'A study on failure prediction models as enhancements to the credit evaluation procedure in a South African Corporate bank'

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In Memory of my Dad

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Table of Contents

List of Tables

Executive Summary

The high incidence of loan defaults currently experienced by the banking industry is resulting in a loss of profits for banks and is restricting their potential to acquire new business due to the liquid asset restrictions imposed by Government legislation. This business problem has been identified at the target corporate bank.

Loan defaults are often the result of business failures and inadequate credit evaluation procedures which do not identify failing businesses in time. Business failures according to G.S Andrews (1978) are the result in 93% of cases of management incompetence. In recent months alone two large public companies namely MacMed healthcare Ltd and LeisureNet Ltd, have been brought to their knees. Creditors along with other stakeholders namely: management, auditors and shareholders are concerned with the going concern and the financial health of businesses in which they have vested interests. Could banks reduce loan defaults and potential losses by predicting business failures sooner than they already do?

This question highlights the need for reducing errors of judgement in existing bank credit procedures. A primary function of the bank credit manager is to evaluate the risk of a borrower, being unable to repay a loan (Falkena, Kok and Meijer, 1989). The existing credit evaluation procedure in the bank relies on the quality of the qualitative and quantitative data which is provided by the sales force. A recent enhancement to the credit procedure has been the introduction of a loan grading system that is a step in the evolution of a more sophisticated model for the defining, managing and pricing of credit

risk. Once the loan has been motivated on the credit information report by the sales manager, the loan will go to the credit manager/panel for approval depending on the loan amount being borrowed. There are six levels of credit panel approval culminating at the banks executive board. The current quantitative process relies on an adhoc use of traditional ratio analysis applied to the borrowers financial statement data. Traditional financial ratio analysis has several shortcomings, the primary one being the ability for ratios to be manipulated through creative accounting. At no stage in the banks credit evaluation procedure are failure prediction models used as a quantitative means of analysing financial statement data.

These limitations in financial ratio analysis inspired Edward Altman (1983), to suggest that to add an appropriate failure prediction model to the tools available to lending officers would be a useful supplement to the overall credit evaluation procedure in a bank. The objective of this dissertation is to investigate whether the credit risk evaluation procedure of a local corporate bank can be enhanced by the use of selected failure prediction models on a local sample of failed and non-failed public companies.

Many formulae have been tested and refined over the years in an attempt to predict corporate failure, but it was the pioneering efforts of William Beaver (1966) with his univariate analysis that set the stage for later multivariate analysis by Edward Altman (1983). The historical development of both univariate and multivariate models is discussed at length in the literature review section of this dissertation as a thorough understanding of the models is necessary to make an informed selection.

Beaver defined failure as not only the inability of a firm to repay its financial obligations as they mature but also as one of several situations namely: bankruptcy, bond default and overdrawn bank account. Beaver selected the best predictive ratio from a sample of 30 ratios. His best predictive ratio is cash flow to total debt and it correctly identified firms one year prior to failure. He also concluded that financial ratios have the ability to predict failure five years before failure. There was not much more univariate work following Beavers studies. Beavers study inspired South African's Strebel and Andrews (1977), to apply his cash flow to total debt ratio to local companies with resultant success thus enabling them to set local guidelines for users of this ratio in analysing failed or non-failed firms.

Edward Altman began work on multiple discriminant analysis (MDA) in 1968. MDA is based on more than one variable (ratio) and is a statistical technique which enables the establishment of a linear equation which when applied to certain variables will classify firms as either failed or non-failed. Altman concluded that the advantage of MDA over traditional univariate analysis was that in MDA combinations of ratios can be analyzed together which has the advantage of removing ambiguities and misclassifications observed in traditional ratio analysis. Altman develped his famous Z-score model which became the platform for the development of similar models worldwide. Misclassifiaction in the Z-score was minimized by having cut-off scores identifying bankrupt, non-bankrupt and zone of ignorance businesses. The Z-score was 72% accurate as a predictor

of failure up to 2 years prior to bankruptcy, and is 96% accurate on data one year before bankruptcy. Altman suggested that his model complement business loan evaluations.

In South Africa the pioneering work on the K-score model by Dr J.H. De La Rey was regarded as South Africa's best known failure prediction model. De La Rey's K-score model sucessfully scored 94.5% of non-failed firms and 98.6% of failed firms two years before failure. A most notable advantage of the K-score is that it can be applied to data across different business sectors. The work of Amiras, Aston and Cohen in South Africa produced the A-ratio model which correctly classified 89% of companies in their test sample as failed or non-failed one year before failure.

The primary limitation of the models has been the fact that they rely on backward looking financial information whilst trying to predict future outcomes. This information can be subject to creative accounting that can mask the true financial position of a business.

The 1994 work of G.A Garbers and Prof E.O. Uliana, provided the source of inspiration for this dissertation. In their study three models were chosen and applied to 17 private companies, which had all been identified as problematic by the target bank. This analysis was to investigate whether the credit risk management of a South African commercial bank could be enhanced by the use of selected failure prediction models. They found that the use of the De La Rey and Beaver models predicted business distress before the bank thus enabling the bank to enhance the effectiveness of the existing credit procedure.

Based on the findings of this research and the identification of a similar business problem at a local corporate bank the null hypothesis for this study was operationalised as:

"A selection of failure prediction models will not enhance the traditional bank credit evaluation procedure by not predicting business failure before the bank".

The alternative hypothesis is:

"A selection of failure prediction models will enhance the traditional bank credit evaluation procedure by predicting business failure before the bank".

This research has relied on both primary and secondary data collection. Secondary data has been sourced from the likes of the university main library and from the internet. Following an initial experience survey with the relevant key personnel in the credit division of the bank, primary data was collected in respect to the existing credit evaluation procedure and the choice of the relevant sample of failed and non-failed businesses was made. The selection of public companies was seen as an adequate representation of the banks borrower profile. The sample consisted of seven failed businesses that had all been recently liquidated or were under liquidation orders and six non-failed companies. Further selection criteria for the sample were:

- 1. The failed and non-failed samples were taken from public companies that had borrowed from the corporate bank.
- 2. The failed and non-failed sample were matched where possible according to industry type, capitalization size and age of the business.
- 3. All the companies had to have at least two years audited financial statements, to enable the selected failure models to be applied to the data.

The models selected for this study were:

- 1. Beaver's univariate model,
- 2. Altman's Z-score model,
- 3. De La Rey's K-score model,
- 4. Amiras, Aston and Cohen's A-ratio model.

The inclusion of Beaver's international model was based on the fact that it has already proved to be reliable as an indicator in local conditions by research findings of Strebel and Andrews and also by Garbers and Uliana. The Altman model is the only international model that was included as a comparative for the local South African MDA models. The results of the Z-score cannot be taken seriously as it is well known from the research of Argenti (1976) and Collins(1974) that Altman's Z-score model cannot be applied to foreign samples, with any degree of accuracy or reliability because the coefficients are formulated on American companies. The De La Rey model had already proved to be reliable in the research conducted by Garbers and Uliana so it was natural to select this famous local model. The A-ratio model was selected as the second local model to expose it to further testing outside of its academic use.

The second stage of primary data collection involved direct analysis of the selected sample of borrowers bank files. Information with regard to financial statement data and the timing of the bank's distress signal was recorded. The timing of the bank's signal would be compared to the timing of the selected model signal. The financial ratio data applicable to each model was taken from the audited financial statements and was then

applied to the selected failure models in a Microsoft Excel spreadsheet. If the resultant score predicted complete failure for the business then the year of this signal would be recorded and compared to the bank's distress signal.

The research has been ex post facto in design and there has been no manipulation of the variables. The bank and model distress signal timing were recorded in the cross-tabulation (Table 4), for both the failed and non-failed sample. These results were then applied to crosstabulation tables, which compared the four selected models along the following criteria:

- 1. Number of times the bank predicted before the model,
- 2. Number of simultaneous predictions with the bank,
- 3. Number of times the model did nor predict before the bank and
- 4. Number of times the model predicted before the bank.

In the case of the non-failed sample the bank had only signalled distress in two of the six companies cases, so the two companies could only be included in the final consolidated summary of the findings (Table 7), making the study consist of nine companies out of the total sample of thirteen. The remaining four non-failed sample remain as an example for the bank that the De La Rey, Beaver and A-ratio model's signaled distress in some years when the bank did not signal at all.

The consolidated failed and non-failed findings (Table 7) indicate:

- 1. Beaver

In the case of Beaver's model it predicted on more occasions before the bank. This finding supported the study by Garbers and Uliana in 1994. The findings for the Beaver model thus reject the null hypothesis and support the alternative hypothesis. The Beaver model will thus enhance the bank's credit evaluation procedure by predicting failure before the bank.

- 2. Altman Z-score.

The results of the Altman Z-score model supported the null-hypothesis and rejected the alternative hypothesis. The bank predicted on six occasions out of nine before the model thus supporting the conclusions made by Argenti (1976) and Collins (1974) that overseas models cannot be successfully used on local companies. The use of the Altman Z-score model does not enhance the bank's credit evaluation procedure, as the model did not predict before the bank. These results were merely for comparative purposes only.

- 3. De La Rey K-score

The De La Rey K-score model provided the most convincing result in favour of rejecting the null- hypothesis. The K-score model predicted before the bank on six occasions out of nine thus firmly supporting the use of this model to enhance the bank's credit evaluation procedure. It predicted failure before the bank on the most occasions out of all the selected models.

- 4. Amiras, Aston and Cohen A-Ratio

The A-ratio model provided the same results as the Beaver model namely it predicted before the bank on five occasions out of nine thus firmly rejecting the null-hypothesis,

and supporting the use of this model as an enhancement to the bank credit evaluation procedure.

The results of this dissertation conclude that the bank can enhance the effectiveness of its existing credit evaluation procedure by using the Beaver, De La Rey and the A-ratio models as these models have predicted failure before the bank on more occasions. These models have therefore rejected the null hypothesis and supported the alternative hypothesis. These models do not replace the existing credit evaluation procedure but are an extra quantitative tool for the existing credit process. The Altman model should not be applied to local samples as the results of this model support the null hypothesis and reject the alternative hypothesis. The Altman model does not enhance the credit evaluation procedure by not predicting failure before the bank.

Future research needs to include a forward looking model in credit evaluation that relies on projected financial data much like Net Present Value project appraisal which would help with ex ante prediction of failure. In this regard, it would be very important to have bank knowledge of the relevant company and business sector, as management can manipulate forecast cashflows more easily than accounting figures. Nevertheless, the combination of forecasts along with the application of failure models to existing data, would provide a broader basis on which to evaluate credit.

Chapter 1

Introduction

1.1 Background and Business Problem

Bankers have to manage a great variety of financial risks, namely: credit, interest rate, liquidity, currency, investment and capital risk exposures. With the sharp increase in interest rates in 1998 in the South African economy the impact on borrowers resulted in an increase in loan defaults causing in some cases losses to the bank. The impact on bank profits and the ability to take on new business, due to the liquid asset requirements of the Deposit Taking Institutions Act of 1990 are affected (Garbers, 1994).

Loan defaults are often caused by business failures, or businesses which are going through troubled times and are about to fail. Loan defaults are also the result of poor credit evaluation procedures at the bank. Business failures according to G.S Andrews, in 93% of cases, is directly attributed to management incompetence (1978: 1). Failure embraces various types of financial distress, ranging from bankruptcy at one extreme to a decline in profitability at the other (Morris 1997:2). Reports of business failure are becoming a more regular feature in the business press in South Africa.

In recent months alone, two large public companies, namely MacMed healthcare Ltd and LeisureNet Ltd, have been brought to their knees. The number of listed companies on the Johannesburg Stock Exchange (JSE) is on the decrease. Of the total number of listed companies 16 have failed over the past two years including the companies mentioned

above (Shevel 2000). According to Robertson in an article by Adele Shevel, "Creditors and other stakeholders take an enormous gamble when affording credit today as the possibility of corporate failure is so high that it is safer to play roulette at a local casino than granting credit to businesses". The reasons for these failures span from mismanagement of alarming proportions to acquisitions of companies at grossly inflated net asset values. Internal shrinkage, dubious auditing, and externalization of creditors money into, "hopefully undetected", offshore banking accounts are to blame (Shevel 2000).

This scenario has highlighted the need for reducing errors of judgement in credit evaluation procedures, and has highlighted the importance of managing credit risk.

A primary function of the bank credit manager is to evaluate the risk of a borrower, (an individual or company), being unable to repay a loan (Falkena, Kok and Meijer 1989). It is well known that to eliminate all credit risk is not feasible, reducing errors of judgement to a minimum is. As the business performance of the debtor usually falls outside the control of the banker, credit risk cannot be easily manipulated once credit has been granted so a major part of credit risk management is therefore related to the initial credit risk assessment.

The prediction of business failure is the objective of bank credit risk assessment. The prediction ability would hopefully reduce loan defaults, and thus reduce losses. Prediction for its part can refer to an ability to identify an event before it occurs, or instead an ability to discriminate correctly afterwards (Morris 1997:2).

The existing credit evaluation procedure includes information derived from a new 'Loan Grading system', which combines both quantitative and qualitative data to derive a single numeric score denoting the degree of risk inherent in a bank loan, and it also relies on the traditional procedure whereby both quantitative and qualitative variables are considered as separate inputs to derive a credit decision. The use of traditional financial ratio analysis is one quantitative method to ascertain the health of the business. The shortcomings of financial statement analysis are well known, the primary limitation been the ability for a company to 'window dress' their accounts by the use of creative accounting. The common ratios analyzed are therefore not reliable indicators of a company's financial health.

At no stage has the bank used failure prediction models to assist the quantitative decision process. Both the quantitative, and qualitative data are initially provided by the bank's sales staff. The sales staff are pressured to meet high monthly targets to grow new business and this means that the credit procedure must be able to sift through the facts in an ordered manner, without the influences of sales people. The quantitative data cannot be influenced by the sales force whereas qualitative data are often subject to debate and can very easily be distorted, due to the very subjective nature of this data.

