CHAPTER 3
RESEARCH DATA AND METHODOLOGY

THE DATA AND SAMPLE USED

Data for this study were drawn from The Kuala Lumpur Stock Exchange Annual Companies Handbook. Taking cognisance of the objective of this research, the following points preponderate in the process of sample selection:

(a) that the data to be used is usually the subject of financial ratio analysis, namely the published annual accounts of Malaysian Industrial Companies.

(b) The firm was required to be listed for at least a consecutive nine year period, in this case from 1984 to 1992 inclusive.

(c) Information regarding the Market value of firm for the period selected must be available. This was necessary to calculate the value of the firms using the Torbin's Q ratio* computed in the following manner.

$$\text{Firm value} = \frac{\text{Market value of firm}}{\text{Replacement cost of assets}}$$

The market value of the firm is the sum of the market values of its ordinary shares, preference shares and debts.

The replacement cost of assets is computed as:

$$R = TA + (RP - BP) + (RI - BI) - DT$$

*: Lindenberg , Eric B. and Stephen A. Ross (1981), Torbin's Q Ratio And Industrial Organization", _____ Journal of Business , 54, 1-32.

whereby,

R	=	the replacement cost of assets
TA	=	total assets
RP	=	replacement cost of fixed assets
BP	=	book value of fixed assets
RI	=	replacement cost of inventories
BI	=	book value of inventories
DT	=	the book value of deferred tax

The replacement cost of fixed assets and inventories are not normally realized and is assumed to be equal to book value; deferred tax is considered as a form of long term liability to the company since companies are allowed to defer payment of tax by one year of assessment. Thus the replacement cost of assets is reduced to total assets.

Therefore,

$$\text{Firm value} = \frac{\text{Market value of firm}}{\text{Total assets}}$$

Since there is no readily available information as to the firms listed on KLSE that were declared bankrupt, the Torbin Q-ratio avails the opportunity to determine the values of the firms and thus differentiate the poorly performing (unsound) firms from the better performing (sound) firms. Using this logic, the value of all the Industrial companies listed on KLSE for the defined period were calculated. The firms were then ranked in descending order of value. A point midway along the rank was considered as the demarcation. Thirty-five firms were then selected starting from the highest value. Another thirty-five firms were selected in the lower region of the demarcation using simple random sampling. These selections were grouped as sound and unsound firms respectively. Thus the sample constitute 70 firms of which 35 were classified as sound and another 35 classified as unsound firms for a period between 1984 to 1992 both inclusive.

THE FINANCIAL RATIOS USED

Ratios are tools for determining the extent of profitability and financial position of the firms in question. By comparing the ratios with those of the earlier periods, of other similar Industries or firms, relative measures of profitability and financial positions can be determined.

Some of the ratios that can be derived from a set of financial statements can be find in appendix 3-A. It is much too large to be incorporated in any one study. Thus in the light of such problems researchers tend to use a smaller subset of ratios for their purposes.

However in selecting the financial ratios for examination the analyst must ensure that the chosen set encompasses all the relevant aspects of the entity. In this study, ratios were chosen on the basis of (I) theoretical arguements, (II) those considered most popular in the literature on this subject, and (III) those which have produced the best results in analogous research. A factor which limited the choice in some cases was the inadequacy of the data. For example, this made it impossible to insert variables based on flow of funds data to variables such as the Earning yield and Earning cover. The absence of such variables may well have reduced the potential significance of the discriminant function some what, since they have proved to be significant in some studies. A list of the selected financial ratios classified into five standard categories, such as liquidity, profitability, leverage, solvency and activity ratios could be find in table 3-1 below.

