A Study of Bankruptcy Prediction in the Tehran Stock Exchange

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INTRODUCTION

One of the most important tools of science is having a model. A model is a distribution of fact, which has different forms. Most of the financial management models are mathematical samples. The most significant characteristic of these models or any other mathematical sample is the provision of appointing relations. Financial mathematics by means of statistical figures helps in decision-making and establishing values mainly concentrating on the future. Economic crisis in 1930 caused financial management to focus on the protective and saving aspects of firms and other problems such as liquidity, bankruptcy, liquidation and reestablishment of companies.

One of the most important controversies in the field of financial management is investing and giving assurance and guarantee to individuals and entities. In developed countries, lot of research has been done on the process of decision making in investment. One of the subjects that help investors in their decision-making is the use of suitable tools and models to evaluate financial and economic positions. A model of bankruptcy prediction is one of the most important tools in decision-making. Investment will be optimal when it has been evaluated precisely by the investors.

The ability of predicting which company cannot repay its debts is very important for bankers, investors and other creditors. A lot of research has been undertaken on using financial rations for prediction of financial and economic future of companies. These researches and studies are extended to create the bankruptcy prediction models. For these models, financial rations are the variables.

Different definitions are given to bankruptcy. Article 141 on the Iranian merchandises act in relation to the bankruptcy of Iranian companies is as follows: "If at least half of the capital of a company is lost due to inflected losses, the board of directors is immediately obliged to call the general meeting of the stockholders to discuss the dissolution or reinvestment of the company. When the above mentioned general meeting doesn't agree with the dissolution of the company in the same session, the capital of this company should be cut down to the working capital" (Jahangir 2002). In Iran, the same article has been considered as the criterion for removal of a company as the company is in a very bad position on going concern- from TSE. In this research, also the same article has been considered the criterion of bankruptcy. In recent years, with regard to the above mentioned law, a large number of textile companies were removed from the TSE.

LITERATURE REVIEW

Since Beaver and Altman in 1966, and 1968 respectively published their bankruptcy prediction models for the first time, a lot of studies have been undertaken to choose the best model for the prediction of bankruptcy. Perhaps the biggest problem for all bankruptcy studies has been the lack of a strong theoretical framework. Wilcox (1971) Blum (1974) argued that in the absence of a strong conceptual model, scarce bankruptcy information was statistically "used up" by searching procedures. Wilcox and Blum in their papers explicitly postulated a general framework for variable selection based upon the Gambler's Ruin Model. The common factors underlying the cash flow framework, liquidity, profitability, and variability in essence did not contradict Altman. Blum selected twelve variables to measure these cash flow parameters.

In most countries, many researches have been conducted to establish an acceptable model, some of which we mention here.

Beaver (1966) conducted a very comprehensive study using a variety of financial ratios. His conclusion was that the cash flow to debt ratio was the single best predictor. Beaver's research (1966) resulted in the establishment of a model, which is known as, "the one - variable model." In 1966, Beaver chose a series of ratios, which consist of 30 financial ratios, which were based upon his opinion. These were the best ratios for the financial assessment of a company. Beaver's model was based on the following four principles:

1- Cash revenues of a company decrease the probability of the bankruptcy.

2- High net liquid cash flow of a company, which is due to the activity of a company in the market, reduces the probability of the bankruptcy too.

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3- The high rate of debts of a company increases the probability of the bankruptcy of that company.
4- The high rate cash requirement for the operating expenses also increases the probability of bankruptcy.
Beaver used his model for the measurement of financial ratios capabilities in prediction of bankruptcy. In this measurement, 79 bankrupt firms and 79 non-bankrupt firms had been chosen. Then he tested each of the 30 financial ratios in the companies and he concluded that the variance validity of the prediction of bankruptcy of each financial ratio differs with each of them. In addition to having less cash flow, the bankrupt companies have less cash reserve than non-bankrupt companies. Meanwhile, he announced that the tendency of the bankrupt companies for a loan is more than that of the non-bankrupt companies although they have capital to cover their commitments.
One of the most valuable studies in the field of bankruptcy is Altman's study (1968). He has used Multiple Discriminant Analysis (MDA) for choosing financial ratios. By using this method, five combinational ratios were chosen from among 22 ratios, which were the best ratios in his opinion for predicting bankruptcy. Altman (1968) made a factor with the combination of these five ratios that they had the best function among these financial ratios. Altman's model is as hereunder:-

$$\mathbf{Z=1.2X_1+l.4X_2+3.3X_3+0.6X_4+0.999X_5}$$

In which:

X_1 = the ratio of working capital to total assets
X_2 = the ratio of retained earning to total assets
X_3 = the ratio of earning before interest and tax to total assets
X_4 = the ratio of market value of equity to book value of debts
X_5 = the ratio of sales to total assets.

