MASTER OF BUSINESS ADMINISTRATION

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

MBA PROJECT PAPER

Submitted to the Management Center
International Islamic University Malaysia

In Partial Fulfilment of the Requirements
For the degree of
Master of Business Administration

25 January 1999

APPROVAL PAGE

NAME OF STUDENT : LEW CHOONG FEI, DANIEL

MATRIC NO : G9610067

TITLE OF PROJECT PAPER : IS CORPORATE DISTRESS PREDICTABLE ?

The undersigned certifies that the above student has fulfilled the conditions of the project paper in partial fulfilment of the requirement for the Master of Business Administration (Finance).

Supervisor

Dr Ahamed Kameel Meera
Head, Department of Business Administration
Kulliyyah of Economics and Management Sciences
International Islamic University Malaysia

Date: 25 January, 1999

الجامعة الإسلامية العالمية ماليزيا
INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA
يونيورسيتي إسلام انتارابغسا ملايسيا

IS CORPORATE DISTRESS PREDICTABLE?

Submitted to the Management Center
International Islamic University Malaysia

By: Lew Choong Fei, Daniel
(Matric No. G9610067)

Supervisor: Dr Ahamed Kameel Meera

In partial Fulfilment of the Requirements
For the degree of
Master of Business Administration

25 January 1999

TABLE OF CONTENTS

ACKNOWLEDGEMENT

I wish to express my sincere appreciation and gratitude to my family, I am indebted to my beloved wife, Anna Ng and my two adorable children, Ivory (6 yrs) and Isaiah (8 mths) for their understanding in neglecting them for the last 2 ½ years and for their tireless effort in motivating and energizing me to go through this program, without which I would have been impossible for me to complete the program.

I am also grateful to Pascorp Paper Industries Sdn Bhd for allowing me to proceed with this program and my special thanks to the Managing Director, En Mas'ut Awang Samah for his guidance and advice.

Last but not least, I wish to record my gratitude to Dr Obiyathulla for his tireless dedication to the IIUM's MBA program and my supervisor, Dr Ahameed Kameel Meera for his valuable suggestions and advice in the writing of this paper.

ABSTRACT

This study examines the usage of Z-Score Model in predicting corporate distress. A total of 345 public-listed companies, both from the Main and the Second Board, were analysed and divided into 2 broad groups namely Healthy Companies (312 companies) and Troubled Companies (33 companies). These sample companies are mainly from the Industrial, Consumer and Properties sectors as the Model cannot be applied to other sectors like Banking, Trading, Hotel, Services and Construction.

The results show that the P Value for the Healthy and Troubled Companies is very significant and thus is in accordance with the Z-Score Model. The results also show that the Mean of the Healthy and the Troubled Companies are statistically different while the Trend Analysis of the study concludes that the Z-Score Model can be used to predict corporate distress up to 2 years' prior to the event for Malaysian companies.

Chapter 1

Introduction

The ability to predict which firms are vulnerable to financial distress has been the focus of many research studies due to its critical importance to creditors and even more so to equity investors. When a firm files for bankruptcy or protection under S176 of the Companies Act 1965, creditors often lose portion of their principal and interest payments, while equity investors can potentially lose all their investments.

Thus, it is important to focus more on trying to predict the companies which are vulnerable to financial distress during this economic turmoil. Most of the research into predicting financial distress centred around using different financial ratios. The most well known amongst these is the Z-Score Model.

The model was introduced in 1968 by Edward Altman through an article in the Journal of Finance entitled "Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcies". It combines a number of financial ratios simultaneously in an effort to determine the company's distress potential. Weights calculated using multivariate discriminant analysis are assigned to each ratio, and based on this, the Z-Score is derived.

The ratios selected by Altman as the best predictor of a company's distress potential include factors like liquidity, cumulative profitability, asset productivity, ability to generate sales and the degree to which the value of the company can decline before becoming insolvent. The interpretation of the Model is straight forward- the higher the Z-Score, the lesser the distress potential. On top of that, Altman established a critical value point - 1.81 - any company with a score below this is considered a prime candidate for distress.

The advantage of the Model is that it is easy to understand and to use. Further, according to academic research, it has been relatively successful in predicting financial failures in the United States and other developed countries like Japan, Canada, France, United Kingdom and others.