The loan application is only submitted to the relevant credit manager once all the information is put together for a decision. This information is in the form of financial statements, and a credit information report (CIR). The score from the loan grading system will also be submitted. The credit mangers have limits of authority, and may only

approve a loan within their respective limit. If a loan is over this limit, the credit manager recommends the loan to the next level. The bank has six levels of credit decision, which will be discussed in the body of this report. The existing credit evaluation procedure is limited by the use of financial ratio analysis on the quantitative side and by the subjectivity of qualitative data.

The traditional limitations of financial ratio analysis inspired Altman (1983), to suggest that to add an appropriate failure prediction model to the tools available to lending officers would be a useful supplement to the overall credit evaluation procedure. In a similar vein, in South Africa, Court and Radloff (1990:11) stated that, "the prediction of corporate failure is of vital interest to those who advance credit". The pioneering failure prediction work of Beaver's (1967) univariate model, and Altman's (1968) multivariate model, provided the platform for the development of local South African models, most notably De La Rey's (multivariate) K-Score model (1981). The literature review will explore at length the development of failure prediction models, both internationally and in South Africa. A thorough understanding of these models is central to the selection process for this research dissertation.

The application of selected failure prediction models as an enhancement to bank credit evaluation procedures was studied by, G.A Garbers and Professor E.O Uliana (De Ratione Vol 8, No1, 1994). The timing of distress signals produced by the Clarke et al (1991), De La Rey (1981), and Beavers (1966) model were compared to the timing of distress signals by a local commercial bank on a sample of problematic private

borrowers. The Beaver and De La Rey models were frequently able to signal distress before the bank and these two models were therefore seen to enhance the banks credit evaluation procedure. Their findings also suggested that the bank test a number of models and identify a small selection that work well for its clients. Garbers and Uliana emphasised that the models supplement, and do not replace, the bank's existing credit evaluation process.

Based on the findings of Garber's and Uliana's research it is the intention to apply international and local models to a sample of failed and non-failed South African public companies, all of which have had substantial borrowings from a local Corporate bank (the bank). The Garbers and Uliana research findings provide an adequate comparative for this dissertation.

Attempts by Argenti (1976) and by Collins (1974) to apply Altman's Z-Score model to United Kingdom, (UK), and to South African companies, respectively, have both proved to be unsatisfactory (Arron & Sandler 1994:59). Research has proven that models based on the statistical information of one country cannot be used in other countries (Warren 1990:53). Based on this fact the inclusion of the Altman international model will be motivated purely as a comparative basis to be made with the results from the local models. The results of this model will need to be interpreted with this fact in mind. The findings of the Beaver model, although international, will be considered relevant as this model was tested for suitability on a sample of South African businesses by Strebel and Andrews (1977), and was also selected as a useful model to assist a South African bank credit procedure by Garbers and Uliana (1994).

1.2 Objectives of the study

It is the objective of this dissertation to investigate whether the credit risk evaluation procedure of a local South African corporate bank can be enhanced by the use of selected failure prediction models on a local sample of failed and non-failed public companies. The failed companies have been identified as problematic and some of the non-failed sample have been identified as problematic. The non-failed sample that have not been identified as problematic will still have the failure models applied to their financial data to act as a comparative basis for the failed sample. The study will entail researching the existing credit evaluation procedure at the bank, and then studying the history and background to failure prediction models in order to select the models which will then be applied to the selected sample, with the purpose of testing the null hypothesis. The null hypothesis is discussed after the literature review.

Chapter 2

2.1 The history of Failure prediction models

'When a man, a business corporation or an entire society is approaching bankruptcy, there are two courses that those involved can follow: they can evade the reality of their situation and act on a frantic, blind, rage-of-the-moment expediency-not daring to look ahead, wishing no one would name the truth, yet desperately hoping that something will save them somehow-or they can identify the situation, check their premises, discover their hidden assets and start rebuilding.' (A.Rand 1961:10)

In the business climate prevailing in South Africa at present an alarming number of seemingly sound businesses face potential collapse, or at best, a substantial deterioration in their financial positions (Feinberg, 1994:51). Failure warning signs, according to Feinberg, are generally ignored while a business is prospering and are heeded only at times of approaching depression or recession – when it is too late to avoid disaster (1994:51). The usefulness of predicting corporate failure has long held the attention of academics throughout the world and many formulae have been tested and refined over the years. Some of these formulae have been superseded by more sophisticated ones, but on the whole they use ratio analysis of the business's financial statements as a basis from which to make a decision on the going concern prospects of a business. Before embarking on a substantial review of the history of bankruptcy studies, it is important to define the precise meaning of the words 'failure' and 'prediction'.

The meaning of 'failure'

Richard Morris, (1997:24), discusses a spectrum of indicators which encompass the word 'Failure', starting with the fairly obvious understanding as 'liquidation' or the appointment of a receiver, to the less obvious indicators of 'financial distress'. His list encompasses:

- 1. Creditors or voluntary liquidation, appointment of a receiver i.e. bankruptcy;
- 2. Suspension of Johannesburg Stock Exchange (JSE) listing;
- 3. Going concern valuation by the auditors;
- 4. Protection sought from creditors;
- 5. Breach of debt covenants;
- 6. Company reconstruction;
- 7. Resignation of directors;
- 8. Take-overs (not always an indicator of financial distress)
- 9. Closure of part of the business;
- 10. A cut in dividends or the reporting of losses; or
- 11. The reporting of profits below a forecast or acceptable level.

Points 1 and 2 are definite proof of failure, whilst the others may be taken as indicators of impending difficulties.

Finding ways of trying to identify failing companies as early as possible is clearly a matter of considerable significance to investors, bankers, trade creditors, company directors, and auditors. Early prediction, for the bank, will allow early settlement of a debt and so can minimise losses of principal and interest before any other lender. In a perfectly competitive economy, market forces operate to eliminate inefficient firms. Thus

it could be said (Altman et al 1981:255), that business failures can have a "cleansing" effect, resulting in a more efficient allocation of resources. The costs of failure such as the loss of principal and interest to the bank, the loss of jobs in the market place have significant adverse spillover effects to the economy as a whole and therefore warrant careful analysis.

The meaning of 'prediction'

According to Morris (1997:25), 'prediction' has two distinct meanings:

- Identification historically (ex-post).
- Forecast in advance (ex-ante).

The forecasting interpretation of 'prediction', is what interests decision makers as in the case of our bank it would enable losses to be reduced, but any advantage given to the bank would be a momentary advantage as other players in the market would mimic the procedure and would thus close out any advantages.

2.2 International Multivariate and Univariate Research

A. Univariate Financial Ratio Analysis

The first serious academic interest in the business failure problem appeared after the Great Depression of the 1930's, in the United States of America (U.S.A). Led by Paul J. Fitzpatrick, Charles L. Merwin, and Arthur H. Winakor, working with Raymond Smith, they explored the apparent causes of business failures in the United States during the late 1920's and 1930's (Marquette 1980:8). The financial ratio was selected as the tool of analysis.

Fitzpatrick examined thirteen ratios for twenty firms that failed between 1920 and 1929. He concluded that of the ratio trends for five years prior to failure, the deterioration of net income to net worth and net worth to total debt provided the best warning of impending failure.

Winakor and Smith examined 183 industrial corporations utilising a total of 21 ratios for a ten-year period prior to failure. The most reliable early warning signal of a firm's financial distress was the trend in the ratio of net working capital to total assets. They also determined that long-term debt coverage ratios deteriorated badly as bankruptcy approached.

The absence of a comparison or benchmark control group, was a shortcoming of these two studies (Marquette 1980:10).

In 1942, Charles Merwin, incorporated in his studies a control group of 'continuing' firms to contrast with his 'discontinuing' firms. He examined the financial statements of 939 companies, and concluded that the ratios of net working capital to total assets, net worth to total debt and the current ratio, provided warning of impending failure up to six years before the fact.

There is a twenty-year break between these initial studies and the next studies to appear in 1966, on the subject of failure prediction. The two studies of Mier Tamari and William Beaver attempt an ex-post facto 'prediction' of corporate bankruptcy.

1. Tamari

Tamari worked in conjunction with a bank in Israel to develop a credit scoring system (Marquette 1981:10). A study was made of 28 Israeli firms, which were either bankrupt or forced to restructure their debt during the period 1956-1960. Tamari found that five

years before failure, selected ratios were lower than industry averages, and in most cases showed a marked decline in the pre-failure period (Marquette 1981:11).

2. Beaver

One of the classic works in the area of ratio analysis was performed by William Beaver (1966), (Altman 1983:101). Beaver's purpose was to test the usefulness of ratio analysis, and his univariate analysis of a number of bankruptcy predictors set the stage for the later multivariate attempts by Edward Altman. Beaver defined failure as not only the inability of a firm to pay its financial obligations as they mature, but also as one of several situations namely: bankruptcy, bond default, an overdrawn bank account, omission of a preferred stock dividend (Altman et al 1981:258).

Data were collected for five years prior to failure from Moody's Industrial Manual, with non-failed firms matched with failed firms by calendar year. The sample size consisted of 117 firms selected five years before failure. Beaver computed 30 ratios for each of the five years, and the ratios were selected on the basis of three criteria: 1. Popularity in the literature, 2. Performance in previous studies, and 3. Definition of the ratio in terms of a cashflow concept. The trend exhibited by the averages showed that non-failed firms had a zero slope trend line, exhibiting stability over time. The failed firms, showed a marked deterioration in many ratios, with deviations from the non-failed trend beginning as early as five years before failure, and accelerating as failure approached (Beaver 1966:80-81). Next the total sample of firms was divided into two groups, A and B, each containing both failed and non-failed firms and each of the 30 ratios were arranged in ascending order. The cutoff point that minimised the percentage of incorrect predictions was noted. Sample bias was eliminated by experimenting with a 'holdout' sample.

Beaver selected six of the original 30 ratios as having the most predictive power. The six are:

- 1. Cash flow to total debt,
- 2. Net income to total assets,
- 3. Current plus long-term liabilities to total assets,
- 4. Working capital to total assets,
- 5. Current ratio,
- 6. 'no-credit interval.'

The total error rate for his best predictive ratio, 1. 'cash flow to total debt', ranged from 13 percent one year prior to failure, to 22 percent five years prior to failure. The Type 1 error (classifying a failed firm as non-failed) was consistently higher than the Type 2 error (classifying a non-failed firm as failing), over the five year period. Cash flow represents annual funds from operations after taxes, interest, and lease payments, or net profits after taxes adjusted for non-cash items, and excludes all non-recurring extraordinary items. Total debt includes all liabilities i.e. long- and short – term borrowings plus current liabilities (Strebel and Andrews 1978).

Beaver's best predictive ratio identified the firms correctly in 90 percent of cases one year prior to failure (Morris 1997:108). The net income to total assets had a success rate of 88 percent one-year prior to failure.

Beaver's major finding was that financial ratios have the ability to predict failure for at least five years before failure. He does warn that not all ratios predict with the same degree of accuracy and ratios have greater success predicting non-failure rather than failure (Altman et al 1981:262).

The only further univariate ratio studies to be undertaken since Beaver's pioneering work in 1966, is by Casey and Bartczak (1984), as most researchers preferred to use multivariate models.

3. Casey and Bartczak

In 1984 Casey and Bartczak assessed the discriminatory power of 'operating cash flow' (OCF) and other cash flow ratios as a survey showed that funds flow indicators were regarded as a key indicator of bankruptcy risk by United States financial executives (Morris 1997:108). Casey and Bartczak found, after comparing 60 failed companies against a control sample of 230 businesses, that they could correctly classify 90 percent of bankrupt firms one year prior to collapse and 92 percent two years before. In classifying non-failed firms the discriminatory power was far worse at 53 percent and 44 percent respectively. After comparing the performance of their univariate model against a multivariate discriminant model based on six accrual based ratios, Casey and Bartczak concluded that cash flow variables were not useful in classifying non-failing firms, because some were in their growth phase of the business cycle, which naturally left them short of cash.

4. Conclusion Univariate Studies

It is disappointing to note that since Beaver's univariate model with its classificational accuracy, there has been no reports of similar studies that support his work. Academics undertaking studies have supported the multivariate method of analysis instead. Before turning to a review on the development of the multivariate model it would be appropriate to conclude this review of the univariate ratio models with a summary of the limitations of ratio analysis as identified by Correia et al (1993:198-200):

- 1. Many large firms are diversified into different industries and it therefore makes comparison with one set of industry averages misleading.
- 2. The effect of different accounting policies must be considered.
- 3. Ratios like the 'stock turnover' ratio are sensitive to the timing of year- ends, and this seasonality affect must be considered in making a comparative analysis.
- 4. The use of 'creative accounting' methods, and the ability to window dress financial statements is a large factor limiting the use of comparative ratio analysis.
- 5. It is difficult to assess how bad or how good a ratio is, as this decision will depend on the perception of the analyst.
- 6. The historic cost basis of preparing financial statements ignores the effects of inflation, and thus removes the accounting amounts from economic value. Equity, fixed assets and possibly stock can be understated.
- 7. Accounting looks backward and does not capture expectations about the future very well.
- 8. Balance sheets are just a snapshot in time, in reality firms are moving targets.

The subjective interpretation of traditional univariate ratio analysis, together with the above limitations resulted in the need for more objective assessments to be explored and hence the birth of a statistical technique called 'multivariate discriminant analysis' (MDA). Most of the research, based on regression analysis, establishes coefficients for the ratios that minimize misclassification (Correia et al 1993:196).