According to this Model (it is called Z Model), if the computed Z in any company is less than 1.81 then, that company is going to be bankrupt, and if it is between 1.81 and 2.675, that firm is on the verge of bankruptcy and if Z is bigger than 2.675, the probability of bankruptcy is very low. He studied a sample of 33 bankrupt companies and 33 non-bankrupt companies. This model achieved an accuracy rate of 95% for bankrupt and non-bankrupt companies.
He tested his model for two years before bankruptcy and got its accuracy to 83%. The Z Model was largely used, but at the same time, many people criticized it. Analysts, accountants, and even the managers of companies believed that Z Model is useable for those companies that have the nature of general tract. Therefore, in 1984 he reconstructed the Z Model and designed a new model, which is called Z' Model. The most obvious reconstruction that he had done in Z' instead of Z was that he replaced the book value of equity rather than market value. After this replacement, he changed the efficiency and limitations of his model. He has used the Z' Model for 33 bankrupt companies and 33 non-bankrupt companies. He attained 94% accuracy for bankrupt and non-bankrupt companies.
Altman changed his model again, but this time without considering the variable "X_5" (the ratio of sales to total assets). He changed the Z' Model to Z" Model. Then he removed the variable "X_5" and made some changes in the model. He established Z" Model for bankruptcy prediction in non-manufacturing companies, specially, for those companies whose type of assets investment is different from similar companies in the same field of industry. Again, he tested this model with a sample of 33 bankrupt companies and 33 non-bankrupt companies. And he announced the result of the Z" Model was like that of the Z' Model.
Springate (1978) continued and completed Altman's model in the field of prediction of bankruptcy. In 1978, he succeeded in inventing a model, which is called the Springate's model. He used step-wise multiple discriminant analysis to select four out of 19 popular financial ratios that best distinguished between sound business and those that actually failed. The Springate Model takes the following form:

$$\mathbf{Z=1.03A+3.07B+0.66C+0.4D}$$

In which:

A = the ratio of working capital to total assets
B = the ratio of earning before interest and tax to total assets
C = the ratio of earning before tax to current liabilities
D = the ratio of sales to total assets

In Springate's model, the company is predicted bankrupt when Z is equal or less than 0.862. Springate tested his model on 40 companies. He gained 92% accuracy for one year before bankruptcy.
Springate's model has been tested in different parts of the world, and different teams have studied this model with

respect to distinctive groups of bankrupt and non-bankrupt companies. It is interesting to note that there was not a single report in these studies to discredit the model. Botheras (1979) tested the Springate Model on 50 companies with an average asset size of $2.5 million and found an 88.0% accuracy rate. Sands (1980) tested the Springate's model on 24 companies and he found that its level of accuracy was about 83%.

Except for the researches mentioned above, there are some other researches for predicting bankruptcy. They are given hereunder:

Deaking (1976) designed his model by using Discriminant Analysis. He tested his model for bankrupt companies and found that its level of accuracy was about 97% for one year before bankruptcy. The results for non-bankrupt companies were also the same.

Zmijewski (1984) designed a model by using Probit Analysis (PA). He tested his model two times; the first time, he found 76% accuracy for bankrupt and non-bankrupt companies totally, and in the second test, he found 97% accuracy.

Fulmer et al. (1984) presented a model for the prediction of bankruptcy. He applied Multiple Discriminant Analysis (MDA) in his evaluation for 40 financial ratios. He used a sample of 60 companies, 30 of which were bankrupt and 30 of which were non-bankrupt to test his bankruptcy prediction model. He found that the scale of exactness of this model for a year before bankruptcy was 98% and for two years before that, it was 81%.

Pantalone and Platt (1987 a.b) by using Logit Analysis (LA) designed a new model. They tested their model for bankrupt companies and found that its level of accuracy was about 98% for one year before bankruptcy. The result for non-bankrupt companies was 92%.

