest*

**Assoc. prof. Alexandru Manole PhD**

*Artifex University of Bucharest*

**Lecturer Mădălina Gabriela Anghel PhD**

*Artifex University of Bucharest*

### Abstract

This paper presents a model for the analysis of selection of entities to form a portfolio. We have taken into account the investment opportunities of the capital market. First of all, we focus on the theoretical aspects indicating the relations which might be used. At the same time, we refer to the main configurations which may be met through the study of rate evolutions. For example, we give attention to the evolution of indicators, the head-shoulders and zigzag configuration, and so on. Having in mind the extension of the capital market we propose a multidimensional approach which might be able to provide data to assist the companies in their investments policies. The proposed architecture involves data sources, a data warehouse and client systems.

**Keywords:** construction of the model, mobile means, data bases, box chart, configuration

### Introduction

The studies of Anghel (2013a, 2013b), Anghelache and Anghel (2014), describe in detail the significant theoretical and practical aspects regarding the management of portfolio. Conan and Holder proposed (1979) a particular scoring model. Furthermore, Altman's (1968) model is accepted as a strong instrument in analyzing the risk of bankruptcy. Ișfănescu, Robu, Hristea (2010) and Robu, Anghel, Șerban (2014) study the characteristics of additive and scoring models in financial analysis. Vintilă (2010) treats on financial management of the company, in the same time employment rate index has a major influence on the financial statement of the company (Sacală 2015). The business intelligence software is recognized as a powerful tool for data analysis. The characteristics of data warehouse were studied and described by Kimball (2015).

---

### Certain aspects concerning the shares issuing and valuation

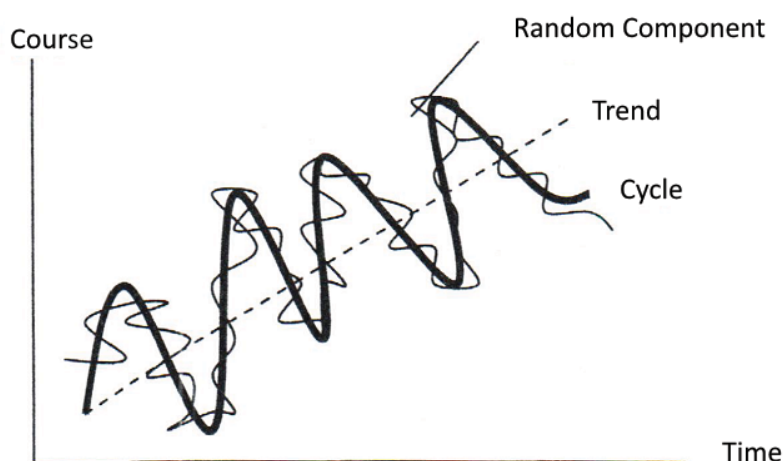
The valuation of the shares based on the technical analysis implies the underlining of the movement recorded by the share rate as a result of the demand and the offer and gives probable information as regards the future evolution of the rate.

In the frame of the technical analysis, the share rate is the most significant element while all the factors which are influencing the market are reflected by the rate level. The movement of the rate over a period large enough is forming a trend.

The technical analysis is based on the historical study of the shares rate, pointing out the trend, the cycle and the random factors.

#### Defining elements of the technical analysis

*Fig. 1*



The main configurations which may be met through the study of the rate evolution are the following:

- The configuration „head- shoulders” which gets formed during a period of 2-3 months. Such a configuration of the rate evolution indicates a decrease of the rate in case that the lowest line is reached. If the market rate exceeds this line, the sale signal is given as a stronger decrease of the rate is forecasted in the future.
- The configuration „head- shoulders” reversed
- The configuration in zigzag

---

The construction of a graphic is defined by the horizontal axis, on which the time and volume are represented, and by the vertical axis, on which there are the rates being recorded. The following types of graphic representations are currently used: live-chart, box-chart, candlestick-chart, point & figure-chart. Also, the mobile means method, one of the most ancient techniques used in statistics is applied, as well as the graphical analysis of the equities rates, provided that the period being chosen for the analysis is long enough (30 – 200 days) in order to fix the tendency. The rate of financial autonomy, which express the weight of the own resources in the total of the financial resources drawn on long term of the company must record a value of minimum 50%.