The remainder of this study contains seven chapters. Chapter 2 provides the development of the Z-Score Model. This section also discusses the traditional financial ratio analysis as a predictor for corporate bankruptcy. Chapter 3 explores the international usage of the Z-Score Model specifically in Japan, Canada and Malaysia. Chapter 4 highlights the distress signal in Malaysia particularly the S176 and the Corporate Debt Restructuring Committee. The hypothesis and objectives of this study are in Chapter 5. This section also discusses the various t-test conducted in this study. Chapter 6 deals with data and the methodology of the study. While Chapter 7 focuses on the results and analysis of this study as well as the limitation

of the Z-Score Model in the Malaysian context. Chapter 8 contains the study's conclusions and suggestions.

Chapter 2

2.1 Traditional Ratio Analysis

The forerunner of the classic works in the area of ratio analysis and bankruptcy classification was performed by Beaver (1968). In a real sense, his univariate analysis of a number of bankruptcy predictors set the stage for the multivariate attempts, by this author and others, which followed. Beaver found that a number of indicators could discriminate between matched samples of failed and non-failed firms for as long as five years prior to failure.

The abovementioned studies imply a definite potential of ratios as predictors of bankruptcy. In general, ratios measuring profitability, liquidity, and solvency prevailed as the most significant indicators.

Eventhough all these works established certain important generalizations regarding the performance and trends of particular measurements, the adaptation of the results for assessing bankruptcy potential of firms both theoritically and practically, is questionable. The main weakness of these studies as evident in almost every case the methodology was essentially univariate in nature and emphasis was placed on individual signals of impending problems. Therefore, ratio analysis presented in this fashion is susceptible to faulty interpretation and is potentially confusing . For example, a company with

a poor profitability and/or solvency record may be regarded as a potential bankrupt. However, because of its above average liquidity, the situation may not be considered serious.

2.2 Multiple Discriminant Analysis

In view of the shortcoming in these traditional ratio analysis, an appropriate extension of the previously cited studies, therefore, is to build upon their finding and to combine several measures, into a meaningful predictive model. Altman (1968) introduced this multiple discriminant analysis (MDA) as an appropriate alternative statistical technique.

MDA is a statistical technique used to classify an observation into one of several a priori grouping dependent upon the observation's individual characteristics. It is used primarily to classify and/or to make predictions in problems where the dependent variables appear in qualitative form, for example, male or female, bankrupt or non-bankrupt. Therefore, the first step is to establish explicit group classifications. The number of original groups can be two or more. Some analysts refer to discriminant analysis as "multiple" only when the number of groups exceed two. However, Altman prefers that the multiple concept refer to the multivariate nature of the analysis.

Once the groups are established, data are collected for the objects in the groups ; MDA in its most simple form attempt to derive a linear combination of these characteristics which "best" discriminates between the groups if a particular corporation has characteristics (financial ratios) which can be quantified for all of the companies in the analysis, the MDA determines a set of discriminant coefficients. When these coefficients are applied to the actual ratios a basis for classification into one of the mutually exclusive grouping exists.

The MDA technique has the advantage of considering an entire profile of characteristics common to the relevant firms, as well as the interaction of these properties. A univariate study, on the other hand, can only consider the measurements used for group assignment one at a time.

Another advantage of MDA is the reduction of the analyst's space dimensionality, that is, from the number of different independent variables to G-1 dimensions where G equals the number of original a priori groups . This analysis is concerned with two groups consisting of bankrupt and non-bankrupt firms. Therefore, the analysis is transformed into its simplest form : one dimension. The discriminant function of the form $Z = V_1X_1 + V_2 X_2 + \ldots +$ VnXn transforms the individual variable values to a single discriminant score, or Z value, which is then used to classify the object where

$V_1 , V_2, \ldots ,$ Vn = discriminant coefficients and

$X_1, X_2, \ldots, Xn$ = independent variables.

The MDA computes the discriminant coefficients – V_J, while the independent variable X_J are the actual values, and $J = 1,2, \ldots, n$.

The Z - Score Model is a linear analysis in that five measures are objectively weighted and summed up to arrive at an overall score that becomes the basis for classification of firms into one of the a priori groupings.

2.3 Development of the Z - Score Model

(i) Sample Selection

The initial sample composed of 66 corporations with 33 firms in each of the two groups. The bankrupt group (Group 1) were manufacturers that filed bankruptcy petitions under chapter 11 of the US National Bankruptcy Act from 1946 through 1965.

Group 2 consisted of a paired sample of manufacturing firms chosen on a stratified random basis. The firms were stratified by industry and by size, with the asset size range restricted between US$ 1 and US$ 25 million. The mean asset size of the firms in Group 2 was slightly greater than that of Group 1, but matching exact asset size of the two groups seemed unnecessary. For the initial

sample test, the data were derived from financial statements dated one annual reporting period prior to bankruptcy. The data were derived from Moody's Industrial Manuals and selected annual reports.