Ohelson (1980) used the Logistic Analysis (LA) and financial ratios to come up with a new model of bankruptcy prediction. His model included nine variables as the rate scale of available cash. He tested the model in the case of a large number of bankrupt and non-bankrupt companies and he got 85% accuracy.

Shirata (1998) designed the model for bankruptcy prediction by using Classification and Regression Trees (CRT). He tested his model on a large group of bankrupt and non-bankrupt companies. He found totally 76% accuracy for bankrupt and non-bankrupt companies.

Van Gestel et al. (2003) by using Least Squares Regression (LSR) and modified Support Vector Machines (SVM) showed significantly better results in bankruptcy prediction when contrasted with the classical techniques.

Foster and Stine (2004) built a Prediction Model for Bankruptcy by using Least Squares Regression (LSR). They used stepwise selection to find predictors of these from a mix of payment history, debt load, demographics, and their interactions. They showed that three modifications turn stepwise regression into an effective methodology for predicting bankruptcy. Their version of stepwise regression (1) organizes calculations to accommodate interactions, (2) exploits modern decision theoretic criteria to choose predictors, and (3) conservatively estimates p-values to handle sparse data and a binary response. With these modifications, stepwise regression predicts bankruptcy as well, if not better than recently developed data-mining tools. When sorted, the largest 14,000 resulting predictions hold 1000 of the 1800 bankruptcies hidden in a validation sample of 2.3 million observations.

Pompe and Bilderbeek (2005) studied about the prediction of bankruptcy of small- and medium-sized industrial firms. They examined several aspects of bankruptcy predictions by using large amounts of data from small- and medium-sized industrial firms. They have tested a hypothesis on the predictive power of different ratio categories during the successive phases before bankruptcy, and one on the relationship between the age of a firm and the predictability of bankruptcy. They found that virtually every ratio investigated had some predictive power, and that the univariate and multivariate importance of ratio stability were not very high.

Min and Lee (2005) studied about bankruptcy prediction by using Support Vector Machines (SVMs) with optimal choice of kernel function parameters. Their paper applied SVMs to the bankruptcy prediction problem in an attempt to suggest a new model with better explanatory power and stability. They used a grid-search technique using 5-fold cross-validation to find out the optimal parameter values of kernel function of SVM. In addition, to evaluate the prediction accuracy of SVM, they compared its performance with those of Multiple Discriminant Analysis (MDA), logistic regression analysis (Logit), and three-layer fully connected back-propagation neural networks (BPNs). The experimental results of their study showed that support vector machines (SVM) outperform the other methods.

Tsai and Wu (2007) studied bankruptcy prediction by using neural network ensembles. They suggested that a combination of multiple classifiers (or classifier ensembles) should be better than a single classifier. However, the performance of multiple classifiers in bankruptcy prediction and credit scoring has not been fully understood.

They investigated the performance of a single classifier - the baseline classifier to compare with multiple classifiers and diversified multiple classifiers by using neural networks based on three datasets. By comparing with a single classifier as the benchmark in terms of average prediction accuracy, the multiple classifiers only perform better in one of the three datasets. The diversified multiple classifiers trained by not only different classifier parameters, but also different sets of training data perform worse in all datasets. However, for the Type I and Type II errors, there is no exact winner. They suggest that it is better to consider these three classifier architectures to make the optimal financial decision.

IMPORTANCE OF THE STUDY:

The importance of this research can be understood by some cases as hereunder:

i). The authorities in the Reception Department of TSE follow a group of conditions and specifications into consideration for listing new companies. One of these conditions is that the companies should have a suitable financial condition in the future years. Therefore, this department needs some tools to make sure of the continuation or otherwise of companies in the coming years.

ii). In recent years due to the failure of some companies in TSE, shareholders need valid models to know more about the future position of the companies. Therefore, reliable bankruptcy prediction models can help them to buy and sell companies' shares in TSE without overreaction or under-reaction.

iii). One of the prevalent problems of banks and financial institutions is giving high amount of loans to this industry. Therefore, banks need some tools to analyze and determine the future position of the companies getting loans.

iv). Investment companies are always trying to determine the suitable position to invest. They analyze the position of these industries in various ways before making investments to guard their interests. One of the ways to analyze companies is to analyze the bankruptcy position of companies. Therefore, they need to investigate the companies' bankruptcy positions.

v). The managers of different industries always decide to mix and buy other companies to develop their predictions and to control the needed materials. These managers study companies and their financial condition in order to avoid any problem afterwards. Therefore, they need some models to predict the future activity positions of these companies.

