CHAPTER 2
LITERATURE REVIEW

INTRODUCTION

Bankruptcy is the status of a debtor who has been declared by judicial process to be insolvent or unable to pay his debts as they fall due out of his assets. This sets in motion a statutory system which has two primary objectives. The first is to vest all the property which the debtor has at the commencement of the bankruptcy or acquires before his discharge in a trustee for distribution among his creditors equitably according to their rights. The second is to release the debtor from his liability to those creditors at the end of a specified period subject to his conduct during the bankruptcy. These issues are reviewed here in the Malaysian context.

It is also noted that a number of studies have been carried out in an attempt to predict business failure. In general, the following issues have been addressed by all or some of these studies: (a) the possibility of extracting the best combination of variables to do the best job among the alternatives; (b) the possibility of data reduction; (c) the extent of the reliability of the predictive power as the date of bankruptcy become more remort; (d) the extend of the accuracy of the predictions. Some of these studies are reviewed here in the proceeding sections.

MALAYSIAN BANKRUPTCY LAW (ACT 360)

An act of bankruptcy is said to be comitted by a debtor in each of the following situations:

(a) If a debtor makes a conveyance of his property to a trustee for his creditors benefit;

(b) If he make a frudulent transfer of any part of his property or creates any charge;

which would be seen in the eyes of the law as a fraudulent preference if he were adjudged bankrupt;

(c) If he departs out of the federation, or absents himself or close his place of business, or submits fraudulently to an order for the payment of money; all with intent to defeat or delay his creditors;

(d) If execution issued against him has been levied by seizure of his property in any civil proceeding in the courts where the judgement, including costs, is for an amount of one thousand dollars or more;

(e) If he presents a bankruptcy petition against himself or files in the court a declaration of his inability to pay his debts;

(f) If he notify the creditors of the suspended payment of his debts;

(g) If he makes to other creditors a proposal for a scheme of arrangement of his affairs and the proposal is not followed by the registration within fourteen days of a deed of arrangement with his creditors in accordance with the rules in force for the registration of deeds of arrangement.

(h) If a creditor has obtained a final judgement or order against him for any amount, a bankruptcy notice under this act requires him to pay the judgement debt or sum ordered to be paid in accordance with the terms of the judgement or order, or to secure or compound for it to the satisfaction of the creditor or the court;

(I) If a debtor possessed no property liable to seizure in the event of a writ of attachment then the date when the writ is lodged with the officer responsible for the execution shall be deemed to be the date of the act of bankruptcy.

According to the act, a bankruptcy notice must be in the prescribed form, stating the consequence of non-compliance and be served in a manner specifying an agent to act on behalf of the creditor in respect of any payment or other matters. This notice can only be invalidated when the debtor disputes the validity of the notice within a specified time, on the grounds of a mistake that the amount specified in the notice as due exceeds the amount actually due.

On the other hand a creditor can present a bankruptcy petition against a debtor under the condition that:

(a) the debt owing by the debtor to the petitioning creditor or creditors amounts to ten thousand Ringgit; and

(b) the debt is a liquidated sum payable either immediately or at certain time in the future; and

(c) the bankruptcy on which the petition is filed occured within six months before the presentation of the petition.

(d) the debtor is residing or has resided in the federation or any state or has carried on business in the federation within one year before the date of the presentation of the petition.

(e) A secured petitioning creditor must state in his petition that he is willing to give up his security for the benefit of the creditors in the event of the debtor being adjudged bankrupt or give an estimate of the value of his security in which case his petition may be admitted as an unsecured creditor.

Thus under these circumstance and the fulfillement of the prescribed proceedings and order on creditor's and debtor's petition, a receiving order is effected. Upon such order being made against a debtor the official assignee takes possession of all books of account and documents in the possession of the debtor relating to all his property or affairs.

Court may detain or order arrest of debtor and commit him to prison unless he gives security not to leave the federation. Then a public examination of debtor is conducted as to his dealing and property.There and then a composition in satisfaction of the debts due to the creditors from the debtor, or a proposal for a scheme of arrangement of the debtor's affairs is agreed upon by the creditors and approved by the court.