TABLE 3-1

FINANCIAL RATIOS USED IN THIS STUDY

LIQUIDITY GROUP

Current Assets To current liabilities = CA / CL

Networking Capital To total assets = NWC/TA

PROFITABILITY GROUP

Net income after taxes, before extraordinary items To share holder's fund = NI / SHF

Net income after taxes, before extraordinary items To turnover = NI / TO

Retained earnings To total assets = RE/TA

ACTIVITY GROUP

Sales To total assets = S/TA

LEVERAGE GROUP

Long term debt To share holder funds = LTD / SHF

INVESTMENT GROUP

Price earning ratio = Market price of shares To earning per share = MPS / EPS

Earnings before interest and tax To total assets = EBIT/TA

Market value of common and preferred stock To book value of debt = MVCP/BVD

Current assets / current liabilities

This ratio is a useful guide for investors who wish to be assured that any Company in which they invest is in a suitable liquid position. It shows the Company's ability to pay its immediate creditors from its liquid or quick sources.

Net working capital / total assets

The ratio of net working capital to total assets is a measure of the liquid assets of the firm relative to the total Capitalization. This ratio is found in many studies of corporate problems. Working capital is defined as the difference between current assets and current liabilities. The size and liquidity characteristics are taken into consideration.

Net income after taxes, before extraordinary items / share holder's fund

Amount of net income received after tax and interest for every ringgit contributed by the shareholders.

Net income after taxes, before extraordinary items / turnover

Propotion of net income after tax but before extraordinary item for every ringgit in sales.

Retained earnings / total assets

It is a measure of the cumulative profitability over time. In this ratio, the age of the firm is implicitly considered. It may be argued that young firms are discriminated against in this analysis since younger firms are likely to show a lower retained earnings / total assets ratio due to the shorter time to build up their cumulative profits. However in the real world situation too, the incidence of failure is much higher in a firm's earlier years.

Sales / total assets

This could be used to measure management's capability in dealing with competitive conditions. It illustrates the sales generating ability of the firm's assets.

Long term debt / share holder funds

The ratio of long-term debts owed to outsiders for every ringgit held by the Company in the form of capital. Thus the lower the gearing ratio of a Company the better for the shareholders.

Price earning ratio (PER)

This ratio is to test how efficient is the performance of the Company's share.
It is useful to investors because it helped to compare the current price with past earnings. If the market lacks confidence on the Company, the market share value of the Company will be low and hence a relatively low PER.

Earnings before interest and taxes / total assets

This ratio is a measure of the true productivity of the firm's assets noting that it is calculated by dividing the total assets of a firm into its earnings before interest and tax reductions. Thus the productivity of the firm's assets is abstracted from any tax leverage. This ratio appears to be particularly ideal for studies on corporate failure since a firm's ultimate existence is based on the earning power of its assets. Further more in a situation when the total liabilities exceed the valuation of the firm's assets with value determined by the earning power of the assets, the firm is said to be insolvent in a bankruptcy sense.

Market value of common and preferred stock / book value of debt

This ratio adds a market value dimension which other failure studies did not consider. The measure shows how much the firm's assets can decline in value before the liabilities exceed the assets and the firm becomes insolvent. It appears to be a more effective predictor of bankruptcy than a similar, more commonly used ratio; Net worth / Book value of total debt.

THE MULTIVARIATE TECHNIQUES

The multivariate discriminant analysis is the statistical technique used in this study, to classify the Malaysian Industrial Companies into fail and nonfail firms.It addresses itself to the problem of;

(1) Determining whether statistically significanct difference exist between the average score profiles of two (or more) a priori defined groups.

(2) Establishing procedures for classifying statistical units (individuals or objects) into groups on the basis of their score on several variables.

(3) Determining which of the independent variables account most for the differences in the average score profiles of the two or more groups. As can be noted from the above stated cbjectives, discriminant analysis is one of the most useful techniques applicable to this studies, which is intended to correctly classify Malaysian Industries Companies into fail or no-fail groups.

This technique begins by determining whether or not a statistically significant function can be derived to separate the two groups. This consists of several separate steps such as variable selection, sample division, the computational method, and statistical significance.