THE OBJECTIVES OF THE STUDY

With due attention to the importance of study, the objectives of this study are to recognize a model to analyze and predict the future positions of companies that can be useful for "The Reception Department of TSE", "Shareholders", "Managers", "Bankers", "Financial Institutions", "Investing companies" in making rational decisions.

RESEARCH QUESTION

The question of this research is:

"Can we predict the bankruptcy of firms in TSE by Springate's prediction bankruptcy model?"

RESEARCH AREA

The research area is the textile companies in TSE. Because of the large number of bankrupt textile companies, the study deals with the companies in textile industry. Therefore, the financial statements of textile companies have been used from the year 1996 to the year 2006. In conducting this research, the entire research area is considered as the sample of our research.

DATA COLLECTION

Data has been collected from firms that filed for bankruptcy from 1996 to 2006. Data for non-bankrupt firms also has been based on information from the years 1996 to 2006. Originally, 22 bankrupt firms were found and all of them were from textile industry. 54 non-bankrupt firms were examined. The financial information extracted from the participating firms' balance sheet, income statement and cash flow are "total assets," "current liabilities", "earning before tax", "total sales", "earning before interest and tax" and "working capital". The financial ratios derived from these variables are "working capital over total assets", "sales over total assets", "earning before tax over current liabilities" and "earning before interest and tax over total Assets."

RESEARCH METHODOLOGY

In this research, the Springate's model has been used. We tested this model from one to four years before bankruptcy. The required variables were extracted from the financial ratios of the companies. Two types of errors were noticed in this research at the time of testing the model. They were as follows:-

"Type I Error" occurs when a company is going bankrupt but the model cannot predict it as a bankrupt company and "Type II Error" occurs when a company is a growing concern and it has good health, but the model predicts it

as a bankrupt company. It is important to explain though that Type I and Type II Errors are about the accuracy of the model. Type II Error is more serious than Type I Error as it may affect the actual position of companies. To explain further, those companies which aren't bankrupt but the model predicts them as bankrupt companies, will have problems in all their relationships with others, such as banks, material suppliers, creditors and some times even the share-holders. Therefore, those companies may not be able to get loans and credits and this situation will affect their financial condition. In a nutshell, we may say that this wrong prediction may lead those companies to real bankruptcy condition in future. So the "Type II Error" is much more serious than the "Type I Error".

The research samples have been taken from all the available companies working in this field. In this study, an effort was made to take model to bankruptcy prediction and to calculate the financial ratios used in the model. Then the results obtained from using this model were compared with the real positions of the same companies. Thereby, the rate of application for this method have been specified.

THE RESULTS OF THE STUDY

As stated above, the model was used to predict the bankruptcy of companies under study from 1 to 4 years before bankruptcy.

In the first section, the model was tested for one year before bankruptcy, and during this period, from among 22 cases, predictions of 19 cases were correct and predictions of 3 cases were incorrect (Table No.1). In other words, the rate of certainty obtained in testing bankrupt companies was 86%. In addition, from among 54 cases of non-bankrupt companies, predictions of 52 cases were correct and predictions of 2 cases were incorrect. Thus, the rate of certainty obtained for testing non-bankrupt companies was 96%.

Table No.1*

The Results of the Model for One Year before Bankruptcy

State / Errors	Number of correct predictions	Percentage of correct predictions	Number of error predictions	Percentage of error predictions	Total
Type I	19	86%	3	14%	22
Type II	52	96%	2	4%	54
Total	71	93%	5	7%	76

* Results from Table No. 6

It is seen in Table No.1 that Type I Error is 14% for one year before bankruptcy and Type II Error is just 4%. Regarding the kinds of errors mentioned before in the research methodology, these results indicate that the author has tried to minimize Type II Error.

In the second section, the model was tested for two years before bankruptcy, and in this period from among 21 cases, predictions of 17 cases were correct and predictions of 4 cases were incorrect (Table No.2). In other words, the accuracy was 81%. As we see in Table No.2, Type I Error is 19% for two years before bankruptcy and the Type II Error is 4%.

