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Financial Distress and Bankruptcy Prediction in Subsidiaries of the Largest Business Holding in Iran Using the Model of Altman

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Abstract

Various factors including management performance or business features may lead to recession and bankruptcy of a company. The important issue is that bankruptcy does not happen abruptly and unexpectedly, but it is predictable from before using some criteria or symptoms. It can be so helpful in preventing bankruptcy or doing corrective actions. Symptoms like intensive reduction of revenues, negative flow of liquidity, increased current debts of current assets and difficulty in access to new financial sources can be considered as some of signs for future bankruptcy. The present study, using a comprehensive approach, reviews different models of predicting bankruptcy, analyzes financial forms of sample companies and studies the situation of the companies about probability of bankruptcy.

Keywords: Bankruptcy, models of bankruptcy based on accounting data, Altman model, financial ratios.

Introduction

The subject of bankruptcy is one of the topics of interest to participants in financial markets. This issue is of considerable importance for investors, legislators, creditors, rating agencies and other stakeholders of the companies. Competitive enterprises have restricted access to resources and incremented the probability of insolvency[1].

In the other hand, in recent years, as a result of consistency among most of financial markets in the world, this issue not only is considered by participants in financial markets, but also it is of interest for legislators and politicians and they pursue the statistics about bankruptcy.

The problems about bankruptcy of companies exist in all financial markets and shareholders of companies have always been worried about the consequences of bankruptcy and how to predict and provide solutions for bankruptcy. Legislators and politicians have also been worried about sequential bankruptcy of companies and crisis or recession in fiscal and financial markets. Studies done in the past have shown that companies hide their bankruptcy and when they announce their bankruptcy, it is too late and attempts for preventing bankruptcy are ineffective[2]. So, one of the first researches about financial situations of companies is that if we can specify the time of bankruptcy of companies? And are there any variables or models to be used as predictors of bankruptcy and to inform shareholders about the risk of bankruptcy.

According to Altman et al the cost to a lender of misclassifying a bankrupt company is far greater than the cost of misclassifying a non-bankrupt company[3]. Casey and Bartczak report classification accuracies for the bankrupt, non-bankrupt and the overall sample based on the accrual model and each of the three cash flow variables, viz. operating cash flow (OCF), operating cash flow to current liabilities (OCF/CL), and operating cash flow to total liabilities (OCF/TL)[4].

The results of researches done in the past about prediction of bankruptcy of companies have not been identical and there are different ideas about definition and identification of bankrupt companies and also variables and models used. The present study is aimed at analyzing and evaluating the financial situation of subsidiaries of ETKA using Altman model as one of the most suitable models for bankruptcy prediction in order to forecast financial condition of the companies in the future and finally provide solutions for preventing financial recession and improving the situation of companies based on findings of the research.

Statement of the Problem: Insolvency or bankruptcy is a normal phenomenon in the corporate life cycle and almost all businesses are facing it during their economic life. Bankruptcy is the final phase in economic life of companies and it has effect on all shareholders of a company[5]. Competition is inevitable for companies in economic environment and wherever it is the subject of competition, some companies will give up and fail in reaching their goals. In the situation of bankruptcy of companies, their resources and facilities will be given to more successful companies.

Prediction of insolvency and bankruptcy is one of the most challenging issues in financial sciences in recent decades and

many studies have been conducted about designing appropriate models for predicting bankruptcy of companies. The researches done, whether about identification of predicting variables or about designing precise and appropriate models for prediction of bankruptcy, did not reach to the same final results and researches continue to increasing accuracy and precession of variables and models.

This research uses one of the most widely used models for predicting financial distress to analyze financial situation of subsidiaries of ETKA and it is aimed at predicting financial distress and bankruptcy in these companies. Using the results of the study, it is possible to decrease destroying impacts of sudden announcement of bankruptcy, and using the appropriate measures and restructuring, financial distress and bankruptcy of the company is prevented from occurring.

The main question of the study is that whether the subsidiary companies of ETKA may soon be faced with bankruptcy or not?

Theoretical Frameworks and background of the Research: In general, companies may be faced with failure in one of the three forms of economic, financial and legal. In financial failure, lack of ability to pay debts and obligations shows financial drain mode. Financial drain is usually a sign of lack of working capital. Lack of working capital can be due to other factors such as the capital structure or inordinate current debt and high operating costs. Usually there is a difference between economic failure and credit or financial failure. In general, the commercial failure is the same economic failure, because the agency has been failed to gain profit more than the cost of investment. Legally, failure means unwillingness or inability to pay debts.