However when a debtor is adjudged bankrupt his property becomes divisible among his creditors and vests in the official Assignee.The debtor at this stage is disqualified for being appointed or acting as a president of a sessions court or magistrate or being nominated or elected to or holding the office of any town or city council.

Bankruptcy proceedings is not without costs, which includes, (a) direct bankruptcy costs such as legal, accounting, filing and other administrative costs; and (b) indirect bankruptcy costs namely the lost profit that a firm can be expected to suffer due to significant bankruptcy potential.Therefore efforts to forecast and avoid this unpleasant scenario is of paramount importance.

BEAVER (1967) -- U.S.A.

One of the most difficult tasks facing the accounting profession is the evaluation of alternative accounting measures, despite the a priori arguments advanced in support of each alternative. Therefore, there was a general recognition for the need of an empirical research so as to obtain a meaningful evaluation.

The specific purpose of this study is two fold:

1. To emphasized the need for emprical verification of a priori beliefs about alternative acccounting measures by citing one area where widely held beliefs were found to be erroneous when examined by empirical evidence, and
2. To illustrate a method for empirically evaluating alternative accounting measures (i.e financial ratios) in terms of their ability to predict failures. There were 158 firms in the study. Out of this, 79 were failed firms and the other 79 were nonfailed firms. The sample were drawn from Moody's Industrial manuals during the period 1954 through 1964 inclusive.The samples were drawn in such a way that the fail firms match in terms of asset size and industry. The firms represented 38 different industries and their asset size ranged from 600,000 to 45,000,000 dollars.

The financial statement data of the failed and nonfailed firms were collected for five years prior to failure. The data were then grouped and the financial ratios computed are : I. NONLIQUID ASSET RATIOS

1. Cash flow to total debt
2. Net income to total assets
3. Totoal debt to total assets

II. LIQUID ASSET RATIOS

A. Total Asset Group

1. Current assets to total assets
2. Quick assets to total assets
3. Networking capital to total assets
4. Cash to total assets

B. Current Debt Group

1. Current assets to current debt (current ratio)
2. Quick assets to current debt (quick ratio)
3. Cash to current debt

C. Net Sales or Turnover Group

1.Current assets to sales
2. Quick assets to sales
3. Net working capital to sales
4. Cash to sales

Three levels of analysis was done, and they are (1) dichotomous classification test, (2) the comparison of mean values of ratio components, and (3) the likelihood ratio analysis.

In the dichotomous classification, test a firms failure status is predicted based solely upon a knowledge of the financial ratio. The firms are randomly divided into two subsamples and for a given ratio the data of the subsamples are arranged in ascending order. This is then inspected to determine an optimal cutoff ratio that best minimizes the percentage of incorrect predictions. Thus the classification of failed or

nonfailed firms depends on whether it is located after or before the cutoff point. The percentage of incorrect classification is determined by comparing the classification with the actual failure status of the firms.Then the optimal cutoff point for the first subsample was used to predict failure status of firms in the second subsample: Similarly second subsample firms were used to predict failures for the first subsample. This procedure was conducted for each year before failure and the results tabulated.

The evidence indicates that, the non-liquid asset measures i.e cash flow and net income ratios predict failure better than the liquid asset measures, even in the years immediately before failure. The debt-asset ratio predicts better than the eleven ratios, one, four, and five years before failure. Secondly the study also demonstrates that there is a vast difference in predictive ability among the liquid asset measures themselves. Networking capital and quick asset predicts better than current assets. However cash predicts better than both current asset and quick assets. To gain additional insight into the differences in predictive ability, the behaviour of the ratio components was examined.

For the analysis of ratio components, the mean values of thirteen financial statement items were computed for each year before failure. The failed firms were found to generate less sales. They have poorer cash flow and net income positions and they incure more debt. Failed firms have less cash but more account receivable. Thus, the reason why cash predicted better than either quick assets or current assets. Failed firms have less curent assets but more current debt. Hence, networking capital highlights the difference between failed and nonfailed firms which makes it a better predictor than current assets alone.

The likelihood ratio approach entails looking at the financial ratios to indicate the extent to which a decision maker's assessments of the probability of failure are altered.