(ii) Variable Selection

After the initial groups were defined and firms selected, balance sheet and income statement data were collected. Because of the large number of variables found to be significant indicators of corporate problems in past studies, a list of 22 potentially helpful variables (ratios) was compiled for evaluation. The variables were classified into five standard ratio categories namely liquidity, profitability , leverage, solvency and activity. The Beaver(1968) study concluded that the cash flow to debt ratio was the best single ratio predictor. This ratio was not considered here because of the lack of consistency and precise depreciation data. The result obtained, however, was superior to the results Beaver attained with his single best ratio.

From the original list of 22 variables, five were selected as doing the best overall job together in the prediction of corporate bankruptcy. In order to arrive at the final profile of variables the following procedures were utilized :

(1) Observation of the statistical significance at various alternative function including determination of the relative contributions of each independent variable ;

(2) Evaluation of intercorrelations among the relevant variables ;

(3) Observations of predictive accuracy of the various profiles;

(4) Judgement of the analyst.

The final discriminant function is as follows :

$$Z = 0.012\,X_1 + 0.014X_2 + 0.033X_3 + 0.006X_4 + 0.010X_5$$

Where

X_1 = working capital / total assets

X_2 = retained earnings / total assets

X_3 = earnings before interest and taxes / total assets

X_4 = market value equity / book value of total liabilities

X_5 = sales / total assets

Z = overall index

X_1, Working Capital / Total Assets (WC/TA) The working capital / total assets ratio, frequently found in studies of corporate problems, is a measure of the net liquid assets of the firm relative to the total capitalization. Working capital is defined as the difference between current assets and current liabilities. Liquidity and size characteristics are explicitly considered. Ordinarily, a firm experiencing consistent operating losses will have shrinking current assets in relation to total assets.

X_2, Retained Earnings / Total Assets (RE/TA) Retained earnings is the account which reports the total amount of reinvested earnings and/or losses of a firm over its entire life. The account is also referred to as earned surplus. It should be noted that the retained earnings account is subject to change via corporate quasi-reorganizations and stock dividend declarations. The age of a firm is implicitly considered in this ratio. For example, a relatively young firm will probably show a low RE/TA ratio because it does not have time to build up its cumulative profits. Therefore, it may be argued that the young firm is somewhat discriminated against in this analysis, and the chance of being classified as bankrupt is relatively higher than of another, older firm, *ceteris paribus*. But, this is precisely the situation in the real world. The incidence of failure is much higher in a firm's earlier years.

X_3, Earnings before Interest and Taxes / Total Assets (EBIT/TA) This ratio is a measure of the true productivity of the firm's assets, abstracting from any tax or leverage factors. Since a firm's ultimate existence is based on the earning power of its assets, this ratio appears to be particularly appropriate for studies dealing with corporate failure. Furthermore, insolvency in a bankrupt sense occurs when the total liabilities exceed a fair valuation of the firm's assets with value determined by the earning power of the assets.

X_4, Market Value of Equity/ Book Value of Total Liabilities (MVE/TL) Equity is measured by the combined market value of all shares of stock, preferred and common, while liabilities include both that of current and long term. The measure shows how much the firm's assets can decline in value (measured by market value of equity plus debt) before the liabilities exceed the assets and the firm becomes insolvent. For example, a company with a market value of equity $1,000 and debt of $500 could experience a two-third drop in asset value before insolvency. However, the same firm with $250 in equity will be insolvent if assets drop only one-third in value. This ratio adds a market value dimension which other failure studies did not consider. The reciprocal of X_4 is the familiar debt/equity ratio often used as a measure of financial leverage. X_4 is a slightly modified version of one of the variables used effectively by Fisher (1959) in a study of corporate bond interest rate differentials. According to Altman, it also appears to be a more effective predictor of bankruptcy than a similar, more commonly used ratio: net worth/total debt (book values).

X_5, Sales /Total Assets (S/TA) The capital-turnover ratio is a standard financial ratio illustrating the sales generating ability of the firm's assets. It is one measure of management's capacity in dealing with competitive conditions

(iii) Variable Tests

According to Altman, to test the individual discriminating ability of the variables, an F - test is performed. This test relates the difference between the average values of the ratios in each group to the variability (or spread) of values of the ratios within each group. Variable means measured at one financial statement prior to bankruptcy and the resulting F-statistics are presented in Table 2-1.

