

Using mathematical methods for analyzing financial statements

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Abstract

Increasing in the financing turnover is one of the most important aims of economical organizations and companies management. In fact, by studying the available data and statistics and digits from their financial accounts, these organizations try to get a figure of their organizational production (which is obtained with the use of energy and lots of money) and with analyzing the present condition and considering the strategic and long term organizational aims and also awareness from their strength and weakness points and proper inductions, can be caused to optimal activities and acceptable exploitation from the financing. In this regard, analysis of cost-effective financial accounts can create the necessary ground for recognition of difficulties ahead of the organization and be a way for solving many problems for the future and look into the future decisions. Even though the analysis of financial relationship has been an important issue in so many years, the limitation of the analysis with regarding one factor on the top and the other factor in the bottom, would be evaluated only one dimension and therefore by considering financial ratio in separate form, it usually cannot be a good guide for financiers and companies' managers. To solve this problem, in this article, it has been suggested that we initially analyze the experts and specialists in industries and use the analytic processes because of importance in different financial ratios in comparison to each other. Then combine the ratios with regard to 4 sets of the ratios as a head of each company. Importance and usability of each company in comparison to the other companies have been measured. The mark for each company's usability with different data mentioned which can be a suitable guide for the financier as well as the managers of the company to notice the primacy of the financing and orientation of the

company was determined with more care. The results of the research indicated that in cash flow ratios, speed ratio, and in growth ratios, increase in the salary ratio and in the operational ratios, stock turnover ratio have the highest importance. After using combined indices as received and use of a covering analyzing model, total data of companies insurability mark calculated.

Keywords: Financial accounts, Financial ratios, Productive companies.

Introduction

Evaluation of financial condition in a company has an important effect in the decision making process of the company, since the activity of the company is mainly depend on the financial condition of that company in a way that a company even though might have good product, good and orderly control and cohesive and synchronized construction, but still because of shortage of finance become bankrupt. Therefore having enough cash flow for each company is necessary.

In financial evaluation process, data is collected directly from financial reports and transfers into abridged data and will be given to the decision makers.

One of the difficulties in financial ratios for evaluation of financial condition of companies is that each package evaluates its special financial ratio in a way that a group of these ratios have the ability to measure the organization cash flow. A group has the ability to evaluate the profitability of the organization (Atansopolas & Plantin, 1995) mentioned that each of these packages is different according to their importances which show more importance in speedy ratio in comparison to other cash flow ability ratio of the organization. These kinds of differences in importance cause

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the use of ratios which be done independently and they cannot be a suitable choice for evaluation of total activity of the company for financiers and managements. To solve this problem, specialists and experts' ideas on multi scales decision making methods, compare the importance of the different financial ratios. Then with mixing the ratios and considering their importance for each company a total mark for each of the package from the ratio should be obtained. Then with the use of total marks (points) ratio of each company will be analyzed as a design for analyzing data coverage and decide the workability of each company in comparison to the other companies.

Therefore, learning analytic process of hierarchy with analyzing data coverage many of the limitations in analyzing financial ratios can be solved in a prevailing method and the other workable analytic methods will be removed since in this workable method according to the entries and outgoings multi variety is solved and has been reported in one standard. On the other hand, data coverage analysis needs to be in a special form that has no production function. This kind of economic measurement is prevailing and for minimum data this technique can be used. (Vartington 1996)

Research background

Use of financial ratio for evaluation of organizations' functions is a deep rooted system. In recent years, there has been a noticeable growth in the applicability of these ratios. Use of this ratio as data needed and for the use of quantitative applicability patterns of evaluation of organizations' function such as axils have been the main consider of the researchers in a way that in many of the studies method of non parametric has been used for determination of organization workability (Berk 1991, Fokoyama 1993). In turn, the workable border line methods are more suitable for analysis of organizations' situation in comparison to traditional methods. In this regard use of workability border methods such as data covering analysis are situated in the financial condition analysis of the companies. Among these researches use of data covering analysis used for evaluation of the bank branches function (Atonsoplas 1997).

In this research by regarding some of the information about profit or lost as deposit and some information of the balance sheet as received of the

data covering model are solved and the place of each branch is determined.

In another project this information has been used for ranking the national discovering companies' financial situation and their gold production in Austria. In this project, in addition to determination of rank of the company, other elements such as the size of the company, kind of ownership and the kind of employing people as the independent variables effective on the workability have been considered and for the evaluation of regression equation, method of economical evaluation have been used (Vartington 1998).