In one hand of the range there is a company with complete financial health and in the other hand there is a disestablished company. The phases of bankruptcy in this range are: Financial health, financial difficulties, Bankruptcy and Disestablishment of the organization. Lau identified five phases for bankruptcy of companies[6]. These phases are: i. Zero point: the company's financial stability. ii. First phase: elimination or reduction in the payment of cash dividends. iii. Second phase: technical failure or reducing the liquidity of the company to pay current obligations. iv. Third phase: exceeding of the company's obligations to the approximate value of the assets. v. Fourth phase: the official announcement of bankruptcy and liquidation of the company.

Bankruptcy prediction models can be classified into the models that use market information of company such as stock prices and models that use accounting information, including financial statements of company. Models based on accounting information, despite being faced with the limitations of accounting information, like being retrospective, but they are appropriate for companies that are not listed in Stock Market. In another hand calculation and interpretation of the results is possible with greater ease.

One of the most famous models for bankruptcy prediction based on accounting information is innovative model of Altman[7]. Z Score Altman Model ever since the creation has gained a great reputation. This model is based on Multivariate Discriminant Analysis. Multivariate Discriminant Analysis is a statistical technique which can be employed in categorization of observations. In this way, the categories are pre-formed according to individual characteristics of observations. This method is employed mainly to predict the correlate qualitative variables. So we can say that the method is very suitable for predicting bankruptcy. One of the advantages of Multivariate Discriminant Analysis is that it considers several distinct features and the relationships between them. Another advantage of this method is its ability to reduce the dimensions on which predefined groupings are based. Therefore it can reduce the dimensions of the problem and change it to the simplest possible form, so that there are just two preformed groups: bankrupts and non-bankrupts.

Altman used analysis of the ratios in the model he introduced in 1968. In this method the probability of failure is estimated by a group of financial ratios.

Population and Sampling: The population considered in this study includes six companies among subsidiaries of ETKA organization: i. ETKA chain stores, ii. Khoramshahr Oil-Manufacturing Company, iii. Panizfam Sugar Company, iv. Fakhr-e Iran Textile Company, v. Iran Garment Company, vi. Mazrae Nemune Company .

Most of the models for prediction of bankruptcy need the information of last year for prediction of bankruptcy for the next year. So the data given is financial information of these firms in 2010. To assess the accuracy of the prediction of the data historically, financial information for three years before that (i.e. until 2009) is also examined, which is the date of establishment for Iran Garment and from that time on, the information is available.

The sample considered includes the entire firms in the population of the study. It is due to mention that the results of the study are true just for the population examined in this study and it cannot be generalized to other populations, necessarily.

Methodology

The steps that should be taken in this research are explained in this part, in order to show the roadmap of this study. Data analysis in the present study is based on analysis of financial forms and predicting bankruptcy is done by selection and application of a model considered in the second chapter of the study.
Step one: Check the sample companies
Step Two: Choosing and implementing a bankruptcy prediction model according to the features of the sample

Step Three: Data gathering needed for models of predicting bankruptcy
Step Four: Prediction of bankruptcy in sample companies
Step Five: Evaluation of prediction accuracy

Results and Discussion

Now we take the steps mentioned in the third chapter and start our analysis.

Analyzing Characteristics of Sample Companies: Based on the properties mentioned in the previous chapter, the table 1 has been prepared and characteristics of sample companies from all aspects have been examined:

Table-1
Characteristics of Sample Companies

Characteristics	Situation of sample companies
Field of Activity	Sample companies are non-financial business institutes.
Market Value	Sample companies are not listed in stock market.
Work Experience	Work experience of some of them is short term and about others their information has been available for researchers only for about 5 years.
Size of Companies	The sample companies can be classified as small to medium sized companies.
Environmental Characteristics	The sample companies operate in a bank based economic environment

Selection and adjustment of a model for bankruptcy prediction according to the features of the sample: Based on the mentioned features in chapter two the table 2 has been provided and bankruptcy prediction model has been analyzed from all aspects according to the features of the sample.

Considering the results of the above table indicate that the best model for the prediction of bankruptcy of companies surveyed is the Altman model. Also, because of the fact that every one of adjusted models for prediction of bankruptcy is suitable for features of one of sample companies, finally we used Z Altman model which is appropriate for small companies, non-manufacturing companies and companies in emerging economies and adjusted model of Altman for bank-based economy of China and also adjusted prediction model of Altman for Iran.

In the table 3, mathematical models, measures of prediction and required data of each of them are mentioned.

To achieve an overall prediction about the situation of each company, ultimately results of predictions by the models and the accuracy percentage of their predictions were combined and an overall probability about bankruptcy of each company was calculated.