Table 2.1 Variable Means and Test of Significant

Variable	Bankrupt Group Mean[a]	Non-Bankrupt Group Mean[a]	F Ratio[b]
X_1	-6.1 %	41.4 %	32.60[C]
X_2	-62.6 %	35.5 %	58.86[C]
X_3	-31.8 %	15.4 %	26.56[C]
X_4	40.1 %	247.7 %	33.26[C]
X_5	1.5 X	1.9 X	2.84

[a] $n = 33$

[b] $F_{1,60}(0.001)=12.00$; $F_{1,60}(0.01)=7.00$; $F_{1,60}(0.05)=4.00$

[c] Significant at the 0.001 level

Variables X_1 through X_4 are all significant at the 0.001 level, indicating extremely significant difference in these variables among groups. Variable X_5 does not show a significant difference among groups and the reason for its inclusion in the variable profile is not apparent as yet. On a strictly univariate level, all of the ratios indicate higher values for the non-bankrupt firms. All of the discriminant coefficients also display positive signs, which is what one would expect. Therefore, the greater a firm's bankruptcy potential, the lower its discriminant score.

One useful technique in arriving at the final profile is to determine the relative contribution of each variable to the total discriminating power of the function. The relevant statistic observed is a scaled vector. Since the actual variable measurement units are not all comparable to each other, simple observation of the discriminant coefficients is misleading. The adjusted coefficients shown in Table 2.2 enable us to evaluate each variable's contribution on a relative basis.

Table 2.2 Relative Contribution of the Variables

Variable	Scaled Vector	Ranking
X_1	3.29	5
X_2	6.04	4
X_3	9.89	1
X_4	7.42	3
X_5	8.41	2

The scaled vectors indicate that the large contributors to group separation of the discriminant function are X_3,X_5 and X_4 respectively. The profitability ratio contributes the most, which is not surprising if one considers that the incidence of bankruptcy in a firm that is earning a profit is almost nil. What is surprising, however, is the second highest contribution of X_5 (sales/total assets). Recall that this ratio was insignificant on a univariate basis : the multivariate context is responsible for illuminating the importance of X_5, A probable reason for this unexpected result is the high negative correlation (-0.78) we observe between X_3 and X_5 in the bankrupt group. The negative correlation is also evident in subsequent bankrupt group samples. (See Cochran (1964) and Cooley and Lohnes (1962) for a discussion of how a seemingly insignificant variable can contribute a great deal in a multivariable context.)

In an evaluation on the discriminant function, Cochran (1964) concluded that most correlations among variables were positive and that, by and large, negative correlations are more helpful than positive correlations in adding new information to the function. The logic behind the high negative correlation in the bankrupt group is that as firms suffer losses and deteriorate towards failure, their assets are not replaced as much as there were healthier times. Also, the cumulative losses have further reduced the asset size through debits to retained earnings. The asset size reduction apparently dominates any sales movements.

Chapter 3

The Successful of Business Failure Prediction Models

The identification of business failure and early warnings of impending financial crisis is important not only to analysts and practitioners in large industrialized nations of the world. Countries throughout the world, even non-capitalist nations, are concerned with individual firm performance assessment. In fact, all countries in the world are vitally concerned with avoiding financial crisis in the private and public sectors. Small and developing nations are more vulnerable to financial panics resulting from failures of individual entities.

3.1. Malaysia's PNB – Score Model

Bidin(1988) attempts to develop a predictive model (PNB – Score) for evaluating performance of companies owned by the government of Malaysia in 1988. The derivation of the model for companies operating in this country was based on the concept proposed by Dr. E.I . Altman of New York University (1968, 1977 and summarised in 1983).

In deriving the PNB-Score, a sample of 42 companies were chosen for the purpose of model development. These companies were divided into two groups. The first group of 21 companies consisted entirely of companies which were known to have serious financial problems. The other group of the same number of companies were

financially sound. All these companies selected were entirely Malaysian-owned companies and which were undertaking business activities in Malaysia.

In building the model, the companies selected were mainly manufacturing companies together with some companies in the transportation and services sector. Companies in the gas and petroleum exploration , finance and plantation sectors were excluded. The companies in the non-problem group were paired with the companies in the problem group based on the principal activities of the companies concerned.

Initially, a total of 41 financial ratios were selected for analysis. These ratios were financial ratios usually associated with the measurement of performance characteristic of the company. The values of these financial ratios were calculated based on the financial items from the annual reports of the companies.

The final ratios included in the model were generated by computer using the step-wise discriminant analysis technique. This technique determined the most significant variables in turn in the computer program until there were no more significant variables to be entered or removed. The order of insertion of the variables is determined by using the partial correlation coefficient (R^2) as a measure of the importance.

The technique began by finding the one-variable that produced the highest R^2. For each of the other variables, the procedure calculated the *F*-statistics. This reflected the