In another project, data covering approach and analysis process of hierarchy have been used for evaluation of different plans locating. In this project, different locating plans have been prepared with the use of a soft ware and then with regard to important indices in locating such as distance, approximation, access and other effective elements, initially the weight of each importance which has been discovered is evaluated with the use of hierarchical analysis process, and then with regard to this weight as received any locating plan from the data covering analysis model will be used and any of the locating plans will be evaluated (Davyo met, 2004).

Holco and Slamoris (2004) have evaluated the banking function in Greece with the use of data covering technique. This study has used some of the financial ratios during 1997 to 99. The model which has been used in this project is nondeposit method and only a received method in such a way that some of the financial ratios have been considered as receive of each bank. In this project, it has been shown that the data covering analysis method can be used as replacement and also as complementary to financial ratios analysis methods for evaluation of organizational function. The results from this project show that banks with more finance are more workable. In addition, part of increasing in workability is because of the mixing of small banks with the bigger banks.

Pour Kazemi has conducted an evaluation of the workability of Iranian petrochemical industry during 2000 to 2003 by utilizing data covering analysis. In this study, while clearing the role of the petrochemical industries in country's extension, need for evaluation and improvement of the workability in these industries have been analyzed. With regard to the data covering analysis, the number of units analyzed should be 3 times more than the number

of entering and outgoing. In this article, this matter has been solved with a creative method and showed that the petro chemical organization has a workability of about 84 % in Iran and two petro chemical organizations of Bandar Imam and Khark are more active than the others.

Methodology

In this research, a linear programming technique is used for calculating the amount of non workability of the companies. Data used are from the financial accounts balance sheet and profitability and lost of the company.

Results

Financial ratios are the relation between two Numbers (amount) either more which have been driven from financial reports to calculate financial ratios, which the kind of information should be considered and are located on the face and bottom of the fraction. In addition to this integration relation and the reasons between the face and bottom is noticeable to be able to obtain meaningful financial ratios suitable and concern from the financial reports (Jandara 2001). While using the financial ratios some limitations and special specifications

about them should be considered and they should not be considered as the only criterion for decision making, but it should be used as a supporting document for decision making (Hefrat 2001).

Other important matter regarding the consideration of financial ratios is the matter of classification scale. One of the divisions of financial ratios is according to the type of report which has been obtained from the financial ratio. According to this the ratio is divided into 4 groups of balance sheet, profit and lost, cash flow, and mixture (Leo, 1974).

Results from the experimental research show that the financial ratios can be grouped according to some elements in a way that ratios located in each group are connected to each other. Therefore many of the financial ratios management text are divided into 4 groups in a way that different ratios in each group show an index and they can be indices for cash flow, functioning, profit making and growth (Chandra 2001). Financial condition of each organization can be a tool for evaluation of 4 indices. Each of the indices consist of a number from financial ratios, in a way that 13 financial ratio have been chosen and in each of the quartet groups have been mentioned. Each group from these indices show one of the quartet abilities. The main financial ratios and their division are shown in table 1 (Faster 1986).

Table 1. Financial ratios and its division

Mixed index	Main index1	Main index2	Main index3	Main index4
Cash flow (Y1) @ debt	Speed ratio (Y12 & debt	Current ratio (Y12) & debt	Debt to finance (Y13	
Profit earning(Y2)	Gross profit ratio (Y21)	Profit edge (Y22)	Finance efficiency (Y33)	Salary earners efficiency
Growth (Y3)	Increase in salary earners (Y31)	Increase in profitability function (Y32)	Increase in sale (Y33)	
Function (Y4)	Ratio of receiving account (Y42)	Ratio of finance movement (43)		

Assessment of mixed indices

Every mixed index consists of many main financial ratios. Since each of these ratios have different weight and importance, therefore a mixed index cannot be obtained with adding many simple financial ratios. For example, if mixed index of cash flow and debt are considered, experts believe that they are among the ratios in the sub total, which are speed ratio, ratio of current and debt on equity, speed ratio with more important weight in feedback of cash flow ability (Faster 1986, Chandra 2001, and Halcoz and Slamoris 2004). Therefore, it is better analyze the ex-

perts 'views in every industry and use them in decision making with multi scale, and obtain an accurate weight for each of the ratios exploited. The process of analysis of hierarchy obtained one of the decision making methods with multi indices which can be used in different alternatives. This method has been presented by Thomas Sati (1980). The main idea in this method is comparison of a pair of different alternative and scales with the use of verbal expression prevailing and then giving the numerical suitable point to the alternatives according to the importance and priority between the two decision elements.

To explain the above idea, cash flow is used as a sample and explained according to the ability of index calculation.