This analysis was conducted based upon an inspection of 140 histograms. The ranking of financial ratios under this analysis was almost the same as it was for the classification test, thus emphasizing the latter.

ALTMAN (1968) -- U.S.A.

Theorists downgrade company ratio comparisons, widely used by practitioners and academicians seem to abandoned ratio analysis in assessing the performance of the business enterprise. However Altman belief that we should bridge the gap between the traditional ratio analysis and the more rigorous statistical techniques which have become popular among academecians in recent years.

The purpose of this study is to attempt an assessment of the quality of ratio analysis as an analytical technique. This is attained by investigating a set of financial and economic ratios of manufacturing corporations in a bankruptcy prediction context wherein a multiple discriminant statistical methodology is employed.

The study sample is composed of 66 corporations with 33 firms in the bankryptcy group and 33 firms in the nonbankruptcy group. The bankrupt group are manufacturers that file a bankruptcy petition during the period 1946-1965. The asset range of these firms is between $0.7million and $25.9million. The nonbankrupt group consisted of a paired sample of manufacturing firms chosen on a stratified random basis. The asset size range is restricted to between $1-$25millions. The firms in this group were still in existence during the time of this study. The data collected are from the same year as those compiled for the bankrupt firms.

From the balance sheet and income statement data of the selected firms, a list of twenty-two potentially helpful variables (ratios) is compiled for evaluation. These variables are then classified into ratio category such as liquidity, profitability, leverage, solvency, and activity groups.

However only five variables are selected from the original list as doing the best overall job together in the prediction of corporate bankruptcy. They are (1) working capital / total assets, (2) retained earnings / total assets, (3) earnings before interest and taxes / totoal assets, (4) market value equity / book value of total debt and (5) sales / total assets. It is noted that this variable profile finally established did not contain the

most significant variables , amongs the twenty-two original ones measured ndependently. The final function Z, stated below, does the best job among the alternatives which include numerous computer runs analyzing different ratio-profiles. The function is as follows:

$Z = .012X1 + .014X2 + .033X3 + .006X4 + .999X5$

where X1, X2, X3, X4, and X5 are the five variables selected above respectively. An "F" test is performed to test the individual discriminating ability of the variables. Results show that variable X1 through X4 are all significant at the .001 level which indicates extremely significant differences betwen groups in these variables. However variable X5 did not manifest any significant difference between groups.

To arrive at the final variable profile, Altman determined the relative contribution of each variable to the total discriminating power of the function, and the interaction between them. Then the accuracy of the model in predicting bankruptcy is monitored by performing tests in the following manner:

(1) Examining the initial sample of firms using data for one year prior to bankruptcy. The model classifies 95 per cent of the total sample correctly. Type I error* proved to be 6 per cent and only 3 per cent for type II error*.

(2) Observing the discriminating ability of the model for firms using data from two years prior to bankruptcy. 72 per cent of the firms were assigned correctly. Type I error is 28 per cent and type II error 6 per cent.

(3) Potential bias and validation techniques in which estimates of the parameters for the model is made using subsets of the original sample, and then to classify the remainder of the sample based on the parameters established. Then the significance of the result is tested by applying a t-test. The secondary sample for this test which is conducted five times is chosen in five different methods: (I) random sampling, (II) choosing every other firm starting with firm

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*Type I error:Predictions of failed companies not to fail.

*Type II error:Predictions of non-failed companies to fail.

number one, (III) starting with firm number two, (IV) choosing firms 1- 16, and (V) firms 17-32.

The results confirmed that there is a difference between the groups and that the model possess discriminating power on observations other than those used to establish the parameters of the model.

(4) Introducing a new sample of twenty-five bankrupt firms of the same asset-size range as the initial bankrupt group and then classify the firms using the model. The results show that for one statement prior to bankruptcy 96 per cent of the firms were correctly predicted, thus a Type I error of 4 per cent.

(5) Selecting secondary sample of nonbankrupt firms that have encountered earning problems. Sixty-six of such firms is selected and evaluated by the discriminant model to determine their predictive bankruptcy potential. The results show that the discriminant model correctly classified 79 per cent of the sample firms.