$$\text{Rate of financial autonomy} = \frac{\text{Own capital}}{\text{Own capital} + \text{Borrowed capital}} \quad (\text{Eq. 1})$$

The rate of stocks financing, which measures that capacity of the stock financing through the bearing fund must record a supra-unitary in order to consider the company as viable.

$$\text{Rate of stock financing} = \frac{\text{Bearing fund}}{\text{Stocks}} \quad (\text{Eq. 2})$$

The rate of assets self-financing is reflecting the extent to which the own capitals are covering the company's assets.

$$\text{Rate of assets self – financing} = \frac{\text{Own capital}}{\text{Fix assets} + \text{Circulating assets}} \quad (\text{Eq. 3})$$

The general rate of indebtedting is showing the total indebtedting of the company in form of short, medium and long term loans as against the own capital and must record a sub-unitary value as a supra-unitary value signifies a high level of indebtedting while a value over 2.33 shows a concerning situation, with a very high indebtedting degree.

$$\text{General rate of indebtedting} = \frac{\text{Total loans}}{\text{Own capital}} \quad (\text{Eq. 4})$$

The coefficient of the financial debts is expressing the indebtedting on medium and long term, the maximum acceptable level counting for 0.5 – 1.0.

$$\text{Coefficient of the financial debts} = \frac{\text{Medium and long term loans}}{\text{Own capital}} \quad (\text{Eq. 5})$$

---

The rate of total debts is representing the weight of the drawn financial sources within the total passives of the company: in practice, it is recommended that the value of the debt rate is placed below the threshold of 50% in order to appreciate a company as a secure one.

$$\text{Rate of total debts} = \frac{\text{Total debts}}{\text{Total assets}} \cdot 100 \quad (\text{Eq. 6})$$

Generally speaking, a good level of the patrimonial solvency is exceeding the value of 0.5. A level included by the interval 0.3–0.5 is reflecting a satisfactory situation. As a rule, a rate of the patrimonial solvency below 0.3 is considered as risky by the financiers[5,6].

$$\text{Patrimonial solvency} = \frac{\text{Own capital}}{\text{Own capital} + \text{Banking credits}} \quad (\text{Eq. 7})$$

The global solvency is reflecting the possibility to cover the total debts by assets. The indicator value must be supra-unitary, as close as possible to the value 2.

$$\text{Global solvency} = \frac{\text{Circulating assets} + \text{Fix assets}}{\text{Total debts}} \quad (\text{Eq. 8})$$

The patrimonial liquidity is giving the ratio in which the claims of the short term creditors are covered by the value of the assets which may be turned into liquidities up to the maturity of the debts. The value recorded by this indicator must be bigger than 1, with a level between 1.7 and 2. Meantime, the down warding evolution of this indicator must be avoided as it is the expression of a declining activity, so that the creditors and suppliers become circumspect as to granting new commercial and banking credits[5,7,8].

$$\text{Patrimonial liquidity} = \frac{\text{Current assets}}{\text{Current debts}} \quad (\text{Eq. 9})$$

The current liquidity is reflecting the company's capability to honor its liabilities on short term out of claims and availabilities and, when calculated, it excludes the stock of circulating assets as they are representing the most uncertain element from the point of view of its value and liquidity[5,7,8]:

$$\text{Current liquidity} = \frac{\text{Current assets} - \text{Stocks}}{\text{Current debts}} \quad (\text{Eq. 10})$$

The value recorded by ROE must be higher 5% and is established by applying the following calculation relation[5,7,8]:

$$ROE = \frac{\text{Net profit}}{\text{Own capital}} \cdot 100 \quad (\text{Eq. 11})$$

The rate of growing of the achieved profit is calculated through the following formula:

$$\%R_p = \frac{P_T - P_{T-1}}{P_{T-1}} \cdot 100 \quad (\text{Eq. 12})$$

where:

PT = profit recorded in the year T;

PT-1 = profit recorded in the year T – 1;

### Model for the selection of the entities

Given the fact that, an essential step for the portfolio construction consists in choosing of the shares are transacted at the Stock Exchange, below is presented a model for the selection of entities based on patrimonial-financial situation analysis and which consists in the study of the three categories of indicators assign according to their importance.