Considering the fact that Z_{China} Model regards bankruptcy of a company the same as failure of the company, we will consider it as the measure of prediction of failure and we will consider Z" as the bankruptcy predicting model. Failure of a company can be an introduction for bankruptcy. Generally, in Adjusted Model for Iran, financial crisis has been regarded including failure of the company, its bankruptcy or its incidence of Article 141 of the Commercial Code.

Prediction of Bankruptcy in Sample Companies: In this part, regarding financial information of each of the sample companies and models for predicting bankruptcy, the situation of the companies will be analyzed from the viewpoint of their bankruptcy or their ongoing activities in 1390. To check the accuracy of the prediction, models were tested on data from previous years and the percentage of the accuracy of the prediction has been calculated overall and also for each of the companies.

Table-2
Characteristics of Sample Companies and Appropriate Bankruptcy Prediction Models

Characteristics	Situation of sample companies	appropriate bankruptcy prediction model
Field of Activity	Sample companies are non-financial business institutes.	Altman model for non-financial institutions, Olson model, BSM model and AI-based models
Market Value	Sample companies are not listed in stock market.	Altman model and Olson model, Altman model adjusted for Iran
Work Experience	Work experience of some of them is short term and about others their information has been available for researchers only for about 5 years.	Altman model and Olson model, Altman model adjusted for Iran
Size of Companies	The sample companies can be classified as small to medium sized companies.	Altman model adjusted for small to medium sized companies.
Environmental Characteristics	The sample companies operate in a bank based economic environment.	Altman model adjusted for bank-based economies, Altman model adjusted for Iran

To calculate the likelihood of each company continuing to operate or its bankruptcy, we consider the probability of predictions and we multiply the prediction of each model to its

accuracy percentage comparing to accuracy of other models for that company. If the sum of the probabilities was over 50%, then the company will go bankrupt and if it was less, the company is likely to continue its activities.

The results of predictions for each model and final results of the survey conducted are presented in the table 4.

Table-3
Bankruptcy Prediction Models Used and the Characteristics of each of them

Model Name	Mathematical Expression of Model	Prediction Measure		Needed Variables	Definition of Bankruptcy
Altman model for non-manufacturing companies and companies outside the US	Z"=3.25+6.56x1+3.26x2 +6.72x3+1.05x4	bankrupt	Z"<1.23	X1: Working Capital to Total Assets Ratio X2: Retained Earnings to Total Assets Ratio X3: Earnings before Interest and Taxes to Total Assets Ratio X4: Book Value of Equity to Book Value of Total Debt Ratio	Exceeding of the Amount of Liabilities over the Amount of Assets
		Gray	2.9>Z"≥1.23		
		Continue of Activity	Z"> 2.9		
Adjusted model of Altman for economy of China	Z_{China}=0.517-0.460X_1+9.320X_2+0.388 X_3+1.158X_4	bankrupt	Z_{China} < 0.5	X1: Total Debt to Total Assets X2: Net Income to Total Assets X3: Working Capital to Total Assets X4: Retained Earnings to Total Assets	Failure of the company
		Gray	.9>Z_{China}≥.5		
		Continue of Activity	Z_{China}>0.9		
Adjusted bankruptcy prediction model of Altman for Iran	P = 3.20784X_1+1.80384X_2+1 .61363X_3+0.50094X_4+0. 16903X_5-0.39709X_6-0.12505X_7 +0.33849X_8+1.42363X_9	bankrupt	P<15.8907	x1: Ratio of Earnings Prior to Interest and Taxes to Assets x2: Ratio of Retained Earnings to Assets x3: Working Capital to Assets Ratio x4: Equity to Debts Ratio x5: Earnings before Interest and Taxes to Sales Ratio x6: Current Assets to Current Liabilities Ratio x7: Net Profit to Sales Ratio x8: Ratio of Debts to Assets x9: Size of the Company	Exceeding the amount of liabilities over the amount of assets or failure of the Company
		Continue of Activity	P≥15.8907		

Table-4
Prediction made and its Accuracy Percentage Generally and According to each of the models

Model	Description	ETKA Chain Stores	Khoramshahr Oil-Manufacturing Company	Panizfam Sugar Company	Fakhr-e Iran	Iran Garment	Mazrae Nemune Company
Model Z"	Prediction of the year 2011	0	0	0	0	0	0
	Prediction accuracy	100%	100%	75%	100%	100%	100%
Z_{China} Model	Prediction of the year 90	0	1	0	1	1	0
	Prediction accuracy	50%	75%	25%	50%	100%	100%
P model	Prediction of the year 90	0	0	0	0	0	0
	Prediction accuracy	100%	75%	50%	50%	100%	100%
Percentage of Bankruptcy Probability		0%	30%	0%	25%	33%	0%