(6) Determining the overall effectiveness of the discriminant model for a longer period of time prior to bankruptcy. This is attained by gathering data for the original firms from third, fourth and fifth year prior to bankruptcy. The results show that the accuracy of the model falls of as the lead time increases and infact the discriminant model becomes more and more unreliable in its predictive ability after the second year.

In order to buttress this findings an observation is made on the five predictive variables on a univariate basis for five years prior to bankruptcy. It is noted that all the ratios show a deteriorating trend as bankruptcy approached and the most significant changes in most of the ratios occured between the third and second year prior to bankruptcy. This provides evidence consistent with conclusions derived from the discriminant model thus manifesting the fact that individual ratio measurement trends takes on significance only when integrated with discriminant analysis.

DEAKIN (1972) -- U.S.A.

Creditors and Stockholders encure substential loses in the event of the failure of a business firm. Therefore a model to provide an ample warning of this event will be quite appealing to these interested parties. This was a sufficient motivation for researchers to develop models for predicting failure based on the financial reports of firms.

The purpose of this paper is to propose an alternative model other than Beaver's (1967, 1968) and Altman's (1968), for predicting failure. Beaver's empirical results suggest that his method has greater predictive ability, however the method used by Altman has more intuitive appeal.

The general procedure used by Beaver in his studies was followed in this one but with one major difference. A sample of 32 failed firms which experience failure between 1964 and 1970 were selected. Failure, in this context includes only those firms which experience bankruptcy, insolvency, or were otherwise liquidated for the benefit of creditors. Beaver's failed firms unlike this, include those which defaulted on loan obligations or missed preferred dividend payments. This could lead to potential bias in certain of the ratios, unless the nonbankrupt firms were matched by debt structure as well as by size and industry. Deakin (1972) selected each of the nonfailed firms to match with the the failed firms on the basis of industry and classification, year of the financial information provided and asset size.

The results of the dichotomous classification test using fourteen financial ratios calculated for each firm is compared with that of Beaver. Then the Spearman rank-order correlation coefficient is used to determine the predictive power of the ratios in the two studies. The coefficients are very high in four of the five years which tend to confirm Beaver's observation.

However the correlation coefficient in the third year is considerably lower than the coefficient in the other four years. To give some insight into why this coefficient is relatively less, a comparison is made of the mean of 13 financial statement items which were used in the calculation of the financial ratios for the five years.

Observation of the mean of the total assets shows that failed firms tend to expand rapidly in the third and fourth years prior to failure. The capital structure indicates that the expansion was financed by increased debt and preferred stock instead of common stock or retained earnings. Therefore, funds raised were invested in plant and equipment rather than in liquid assets. This phenomenon did not appear in the Beaver study. Results show that these firms could not later support their heavier debt by the sales and net income they generate and therefore rapidly loss their assets after the third year prior to failure. At that point, their debt ratios and asset ratios tend to fall back in line with the ratios shown in the earlier studies.

Discriminant analysis is then used to improve on the 20% error in misclassification in the year prior to bankruptcy. It is thus demonstrated that discriminant analysis can be used to predict business failure from accounting data as far as three years in advance with a fairly high accuracy.

BLUM (1974) -- U.S.A.

Antitrust laws are often violated by mergers of competitors. The Failing Company Doctrine is one of the few possible defenses to a merger prosecution. This defense can be invoked when a failing company involved in a merger, receives no offer to merge from a company with which a merger would have been legal.

The purpose of this study is to construct a failing company model to aid in assessing the probability of business failure. The theory of the various ways in which impending failure might be symptomised by accounting data, form the basis of selection of variables for the failing company model. To provide a general framework for variable selection Blum (1974) considered a business firm as a reservoir of financial resources and describe its probability of failure in terms of expected flow of those resources. He asserted that the probability of failure is most likely:

(1) the smaller the reservoir,

(2) the smaller the inflow of resources from operation in both short and long run,

(3) the larger the claims on the resources by creditors,

(4) the more highly variable are earnings and claims against resources,

(5) the greater the outflow of resources required by the operations of the business,

(6) the more "failure-prone" the industry locations of a firm's business activities are expected to be.