### Importance weights used

Table 1

Category of indicators	weight
I. Indicators of the indebteding degree	25%
II. Indicators of the valuation of the bankruptcy risk through the scores method	35%
III. Indicators of the economic-financial equilibrium	40%
Total	100%

On the basis of scientific criteria rigorously applied, the indicators analyzed are assigned ratings of importance to which they correspond to certain scores presented in table below:

### The granted mark and the scores corresponding to analyzed indicators

Table 2

Granted mark	Excellent	Good	Weak
Symbol of the mark	E	G	W
Connected score	5	3	0

The score obtained by each entity in part shall be calculated by taking into account the weightings above, using the following relationship:

$$\text{Calculated score} = 0,25 \cdot \text{Score Category I} + 0,35 \cdot \text{Score Category II} + 0,40 \cdot \text{Score Category III}$$

The score received by each category of indicators is calculated by applying the grades awarded in accordance with the methods of interpretation analyzed indicators values found in the literature.

### Category I: Indicators of the indebteding degree

Table 3

Indicator	Interval	Qualification (mark)	Granted score
Rate of total debts	< 30%	E	5
	[30%–50%)	G	3
	> 50%	W	0
General rate of indebteding	< 1	E	5
	[1 – 2.33)	G	3
	≥ 2.33	W	0
Rate of financial debts	[0.5 – 1]	E	5
	(1 – 2.5)	G	3
	≥ 2.5	W	0
Score Category I			

Source: self-calculations

The rate of total debts is representing the weight of the drawn financial sources within the total passives of the company: in practice, it is recommended that the value of the debt rate is placed below the threshold of 50% in order to appreciate a company as a secure one.

$$\text{Rate of total debts} = \frac{\text{Total debts}}{\text{Total assets}} \cdot 100$$

The general rate of indebteding is showing the total indebteding of the company in form of short, medium and long term loans as against the own capital and must record a sub-unitary value as a supra-unitary value signifies a high level of indebteding while a value over 2.33 shows a concerning situation, with a very high indebteding degree.

$$\text{General rate of indebteding} = \frac{\text{Total loans}}{\text{Own capital}}$$

The coefficient of the financial debts is expressing the indebteding on medium and long term, the maximum acceptable level counting for 0.5 – 1.0.

$$\text{Coefficient of the financial debts} = \frac{\text{Medium and long term loans}}{\text{Own capital}}$$

**Category II. Indicators of the valuation of the bankruptcy risk through the scores method**

*Table 4*

Indicator	Interval	Qualification (mark)	Granted score
Altman	> 2.6	E	5
	[1.1 – 2.6]	B	3
	< 1.1	S	0
Canon & Holder	> 9	E	5
	[4 – 9]	B	3
	< 4	S	0
Score Category II			

Source: self-calculations

The model Canon & Holder is based on the following function[5,6]:

$Z = 0,24 * x_1 + 0,22 * x_2 + 0,16 * x_3 - 0,87 * x_4 - 0,1 * x_5$ , where the values of  $x_1 - x_5$  are established through the relations:

$$x_1 = \frac{\text{Gross excedent out of exploitation}}{\text{Total debts}}$$

$$x_2 = \frac{\text{Own capital}}{\text{Total pasive}}$$

$$x_3 = \frac{\text{Circulating assets} - \text{Stocks}}{\text{Total pasive}}$$

$$x_4 = \frac{\text{Financial expenses}}{\text{Turnover}}$$

$$x_5 = \frac{\text{Personnel expenses}}{\text{Gross added value}}$$

The model Altman is based on the following function[1]:

$Z = 6,56 * x_1 + 3,26 * x_2 + 6,72 * x_3 + 1,05 * x_4$ , where:

$$x_1 = \frac{\text{Net circulating assets}}{\text{Total active}}$$

$$x_2 = \frac{\text{Re} - \text{invested profit}}{\text{Total active}}$$

$$x_3 = \frac{\text{Current result before taxation}}{\text{Total active}}$$

$$x_4 = \frac{\text{Stock exchange capitalization}}{\text{Short term debts}}$$

### Category III. Indicators of the economic-financial equilibrium

Table 5

Indicator	Interval	Qualification (mark)	Granted score
Rate of assets self-financing	[0.75–1]	E	5
	[0.50–0.75)	G	3
	< 0.5	W	0
Rate of stocks financing	> 2	E	5
	[1 – 2]	G	3
	< 1	W	0
Rate of financial autonomy	[0.75–1]	E	5
	[0.50–0.75)	G	3
	< 0.5	W	0
Score Category III			