B. International Multivariate Discriminant studies

A. U.S.A

1. Altman

Edward Altman began work in 1968 on the application of Multiple Discriminant Analysis, (MDA), two years after Beaver's work. MDA had been utilized in a variety of disciplines, such as the biological and behavioural sciences, since its first application in the 1930's (Altman 1983). MDA is based on more than one variable (ratio), and is a statistical technique which enables the establishment of a linear equation which, when applied to certain variables (ratios in the context of financial statement analysis), will classify firms as either failed or non-failed (bankrupt or non-bankrupt). According to Altman, the distinction between the MDA technique and univariate analysis is that MDA has the advantage of considering an entire profile of characteristics common to the relevant firms, as well as the interaction of these properties, whilst a univariate study can only consider the measurements used for group assignments one at a time (1983:102). This ability to analyze the entire variable profile rather than relying on univariate, sequential analysis is the primary advantage of MDA. Combinations of ratios can be analyzed together which has the advantage of removing ambiguities and misclassifications observed in traditional ratio analysis.

A. The Altman 'Original' Z-Score model

It is appropriate to use Altman's earlier (1968) 'original' Z-Score model as the basis for the development of MDA models as Altman was the most active researcher in the United States, and assisted researchers in other countries in compiling their own models (Warren 1991).

Altman (1968), used a final sample consisting of 33 manufacturing firms filing Chapter Ten bankruptcy petitions between 1946 and 1965, and 33 non-failing firms matched by industry, size and year (Morris 1997).

He included five ratios out of an original 22 in the final function, and the equation was estimated on the last year's data before failure (year-1). The ratios were:

- **X1**. working capital/total assets,
- **X2**. retained earnings/total assets,
- **X3**. earnings before interest and taxes/total assets,
- **X4**. market value of equity/book value of total liabilities,
- **X5**. sales/total assets.

X1, Working Capital/Total Assets

Working capital is defined as the difference between current assets and current liabilities plus listed investments.

X2, Retained Earnings/Total Assets

This is a measure of cumulative profitability.

X3, Earnings before interest and Taxes/Total Assets

This ratio measures the productivity of the firm's assets stripping away the effects of leverage and tax factors.

X4, Market Value of Equity/Book Value of Total Liabilities

Equity is the combined value of all outstanding common and preferred shares of stock, whilst total liabilities includes both long term and current liabilities.

X5, Sales/Total Assets

This turnover/sales ability of the firms assets are reflected in this ratio

The weighting of the variables are reflected in Altman's five-variable discriminant function:

Z = 0.012X1 + 0.014X2 + 0.033X3 + 0.006X4 + 0.999X5

Regression computer analysis revealed which ratios are consistently and significantly different between the failed and non-failed groups. The significant ratios are scored using a weighting system. The formula would tell us whether any given firm has a profile that more closely corresponds to other failed or non-failed businesses. Altman's model predicts because the coefficients of the discriminant function are estimated prior to actual past bankruptcies (Altman et al 1981:269). If the model is applied to sample firm X, for example, and firm X's condition continues to deteriorate, in the manner of the average Altman bankrupt firm, then one year hence firm X will probably be bankrupt.

What started as a problem with 22 dimensions, (variables), was reduced to 5 and then, through a linear combination of the five variables, reduced to one dimension, the Z – score. A Z-score is then calculated for each firm in the sample and classifies the firm into the bankrupt or non-bankrupt group. The overall misclassification is minimized by a cutoff score of 2.675. Firms having Z-values below 2.675 are classified as failing and those above 2.675 classified as non-failing. The cut-offs were:

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

Conclusion

Altman concluded that his model is 72% accurate as a predictor of failure up to 2 years prior to bankruptcy, and is 96% accurate on data one year before bankruptcy. After year two the predictive ability declines significantly. Of the 66 firms classified 1 year prior to bankruptcy, only three firms were misclassified, two of which became future bankrupts. Of the 65 firms classified 2 years prior to bankruptcy, eleven were misclassified, nine of which were future bankrupts. Altman's 'original' Z-score is the tried and tested formula for bankruptcy prediction. It is only reliable if the firm being examined is comparable to the database. Attempts by Argenti (1976) and by Collins (1974) to apply Altman's Z-score to UK companies and to South African companies respectively have both proved to be unsatisfactory, thus bringing into question the use of Altman's model on overseas samples of businesses.

Second Sample and Results

In order to further test the accuracy of the original data, Altman tested his Z-score on another sample of firms. The second sample consisted of 25 bankrupt manufacturers and 66 non-bankrupt firms over the same period of time. The only requirement in terms of matching was that they were all manufacturers. Altman's objective was to test how well the model predicted on firms with financial difficulties short of bankruptcy (Altman et al 1981). With a Type 1 error of 4.0 percent and a Type 2 error of 21.2 percent the model was quite sensitive in distinguishing between permanent and temporary financial problems. 10 of the 14 non-bankrupts were misclassified and one-third of the Z-scores appeared within the 'zone of ignorance'.

Conclusion

Altman suggested that his model could complement:

- 1. Business loan evaluations,
- 2. Accounts receivable management,
- 3. Audit procedures,
- 4. Investment strategies. (Altman et al 1982:267).

Altman believed that his quantitative model should be used by bank loan officers to complement their more "qualitative and intuitive" approach in approving loans to commercial clients. The Z-score would be a valuable tool in determining the overall creditworthiness of business clients, but by no means was advocated as a credit-scoring mechanism or a substitute for the evaluations of loan officers. A further use of the Z-score is to pinpoint problem areas in a company, by identifying abnormal ratios, which may well be symptoms and not causes, but nevertheless highlights the need for investigation in a particular area. Altman (1968) concluded that his model is an accurate predictor of bankruptcy up to two years prior to failure, beyond the second year, the accuracy of the model diminishes.

B. 'Model A' Z-score for unlisted companies

The determination of the 'original' Z-score for public companies relies on the market value of equity as a numerator for the X4 ratio. This information is not available for private enterprise, so Altman revised his 'original' Z-score model as follows to replace the market value of equity with the book value in the X4 ratio (Warren 1991:80):

$$\mathbf{Z=0.007X1 + 0.008X2 + 0.031X3 + 0.0042X4 + 0.998X5}$$

All the coefficients change as Altman advocated a complete re-estimation of the model. The Type 1 accuracy is slightly under the market value model at 91% but the Type 2 accuracy is identical at 97%. The predetermined cutoffs for this model are:

Bankrupt less than	1.23
Zone of ignorance	1.23-2.90
Nonbankrupt greater than	2.90

C. Altman's Critics

Altman was not without repeated criticism from the likes of Johnson (1970), Wilcox (1973) and Joy and Tollefson (1975) and (1978), but this did not deter Altman from publishing follow up studies.

1. Johnson (1970)

Johnson criticized Altman whether models composed of financial ratios could predict failure and he focused on three issues, namely:

- 1. Model building,
- 2. Financial ratio interpretation,
- 3. Ex post reasoning (Altman et al 1981:270).

2. Wilcox (1973)

Wilcox expressed a lack of confidence in Altman's research methods, criticizing his sample selection, but did say his research was an "ambitious effort" (Altman et al 1981:270).

3. Joy and Tollefson (1975)

The fundamental core to Joy and Tollefson's (J&T), critique of the Altman model was that classifications were not predictions but merely ex-post discriminations (Altman et al 1981:270).

4. Pitt (1982)

Pitt levelled his criticism, in an article by Mark Lee Inman (Management accounting, 1982:39), at the need for a more detailed analysis of specific industrial groups to be given.

D. ZETA Analysis

Altman together with Haldeman, and Narayanan, (Altman et al), developed their new ZETA model in 1977, which was found to have an accuracy of over 90% on data of one year prior to bankruptcy and of 70% up to five years before. The model was developed jointly with a private financial firm, and this means that the coefficients and covariance terms cannot be published, and the model and trade mark are the property of Wood, Struthers and Winthrop and are used in a statistical service run by them.

The purposes of the ZETA study were conveyed adequately within one main reason and that was to test the latest advances in discriminant analysis in the formulation of a new model.

ZETA Variables

X1, return on assets, earnings before interest and taxes/total assets.

X2, stability of earnings – is measured by a normalized measure of the standard error of estimate around a 10-year trend in X1.

X3, debt service, earnings before interest and taxes/total interest payments.

X4, cumulative profitability, retained earnings/total assets. This ratio, and as results have shown, according to Altman, is unquestionably the most important variable, when utilised in univariate or multivariate studies.

X5, liquidity, current assets/current liabilities.

X6, capitalization, ordinary shareholder's equity/total long-term capital.

X7, size, is measured by total tangible assets of the firm.

Altman used a method called 'stepwise analysis' to establish a relative ranking of variable importance. The most important variable is the cumulative profitability ratio X4. The overall ranking according to 'forward stepwise discriminant analysis' is:

- 1. Cumulative profitability
- 2. Stability of earnings
- 3. Capitalization
- 4. Asset size
- 5. Liquidity
- 6. Debt service
- 7. Overall profitability

Altman, et al examined 53 bankrupt and 58 nonbankrupt manufacturing and retailing firms (Morris 1997:137).

Conclusion

The 'original', Z-score model cannot be used in South Africa as research in other countries, in developing MDA models, has shown that applying American discriminant coefficients to companies in other economies is unlikely to succeed (Warren 1991:81).

Attempts by Argenti (1976) and by Collins (1974) to apply Altman's coefficients to UK companies proved to be unsatisfactory (De Ratione Vol 8 No.2, 1994:59).

Over the next decade, many variations on Altman's study were made as useful contributions towards MDA studies, particularly work towards models designed for use within particular countries.

2. Blum (1974)

This model was developed as a failing company model (FCM), to aid the United States Antitrust Division of the Justice Department, with evidence in antitrust actions brought under the anti- competitive merger rules of the Clayton act (Altman et al 1981:277; Marquette 1981:23).

Based on the International Shoe decision, Blum defined failure as one of three events, namely:

- 1. Inability to pay debts as they come due,
- 2. Entry into a bankruptcy proceeding,
- 3. An explicit agreement with creditors to reduce debts (Altman, 1983:150).

The sample of failed firms consisted of 115 firms that failed from 1954 to 1968.

Pairing of the 115 failed firms was made with 115 nonfailed firms, on the basis of industry, size and fiscal year.

Blum did not according to Altman, search through a large selection of variables, instead like Beaver (1966), he based his variable selection on the concept of a business as a reservoir of financial resources with expected cashflows as the measure of the probability

of failure. Three common factors, namely: liquidity, profitability, and variability, underpinned Blum's cashflow framework.

The overall accuracy of Blum's model is reflected in the results: 94% for year 1, 80% for year 2, and 70% for year three (Altman et al, 1981:278).

Critique

Marquette in her 1980 doctoral research claimed that the Blum research was the height of the art in using MDA to predict corporate bankruptcy (1980:26).

3. Deakin (1972)

Deakin replicated Beaver's original study by using stepwise MDA and developing a model from the same ratios examined by Beaver. Deakin differed to Beaver in his definition of failure, by defining failure to be at minimum, filing for bankruptcy (Marquette 1980:22).

Deakin wanted to capture the best of both Altman's and Beaver's studies, by employing the 14 ratios Beaver used and then to search for the linear combination with the greatest predictive accuracy (Altman, 1983:152).

Deakin found the cashflow-to-total debt ratio to be the most useful univariate predictor of failure (Marquette, 1980:22).

- Cashflow is defined as net income plus depreciation, depletion, and amortization;
- Total debt is total liabilities plus preferred stock.

According to Altman (1983), Deakin's total misclassification rates on the original sample for the first three years were all less than 5%, indicating that the two groups are quite distinct and that the error rates up to three years before failure are acceptable. In the

fourth and fifth years there was less distinction and the error rates were too high to accept as accurate predictors of failure (Altman et al, 1981:283).

Deakin concluded that discriminant analysis can be used to predict business failures, as far as three years in advance with a fairly high accuracy (Altman, 1983:153). Deakin's results according to Marquette (1980) provide an argument for models, which specifically incorporate time to failure.

4. Libby (1975)

The usefulness of accounting ratios to loan officers in determining business failures was at the heart of Libby's study (Altman, 1983:153).

Libby used 60 of the 64 firms from Deakin's sample, splitting them into 30 failed and 30 non-failed firms drawn at random. The commercial bank loan officers were asked to predict 'failure' or 'non-failure' by applying the subset of Deakin's 14-variable ratio set (Altman, 1983). The accuracy of the loan officer's predictions was the 'useful' yardstick. Each of the forty-three loan officers in the experiment was given 70 ratio data sets of five ratios each. They were told that one-half of the firms experienced failure within three years, which Altman (1983), criticised heavily in his critique of Libby's experiment.

Libby concluded after sending the loan officers away for a week that the loan officers predictive accuracy was superior to random assignment, and they had used the ratio information correctly (Altman, 1983:154). Libby concluded that:

- 1. There was no significant difference between the mean predictive accuracy of the small and the large bank representatives;

- 2. There were no significant correlation's between predictive accuracy and loan officer characteristics, such as age and experience,
- 3. There were no differences in short-term, test-retest reliability between user subgroups,
- 4. There was a relatively uniform interpretation of the accounting data across bankers (Altman, 1983:154).

Critique

Altman (1983) felt that the one-half failed information should not be disclosed and is infact not available to analysts anyway. Casey (1980) found that loan officers who did not have failure information could only correctly predict 27% of a sample of failed firms.

5. Deakin (1977)

The purpose of the 1977 study was twofold according to Altman (1983):

- 1. To provide an indication of the frequency and nature of misclassification of nonfailing companies,
- 2. To compare auditors opinions with the model's predictive ability.

Of the 63 failed firms, 32 were from his 1972 study, and 31 had failed in 1970 and 1971. The nonfailed group consisted of 80 firms randomly selected from Moody's Industrial Manual, matched by year of data (Altman, 1983:155).

Using the weaker of his definitions of distress, i.e.: including dividend cuts to bankruptcy, liquidation, or reorganization, Deakin's model correctly identified 77.2% of the sample set as failures. Of the sample of 100 predicted nonfailures, an error rate of 35% resulted as 35 eventually had stress (Altman, 983:156).