The model is thus constructed with reference to three denominators, which are liquidity, profitability, and variability.

A sample of 115 companies (industrial firms) which failed during the year 1954-1968 and which had a minimum of $1,000,000 in liabilities at date of failure were selected.The 115 failed firms were paired with 115 nonfailed fairms. To achieve a match, sampling was based on four criteria utilized in the following order: industry, sales, number of employees, and fiscal year. This is intended to exclude companies which because of size or industry were extremely unlikely to fail. Data is drawn from balance sheets, income statements and stock market prices for a period of at least three years.

The accuracy of the model is tested by using discriminant analysis for computing an index and a cutoff point on the index. A company's index score is said to be the sum of its standardized variables. A critical score (cutoff point on the index) results in a minimum of misclassification. The model predicted with an accuracy of approximately 93% at first year before failure and 80% at the second year and 70% at the third, fourth and fifth year before failure.

ALTMAN, BAIDYA, AND RIBEIRO-DIAS (1979) -- BRAZIL

The sample consists of a group of 23 firms categorized as serious-problem (SP) and another 23 categorized as no-problem (NP).The serious-problem firms were those filing formal petitions for court-supervised liquidations, legal reorganizations in bankruptcy, and out-of-court manifestations of serious problems. A number of variables were then calculated for each observation. The data collected covered the period from one to three annual reporting statements prior to the problem date. The

average asset size of the serious-problem firms was at U.S. $25-30million and that of the no-problem group is smaller.

In this Brazilian study the classification procedure is based on Altman's 1968 model modified for Brazilian standard, also the same variables were utilized. However X2 and X4 were modified. X2, the retained earnings account on U.S. balance sheet has nearest translation to those earnings retained in the business after distribution of dividends, in the Brazilian context. To derive the new value for X4, the book value of equity was substituted and divided by the total liabilities. Models Z1 and Z2 below, were developed.

$Z1 = 1.44 + 4.03X2 + 2.25X3 + 0.14X4 + 0.42X5$

$Z2 = 1.84 - 0.51X1 + 6.23X2 + 0.71X4 + 0.56X5$

Model Z1 does not include X1 because the stepwise discriminant program indicated that it did not add any explanatory power to the model and the sign of the coefficient was contrary to intuitive logic. Model Z2 does not include X2 because it is difficult to derive X2 with just one set of financial statements and it is similar to X4. The critical cutoff score is zero in both cases.

Results show that model Z1 perform better for year 2 and 3, therefore it is selected as the base of the analysis. The model yielded an accuracy of 88%. The Type I error was 13% and Type II error 11.4%. Further more the weights from the model constructed with year 1 data was utilized and then variables measured for year 2 and 3 prior to SP date were inserted. A drop in the accuracy of the model is noted as data become more remote.

TAKAHASHI, KUROKAWA, AND WATSE, (1979) -- JAPAN

Some Japanese studies published include Nomura Research Institute (1973), Toda (1974), Itoh (1977), Ohta (1978), Tanaka and Wakagi (1978), Murahami (1979), Igara and Ozeki and Ohno (1980). Most of them used multivariate predictioon models using discriminant functions and they invariably deal with listed corporations as their sample firms. Since bankruptcy is very rare in the listed corporations in Japan, none of the

studies mentioned above uses any verification test samples (secondary samples) apart from samples for analysis purposes (initial samples).

The purpose of this study is to highlight the financial characteristics of failed firms in Japan, and to construct corporate bankruptcy prediction models with greater prediction accuracy.

Takahashi et al selected 36 pairs of failed and nonfailed manufacturing entities which were listed on the Tokyo Stock Exchange from 1962 through 1976.

17 different models were developed from the numerous financial statement data and indices used, which are (a) non-adjusted data or data adjusted to reflect the exceptions in the audit report, (b) accrual or cash base financial data indices; (c) index value for three or one year before failure; or (d) ratios alone, or a combination of ratios and absolute amounts.