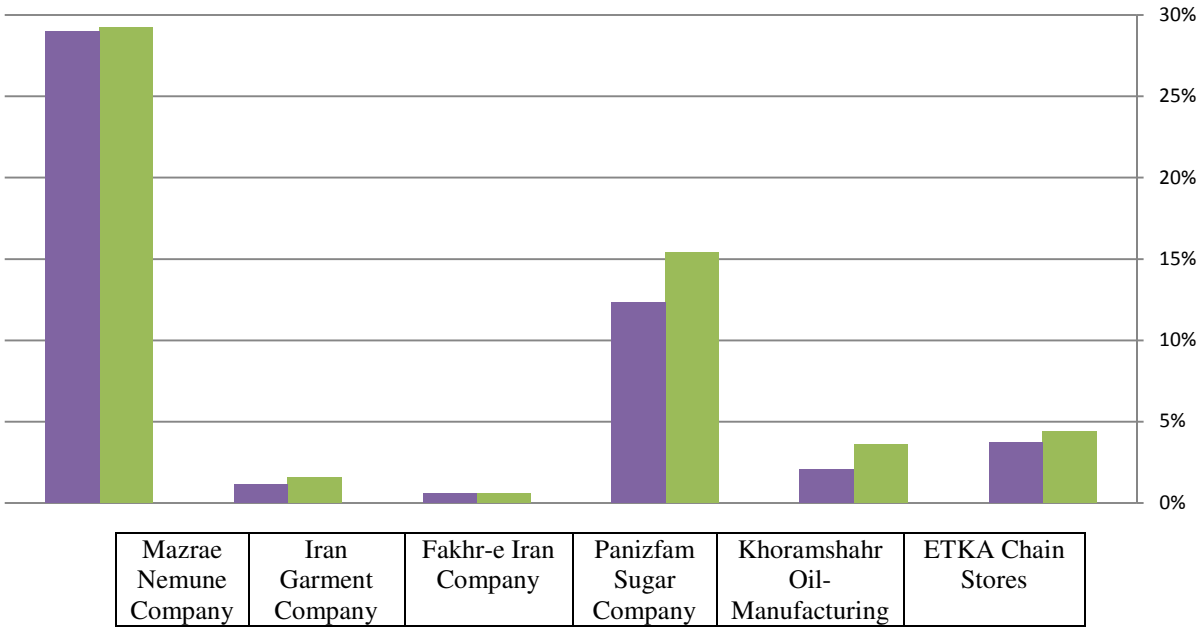
1: Bankruptcy 0: continue

Conclusion

Profitability of the companies surveyed and the effect of Hekmat plan: To study profitability of discussed companies, we will consider the profit prior to interest and taxes and the net profit. The difference between net profit and gross profit of the companies shows the effect of using debts.

The status of companies in this regard has been provided in the figure 1 and 2.

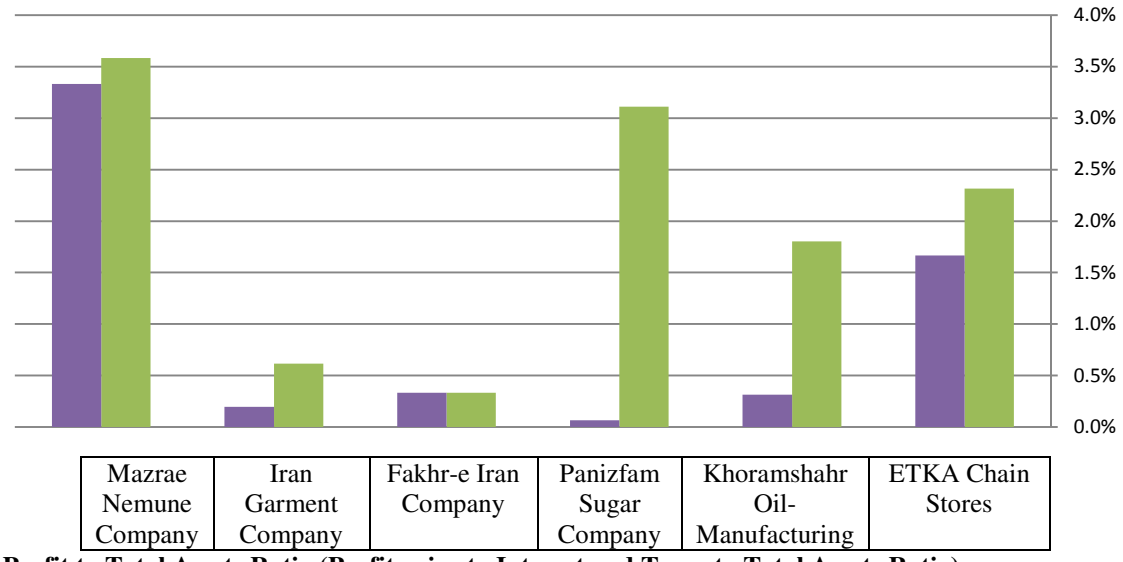
Totally, the amount of the net profit to assets ratio is more for Mazrae Nemune Company in the year 1389 in comparison to other sample companies, regarding Hekmat Plan, which can be considered as an output for assets. Studies showed that, adding Hekmat Plan to calculations, the real turnover of the sample companies can expressed better. The importance of Hekmat Plan in each of the companies surveyed is observable in the subsequent figure 3.