Two years prior to failure, the five-variable model correctly identified 39 of the failures, misclassified one firm, and identified seven companies as in need of further investigation (Altman, 1983:156).

6. Edmister (1972)

Edmister's purpose for the study was to test and develop a number of methods of analysing financial ratios to the problem of predicting small business failure (Altman et al, 1981:289). Using the data from the loan files of the Small Business Administration (SBA), Edmister applied dummy regression analysis to the sample of borrowers for the period 1954 to 1969 (Altman, 1983:156). With a requirement of three consecutive annual financial statements the sample increased to 562 failed firms and a like number of nonfailed firms.

Edmister analysed 19 ratios and developed a seven-variable, linear regression equation (Altman, 1983:157):

$$\mathbf{Z = 0.951 - 0.423X1 - 0.293X2 - 0.482X3 + 0.277X4 - 0.452X5 - 0.352X6 - 0.924X7}$$

- **X1,** annual funds flow to current liabilities.
- **X2,** equity to sales.
- **X3,** net working capital to sales divided by the corresponding market average.
- **X4,** current liabilities to equity divided by the corresponding market average.
- **X5,** inventory to sales divided by the corresponding market average.
- **X6,** the quick ratio divided by the trend in the market average quick ratio.
- **X7,** the quick ratio divided by the market average quick ratio.

Nonfailure Z = 1

Failure Z = 0

An overall accuracy of 90% was achieved, with failed firms representing 100% and nonfailed representing 86% correct classification results (Altman, 1983:158).

Edmister found his best predictors to be in the trends:

- 1. Annual funds flow to current liabilities,
- 2. Equity to sales,
- 3. Working capital to sales,
- 4. Current liabilities to equity,
- 5. Inventory to sales,
- 6. The quick ratio (Marquette, 1980:20).

Critique

According to Marquette (1980:20), this model of Edmister was open to criticism based on statistical grounds as the use of dummy independent and dependent variables is a violation of regression assumptions of multivariate normal distributions. He also reclassified his original sample and according to Marquette (1980:21), this is a procedure that is well known to create substantial upward bias. The incorporation of industry trends into the model was a most notable contribution to failure study according to Marquette (1980). Edmister published in 1971, in the 'Journal of Commercial Bank Lending', and advocated his model for use in the evaluation of small business loan applications (Marquette, 1980:21).

7. Elam (1975)

Elam's purpose was to determine if capitalisation of (nonpurchase) leases enhanced the accuracy of a failure prediction model (Altman, 1983:159).

A sample of 48 failed firms from 1966 to 1972, which reported lease information in the financial statement footnotes, was compiled as his sample. 28 ratios for the 48 firms filing either for Chapter X or Chapter X1 bankruptcy was compiled (Marquette, 1980:27).

Elam, according to Altman (1983), found that the addition of capitalised lease data did not significantly improve the overall classification accuracies of the models tested, particularly in the first, second, fourth or fifth years prior to failure. Elam's selected ratios are:

- 1. Cashflow to sales,
- 2. Cashflow to total assets,
- 3. Total liabilities plus preferred stock to total assets (Marquette, 1980:27).

Critique

Altman criticized the Elam study on the grounds that he:

- 1. Failed to isolate the question of whether failed firms make the same, more, or less use of leases than nonfailed firms,
- 2. That Elam failed to test several 'proven' ratios (Marquette, 1980:28).

Elam's response to this criticism was that if failed and nonfailed firms did employ leases to the same extent, then the discriminant results before and after capitalisation would be identical (Marquette, 1980:28). A further criticism, by Altman (1983), is directed at the lack of use of a holdout sample, thus casting light on the validation procedure of Elam.

8. Wilcox (1971), (1973), and (1976)

Wilcox focused on the application of the gambler's-ruin model to business risk. His 1973 and 1976 articles focused upon:

- 1. Quantifying the risk of financial failure,
- 2. Presenting empirical evidence,
- 3. Describing potential remedial action for the management of distressed firms (Altman et al, 1981:296).

The 1973 definition, according to Altman et al (1981), of failure was a Chapter Ten or Eleven bankruptcy petition. A sample of 52 firms that failed between 1955 and 1971 was selected, and matched on the following basis:

- 1. Industry group,
- 2. Size,
- 3. Availability of data for the same years as the failed firm up to 9 years prior (Altman et al, 1981:298).

The model, according to Altman et al, (1981), focused upon net liquidation value (NLV) and the factors that cause it to fluctuate. NLV is a dollar level determined by liquidity inflow and outflow rates. The main focus of the model was with predicting when NLV will be negative, which will happen shortly before failure (Altman et al, 1981:297). Wilcox's 1976 results were based upon a linear gambler's – ruin score, and Wilcox contended that his results compared "favourably" with Beaver's and Altman's (Altman et al, 1981:298). The gambler's-ruin score was calculated for 26 major firms and according to Altman et al (1981), the firm with the lowest score in 1973 and 1974 went bankrupt in

1975. Wilcox concluded that most bankruptcies can be avoided by focusing on three means at reducing risk of ruin:

- 1. Increase NLV directly,
- 2. Increase inflow
- 3. Reduce outflow (Altman et al, 1981:300).

Critique

This straightforward model to predicting business failure is as accurate as those of other researchers, and according to Altman et al (1981), focuses on the dynamic factors that determine a firm's financial risk.

B. United Kingdom

1. Taffler (1974-1994)

Taffler developed his first model in 1974 based on a sample of 23 companies which failed over the period 1968-1973, together with a control sample of 45 companies (Morris, 1997:138). The original model according to Morris (1997), "discriminated extremely well in the last year before failure, but far less well for previous years".

Taffler refined the model in 1982, and 1983, expanding the sample to 46 listed manufacturing concerns which failed over the period 1969-1976, and matched by industry and size to another 46 firms.

After screening 80 ratios the variables in the final model were:

- X1. Profit before tax/average current liabilities,
- X2. Current assets/total liabilities,

- X3. Current liabilities / total assets,

- X4. No-credit interval (current liabilities/operating costs excluding depreciation). This model Taffler claims to be "extremely successful with a success rate of almost 100% one year in advance, and has been used by a firm of London Stockbrokers with considerable success" (Andrews, 1978:4). The success rate according to Morris (1997), for years two, three and four, was 67%, 41% and 29% respectively. The Z – score formula with weightings is:

$$\mathbf{Z = 0.53X1 + 0.13X2 + 0.18X3 + 0.16X4}$$

According to an article written by Moon and Bates in 1992 in 'Management accounting', the cutoffs for the Taffler model, to define failed and nonfailed, are:

A Z-score above 0.3 indicates good long-term survival prospects, whilst a Z-score below 0.2 shows characteristics of companies that have failed in the past.

Critique

Taffler's models are widely used by practitioners, but according to Morris (1997:140), Taffler is in fact "very careful not to claim too much for them". A Z-score is based on a companies last published accounts and these normally are released just prior to the final downward plunge. Morris (1997), goes on to say that Taffler emphasises "the appraisal is principally descriptive in nature, and the model is doing little more than reflecting and condensing the information conveyed by the set of accounts itself". The model's power is its ability to discriminate correctly between failures and nonfailures (Morris, 1997:140).

Due to sampling bias, the misclassification rates for nonfailed companies are high, and as Morris (1997:141), states "the opportunity costs of such misclassification might be regarded by analysts as sufficient for them not to follow its signals blindly".

Before turning to the South African models, it is appropriate to end this literature review with the summarized findings, of Marquette (1980:48-51), with respect to some of the international models we have discussed:

- 1. "Some ratios are stable predictors through time whilst others are not".
- 2. "Firm failure is affected by general economic conditions and the business cycle".
- 3. "Failing firms exhibit volatile financial patterns over time".
- 4. "Cash flow variables appear most often as primary determinants of failure".
- 5. "Age and size effect going concern status".
- 6. "Industry classification affects failure".
- 7. "Firms go bankrupt over a number of years. Univariate studies detect trends toward failure five years in advance, whilst the more sophisticated multivariate studies are unable to surpass a two year time horizon".

2.3 South African Univariate and Multivariate Research

A. Univariate Studies

1. Strebel and Andrews (1977)

The detailed studies of Beaver and later Altman, suggested that failure, or bankruptcy could be predicted with significant levels of confidence. Such studies inspired the South African research team of Strebel and Andrews to simplify the relative complexity of the detailed, international analyses to date. It was Beaver's detailed 1966 univariate analysis that first isolated the 'Cash flow to total debt' ratio as been the best predictive ratio. The U.S.A research established the predictive power of 30 traditional ratios, and concluded that the more common ratios, such as the acid test, or debt/equity ratio, turned out to be short term predictors, whereas, cash flow to total debt had predictive power for five years prior to bankruptcy (Strebel and Andrews, 1977:3). Cash flow to total debt correctly classified 90% of companies one year before failure, 82% two years before failure, 79% three years before, 76% four years before, and 78% five years before. Peter Feinberg, in his article in 'Buinessman's Law', on 'Predicting business failure-the auguries of impending collapse' (1994), claims "the most reliable single augury of business failure is the ratio of cash flow to total debt".

The cash flow to total debt ratio reflects the ability of the company to repay its outstanding liabilities. According to Strebel and Andrews, "cash flow represents annual funds from operations after taxes, interest, and lease payments, or net profits after taxes adjusted for non-cash items (such as depreciation), and excludes all non recurring extraordinary items". Total debt includes all long and short-term borrowings plus current liabilities, excluding net worth.

Quite simply, according to Strebel and Andrews (1977), "a company with a ratio of 0.33 could payback its liabilities within an average period of three years". The inclusion of the short term borrowings along with current assets gives the model a more realistic picture as companies about to go bankrupt normally extend their overdraft facilities, factor their debtors book and generally show problems in the areas of short term finance (Strebel and Andrews, 1977:1).

Initially the usefulness of the cash flow to total debt ratio was shown by Strebel and Andrews when they applied it to a local company 'Glen Anil'whose cash flow in 1972 had dropped to 10% of total debt. This ratio reflected problems four years before the companies demise and Strebel and Andrews speculate as to the difference that could have been made in this company failure had the ratio, cash flow to total debt, been widely monitored in the seventies (Strebel and Andrews, 1972:2).

From an initial sample of 16 failed companies and 13 nonfailed companies, Strebel and Andrews concluded that the average cash flow to total debt for nonfailed companies, since 1971, has averaged around 18%. The ratios for failed or potential to fail companies has fallen away from this average at least two to three years prior to failure (Strebel and Andrews, 1977:4). Fourteen of the sixteen failed companies had a cash flow to total debt ratio of less than 5% one year before failure, and thirteen of the sixteen failed companies could have been isolated two years prior to failure using an 11% cut-off (Strebel and Andrews, 1977:5). The pilot study suggested the following guidelines for outsiders who use this ratio to analyse failed or nonfailed firms (Strebel and Andrews, 1977:7):

- Cash flow to total debt below 10% is a symptom of potential bankruptcy.

- Cash flow to total debt below 5% indicates a high probability of bankruptcy.
- A slow trend downwards for three consecutive years is indicative of eventual collapse.
- Creative accounting may be causing a fluctuation in the ratio.
- A "precipitous fall" is a strong indicator of eventual collapse.

Conclusion

Strebel and Andrews stress in their conclusion on their findings, "While the ratio suggests that 9 out of 10 companies with cash flow to total debt of less than 5% will fail within a year, the ratio cannot provide an indication of who the one survivor might be. The ratio is not infallible and should be used as an indicator only". It must not be forgotten when relying on quantitative based decision making, that many studies reveal that 93% of business failures are attributed to incompetence and lack of expertise of management.

2. Daya (1978)

Daya used 31 failed and 31 non-failed companies, matched by industry and size (Andrews, 1978:8). He computed 30 ratios for the sample. By applying the dichotomous classification test an optimal cut-off point will classify the firms as failed or non-failed, and will minimize the percentage of incorrect predictions. According to Andrews (1978:8), if a firm has a ratio above or below this cut-off point, the firm is classified as failed or non-failed. Like Strebel and Andrews one year earlier, Daya concluded that the

ratio with the greatest predictive power, one year before failure, was cash flow to current liabilities.

Critique

Daya provided a useful base for future research to be launched, but recognised that, "it is possible that multivariate ratio analysis would predict better than a single ratio." A major limitation directed towards Daya's research is very similar to that directed at Libby's research, discussed earlier in this review, and is the fact that the cut-off point is selected ex post, and it is felt by critics that in a real decision making situation, the decision maker does not have this advantage.

B. Multivariate Studies

1. Katz and Nosarka (1978)

A term project paper by Katz and Nosarka, according to Andrews (1978), attempted to validate the Altman ratio with the cash flow to total debt ratio tested by Beaver and Strebel and Andrews. Their results confirmed that Altman's ratio is unreliable outside the United States and that a unique South African multivariate model would need to be developed for our local conditions.

2. Amiras, Aston and Cohen 'A-Ratio' (1978)

Seventeen ratios were initially identified and by applying the multiple regression technique the most significant of those ratios were selected. Failed and non-failed firms

were identified by discriminant analysis and the coefficients or weights applicable to each resultant ratio were calculated together with a constant (Andrews, 1978:9).

The seventeen ratios were reduced to five of the most powerful ratios in terms of predictive ability, and they were:

- **R1,** Cash and Bank / total assets.
- **R2,** Profit after tax / ordinary equity plus retained earnings.
- **R3,** Current and long term liabilities / total funds employed.
- **R4,** Profit after tax / total assets.
- **R5,** Profit after tax / total debt.

The discriminant function was found to be:

A = -0.0979R1 – 0.00168R2 + 0.0106R3 – 0.00413R4 – 0.01166R5 – 0.49253

The sample was chosen from those companies considered to be "inordinately high risk" by the Ivor Jones, Roy and company (Andrews, 1978:11). Ratios for 12 of the 16 companies were available, and the results showed that 11 of the 12 achieved positive "A" scores i.e.: were identified as failed.