Table No.2*

The Results of the Model for Two Years before Bankruptcy

State / Errors	Number of correct predictions	Percentage of correct predictions	Number of error predictions	Percentage of error predictions	Total
Type I	17	81%	4	19%	21
Type II	52	96%	2	4%	54
Total	69	92%	6	8%	75

* Results from Table No. 7

In the third section, the model was tested for three years before bankruptcy, and in this period, from among 21 cases, predictions of 15 cases were correct and predictions of 6 cases were incorrect (Table No.3). In other words, the rate of certainty obtained was 71%. As it is seen in Table No.3, Type I Error is 29% for three years before

Table No.3*

The Results of the Model for Three Years before Bankruptcy

State / Errors	Number of correct predictions	Percentage of correct predictions	Number of error predictions	Percentage of error predictions	Total
Type I	15	71%	6	24%	21
Type II	52	96%	2	4%	54
Total	67	89%	8	11%	75

* Results from Table No. 8

bankruptcy and the Type II Error is 4%.
In the fourth section, the model was tested for four years before bankruptcy, and in this period from among 20 cases, predictions of 13 cases were correct and predictions of 7 cases were incorrect (Table No.4). Thus, the rate of accuracy obtained was 65%. As it is shown in Table No.4, Type I Error is 35% for four years before bankruptcy and the Type II Error is 4%.

Table No.4*
The Results of the Model for Four Years before Bankruptcy

State / Errors	Number of correct predictions	Percentage of correct predictions	Number of error predictions	Percentage of error predictions	Total
Type I	13	65%	7	35%	20
Type II	52	96%	2	4%	54
Total	65	88%	9	12%	74

* Results from Table No. 9

The results from bankruptcy prediction by using Springate's model, which have been shown in Tables 1, 2, 3 and 4, have been represented all together for the period of one to four years before bankruptcy in Table No.5.
Totally, we got 76% accuracy for these periods before bankruptcy. As we see in this table, Type I Error is 24% and the Type II Error is just 4%. These results indicate the Type II Error was controlled. Therefore, these results indicate that Springate's bankruptcy prediction model is a valid model for bankruptcy prediction in the case of Textile Industry in TSE.

Table No.5*
The Results of the Model for the Period of One to Four Years before Bankruptcy

State / Errors	Number of correct predictions	Percentage of correct predictions	Number of error predictions	Percentage of error predictions	Total
Error Type 1	64	76%	20	24%	84
Error Type 2	52	96%	2	4%	54
Total	116	84%	22	16%	138

* Results from Tables No. 1, 2, 3 and 4

Table No.6
The Results of the Model for One Year before Bankruptcy

Company	Result from model	The predicted position by the model	Correct	Incorrect
Babakan Textile	2.149	non bankrupt	0	1
Bafandegi Rei	-0.564	Bankrupt	1	0
Baft Azadi	0.582	Bankrupt	1	0
Barak	0.030	bankrupt	1	0
Derakhshan Yazd	0.158	bankrupt	1	0
Ekbatan	-0.466	bankrupt	1	0
Gaem Shahr Textile	-5.176	bankrupt	1	0
Garb Textile	0.807	bankrupt	1	0
Gerdbaf Yazd	0.589	bankrupt	1	0
Hallal Iran	0.685	bankrupt	1	0
Khoi Textile	0.444	bankrupt	1	0
Makhmal Kashan	1.370	non bankrupt	0	1
Mazandaran Textile	0.161	bankrupt	1	0
Nagsh Iran	0.532	bankrupt	1	0
Pakris	-0.498	bankrupt	1	0
Pars	0.744	bankrupt	1	0
Poplin	0.191	bankrupt	1	0
Risandegi Kashan	0.210	bankrupt	1	0
Risman Semnan	0.176	bankrupt	1	0
Tim	0.115	bankrupt	1	0
Vatan	1.323	non bankrupt	0	1
Yazdbaft	0.710	bankrupt	1	0
Sum		22	19	3
The accurate rate of the model :				19/22 = **0.86**