Net Profit to Total Assets Ratio (Profit prior toInterest and Taxes to Total Assets Ratio)

Figure-1

The Profit to the Assets Ratio of the Sample Companies in the year 89, Considering Hekmat Plan



Net Profit to Total Assets Ratio (Profit prior to Interest and Taxes to Total Assets Ratio)

Figure-2

Ratio of Profit to Assets of the Sample Companies in the year 89, Regardless of Hekmat plan

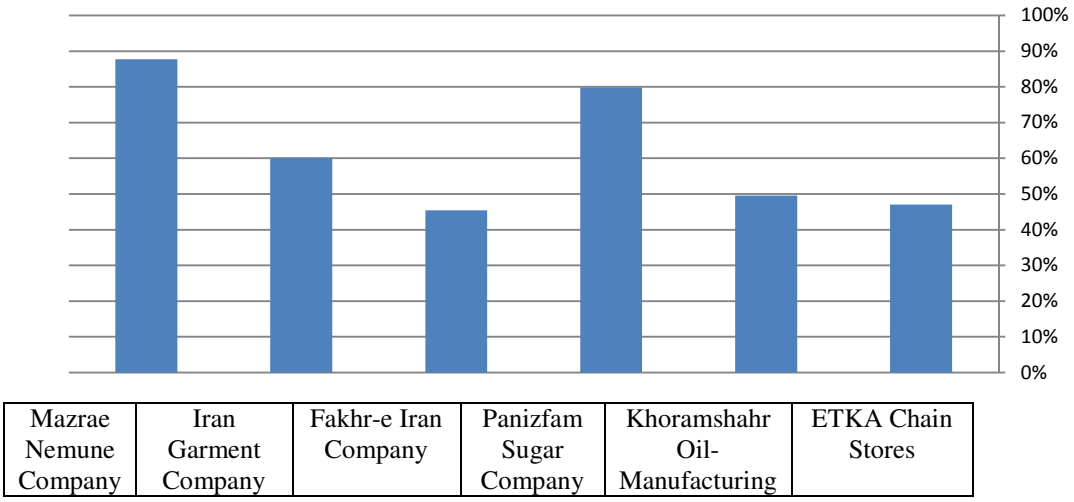


Figure-3
The Percentage the Effect of Hekmat Plan in the Profit before Interest and Corporate Tax

Summary of the Data Resulted from Analysis of the Companies: Totally we can say that the sample companies are financially in a good condition and among them Mazrae Nemune is in a better situation from different aspects. Iran Garment Company has used more debt ratio in its capital structure compared to other companies. Of course, concerning its positive ratio of working capital to its assets, this company is not faced with problems in short term, but using a lot of debt in the capital structure, in long term, can raise the risk of bankruptcy of the company.

About Fakhr-e Iran Company, we can also say that, although the company has used less overall debt in its capital structure than the other companies, but its negative working capital shows that this company has provided some of its long-term assets through short-term financing and debts. It is a bold funding policy and this can increase the risk of the company's lack of ability to pay short-term obligations.

Suggestions According to the Results of the Research: Regarding the results of the research, it is suggested that the managers pay more attention to the companies which are more likely to be bankrupt and analyze their structure in order to find the source of the company's problems.

About other corporations, also, in some cases that one of bankruptcy prediction models considered the high possibility of bankruptcy or considered the situation suspicious, it is better to have more reviews and preventive measures should be taken.

Investors can achieve higher price to earnings ratio by investigating in increasing earnings firms. Creditors can identify increasing earnings firms which are in better financial, liquidity and profitability position to estimate the liquidity and profitability position of the firms in order to ensure that they would be able to get back the money and the interest of their granted loans[8].

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