This model correctly classified 89% of companies in the test sample as failed or non-failed one year before failure. The level of accurate prediction for non-failed firms remains high over the five year sample, an example from Amiris, Aston and Cohen's results in year five is 90% (Andrews, 1978:10). With respect to failed firms, the year five

prediction is with 27% accuracy, a considerable drop off from year one prediction. These poor results in predicting failure two or more years prior to failure are similar to Altman's results in the U.S.A. According to Andrews (1978), the "A" score as this model became known, is superior to the predictive ability of Altman's Z-score for years three to five.

The Pre-determined cut-offs of the 'A-Ratio'

Bankruptcy score greater than	+0.25
Zone of ignorance between	+0.52 and –0.52
Nonbankrupt greater than	-0.52

A positive score therefore means failure and a negative score non-failure.

Conclusion

The narrow spread around zero, with regard to the cut-offs, demands caution in the use of the "A" scores, as concluded by Amiras, Aston and Cohen (Andrews, 1978:10).

3. De La Rey 'K-score' (1981)

In 1981, Dr J.H. De La Rey developed what is widely regarded by locals as the best known South African failure prediction model (Garbers and Uliana, 1994:38). De La Rey was working for the Bureau of Financial Research at the University of Pretoria when he developed his K-score model. He was, like his international counterparts, inspired by the work of Altman applying the Z-score to financial statement analysis. According to Warren (1991:84), "certain financial institutions have, either privately or with De La Rey,

developed their own models based on client's records, and are using these models, together with the K-score model, extensively in the course of day-to-day analysis of client's financial positions to guide them in loan decisions".

Sample and Empirical Results

The K-score model was developed using 32 failed and 32 non-failed companies matched according to industry, size and age, like the 'original' Altman Z-score. The study encompassed hundreds of different ratios, of which six were selected for his model. "Four of the six ratios," according to Warren (1991:83), "have been in common use over the years". The model was developed using the financial data of listed companies, (on the Johannesburg Stock Exchange, JSE), within the industrial sector (Warren, 1991:84). De La Rey concluded that, "as there are too few listed companies to develop a model per industry sector, the K-score model has been used with much success on private companies and other forms of enterprise" (Warren, 1991:84).

De La Rey's K-score model has the following notation:

K = -0.01662A + 0.0111B + 0.0529C + 0.086D + 0.0174E + 0.01071F – 0.06881

- **A,** Total outside financing / Total assets.
- **B,** Earnings before interest and tax / Average total assets.
- **C,** Total current assets and listed investments / Total current liabilities.
- **D,** Earnings after tax / Average total assets.

- **E,** Net cash flow / Average total assets.

- **F,** Stock / Inflation adjusted total assets.

- **A,** A gearing ratio in which preference shares are excluded from outside financing."Total outside financing" includes all long and short-term financing.

- **B,** Return on Assets. "Total assets" includes all fixed, current and other assets but excludes fictitious assets.

- **C,** Current ratio-modified to include listed investments. "Average total assets" is the sum of the current year added to the figure for the previous year and the sum divided by two.

- **D,** Return on assets (after tax).

- **E,** Not a common ratio amongst analysts. "Cash flow" is net cash flow from business activities. Net profit after tax plus non-cash items, (depreciation for example), less extraordinary non-recurring items.

- **F,** The use of inflation adjusted figures, has not appeared in other models. "Stock" is the stock figure as at the end of the year under review. "Inflation adjusted total assets" is the adjusted figure for the assets as they were at the end of the year under review.

According to Warren (1991:84), "the K-score model successfully scored 94.5% of the non-failed firms and 98.6% of the failed/bankrupt firms out of a sample of 138 failed and 255 non-failed firms". The average success rate was 96.6%. These scores were attained up to two years before failure. The accuracy decreases as time lengthens.

The – 0.06881 at the end of the model notation is to return the point of separation between failed and non-failed firms to zero.

The predetermined cut-offs of the "K-score" model.

Bankrupt less than	-0.19
Zone of ignorance	-0.19 - 0.20
Nonbankrupt greater than	0.2

According to De La Rey conservative well-established businesses have K-scores between +1 and +1.5, whilst the most dynamic companies have scores between +0.6 and +0.8 (Warren, 1991:84). Any business, according to Warren (1991), that has a K-score of –0.2 or less is well beyond saving.

Critique

This is the first highly regarded MDA model in South Africa with such accurate predictive ability up to two years before failure. A most notable advantage of the K-score model is that it can be applied to data across different business sectors and to private companies. As discussed a number of financial institutions in South Africa either use the K-score model or have developed their own models. According to Warren (1991: 85), "the real value of the model, lies in the internal use by management in early prediction of problem areas and the corrective steps to take are highlighted to eliminate these problems before they can do damage".

2.4 Application of South African failure prediction models

1. Garbers and Uliana (1994)

Garbers and Uliana identified the need for a local South African commercial bank to reduce errors of credit judgement, in order to maintain bank profits. They identified the business problem as a loss of profit from bad lending decisions and also a restriction by Government legislation on access to new business (De Ratione Vol 8, 1994:37). After extensive historical research on failure prediction models, Garbers and Uliana set out the objective of their study namely, "to investigate whether the credit risk management of a South African commercial bank can be enhanced by the use of selected failure prediction models".

Three models were chosen for comparison purposes, namely Beaver's cash flow to total debt ratio as the univariate model, De La Rey's K-score, and Clarke's Z-score as the multivariate models (De Ratione Vol 8, 1994:39).

Methodology

The authors analysed 17 private trading companies who had been identified as problematical by the bank. The private companies had been in existence longer than five years and audited financial statements for at least three years were available.

After examining the bank's files the date that the sample firm was labelled problematical was recorded. After applying the three failure models to each sample firm the dates on which the models produced the first distress signal was recorded. The respective dates were compared to establish the number of times that the models detected a distress signal

before the bank. This analysis would test the authors hypotheses namely: 'the models are able to signal distress before the bank' (De Ratione Vol 8, 1994:40).

Table 1: Relative success of models (De Ratione Vol 8, No 1 1994:41).

	Beaver	Clarke	De La Rey
Number of times bank predicted before the model	5	16	6
Number of simultaneous predictions with the bank	5	0	3
Number of times model did not predict before the bank	10	16	9
Number of times model predicted before the bank	7	1	8
Total	17	17	17

Results

Table 1 shows that Beaver's and De La Rey's models were frequently able to signal distress before the bank. This followed a simple binomial test to ensure that the early signals produced by the models are not simply due to chance. Thus the conclusion could be drawn that, "the bank is able to enhance the effectiveness of it's existing credit evaluation process by using Beaver's and De La Rey's models" (De Ratione Vol 8, 1994:42).

Garbers and Uliana, emphasised that these models "supplement and do not replace, the bank's existing credit evaluation process".

2.5 Summary of Literature Review

The literature review has covered the historical development of an extensive range of international and local failure prediction models, with the purpose of highlighting the respective inputs, outputs, advantages and disadvantages of the models. These models were designed with the objective to provide businesspeople and academics with a more objective, quantifiable tool other than traditional ratio analysis, in assessing the going concern of a business. A thorough understanding and background to the respective models is necessary, as a vital part of this study in testing the hypotheses, is the selection of the models. Our business problem is that the chosen local bank is incurring declines in profit, due to poor credit lending decisions, which result in loan defaults or ultimately losses. The bank is therefore restricted by regulatory laws, in its ability to take on new business. The large number of business failures, particularly amongst public listed companies, have also resulted in these loan defaults, and loan losses through the liquidation of the borrowers. This volatile business environment, with external (interest rate hikes), and internal (mismanagement), factors causing local businesses to fail, means lenders need to be extra careful in their initial credit decisions. The literature survey ends with the work of Garbers and Uliana (De Ratione Vol 8, 1994), who clearly focus on this very problem of credit evaluation risk with regard to a local commercial bank. They concluded, "this study has shown that the bank could enhance its credit evaluation procedures by testing a number of models and selecting a small number that work well for its clients". This current business problem is the target in this study and this research is therefore very similarly based to the research of Garbers and Uliana (De Ratione Vol 8, 1994).

2.6 Hypotheses

Based on the objectives of this research dissertation the alternative and null hypotheses are as follows:

Alternative Hypothesis

'A selection of failure prediction models will enhance the traditional bank credit evaluation procedure by predicting business failure before the bank'.

Null Hypothesis

'A selection of failure prediction models do not enhance the traditional bank credit evaluation procedure by not predicting business failure before the bank'.

Chapter 3

3.1 Research Design and Methodology

A. Introduction

The business problem has been identified within the 'corporate' division of a diversified South African bank, ('the bank'). Corporate division specialises in lending money for the financing of, 'moveables' and 'property', to commercial and agricultural borrowers. The following bank criteria were issued by senior management and the bank board of executives in approving the research project:

- 1. Data will only be available on public listed companies, and not on private companies.
- 2. No direct reference will be made to the Bank throughout the study.
- 3. The specific loss amounts on deals will not be stated.
- 4. The draft copy of the dissertation must be vetted by the bank before final submission to the Graduate School of Business at the University of Natal Durban.

B. Formal Study

A formal study approach to this research dissertation has been applied, utilising both primary and secondary data.

C. The purpose of the Study

The study objective is to test whether the application of the selected failure prediction models will indeed assist the bank in predicting failure before the bank credit evaluation procedure. The purpose is therefore to ascertain which models predict before the bank by measuring the frequency of distress signals made by the selected model's before the bank's distress signals. The study is therefore descriptive in design rather than a direct causal study.

D. Method of Data Collection

1. Secondary Data Collection

Failure prediction models are the central variable in testing the research hypotheses, and are therefore central to the solution of the business problem. The existing bank credit evaluation procedure is also central to the solution of the business problem, but only primary data can be gathered with respect to this area of information.

The secondary data research in Chapter Two has focused extensively on the historical design and formulation of international and local models. The historical knowledge of the models is extremely important primarily enabling an informed decision to be made in the selection process. The perusal of academic journals, such as De Ratione, provides the seedbed to stimulating research objectives which can solve business problems. Sources of secondary data information have been taken from:

- 1. The University of Natal main library.

- 2. National and International Interlibrary data.
- 3. Academic as well as organisational journals.
- 4. The internet.

These sources of information have been utilised at various times of this research. Initially an extensive review of past and present research in the topic area is conducted to establish the framework of the new study, to set objectives and to gain a thorough knowledge of the chosen topic. Thereafter the study focused primarily on the collection of primary data. A tremendous benefit during this study has been the use of the internet, as a fast and effective source of secondary data and primary data information.

2. Primary Data Collection

Stage One

The 'communication based' method of primary data collection has been used to initially set up a formal interview with the selected bank personnel involved in the research. The initial encounter could be defined as an 'experience survey'. The objective of this survey was to:

- 1. Ascertain the scale of the business problem from those with the knowledge and experience,
- 2. Discuss and record the current credit evaluation procedures been used by the bank in assessing loan applications'

- 3. To discuss the strategy for the research going forward.

A summary of the informal questions that were used to guide the 'experience survey' are as follows:

The problem

- 1. What is the scale of borrower defaults impacting on the bank?

- 2. Could some of these defaults/losses have been avoided?

The sample

- 3. Can you please identify those public companies that are problematic to the bank. They have defaulted through either going into bankruptcy or have potential to go bankrupt in the near future?

- 4. Please identify borrowers that are not problematic and can be matched by either industry, size or age, to the problematic borrowers.

The existing credit evaluation procedure

- 5. What is the existing credit evaluation procedure of the bank? Please provide written procedural material that will not be disclosed in the study, as this is private information for the bank.

- 6. What are the current advantages and disadvantages of the system?

- 7. Is there scope for improvement in credit decision making?

- 8. Does the quantitative aspect of the credit analysis procedure rely on traditional ratio analysis?
- 9. Have failure prediction models ever been used to assist an initial credit decision?
- 10. What is the banks understanding of such models?
- 11. What are the respective credit approval levels within the bank?

A major part of the data collected in this meeting was based on a thorough discussion with a senior manager, about the current credit evaluation procedure being used by the bank (Please refer to Chapter 4 'The Findings'). Based on the confidentiality of such information, it has been decided to provide a basic outline of the policy and procedures in place at the bank. This information is important as the timing of the distress signal by the bank is the result of this current credit evaluation process, and without a thorough understanding of the bank credit process it would be impossible to test the research hypotheses.

Stage Two

The second stage of the primary data search involved visits to the bank to engage in direct interaction with the loan file to photocopy financial statement data, to record the timing of the bank's distress signal and to photocopy any relevant documents that would assist in achieving the research objectives. The financial data is taken from the audited financial statements and applied to a spreadsheet which has the formulae and predetermined cut-offs of the selected models (see Appendix B). Altman's 'original' Z-score model requires the market value for equity. This information was obtained from the

JSE, and verified where possible in the financial statements. De La Rey's K-score model requires a value for inflation adjusted total assets. The inflation rates for each month of a particular financial year were obtained from BoE securities and applied to the data of the sample relevant for this model. These data inputs enabled the final score to be calculated by the models, and the presence or absence of a distress signal could be recorded.

