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A Review of Bankruptcy and its Prediction

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Abstract

Bankruptcy is one of the key issues across the globe which influences the economy of all the countries. Heavy social investigating the research literature and providing some definitions on bankruptcy and its reasons, we will deal with different modes of predicting bankruptcy in two groups of parametric and non-parametric. Non-parametric methods such as neural networks have high level efficiency and accuracy due to their unique features compared to statistical model and economic costs which are imposed by bankrupted companies on stockholders can cause motivation of researchers in providing different methods for predicting bankruptcy.

Keywords: Bankruptcy, Prediction of Bankruptcy, Multiple Discriminant Analysis, Parametric Techniques, Non-Parametric Techniques

Introduction

Bankruptcy problem and companies' not being successful have always been a big problem. Undesirable condition of companies can cause loss for different people of society, especially investors. Not only investors, but also senior managers and accountants are interested in predicting financial conditions of companies scientifically. Occurrence of bankruptcy with significance of 60's caused growth of interest on bankruptcy prediction models. World economy, especially after bankruptcy of huge organizations such as WorldCom and Enron became aware to the risk present in structure of companies' capital so that one of the most important goals of bankruptcy rules in most countries is reduction of credit risk.

Different methodologies in bankruptcy literature were created for modeling prediction of trading disability. Each one of these methods has their own limitations, but main assumption of most of them is that companies can be classified into two groups: 1. Companies with financial health, 2. Companies with financial inability. Anyway, some suggestions were provided on defining more than two groups based on the risk level, as well. But due general acceptance of the two classified groups the main attention is on two-grouped classification methods (Dimitras et al., 1996). In this research we tried to have a

comprehensive review by providing some definitions on bankruptcy and expressing their reasons and arguing on different techniques of bankruptcy prediction.

Definition and Reasons of Bankruptcy

According to definition of Altman (1996), bankruptcy occurs when companies are not capable of paying off their debts; therefore they cannot keep on with their activities. In Oxford Dictionary, the word "Distress" means inability, pain, sorrow, lack of financial resources and poverty.

In financial literature different definitions were presented on bankruptcy. In one of his studies on financially inability theory Gordon (1971) defined it as reducing of profiting power of companies where probability of disability in paying profit and original debt can be increased.

From view of economic bankruptcy can be accounted for companies` being loss where companies may fail. In fact, in this condition rate of return of companies is less than rate of capital (Weston and Copland, 1992). Determining real reason of reasons behind bankruptcy and financial problems is not an easy task (Dun and Bradstreet, 1998). In some cases the reasons behind bankruptcy can be specified with test of financial sheets and records.

Accountants with experience in analyzing financial condition of companies which are falling down can easily identify and determine the reasons behind bankruptcy. But sometimes problems support a fin cycle in a trading unit during a relatively short period and hide bankruptcy from the eyes of accountants.

Types of Bankruptcy Prediction Techniques

Parametric Techniques

Beaver Model (1966)

The model is a single variable analysis for bankruptcy. Beaver in 1966 chose a full set containing 30 financial ratios which seemed the best ratios for analyzing health of a company.

Beaver adjusted his model based on four principles:

1. Net cash income of a company can reduce probability of bankruptcy.
2. High level of net cash flow resulting from company activity in the market can also reduce probability of bankruptcy.
3. High level of debt for every company can increase probability of bankruptcy.
4. High rate of cash income needed for capital operational costs can increase probability of bankruptcy.

Beaver investigated changes in value of stock market as a predicting factor in predicting companies` bankruptcy. He realized that he could predict bankruptcy market of a company at least one year before the real occurrence.

Multiple Discriminant Analysis

The model is linear combination of certain differential variables. According to the model based on comparing grade gained out of the model and domain determine for differentiation, companies will be classified in groups of bankrupted and non-bankrupted (Altman, 1994; Morris, 1997).

Altman (1968) is the first person to provide multi-variable bankruptcy prediction models. Applying multiple detachment analysis method and using financial ratios as independent variables, he was seeking to predict bankruptcy of institutes. He presented his

famous pattern titled Z-score which is well-known in predicting trading bankruptcy. As Altman emphasizes multiple distinctive analysis has several advantages over single-variable analysis.

In this study, Altman gathered a sample including 66 productive companies for the period 1946 to 1965 by designing using non-bankrupted company according to bankruptcy. After analyzing data five ratios of the most important financial ratios were selected for predicting model. If Z-score is low, undesirable financial condition will happen and if the grade is high it shows good condition. The model reported the prediction accuracy 95% for one year and 72% for two years before bankruptcy. Comparing the results gained out of Beaver's study Altman concluded that the prediction model based on multiple detachment analysis has the ability to provide better prediction in differentiating bankrupted and non-bankrupted companies compared to multi-variable analysis.