In variable selection, the financial ratios are taken to be the independent variables and a two group (dichotomous) fail and non-fail firms constitute the dependent variable. Sample division becomes a necessity for testing the validity of the discriminant function that has been derived, provided the total sample will constitute at least 100. In this instance the usual procedure is to devide the total sample randomly into two groups. One group is referred to as analysis sample and the second group, referred to as the holdout sample which is used to test the discriminant function. This method of validating the function is referred to as the Split-sample or Cross-validation approach *. However, in this study the sample size is too small to justify a division into analysis and holdout groups. Therefore the function is developed on the entire sample and then the function is used to classify the same group used to develop it.

The computational method can be done in a number of ways i.e. forward entry, stepwise selection and backward elimination. The approach used in this study is stepwise variable selection. In this approach the algorithms combine the features of forward selection and backward elimination. This stepwise procedure is designed to develop the best one-variable (financial ratio) model, followed by the best two-variable model, and so forth, until no other variables meet the desired selection rule. The selection rule in this study is minimization of Wilks' lambda; sometimes called the U statistics. When variables are considered individually as in this case, lambda is the ratio of the within-groups sum of squares to the total sum of squares. A lambda of 1 occurs when all observed group means are equal. Values close to 0 occur when within-groups variability is small compared to the total variability, that is when most of the total variability is attributable to differences between the mean of the groups. Thus, large values of lambda indicate that group means do not appear to be different, while small values indicate that group means do appear to be different.

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*Paul E. Green, Donald S. Tull and Gerald Albaum (1984), Research for marketing decisions, Englewood cliffs, Newjersey: Prentice-hall Inc. fourth edition.

Many researchers belief that the level of significance of the discriminant function should be at or beyond .05 level. However some scientist and business analyst argued that more weight should be given to the cost versus the value of the information. Once the discriminant function has been derived, a validation exercise is then undertaken. The major considerations involved in this are: the reason for developing classification matrices, chance models, and classification accuracy relative to chance.

It is noted that one of the standard outputs of a discriminant analysis is a measure of the statistical significant of the discriminant function. For the SPSS package (which is used in this study), it is the chi-square statistic. However this statistical test do not tell us how well the function predicts. Thus to determine the predictive ability of a descriminant function, the analyst must construct classification matrices.

Before a classification matrix can be constructed, the cutting score must be determined. This is the criterion (score) against which each individual's discriminant score is judged to determine into which group the individual should be classified. In this study, since the groups sample size are equal the optimal cutting score (or critical Z value) will be halfway between the two group centroids. The cutting score is therefore defined as

$$Zce = \frac{Za + Zb}{2}$$

where

Zce = Critical cutting score value for equal group size

Za = Centroid for group A

Zb = Centroid for group B

The procedure involved in constructing the classification matrices is multiplying the weights generated by the analysis sample by the raw variable measurements of the holdout sample, to obtain discriminant score for the holdout sample. The individual discriminant scores for the holdout sample are then compared with the critical cutting score value and classified as follows:

(1) If Zn < Zct, individual is classified into group A

(2) If Zn > Zct, individual is classified into group B

where

Zn = Discriminant Z score for the nth individual

Zct = Critical cutting score value.

The classification results are presented in matrix form. In this study, due to the restricted sample size, the raw variable measurement of the analysis sample is used in the generation of the classification matrices instead of holdout sample as stipulated above.

The question of an acceptable level of predictive accuracy for a discriminant function, has to be addressed by the analyst. Thus the percentage that could be classified correctly by chance (chance model) without the aid of the discriminant function has to be determined. In this study, with two group equal sample size, the chance classification is obtained by dividing 1 by the number of groups. The formula is $C = 1/$ number of groups.

Having developed the chance model, some analyst recommended a classification accuracy of at least 25 percent greater than achieved by chance. However by and large, the determining factor should be based on the cost in relation to the value of the information.