The last part of data collection has been the recording of the first year in which the model and the first year in which the bank recorded distress signals in the crosstabulation chart (Chapter 3 'The Findings'). In some cases the financial statement data in the file was not adequate in terms of the number of years required for this research (a minimum of two), so it was necessary to contact the companies involved by phone or by internet, to obtain further years financial statement data. This information was impossible to attain in the case of failed companies who were not in existence any more. An example of this paper trail is LeisureNet. The only set of financial statements on the bank file were a mixture of audited and unaudited copies, some were for a three month and six month interim period. The only final source of 1999/ 2000 financial statements were the transfer secretaries, namely Mercantile Registrars in Johannesburg, who sent the copies. Auditors were in most cases extremely unhelpful in obtaining information, that after all was related to public companies and should therefore have not posed a problem in terms of client confidentiality. It must be noted for the interest of future research studies that contacting the auditors of failed companies is not a reliable source of primary information at all. In the case of Tridelta magnets Pty Ltd, only one years copy of financial statement data was on the bank file. In contacting the auditors, namely KPMG, and then the new auditors, namely Fisher Hoffman and Sithole, both auditors would not send copies of previous

years audits even though these were public companies. Senior partners were not interested in discussing these accounts. In terms of non-failed companies it was easier to locate financial statement data, a simple call to the company secretary often resulted in the relevant information being sent. The internet was also an excellent source of up to date financial statement data. It took time to locate an adequate sample of financial statement data.

Stage Three

Analysis and conclusions from the primary data (Chapter 4 and 5).

E. Control of the Variables

This research has been 'ex post facto'in design and therefore there is no manipulation control of the variables. The dependent variable, namely the 'timing of the distress signal' is effected by the application of the independent variables namely the 'existing bank credit evaluation procedure' and the 'selected failure prediction models' to the sample of failed and non-failed public businesses.

F. The Time Dimension

In applying the selected failure models to the sample, the analysis is both cross-sectional and longitudinal in time dimension. The reason for this is that one of the criteria in selecting the sample has been that a minimum of two years of audited financial statements must be available with respect to the public company. This means that, although the financial statements for one year reflect a snapshot in time, the study is also taking a longitudinal snapshot of the particular company over at least a two year period,

in most cases five years. The final objective, however, is to record one date and one time of the model's, and the bank's, distress signal. This makes the time dimension primarily cross-sectional in nature.

G. The Selection of the Models

The extensive literature review on the international and local models has provided the background to the selection of the chosen models for this study. This study is similar in objective and design to the 1994 research of Garbers and Uliana (De Ratione Vol 8, No.1, 1994). Their study chose three local models as representative of univariate and multivariate failure prediction techniques, namely the Clarke, De La Rey, and Beaver models. Beaver's and De La Rey's models were frequently able to signal distress before the bank based on a sample of private companies. Based on these findings it is logical to apply these two models to this studies sample of public companies to further test their local reliability and validity as test models in the South African banking environment.

1. Beaver 'Cash Flow to Total debt ratio'.

Beaver's model is the result of the now famous international univariate study. In Strebel and Andrews (1977), study they concluded that the use of the Beaver univariate ratio on a South African sample of businesses generated statistically significant classification of failed and non-failed companies. These results therefore make the inclusion of Beaver's, 'cash flow to total debt' model a must in this study.

2. De La Rey K- score model.

De La Rey's multivariate K-score model is South Africa's most well-known failure prediction model. The results from Garbers and Ulianas research support using this model in a bank. It will be useful to further test this model on a sample of public companies rather than private companies.

3. Amiras, Aston and Cohen 'A- Ratio model'

The Clarke model will not be selected based on its complete failure to signal in the 1994 study. In place of the Clarke model, the A-Ratio model developed by South Africans Amiras, Aston and Cohen, has been selected. There is no literature evidence of its application in the South African banking environment, making this a first for the application of this model.

4. Altman 'Original' Z-score model

It has been discussed at great length earlier, that there is no relevancy in applying overseas failure prediction models to local South African data. Argenti (1976) and Collins (1974), applied Altman's Z-score model to UK and South African companies respectively and both results proved to be unsatisfactory (De Ratione Vol 8 No.2 1994/1995, Arron and Sandler). Warren (1991) also stressed that "applying American discriminant coefficients on foreign companies will not succeed". Having discussed this finding, with Professor Uliana at Cape Town University, it has been decided to include in the selection of failure prediction models Altman's 'Original' Z-score model. This will add an international multivariate model as a means of comparison with the local

multivariate and the Beaver univariate models. It must be noted that the inclusion of Altman's model will be merely as a comparative basis for the other models and the results of Altman's model must be viewed in the knowledge that the discriminant coefficients are not suitable to make a reliable credit decision in the bank.

The selection of model's to be applied to this study's sample, together with the cut-off scores and the respective formulae are as follows:

1.. Beaver's univariate 'Cash flow to total Debt ratio'.

Cashflow / Total Debt

Cashflow represents annual funds from operations after taxes, interest, and lease payments, or net profits after taxes adjusted for non-cash items (such as depreciation), and excludes all non-recurring extraordinary items.

Total debt includes all long and short-term borrowings plus current liabilities, excluding net worth.

Cut-off scores:

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5% - 10%
Bankrupt less than	5%

2. De la Rey's multivariate K-score model.

K = 0.01662A + 0.0111B + 0.0529C + 0.086D + 0.0174E + 0.01071 F – 0.06881

- **A,** = Total outside financing / Total assets.
- **B,** = Earnings before interest and tax / Average total assets.
- **C,** = Total current assets and listed investments / Total current liabilities.
- **D,** = Earnings after tax / Average total assets.
- **E,** = Net cash flow / Average total assets.
- **F,** = Stock / Inflation adjusted total assets.

Cut- off scores:

Bankrupt less than	-0.19
Zone of ignorance	-0.19 – 0.20
Nonbankrupt greater than	0.2

3. Amiras, Aston and Cohen 'A-Ratio' multivariate model.

A = -0.0979R1 – 0.00168R2 + 0.0106R3 – 0.00413R4 – 0.01166R5 – 0.49253

- **R1,** = Cash and Bank / total assets.
- **R2,** = Profit after tax / ordinary equity plus retained earnings.

- **R3,** = Current and long term liabilities / total funds employed.
- **R4,** = Profit after tax / total assets.
- **R5** ,= Profit after tax / total debt.

Cut-off scores:

Bankrupt greater than	0.52
Zone of ignorance	0.52 to –0.52
Nonbankrupt less than	-0.52

4. Altman's 'Original' multivariate Z-score.

Z = 0.012X1 + 0.014X2 + 0.033X3 + 0.006X4 + 0.999X5

- **X1**. working capital/total assets,
- **X2**. retained earnings/total assets,
- **X3**. earnings before interest and taxes/total assets,
- **X4**. market value of equity/book value of total liabilities,
- **X5**. sales/total assets.

Cut-off scores:

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

It must be noted that Altman's 'Original' Z-score was applied to public manufacturing companies and used the 'Market value' of equity for the X4 function. The 'Model A' Z-score was applied to private manufacturing companies and the book value of equity was used for the X4 function, and there were revised discriminant coefficients.

H. Sample Design

The probability method of sample design is based on quantitative techniques whilst the non-probability method is based on more subjective techniques.

The conditions and objectives of this study have resulted in the choice of the non-probability 'Quota' method of sample design. The reasons being:

- 1. The sample of failed, and non-failed, companies have been selected by the bank, having fulfilled the five criteria listed below. The bank have chosen a sample of public companies which to their best knowledge and intention fairly represents a good cross-section of their public lending book which fulfills the criteria outlined below.

- 2. The research objective is to test for the timing of a distress signal by the bank and by the failure prediction model. It is not to test a specific cross-section sample of industry sectors on a model. The objective is not to design and modify a new or existing model where the choice of the sample is central to the reliability and validity of data. The primary variables as discussed are the dependent variable, 'the time of a distress signal' and the independent variables which effect the dependent variable namely 1. 'the bank credit procedure' and 2. 'the selection and type of model'.

- 3. The five criteria stated below, adequately represent the population of public borrowers.

The following criteria were adhered to in the selection of the public sample of failed and non-failed companies (refer Table 2 and Table 3 below):

- 1. The borrowers had to be identified and split between failed, and non-failed businesses. The failed sample had either completed liquidation procedures or were entering them at the time of this study. The inclusion of the non-failed companies is a control and comparison for the distress signal results. The non-failed sample will only be included as a comparison where there are bank signals of possible problems with the borrower. If there are no bank signals then it will be useful to see if the models make any signals whilst the bank does not. The models have themselves been tested at the design stage, on a failed and a non-failed sample. This sample split is therefore intended to add uniformity to sample methods.

- 2. The sample of companies were all currently or had been public listed companies on the JSE.

- 3. The sample was taken from diverse business sectors and the failed and non-failed were matched according to industry sector, capitalisation size or age of the business.

- 4. All the companies had been in existence for longer than three years to eliminate 'start up' business cycle influences.

- 5. Audited financial statements for at least two years had to be available from either the loan file or from other sources such as auditors or the JSE.

Table 2, The Sample of Failed Public Companies.

Number	Company	Sector	Market Capitalisation December 1998
1	Coastal Group Ltd	Clothing &Textiles	R 437 million
2	DeNim Textiles Ltd	Clothing &Textiles	Part of the Coastal Group
3	LeisureNet Ltd	Hotel &Leisure	R 639 million
4	MacMed Healthcare Ltd	Healthcare	R 809 million
5	Paradigm Capital Holdings Ltd	Financial Services	R 716 million
6	Roadcorp Ltd	Transport	R 225 million
7	Tridelta Magnets Ltd	Manufacturing	R 1119 million

Table 3, The Sample of Non-Failed Public Companies.

8	A.M.Moolla Group Ltd	Clothing & Textile	R 57 million
9	Bearing Man Ltd	Retail	R 89 million
10	Gray Security Services Ltd	Service	R 384 million (1999)
11	McCarthy Retail Ltd	Retail	R 156 million
12	National Chick Ltd	Food	R 44 million
13	Sun International (S.A) Ltd	Hotel & Leisure	R 877 million

I. Measuring Instruments

1. Model Distress Signal Timing.

The models selected for this study have been applied to the financial data of the sample within a Microsoft Excel spreadsheet (Appendix A). The timing of a distress signal, determined as a 'failure' has been recorded on the crosstabulation in Table 1. The model

is applied to as many financial years, from two in one case to five years before liquidation. The distress signal is in the form of a Z-score, K-score or A-ratio, for the multivariate models, and a percentage for the univariate model. This score is compared to the pre-determined cut-off scores that determine whether a business is failed, non-failed or in the zone of ignorance for that year. The year in which each model first produced a distress signal, defined in this study as absolute 'failure', has been recorded on a crosstabulation table (Chapter 4 'Results', Table 1.). The models have already been tested for predictive ability and susceptibility to false classification. Failure is recorded when the model signals a company as 'bankrupt' i.e. the score equals or is below the 'bankrupt' cut-off score. If a score is recorded in the 'zone of ignorance' it will not be recorded as a signal of failure.

2. Bank Distress Signal Timing.

The bank credit evaluation procedure, discussed in 'the findings' Chapter 4, is the second measuring instrument for the timing of a distress signal. The distress signal by the bank credit procedure is not as clearly defined as the distress signal produced by a model. The model produces a scoring number that can be compared to the pre-determined cut-off scores, whereas the bank credit procedure consists of both qualitative and quantitative inputs that do not make the recording of a time of distress that simple. It has been noted by examining the files that in some instances a loan file will contain a memorandum from a junior credit member which has expressed reservations about further lending to an established client. The loan is nevertheless approved at a higher credit panel level. In this type of example, the junior managers signal is not taken as a distress signal as the bank

has actually lent further funds to this client, and it can be taken that they have not identified the client as problematic. If the company has subsequently gone bankrupt shortly after further funds were lent to it, the actual date of the liquidation order is taken as the bank's first signal of distress. The use of this market- based timing signal has been discussed with the bank's legal advisor and it has been agreed that this would indeed be the most reliable signal.

To remove any potential bias in the timing of bank distress signals during a particular financial year, the signal was deemed to have been detected at the date of the previous financial year end, as the banks credit decisions are based on the previous financial year's statements.

A further difficulty in identifying the bank's timing of distress, has been the fact that in many cases the client (company), does not only have borrowings with the bank's corporate division, but may well have borrowing exposure through other divisions of the bank, such as: treasury division, properties division and the merchant bank division. The different divisions do have access to a Group exposure database system, which has only recently been implemented by the information technology division. This system is used to provide and collate total exposures of a client and should enable uniform credit decision making throughout the bank group. In reality each bank division has its own separate credit criteria, based on the type of specialist lending provided by the division. This results in very different credit decisions being taken by the different divisions. The treasury division may well approve a very large overnight facility to a company, whilst another division has identified the client as problematic and will not provide further funds

to this client. This problem of separate credit criteria and decision making is common to all big diverse groups, and therefore further suggests that the application of uniform credit evalution procedures, need to be applied across all divisions.

The banks timing of distress has been recorded in Table 1, Chapter 4, 'Results'.

J. Data Analysis

The comparative data on distress signal timing disclosed in Table 4, Chapter 4, 'The Findings' is summarised in Table 5, 6 and 7. This will enable a numerative score to be recorded with respect to the number of times either the model or the bank predicted distress.

K. Operational Hypothesis

The significant number of times a model signals before the bank will be the final test of the Null hypothesis. Inherent in any analysis is the chance of error. A Type 1 error is committed, if a true null hypothesis is rejected. A Type 2 error is committed when a false null hypothesis is accepted. The cost to the study in making either a Type 1 or Type 2 error is that the bank will not include failure prediction models in their future credit evaluation procedure. This type of decision may well deny the bank the use of a quantitative tool, which could enhance the quality of credit decisions, and hopefully improve bank profits.

3.2 Research Limitations

A. Model limitations

This study is designed to test whether the models will produce a distress signal before the bank, and is not a test on the validity and accuracy of the models themselves. As discussed earlier it is well known that the international multivariate models designed on the statistical information of that country cannot be used in a foreign country, such as South Africa, but this has not impaired local practitioners from using these international models to compare their results to local multivariate models results. The models have already been subjected to a vast array of statistical testing in their formulation and in their susceptibility to false classification. It is, however, worth noting the common limitations of international and South African failure prediction models as described by Gregory J Eidleman (1995):

- Models move us one stage further from the raw accounting data. Only experienced users realize how imprecise "exact" information sometimes is.
- Models often do not give a clear result. The intangibles and qualitative issues must be addressed.