Table No.7
The Results of the Model for Two Years before Bankruptcy

Company	Result from model	The predicted position by the model	Correct	Incorrect
Babakan Textile	2.062	non bankrupt	0	1
Bafandegi Rei	0.470	bankrupt	1	0
Baft Azadi	0.512	bankrupt	1	0
Barak	0.861	bankrupt	1	0
Derakhshan Yazd	1.719	non bankrupt	0	1
Ekbatan	0.056	bankrupt	1	0
Gaem Shahr Textile	-1.543	bankrupt	1	0
Garb Textile	0.072	bankrupt	1	0
Gerdbaf Yazd	0.816	bankrupt	1	0
Hallal Iran	0.751	bankrupt	1	0
Khoi Textile	0.598	bankrupt	1	0
Makhmal Kashan	1.461	non bankrupt	0	1
Mazandaran Textile	0.360	bankrupt	1	0
Nagsh Iran	0.810	bankrupt	1	0
Pakris	0.231	bankrupt	1	0
Pars	0.078	bankrupt	1	0
Poplin	0.763	bankrupt	1	0
Risandegi Kashan	1.124	non bankrupt	0	1
Risman Semnan	0.383	bankrupt	1	0
Tim	0.661	bankrupt	1	0
Yazdbaft	0.643	bankrupt	1	0
Sum		21	17	4
The accurate rate of the model :				17/21 = **0.81**

Table No.8
The Results of the Model for Three Years before Bankruptcy

Company	Result from model	The predicted position by the model	Correct	Incorrect
Babakan Textile	2.723	non bankrupt	0	1
Bafandegi Rei	0.684	bankrupt	1	0
Baft Azadi	0.847	bankrupt	1	0
Barak	0.802	bankrupt	1	0
Brojerd Textile	0.936	non bankrupt	0	1
Derakhshan Yazd	0.027	bankrupt	1	0
Gaem Shahr Textile	-1.739	bankrupt	1	0
Garb Textile	0.823	bankrupt	1	0
Gerdbaf Yazd	1.243	non bankrupt	0	1
Hallal Iran	0.725	bankrupt	1	0
Khoi Textile	0.490	bankrupt	1	0
Makhmal Kashan	1.522	non bankrupt	0	1
Mazandaran Textile	1.342	non bankrupt	0	1
Nagsh Iran	0.847	bankrupt	1	0
Pakris	0.623	bankrupt	1	0
Pars	0.605	bankrupt	1	0
Poplin	1.038	non bankrupt	0	1
Risandegi Kashan	0.606	bankrupt	1	0
Risman Semnan	0.391	bankrupt	1	0
Tim	0.692	bankrupt	1	0
Yazdbaft	0.714	bankrupt	1	0
Sum		21	15	6
The accurate rate of the model :				15/21 = **0.71**

Table No.9
The Results of the Model for Four Years before Bankruptcy

Company	Result from model	The predicted position by the model	Correct	Incorrect
Bafandegi Rei	0.789	bankrupt	1	0
Baft Azadi	0.142	bankrupt	1	0
Barak	0.857	bankrupt	1	0
Brojerd Textile	0.752	bankrupt	1	0
Derakhshan Yazd	1.989	non bankrupt	0	1
Gaem Shahr Textile	0.087	bankrupt	1	0
Garb Textile	1.226	non bankrupt	0	1
Gerdbaf Yazd	1.870	non bankrupt	0	1
Hallal Iran	0.839	bankrupt	1	0
Khoi Textile	0.325	bankrupt	1	0
Makhmal Kashan	2.089	non bankrupt	0	1
Mazandaran Textile	1.982	non bankrupt	0	1
Nagsh Iran	0.853	bankrupt	1	0
Pakris	0.951	non bankrupt	0	1
Pars	0.096	bankrupt	1	0
Poplin	1.217	non bankrupt	0	1
Risandegi Kashan	0.491	bankrupt	1	0
Risman Semnan	0.569	bankrupt	1	0
Tim	0.769	bankrupt	1	0
Yazdbaft	0.843	bankrupt	1	0
Sum		20	13	7
The accurate rate of the model :				13/20 = **0.65**

In this way, we tested Springate's bankruptcy prediction model in 138 cases of bankrupt and non-bankrupt companies for the periods of one to four years before bankruptcy. We got totally 84% accuracy.

CONCLUSION:

With regard to the results of this research, it is indicated that Springate's bankruptcy prediction model is a valid and suitable model for bankruptcy prediction regarding Textile Industry in TSE. And with due attention to the importance of the study, it is suggested to "The Reception Department of TSE", "Share-holders", "Managers", "Bankers", "Financial Institution", "Investing companies", etc to use Springate's model to make rational decisions.

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