1. Determination of weight in importance of main indices belonging to cash flow and debt with process of hierarchical analysis:

With comparing each pair of main indices belonging to sub total of cash flow and obtaining the views of industrial experts, it has been recognized that speed ratio (Y11) has more average in

comparison to the ratio of debt to equity (Y13) and speed ratio (Y11) is a little more important in comparison to ratio of debt to equity (Y13). Therefore it can be proved that there is compatibility between pair comparisons conducted. The above matrix can be a base for exploitation of priority degree of each of the ratios. With the use of hierarchical process analysis the weight importance of these 3 ratios are 0/3596, 0/2969, and 0/1634 respectively.

Table 2. Weight of main ratios in each mixed index

Mixed index	Main index1	Main index2	Main index3	Main index4
Cash flow(Y1)	0/5396	0/2969	0/1634	-
Profit making (Y2)	0/2274	0/1227	0/2274	0/4231
Growth(3)	0/5	0/25	0/25	-
Functions(Y4)	0/4	0/4	0/2	-

Estimation of the average amount for each main index for an industry.

1. The amount of average in main index for an industry, weights' average of main index of all organizations in that industry have been evaluated. For example the average main index in relation to an industry has been obtained with the use of following equation:

$$\text{Speed ratio average} = \sum Q A_i / \sum H_i$$

Q A_i = speed equity of iM organization.

L L_j = current debt of iM organization.

2. Other amount of average indices in similar method can be calculated.

Estimation of relative amount of financial indices with the use of one of the following equation:

$$G_{ij}^m = Y_{ij}^m / Y_i^m \quad (1)$$

$$G_{ij}^m = \frac{Y_{ij}^m}{Y_i^m} \quad (2)$$

Y_{ij}^m = main index amount of j in the ability index I

Y_{ij} = average amount of main index j in ability index I

M = M organization

Equation (1) is a suitable condition which bigger amount of one ratio is better and equation 2 is for condition where lesser amount is better.

3. Use of equation (3) for estimation of the amount of ability index I by using weighing table 2 and ratio amount of main indices of organization M.

$$Y_j^m = \sum W_{ij} G_{ij}^m \quad (3)$$

M = M organization

Y_i = ability index amount i

Choosing the model of data covering analysis.

Each organization can be considered as a decision making unit, and therefore whenever the amount of mixed index has been estimated, (4) will be written for M organization:

$$Y^m = (Y_1^m, Y_2^m, Y_3^m, Y_4^m) \quad (4)$$

In this project, each organization has 4 indices of receiving Y1, Y2, Y3, Y4 which are respectively showing the ability of cash flow, profitability, growth and functioning of each organization. N organization can be chosen in an industry as n unit of decision making in data covering analysis and the data covering analysis of total model can be used for evaluation of ratio workability. Since it does not have, none of the decision making units of index, therefore the data covering analysis is arranged as follows:

$$A = \text{Max} (e^T s^*) \quad (5)$$

$$\sum_{m=1}^n Y^m \lambda_m - s^- = Y_0 \quad (6)$$

$$\sum_{m=1}^n y^m \lambda_m = 1 \quad (7)$$

$$m = 1, 2, \dots, n \quad (8)$$

$$\lambda_m \geq 0$$

$$S^+ \geq 0$$

In the above template, $\lambda_m, S_i, S^+ = (s^1, s^2, s^3, s^4)^T$ are decision variables ($I=1,2,\dots,4, m=1,2,\dots,n$) and e is vector for (1...1). According to the basic recom-

mentations in this model, an organization is workable only if it is lonely when the amount of A for each organization is equal to zero (Vey 1988). With positioning this amount of indices ability in model A, the amount of A is estimated for each organization and according to presupposed model, all the following organizations can be categorized.

Conclusions

Analysis of the companies' function and productive organizations are among the main responsibilities of the management. One of the important subclasses in the production which plays an important role in the economy of the society, are productive companies. To empower these companies, awareness from the condition of each and finding the improving horizons for the future are among the necessities. One of the methods for recognizing the condition of these companies by regarding elements such as profit earning and the amount of sale and other statistics and accounting numbers which are usually in the form of financial ratios have been used in the extended ways. But in the view of diversity and extension, these data and ratios on one side and different importance of these information and ratios in different departments of production on the other side, so considering these ratios cannot be separated from each other and give complete short information which can be useful. But since the weight importance of ratios from the financial situation of the companies are different. Considering each one without taking account to the company's condition from the other ratios are misleading. But with mixing ratios in the workability marks of each

company, a clear picture of the evaluation will be given. And the recommended model is used in the productive companies such as cement, food staff, sanitation and other integrated materials which the buyers can understand them clearly and completely.

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