Six different cutoff points were adopted for the models. The argument being that when the Japanese try to predict bankruptcy of a firm they would prefer to have more than one cutoff point, such as the most conservative point, the most optimistic point or the point where bankruptcy may occur with a certain statistical probability percentage.

The prediction accuracy tests conducted for the 17 models revealed that models with several years of data for each firm outperformed a similar model with data from only one year prior to failure. Further, they found that absolute financial statement data contributed to the improved classification accuracy and that data from financial reports prepared from an "investment effect" or cash basis method. Also, adjusting the data to account for auditor opinion limitations improved the information content of the reported numbers and ratios. Model 17 which used both ratios and absolute amounts derived from adjusted accrual base and cash base financial statement data for three years before failure, emerged as the best prediction model. Takahashi et al. (1979) argued that their model could be more accurate than Altman's because of the four premis, mentioned earlier, on which the models were developed.

SANDRO (1984) -- ITALY

Many studies have been made concerning the prediction of corporate bankruptcy. This was as a result of economists demonstrating that certain financial ratios can be useful in predicting insolvencies. Appetiti of Italy conducted his studies with the following objectives in mind. (I) to develope a predictive model, using discriminant analysis to forecast the solvency of Italian firms and (II) to compare the ability of this model with that of a second one in which static ratios have been replaced by values that take account of their own trends.

A sample of 25 unsound firms and 25 sound firms were selected. In Italy bankruptcy is not necessarily set up for firms that are either insolvent or in a state of crisis. Thus unsound firms are defined as those that were insolvent in the sense that they had not met their obligations with the Bank, or had had serious and not temporary difficulty in doing so.

Samples were made up of firms belonging to the manufacturing sector only. The sound and unsound firms were paired only on the heading of Industry.
The data used in the study were taken from balance sheets and profit and lost accounts.

In this study a total of 47 ratios was selected, divided into six groups. The group headings are (1)liquidity, (2) turnover, (3) gearing, (4) operative structure and efficiency, (5) size and capitalization, (6) profitability. The analysis of the mean and variance of each ratio showed significant differences between the two groups which confirms what was expected.

A best two variable function comprising working capital/medium- and long-term debt and accumulated depreciation/gross fixed assets ratios is then developed. This function correctly classifies 84% of the firms. However a validation test carried out on a separate sample, showed a serious decrease in the efficiency of the function. with an error rate of 30% in year -1.
In order to construct the second model , the standardized values of the ratios were used. Then a two variable function was obtained. The values included in the function

were those concerned with ratios which represent interest charges / value added. This function correctly classifies 92% unsound firms and 84% sound firms.
The results indicate that the trend methodology (i.e. second model) produced better results. It indicate ratios that are also the two best single ratios. This shows trend variables great ability to draw out information from balance sheet data.

In conclusion, the results obtained, confirmed that balance sheet ratios can be a helpful instrument in analyzing firms in Italy and also that trend variables within a discriminant function provide more information than static values, at least for the last three years prior to insolvency.

BERNARD (1984) -- FRANCE

Business failure are a matter of major concern to governments and business alike. The period of slow growth in France, and the rigidity of its productive system make it more important than ever to act to insure the survival of its industrial fabric. To this end the French Parliament passed a Government bill designed to head off business failures by means of a series of early-warning signals.
The objective of this paper is three fold:

1. To find a discriminant function capable of detecting symptoms of failure, two or three years in advance.
2. To develop a function capable of preserving its predictive powers even when applied to a period subsequent to the one in which it was established.
3. To formulate the discriminant function exclusively on the basis of accounting, economic and financial ratios to ensure that each observers outside the firm could calculate the function without inside information.

The sample for the normal companies selected is 1,150. They were all in business through the period 1972-1979. From this, two subsamples were defined. The first consists of 83 companies for the purpose of determining functions according to the year in which failed companies were declared bankrupt (1975-1980). The second

consists of 264 companies for the purpose of determining functions according to the period of bankruptcies (1975-1977, 1978-1980) of failed companies.

The sample for the failed business is 520 companies which failed between 1975 and 1980. The term "failed business" covers companies whose failure has been sanctioned either by judicial proceedings, by merger or takeover, or by voluntary winding up.