Edmister (1972) tried to apply multiple discriminant analysis method for predicting bankruptcy in small companies. The study used 21 pairs (totally 43 companies) bankrupted company and small non-bankrupted company between 1954 to 1969 for designing pattern and then the model's accuracy was reported 93%.

The first limitation of model Z was the necessity of being normal in prediction variables. Beck et al (1996); Doumpos and Zopounidis (1999); Deakin (1972) point out that most financial ratios don't have a normal distribution and the fact limits validity of multiple detachment analysis model. The second limitation was authority of Z-score in above model. The third limitation of the model is that assumption of corresponding independence of ratios is not met in multiple detachment analysis. Using multiple ratios was with high level of correlation and it shows lack of consistency of function factors for different samples (Jonson, 1970).

Logit Model

Logit is the development of multiple regressions in dependent variable where variables are not linked. Logit model in twofold dependent variable is probable logarithm where bankruptcy or non-bankruptcy events may happen. If the probability is equal to 0/5 the chance of bankruptcy and non-bankruptcy of the company is the same. The more the probability is close to zero, the more the chance of bankruptcy will be and the closer the probability to one, chance of bankruptcy will be less (Morris, 1997).

Using non-random sampling pattern, the study is a sample of 105 bankrupted companies and 2058 non-bankrupted companies from public companies for years 1970 to 1978 were gathered and value of predictor variables were then gathered for every company. The Logit model showed accuracy of classification 925/84, 95/55 and 96/2% for 105 bankrupted companies and 2058 non-bankrupted companies between 1970 to 1976, respectively. It seems that the results indicate linear change in predictors according to certain probability distribution has more prediction ability and they suggest about future studies to use key predictions which can improve power of the model prediction.

Non-parametric Techniques

Recursive Portioning Algorithm

The algorithm is a computer techniques and non-parametric technique in identifying pattern which has feature of multi-variable analysis and classifying a traditional variable.

The advantage of the method to Logit multiple detachment analysis is that it is not participated in action between variables in the model. Variables combination and threshold value were estimated from possible divergence points and those with power of prediction are

chose. Result of a decision model is in form of tree (Edmister, 1972; Johnson, 1970). The models which were used in returning algorithm, in fact are a zero and one classification tree which are allocated to each one of nodes. One of main disadvantages of the model is that a variable may appear in the next repeating steps (Fallahpour, 2004)

Among the models predicted in bankruptcy of companies, the model used the least amount.

Freedman, Altman and Kao were the first to apply returning algorithm comparatively by analyzing multiple detachment. Their study was formed from 58 bankrupted companies and 142 non-bankrupted companies between 1971 and 1981. According to previous studies conducted and presenting a table on ratios, they applied ten net profit variables to total assets, current assets to current debts. Logarithm of total assets, value of normal stock market to total financial provision resources, current assets to total assets, cash flows to total debts, quick assets to current debts, profit before interest and tax to total assets and logarithm of covering cost of interest plus fifteen for the primary model.

Prediction accuracy of the model was 90% and ratio of cash flows to total debts was recognized as the most important predictor variable of the model.

Neural Networks

Neural networks are calculation non-linear algorithms for processing numeric data. Several features of neural networks such as internal dynamic of neural networks in prediction, changes in information error and lack of need to added information on input data can make using neural network interesting in many problems.

One of neural network structures is multi-layered perceptron structure. We can train a multi-layered perceptron by non-linear functions is a way that every measuring function can be estimated and predicted. Neural networks apply training algorithm using set of real data (input and output) to form hidden information between input and output data through weight coefficients, biases and email function to output of every layer.

Of the most important training algorithms, post-publishing algorithm can be mentioned. In this algorithm in every step, the new calculated output level is compared with real value and according to the error gained; weights or network biases are dealt with, so that at the end of each repetition process, the error size gained should be less than the level gained in the previous repetition process. Basis of this minimizing is moving on function gradient vector of network square error and the vector is gained by chain differentiation from error function to all the network parameters (Rumelhart et al., 1988).

Conclusion

Since companies' bankruptcy has heavy costs, the condition can be specified before a company reaches to it and some measures can be taken so get the company out of bankruptcy condition. In this research we tried to deal with different methods and techniques by presenting some definitions on bankruptcy. According to profile of models mentioned we can suggest that today multi-variables analyses, especially non-parametric have high level of efficiency and high level of accuracy to prediction primary models.

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