Source: self-calculations

The rate of assets self-financing is reflecting the extent to which the own capitals are covering the company's assets.

$$\text{Rate of assets self – financing} = \frac{\text{Own capital}}{\text{Fix assets} + \text{Circulating assets}}$$

The rate of stocks financing, which measures that capacity of the stock financing through the bearing fund must record a supra-unitary in order to consider the company as viable.

$$\text{Rate of stock financing} = \frac{\text{Bearing fund}}{\text{Stocks}}$$

The rate of financial autonomy, which express the weight of the own resources in the total of the financial resources drawn on long term of the company must record a value of minimum 50%.

$$\text{Rate of financial autonomy} = \frac{\text{Own capital}}{\text{Own capital} + \text{Borrowed capital}}$$

### Software architecture model (BI)

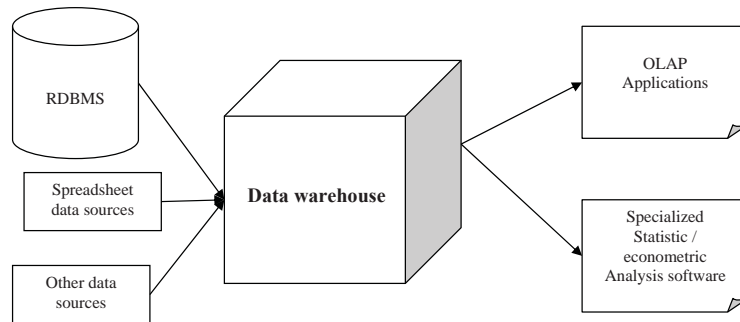
The analysis models and indicators proposed, which are based on specific and relevant measures, can be exploited through business intelligence software, centered around a data warehouse, and connected to proper data sources. The architecture model we propose can be conceptualized as the following figure shows:



---

### Business intelligence mode

Fig. 2



The model includes the following components:

- *Data sources*: data describing the values of indicators can be drawn from various sources, including relational databases, spreadsheet/data files etc.;
- *Data warehouse*: a central data structure, constructed according to principles outlined by Kimball;
- *Data analysis applications*: OLAP embedded applications, specialized analysis software.

### Conclusions

We have proposed a set of analysis tools able to help the investment companies in approaching the capital market context and opportunities. The indicators we proposed offer sufficient information to support the investments decision, and the software architecture model, which we intent ourselves to further develop, is based on the principles of the financial analysis exposed in the first parts of the article.

We consider that the sound basis of the financial analysis indicators and models, corroborated with the capabilities of the software applications that can be chosen as support for the analysis, is a proper foundation to aid the potential investors to appraise the information relevant to investment decisions and to help them formulate viable alternatives from which the most profitable one can be chosen.

### References

- Altman, E.I. (1968), Financial ratios, Discriminant Analysis and the prediction of Corporate Bankruptcy”
- Anghel, M.G. (2013), Modele de gestiune și analiză a portofoliilor, Editura Economică, București

- 
- Anghel, M.G. (2013), Modele de construcție a portofoliilor de instrumente financiare, Revista Română de Statistică, Supliment
  - Anghelache, C.; Anghel, M.G. (2014), Modelare economică. Concepte, teorie și studii de caz, Editura Economică, București
  - Ciobănașu, M. (2011), Analiza economico- financiară, Editura Universitară, București,
  - Conan, Holder (1979), Variables explicatives de performances et controle de gestion dans les P.M.I.
  - Ișfănescu, A.; Robu, V.; Hristea, A.M. (2010), Analiză economico-financiară, Editura ASE, Bucuresti
  - Robu, V.; Anghel, I., Șerban, E.C. (2014), Analiza economică – financiară a firmei, Editura Economică, București
  - Sacală, C., (2015) - Creșterea economică, ocuparea forței de muncă și criza în Europa, Revista Română de Statistică Supliment nr. 3/2015
  - Vintilă, G. (2010), Gestiunea financiară a întreprinderii, Editura Didactică și Pedagogică, București
  - Information on <http://www.kimballgroup.com/wp-content/uploads/2013/08/2013.09-Kimball-Dimensional-Modeling-Techniques11.pdf>