A total of 19 accounting, economic and financial ratios representative of the company's financial structure, dynamism, results and day-to-day management were choosen. The ratios fall within a general pattern inetnded to describe the firm as a going concern. This is aimed at appraising the firm's vulnerability rather than its insolvency.

The function is determined by conducting two analysis. The first analysis compared normal companies with failed ones three years, two years and one year prior to failure. The second analysis covers failures in the two subperiod, occuring in 1975-1977 and in 1978-1980, i.e. 246 and 265 companies respectively. This is to attenuate the influence of short-term environmental factors.

From the test conducted to select the function, the function calculated at 3 years during the failurre period 1978-1980 emerged as the most desirable. One reason being that it is capable of detecting the symptoms of failure both 3 yeras, 2 years and 1 year prior to failure. It classifies 77.3% of the faied companies and 80.1% of the normal companies correctly. However its accuracy deteriorates as the years to failure increase. One salient characteristic of this function is the preponderant role of the first ratio, interest charges / gross operating profit (debt service), which accounts for about 42% of the behavioral differences observed.

IZAN (1984) -- AUSTRALIA

In Australia at the time, there was a very small number of business failure from any one sector. This makes it difficult to develop a failure classification model for any one industrial sector. The model developed in this studies is sufficiently general to be applied across several industrial sectors.

The purpose of this paper is to investigate the indication of corporate distress in Australia and to construct a business failure classification model which could be reliably applied across a broad cross-section of industrial sectors. While many of the studies to predict individual firm distress problems have been fairly accurate, few had sufficient number of failed firm observations to conduct independent holdout tests or have carried out follow-up predictive studies. Thus there is great concern with the limited applicability across industries. This paper seeks to address this issue and will use an industry-relative approach to take into account differences across industries.

The sample is composed of 53 failed firms representing 12 industrial sectors and rangeed in size from $0.3 million to $143.0 million in tangible assets. The failed group are firms that had a receiver or liquidator appointed over the period 1963-1979. 50 non-failed firms were matched to the failed sample by randomly selecting firms from the same industry for the same year.

Ten ratios were selected based on an assessment of their potential to provide early warning indicators of financial distress. Since ratios were selected from various types of manufacturing, retailing, building, developers and service firms, a method to adjust the raw ratios to reduce the impact of industry difference is thus used. The following "industry relatives" are used here to reduce this impact

Xit / Xigt = Irit,

where Xi = RATIO I,

g = industry g

t = year t, where t = 1960-1978, and

Xigt = industry g's median for ratio i in period t.

Irit = Industry relative

An industry relative below 1.0 indicates a less than industry "average" performance for tha ratio in that specific year. An IR greater tahn 1.0, of course, indicates above average performance.

From the original list of variables, the following five industry relatives were selected as doing the best job: (1) Earning before interest and taxes (EBIT) / tangible total assets, (2) EBIT / interest payments, (3) current assets / current liabilities, (4) funded debt (borrowings) / share holder funds, (5) market value of equity / total liabilities.

This yields a Z score, $Z = A0 + A1X1 + A2X2 + A3X3 + A4X4 + A5X5$

where A0 is the constant term, A1-A5 are the coefficients or weights, and X1-X5 are the discriminant variables (industry relatives).

Results show that the Type I accuracy is 94.1% and the Type II accuracy is 89.6%. Results also show that the 'best' raw-ratio profile applied to the initial sample of firms are not as accurate as for the industry-relative model. Also the misclassified firms for the raw-ratio approach included errors from six industries while the industry-relative approach include errors from only four industries. The results of the classification accuracy test of the industry-relative model shows modest accuracy of 75.0% for year 2 and barely acceptable accuracy of 63.5% for year 3 as opposed to 94.1% in the original year. Data on a secondary sample of ten failed companies which are not included in the original sample show a classification accuracy of 100%, 70% and 40% in year 1, 2 and 3 prior to failure, respectively. The model is felt to be sufficiently robust so as to be applicable across a broad cross-section of firms and industries and appropriate for analyzing firms of all sizes.

A summary of these studies can be find in appendix 2-A.