CHAPTER 2 - LITERATURE REVIEW

Most failure prediction studies apply an empirical approach, i.e. they are aimed at improving prediction accuracy by appropriate selection of financial ratios for the analysis. According to Altman (1968), the empirical studies proved that public accounts ratios contain sufficient information for ex-ante failure prediction, because in almost all cases, the fundamental business distress problem lies within the firm. Therefore accounting ratios capture and quantify both the unique financial characteristics of the specific firm and macroeconomic pressures on the corporate sector. There are also some efforts to create theoretical construction in failure prediction context (Scott 1981), but no unified theory has been generally accepted as a basis for the theoretical ratio selection.

The discriminant model classifying companies into healthy and failed on the basis of forecasted accounts, depends on predictor-variables measuring profitability, liquidity, cashflow, operating leverage and financial leverage. The two most frequently used methods in deriving the discriminant models are the simultaneous (direct) method and the stepwise method. The former is based on model construction by e.g. theoretical grounds, so that the model is ex ante defined and then used in discriminant analysis. When stepwise method is applied, the procedure selects a subset of variable to produce a good discriminant model using forward selection, backward elimination, or stepwise selection.

As pointed out by Neophytou (2000), most researchers employed data to extend the linear discriminant analysis approaches developed by Beaver (1966) and Altman (1968). These extensions include among others: i) the use of more appropriate quadratic classifier

(Altman et al., 1977), ii) the assignment of prior probability membership classes (Deakin, 1972), iii) the use of cashflow based model (Gentry et al., 1987), iv) the use of quarterly information (Balwin and Glezen, 1992) and v) the use of current cost information (Aly et al., 1992).

While the studies of failure prediction using discriminant model have provided high accuracy, they were criticised because multiple discriminant analysis (MDA) models are based on certain assumptions that are frequently violated. Discriminant analysis does very well provided that the variables in every group follow a multivariate normal distribution and the covariance matrices for every group are equal. However, empirical experiments have shown that firms violate the normality condition, especially those that failed. Moreover, multicollinearity among the independent variables is often a serious problem especially when stepwise procedures are employed. The equal group variances condition is also violated. 'Nevertheless, empirical studies have proved that the problems connected with normality assumptions were not weakening its classification capability, but in its prediction ability' (Hair et al., 1992).

In 1980, Ohlson applied an alternative statistical method, logit analysis, in predicting corporate failure. Logistic analysis applies the same variable selection method as discriminant analysis presented above. However, logit method fits linear logistic regression model for binary and ordinal response data by the method of maximum likelihood. Logistic regression has been used extensively for the development of failure models as this method avoids some of the argued limitations of the MDA approach. Extension to Ohlson's study include among others the following: i) the effect of industry-relative ratios on the likelihood of corporate failure (Platt and Platt, 1990), ii) the distinguishing between firms in financial distress and failed firms (Gilbert et al., 1990), iii) development of industry specified models (Platt et al., 1994) and iv) expanding the outcome space used to predict failure to include a third group of financially weak firms in an attempt to reduce the misclassification error (Johnsen and Melicher, 1994).

Neural Network (NNs) is another technique that has been applied in the corporate failure prediction area mainly in the last two decades. NNs are computer systems that take the inspiration from known facts about how the brain works and they can be "trained" to solve certain problems or identify specific pattern. NNs implements some function f that maps a set of given input values x to some output values y: $y = f(x)$. A neural network tries to find the best possible approximation of the function f.

A major advantage of NNs is their ability to induce algorithms for recognizing patterns. Unlike traditional models, the NNs approach is considered to be more effective as it is not subject to restrictive statistical assumptions such as the linear relation and/or multivariate normality. As such it has an adaptive nature and has the ability of expressing non-linear relations (Suh and Kim, 1996). As pointed out by Hawley et al. (1990), the NN approach can be most effectively applied to such tasks as classification and clustering where problem-solving environments are unstructured with incomplete data. NNs have been used successfully in many accounting and financial applications. Dutta and Shekhar (1988) have applied NNs to bond ratings. Hansen et al. used the NN to distinguish between qualified and unqualified audit options and litigated and non-litigated firms.

However, NNs also present some drawbacks. First, they do not provide the contribution of each variable to the final classification (i.e. the variable's significance). Thus, it is impossible for an investigator to select the most significant predictor variables for the model development with the NNs approach. In addition, the investigator must decide upon the physical architecture of the network. This is often done by trial and error, varying the number of layers, the number of processing elements in each layer, the nature of the connection pattern etc. 'Moreover, the danger of over-parameterisation of the model is always present and finally, derived weights are not readily interpretable as with discriminant or logit analysis' (Taffler, 1984).

Coats and Fant (1993) and Wilson and Sharda (1994) compared the results of multiple discriminant analysis against the neural network approach and their results suggested that the NNs approach is more effective than MDA in classifying distressed and non-distressed firms, whereas Boritz, Kenedy and Albuquerque (1995), after comparing two NNs techniques to MDA, probit and logit, as well as against Altman's and Ohlson's prediction models, found that the NNs techniques did not provide superior classification rates. Similar results were also reported by Laitinen and Kankaanpaa (1999).

All the aforementioned failure prediction studies, regardless of the approaches used, have one common impediment: they are not based on economic theory in choosing the variables for distinguishing between failing and non-failing firms. Discriminant analysis, logit analysis and genetic algorithms have all different assumptions concerning the relationships between the independent variables. Linear discriminant analysis is based on linear combination of independent variables, logit analysis uses the logistic cumulative probability function and genetic algorithm is a global procedure based on the mechanics of natural selection and natural genetic. Instead, researchers selected financial ratios as predictor variables mainly because of their popularity and predictive success in previous researches.

Most of the failure prediction studies focus on a particular region such as country specific or are based on status of development such as developed and developing countries. However, these studies do not take into consideration industry specific factors, which may affect the performance of the firms. Microeconomic factors such as exposure to commercial property development, hotel development, and even Bumiputera ownership (unique to the Malaysian property sector) should be taken into consideration in failure prediction.