Richard Morris (1997:1) adds the following limitations to the failure models:

- Failure models frequently exhibit high misclassification rates outside the sample period.
- 20% of healthy companies have been classified as failures.
- Symptoms rather than causes of failure are focused on.

B. Firm specific, Non-financial variables.

It is well accepted that the main reason for corporate failure is managerial incompetence (Altman 1983). In his paper P.W Court (1991:11), attempted to illustrate that the inclusion of certain firm-specific non-financial variables would enhance the predicitve

ability of a failure prediction model using only financial ratios. The inclusion of the non-financial variables improved the predictive accuracy of the model from 66.7% to 100% in the year prior to failure.

Argenti (1977), states: "Failure is a process that takes many years to complete and companies display at least one of three distinct stages on their way to insolvency. First, there is something wrong with them, pre-eminently with their top management or with the way they respond to change. Then they make a mistake. Finally their finances deteriorate. So we have the sequence: defects, mistakes, symptoms." The Argenti A-Score takes a non-financial perspective to failure prediction and is complementary to Z and K- scores.

This study has not considered the qualitative, firm specific, non-financial variables of the sample of public companies, as listed in the Argenti A-Score model, and the research of P.W Court.

C. Macro/Micro Economic variables

In applying the failure prediction models to the financial data of the selected public companies, the results are further limited by the fact that the models do not incorporate information on micro and macro-economic data such as:

- 1. The impact of interest rate hikes,
- 2. The stage of the economy as a whole.

Business cycle influences have been controlled by ensuring the company sample is of companies over three years old. During times of economic prosperity even poorly managed enterprises may succeed, but during the recession periods that follow, (as

witnessed in South Africa in late 1998), the business world is purged of inefficiency, which is evidenced by a sharp rise in bankruptcies (Falkena, Kok, Meijer 1989:20).

D. Financial Ratio Analysis

The existing credit evaluation procedure uses ratio analysis as the predominant quantitative credit technique. Financial ratio analysis is historical in nature, relying on backward looking information which does not predict the future at all. This same backward looking information is taken from the financial statements and is used as the input data for the failure models and by the time the symptoms of failure are externally evident in a business, the collapse is often well entrenched. Academics are moving toward the elimination of ratio analysis as an analytical technique in assessing the performance of the business enterprise. Theorists downgrade arbitrary rules of thumb, (such as company ratio comparisons), widely used by practitioners (Altman 1983:99). These limitations to the use of financial statement data emphasise the need for academics to design forward looking failure models that rely on projected financial data and that capture predictions about the future health of a business.

Chapter 4

4.1 The Findings

A. The Existing Credit Evaluation procedure

This information was obtained in the initial 'experience survey' with senior bank officials (see appendix A). Once a loan application has been completed by a sales consultant it is submitted to an assessor, based at the branch, who will value the moveables or the property being offered as security in the transaction. Once a final value has been allocated to the asset being purchased the application is submitted for credit checks and for the recommendation by the sales manager at the branch. The application is then submitted to the branch credit manager for either approval or for recommendation to a higher credit level, depending on the loan amount requested by the client. The application will only be approved or recommended to higher levels if it has all the necessary documents and information for a good credit decision. This information and documentation includes:

- 1. Completed signed loan application with all the relevant personal details of the borrowing entity, for example members details if the borrowing entity is a Close Corporation.
- 2. Credit Check information on the individual borrowers, together with credit check information on the business(s) applying for the loan. The credit check system, namely Information Trust Corporation (ITC), will provide a detailed credit analysis of the business entity applying for credit. This credit check provides information on the moral risk of the applicants. Any previous judgement(s) or credit default information will be recorded on these reports, enabling an informed decision to be made.

- 3. Inclusion of a recommendation from the sales manager in the form of a Credit Information Report (CIR), which would normally have the following details:
  - The purpose of the application, including details of the moveables or property to be financed in this transaction.
  - The background to the relationship of the applicant with the bank.
  - The nature of the applicants business.
  - The ownership of the business.
  - The background to the business, with any explanation for previous credit judgements or defaults.
  - The management of the business.
  - The financial position of the business, including up to date financial statements.
  - Banking arrangements.
  - Future prospects and objectives of the business.
  - Strengths and weaknesses of the borrower.
  - Recommendation.
- 4. The CIR is accompanied with the loan grading scoring sheet. The loan grading sheet will have information pertaining to the moveables or property being offered as security. This information is provided by an assessor who, in the case of property finance, has visited the property to assess the property for final value purposes. The assessors comments are very important in terms of assessing the final risk allocated to a transaction. This persons experience and input in evaluating credit risk is a vital part of the whole process.

The above information is important to enable the various credit levels to make informed credit decisions. An initial limitation to this traditional credit process, and indeed the loan process as a whole, is that it relies on data often collected and put together by target driven sales staff. Sales staff work under pressure to achieve monthly targets to grow the bank's business, and are incentivised according to the volume rather than the quality of loans submitted. The credit manager therefore relies on information provided by the sales force which is motivated by different objectives to the credit division. If this information has been distorted or manipulated in any way it is up to the credit procedure to hopefully highlight such irregularities.

Every credit manager has a specific lending authority. If the loan exceeds this personal limit then it must be recommended to the next level of authority up until it can be approved. There are six levels of lending authority namely:

- 1. Regional Credit Panel Limit (R4million).
- 2. Regional General Manager Limit (R7million).
- 3. Head Office Panel Limit (R20 million)
- 4. Divisional Executive Panel Limit (R60 million)
- 5.Group Executive Panel Limit (R100 million)
- 6. Board's Credit Panel Limit (R500 million)

The regional credit managers have authority to approve loans up to specific limits. Any loan over their limit is submitted to the head office credit division, consisting of managers who each have respective limits. These loan approval levels can be pooled to allow two managers to combine their lending limits. If the loan exceeds the limit of the head office

credit managers, they will have to recommend the loan to higher levels for approvals. This head office process can result in a large loan being recommended to the bank's board of executives for approval.

The credit manager relies on both quantitative and qualitative data with respect to inputs at arriving at a credit decision. Financial ratio analysis is the most often used quantitative method to ascertain the health of a business, and the limitations of this method have been discussed at length. The loan files revealed no uniform policy and procedure in applying financial ratio analysis in fact this method was applied in an adhoc manner. The reliability of such data would need to be questioned. The bank is aware of the existence of failure prediction models but they are not applied at all to assist the quantitative part of the existing credit evaluation process.

The bank has introduced a new loan grading system for moveables and property transactions that incorporates both quantitative and qualitative data to translate this data, which is in the form of questions, into a single numeric score denoting the degree of risk inherent in a bank loan. This model is seen as a further step in the evolution of a more sophisticated model for the defining, managing and pricing of credit risk. This new system is not seen as a replacement to the traditional credit process, but will provide information in the following areas:

- 1. Costing,
- 2. General provisioning,
- 3. Comparison,
- 4. Rating purposes.

A loan grade is derived from combining the quality of the client with the quality of the security. The information pertaining to the quality of the security is provided by the assessor, whilst the information pertaining to the quality of the client is provided by the sales consultant. The credit qualitative decision relies on how well the credit manager knows the client and on work experience. The sales consultant can provide a lot of the qualitative data but this data can be subjective and open to manipulation. The various credit panels rely on many sources of information, in several cases the simple e-mail has conveyed one manager's sentiments about a particular deal to another, enabling information to be pooled and shared. It was discussed earlier that in some cases the sentiments of a junior credit manager are overruled by more senior levels, even if with hindsight these sentiments turned out to be correct. The sharing and pooling of ideas, views and experience during the entire credit evaluation process is enhanced by the quality of information provided and relies on this quality. If fraudulent information is provided at any stage of the procedure then it can lead to incorrect credit decisions.

Once a loan is approved the various conditions of the approval will be attached to the approval page enabling the sales consultant to discuss these conditions with the client. These conditions are often standard legalistic requirements of loan transactions, but in unique situations, the credit managers will apply unique conditions to a transaction enabling the bank risk to be controlled and minimised.

B. Distress signal timing comparison

Table 4 below shows the years in which the bank and the model's signalled distress for the first time. The coding also highlights the availability of financial statement data in particular the no info (no information) caption. The problem of sourcing extra years

financial statements was discussed previously, but is certainly more noticeable with the failed sample set. These companies have been delisted from the JSE and are no longer in existence. In the case of Tridelta Magnets (Company No. 7), only two years financial statements were available, one from the bank file and one from the transfer registrars.

Model and Bank coding for distress timing comparison

A = Year in which Altman first signalled distress.

B = Year in which Beaver first signalled distress.

C = Year in which A-Ratio (Amiras, Aston & Cohen) first signalled distress.

D = Year in which De la Rey first signalled distress.

E = Year in which the bank first signalled distress.

Table 4, Distress signal timing comparison

Company	1995	1996	1997	1998	1999	2000
1	No Info	B,D,C	No signals	No signals	B,A,D	E
2	No signals	No signals	No signals	No Info	B,D,C	B,A,D,C,E
3	No Info	No Info	No Info	No signals	B,A,D,C	B,A,D,C,E
4	No signals	No signals	No signals	No signals	E	No signals
5	No Info	No Info	No signals	No signals	No signals	C,E
6	No Info	D	No signals	No signals	No Info	E
7	No Info	No Info	No Info	B,D,C	B,A,D,C	E
8	No Info	No Info	No Info	No signals	No signals	B,A,E
9	No signals	No signals	No signals	No signals	C	No signals
10	C,D	C,D	C	B,D,C	No signal	No signal
11	No Info	No Info	B	B,D,C	B,D,C,E	B,D,
12	C	No signals	No signals	No signals	No signals	No Info
13	No Info	No signals	No signals	No signals	A	D

Non-Failed Sample (Table 3, Co's 8 to 13)

The bank's files had only recorded distress signals with respect to two companies out of the total of six non-failed sample. This has meant that the results in Table 6 have only included these two companies, as both bank and model signals need to occur for the purposes of this study. The consolidated findings in Table 7 include the two companies from the non-failed sample. The overall predictive result is therefore drawn from nine public companies instead of the total of thirteen used in the complete sample. The non failed sample is also a useful comparative to the failed sample based on size and industry type. It is interesting to note in Table 4 with respect to the four remaining non failed sample that certain models signal distress when the bank has not signalled at all.

C. Relative Success of Models: Table 5, 6 and 7.

Table 5: Relative success of models applied to Failed business sample. (Table 2, 1 – 7).

	Beaver	Altman	De La Rey	A-Ratio
Number of times bank predicted before the model	3	3	2	2
Number of simultaneous predictions with the bank	0	1	0	1
Number of times model did not predict before the bank	3	4	2	3
Number of times model predicted before the bank	4	3	5	4
Total	7	7	7	7

Table 6: Relative success of models applied to non-failed with bank signal. (Table 3, 8-13)

	Beaver	Altman	De La Rey	A-Ratio
Number of times bank predicted before model	0	1	1	1
Number of simultaneous predictions with bank	1	1	0	0
Number of times model did not predict before bank	1	2	1	1
Number of times model predicted before bank	1	0	1	1
Total with bank signal	2	2	2	2

Table 7: Summary of Failed and Non-failed samples. (Table 5 and 6).

	Beaver	Altman	De La Rey	A-Ratio
Number of times bank predicted before the model	3	4	3	3
Number of simultaneous predictions with the bank	1	2	0	1
Number of times model did not predict before the bank	4	6	3	4
Number of times model predicted before the bank	5	3	6	5
Total with bank signal	9	9	9	9

An analysis of the results will either support or reject the null hypothesis.

1. Table 5, Relative success of models applied to the failed business sample.

The analysis of Table five reveals the following results with respect to the models:

- **Beaver Model**

This model predicted failure on four occasions before the bank out of the sample of seven, whilst the bank predicted on three occasions before the model. This is a majority count in favour of this model.

- **Altman Z-Score Model**

Altman's famous model signalled on three occasions before the bank, whilst it did not signal before the bank on four occasions including the one simultaneous occasion. This majority count of four versus three is the only result from the four models tested on this sample of failed companies that would infact support the null-hypothesis. The Altman model has not signalled more times than the bank. This does not mean that it wouldn't, it may well do so with a different sample, so caution is exercised in making such a comment.

- **De La Rey K-score Model**

De la Rey's K-score model signalled on five occasions before the bank, whilst the bank signalled on two occasions before the model. This is the most convincing result from all the models selected.

- **Amiras, Aston and Cohen (A-ratio) Model**

This local model replaced the rejected Clarke model used in the 1994 study by Garbers and Uliana (De Ratione Vol 8, No 1, 1994). This is a relatively unknown model in South Africa. Historically the A-ratio has an 89% predictive accuracy one year before failure. The A-ratio signaled four times before the bank, whilst the bank signaled two times before the model. There was one simultaneous prediction, which still leaves the model in a majority count of four to three in its favour.

2. Table 6, Relative success of models applied to Non-Failed sample with bank signal.

The total number of non-failed companies used for this study is six. Of these six companies the files contain only two significant recordings of distress signals. The results of the models applied to the remaining four non-failed sample as shown in Table 4 (Distress signal timing comparison) are interesting as the models have signalled on a number of occasions that failure is imminent, whilst the bank has not recorded any concrete distress signals in the respective year of analysis. The A-ratio is the only model which signals distress with company 9. With regard to company 10, the Beaver, A-ratio and the De La Rey models all signal distress in 1998. Only the A-ratio signals with Company 12. Altman and De La Rey both signal in different years with company 13. Maybe time can prove these distress signals to be right or wrong, if any of the non-failed sample become tomorrows failed sample. Table 6 has the following results:

- **Beaver Model**

The Beaver model predicted on one occasion before the bank, whilst the bank and model simultaneously predicted on one occasion.

- **Altman Z-score Model**

Altman's Z-score did not predict before the bank on both occasions. The bank predicted before the model on one occasion whilst the model and bank simultaneously predicted on one occasion.

- **De La Rey K-score Model**

The model predicted on one occasion before the bank whilst the bank also predicted before the model on one occasion. The combined results of the failed and non-failed sample need to be analysed to make sense of this 50/50 result.

- **Amiras, Aston and Cohen (A-ratio) Model**

The A-ratio predicts on one occasion before the bank whilst the bank predicts on one occasion before the model. The combined results of the failed and non-failed sample need to be analysed to make sense of this 50/50 result.

3. Table 7, Summary of the success of the model's and bank signals over both the failed and non-failed sample.

- **Beaver Model**

The consolidated findings show that the Beaver 'cash flow to total debt ratio', predicts before the bank on five occasions out of the total sample of nine companies. The model does not predict before the bank on four occasions including one simultaneous occasion. The bank predicts before the model on three occasions. The number of times the model predicts before the bank exceeds the number of times the bank predicts before the model.

- **Altman Z-score Model**

The Altman Z-score model predicts before the bank on three occasions out of the total sample of nine companies. The bank predicts before the model on four occasions. There are two simultaneous predictions, making the number of times the model did not predict

before the bank six times. The majority of predictions are with the bank and the Altman model is therefore the only model that does not predict before the bank out of the four selected models.

- **De La Rey K-score Model**

The K-score model predicts before the bank on six occasions out of a total sample of nine. The bank predicts on three occasions before the model. This is the most convincing score out of all the models in favour of the use of the model.

- **Amiras, Aston and Cohen (A-ratio) Model**

The model predicted failure before the bank on five occasions out of the sample of nine whilst the bank predicted failure before the model on three occasions. There was one simultaneous prediction which means the model did not predict before the bank on four occasions. The number count in favour of this model exceeds the count in favour of the bank thus favouring the use of this model.

Chapter Five

5.1 Summary and Conclusions

The conclusions that can be made from the consolidated results of the failed and non-failed samples in Table 7 are as follows:

- **A. Beaver Model**

The positive results in support of the use of this model in a bank as reflected in the rejection of the null-hypothesis also support the findings of the Garbers and Uliana research in 1994, and the research of Strebel and Andrews in 1977. The findings in Table 7 are as reliable and convincing as the Garbers and Uliana study, because the number count of model predictions before the bank exceeds the number count of bank predictions before the model.

The model does predict failure on a significant number of times before the bank. The Garbers and Uliana results (see Table 1), accepted the Beaver model as an accurate predictor based on seven positive model signals versus ten signals that did not predict before the bank. Table 7 shows this studys count to be five positive model predictions before the bank versus four signals that did not predict before the bank, including simultaneous predictions. The Beaver model has a 90% accuracy predictive ability one-year before failure, and is also the only model, based on historical analysis that can predict five years before failure. The consolidated results in Table 7 support the use of this 'international' model as an enhancement to the existing bank credit evaluation procedure by predicting business failure before the bank.

- **B. Altman Z-score Model**

Out of the four models the Altman model signals before the bank on the least number of occasions as supported in the results reflected in Tables 5, 6 and 7. The famous Altman Z-score model therefore supports the null-hypothesis, and is therefore not an enhancement to the bank credit evaluation procedure as it does not predict business failure before the bank. These findings support the research of Argenti (1976) and Collins (1974), namely that the application of Altman's model with American discriminant coefficients to companies in other economies is unlikely to succeed. This fact was made in the initial selection of this model in the design and methodology stage of this study and the selection was made for comparative purposes with the local models only. The Altman model should therefore not be included in the banks quantitative credit evaluation procedures.

- **C. De La Rey K-score Model**

According to Garber's and Uliana's study in 1994, (De Ratione Vol 8 No1, 1994), South Africa's most famous prediction model the De La Rey K-score, was one of the models selected to be used by a bank to signal distress before the bank and thus enhance the bank's credit evaluation procedure. The 1994 study of Garbers and Uliana selected the De La Rey model based on the following results: the bank predicted on six occasions before the model whilst the model predicted on eight occasions before the bank. The combined failed and non-failed results of this study taken from Table 5 and Table 6 and summarised in Table 7 support the 1994 findings. De La Rey's model predicted failure

before the bank on six occasions whilst the bank predicted failure before the model on three occasions.

This is the most reliable, in terms of positive counts, result from all the models tested and supports the alternative hypothesis and firmly rejects the null-hypothesis. The K-score model does enhance the bank credit evaluation procedure by predicting failure before the bank. This model has a predictive classification ability which is 99% on a non-failed sample two years before failure and 95% on a failed sample two years before failure. These results support comments that the De La Rey model is indeed South Africa's most favoured failure prediction model.

- **D. Amiras, Aston and Cohen A-Ratio Model**

The combined results for this model in Table 7 are the same as the results recorded for the Beaver model. The A-ratio model predicted on five occasions before the bank whilst the bank predicted on three occasions before the model. When the simultaneous predictions are counted then the number of times the model did not predict before the bank is four times. The majority number of predictions in favour of the model rejects the null-hypothesis and supports the alternative hypothesis. The A-ratio model will therefore be a useful enhancement to the bank credit evaluation procedure because it predicts business failure before the bank.

The identification of the problem of loss of profits for the bank as a result of credit evaluation procedures that did not warn of business failures in time pointed to the need to examine whether the use of failure prediction models could assist the bank credit

evaluation procedures in warning of potential failure before the bank. This then required an extensive literature survey on the history and development of failure prediction models, and an analysis of the existing bank credit evaluation procedure.

The findings in Chapter 4 of the existing credit evaluation procedure have revealed the need for banks to continually update credit procedures. This study has highlighted the limitations of using financial ratio analysis as a method of quantitative credit analysis. This method is used in an adhoc manner in the current credit evaluation process, bringing into question the reliability of this quantitative data at the bank. The bank is aware of failure prediction models, but has not used them to assist the quantitative credit analysis process. The findings of this research support the need for the bank to introduce the three successful models, namely Beaver, De La Rey and the A-ratio, as reliable and valid enhancements to the existing quantitative credit procedures. Failure prediction models will not replace existing procedures, but will be a supplement to them.

The combined results in Table 7 show the success of the Beaver, De La Rey and A-Ratio models in predicting failure before the bank as applied to both the failed and non-failed sample of public companies. The results for these three models favour the alternative hypothesis, enhancing the traditional bank credit evaluation procedure by predicting business failure before the bank. The results for Altman's Z-score model as summarised in Table 7 support rejecting the use of this model as an enhancement for existing credit procedures as the bank predicts before the model on more occasions. The Altman model therefore supports the null hypothesis and rejects the alternative hypothesis, bearing in mind the lack of validity of international models applied to local samples.

E. Suggestions for Further Research

Future research would naturally build on the strengths of previous research and endeavour to nullify the weaknesses. The limitations of this research have been discussed at length in Chapter 3. The primary limitation of the models themselves is that they rely on backward looking financial statement data that does not capture an adequate forecast of the future. There is a need to include forward looking models in credit evaluation procedures that would rely on projected financial data much like Net Present Value project appraisal which would help with ex ante prediction of failure. In this regard, it would be very important to have bank knowledge of the relevant company and business sector, as management can manipulate forecast cashflows more easily than accounting figures. Nevertheless, the combination of forecasts along with the application of failure models to existing data, would provide a broader basis on which to evaluate credit.

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Appendix A: Experience Survey informal questionnaire guide.

A. The problem

- 1. What is the scale of borrower defaults impacting on the bank?
- 2. Could some of these defaults/losses been avoided by better credit procedures?
- 3. Can you please identify those public companies that are problematic to the bank. Have they gone into bankruptcy or do they have potential to go bankrupt in the near future? Please identify borrowers that are not problematic/ non-failed that can be matched by either industry, size or age, to the problematic/failed borrowers.

B. The existing credit evaluation procedure.

- 1. What is the existing credit evaluation procedure of the bank?
- 2. What are the current advantages and disadvantages of the system?
- 3. Is there scope for improvement in credit decision making?
- 4. Does the quantitative credit analysis procedure rely on traditional ratio analysis?
- 5. Have failure prediction models ever been used to facilitate an initial credit decision?
- 6. What is the banks understanding of such models?
- 7. What are the respective lending levels within the bank?

Appendix B: Failure Prediction Model Excel Spreadsheets

The selected models have been applied to the respective financial year end results for both the failed and non-failed sample of public companies.

Please note that in the case of DeNim Textiles, Altman's Model 'A' Z-score was applied to the data in place of the selected 'Original' Z-score. The 'A' Z-score model is applied to private companies (unlisted). DeNim Textiles was absorbed into the Coastal Group in 1999, and was therefore listed only as part of the Coastal Group Ltd, at this time.

Coastal Group Ltd Year Ended Dec 1996

Beaver

	R000			
Cash flow	-2262	Cash Flow		
Total Debt Beaver	1507	Total Debt	**-150.10** %	

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman

	R000	X1		X2	
Working Capital	383	Work Capital		Ret earnings	
Total Assets	26304	Total Assets	1.46 %	Total Assets	-8.48 %
Retained Earnings	-2230				
Ops income/EBIT	-2008	**X3**		**X4**	
Mkt value Equity	148257	EBIT		Mkt val Eq	
Book value Equity	24433	Total Assets	-7.63 %	Total Debt	7923.94 %
Total Debt	1871				
Sales	340				

	X5	
	Sales	
	Total Assets	0.01 Times

Original "Z-Score" = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

47.20

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

De La Rey

	R000	a		b	
Avg Total assets	26304	Total Debt		EBIT	
Curr Ass + Invest's	568	Total Assets	7.11 %	Avg Total Ass	-7.63 %
Curr Liabilities	185				
Pait	-2230	c		d	
Stock	0	Curr Ass+Inves		PAIT	
Infl adj Total Assets	28006	Curr Liabs	3.07	Avg Total Ass	-8.48 %
		e		f	
		Net Cash Flow		Stock	
		Avg Total Ass	-8.60 %	Adj TotalAss	0.00 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

-0.99

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	364	Cash at Bank		Pait	
Total Funds employed	26119	Total Assets	1.38 %	Book Equity	-9.13 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	7.16 %	Total Assets	-8.48 %
		R5			
		Pait			
		Total Debt	-119.19 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

0.89

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

Coastal Group Ltd Year ended Dec 1997

billy

Beaver

R000

Cash flow	32940	Cash Flow		
Total Debt Beaver	24859	Total Debt	**132.51** %	

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman

	R000	X1		X2	
Working Capital	117603	Work Capital		Ret earnings	
Total Assets	409129	Total Assets	28.74 %	Total Assets	7.54 %
Retained Earnings	30867				
Ops income/EBIT	42778	**X3**		**X4**	
Mkt value Equity	273105	EBIT		Mkt val Eq	
Book value Equity	342297	Total Assets	10.46 %	Total Debt	408.64 %
Total Debt	66832				
Sales	253708				

X5		
Sales		
Total Assets	0.62	Times

Original "Z-Score" = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

3.87

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

De La Rey

	R000	a		b	
Avg Total assets	409129	Total Debt		EBIT	
Curr Ass + Invest's	160859	Total Assets	16.34 %	Avg Total Ass	10.46 %
Curr Liabilities	43256				
Pait	18668	**c**		**d**	
Stock	59144	Curr Ass+Inves		PAIT	
Infl adj Total Assets	434004	Curr Liabs	3.72	Avg Total Ass	4.56 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	8.05 %	Adj TotalAss	13.63 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

0.65

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	41973	Cash at Bank		Pait	
Total Funds employed	365873	Total Assets	10.26 %	Book Equity	5.45 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	18.27 %	Total Assets	4.56 %
		R5			
		Pait			
		Total Debt	27.93 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

-1.66

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

Coastal Group Ltd (Group) Year ended 31 Dec 1998

Beaver	**R000**			
Cash flow	46057	Cash Flow		
Total Debt Beaver	279464	Total Debt	**16.48** %	

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman	**R000**	**X1**		**X2**	
Working Capital	120367	Work Capital		Ret earnings	
Total Assets	678739	Total Assets	17.73 %	Total Assets	7.66 %
Retained Earnings	51974				
Ops income/EBIT	50451	**X3**		**X4**	
Mkt value Equity	437038	EBIT		Mkt val Eq	
Book value Equity	385441	Total Assets	7.43 %	Total Debt	149.01 %
Total Debt	293298				
Sales	251167				
		X4		**X5**	
		Book val Eq		Sales	
		Total Debt	131.42 %	Total Assets	0.37 Times

Original "Z-Score" = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

1.83

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

De La Rey	**R000**	**a**		**b**	
Avg Total assets	543934	Total Debt		EBIT	
Curr Ass + Invest's	221355	Total Assets	43.21 %	Avg Total Ass	9.28 %
Curr Liabilities	100988				
Pait	24167	**c**		**d**	
Stock	50216	Curr Ass+Inves		PAIT	
Infl adj Total Assets	739893	Curr Liabs	2.19	Avg Total Ass	4.44 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	8.47 %	Adj TotalAss	6.79 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

0.03

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	R000	R1		R2	
Cash at Bank	13834	Cash at Bank		Pait	
Total Funds employed	577751	Total Assets	2.04	Book Equity	6.27
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	50.77	Total Assets	3.56
		R5			
		Pait			
		Total Debt	8.24		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253
-0.28

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

Coastal Group Ltd Year ended Dec 1999

Beaver	**R000**			
Cash flow	-22122	Cash Flow		
Total Debt Beaver	347467	Total Debt	**-6.37** %	

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman	**R000**	**X1**		**X2**	
Working Capital	13326	Work Capital		Ret earnings	
Total Assets	858032	Total Assets	1.55 %	Total Assets	2.02 %
Retained Earnings	17355				
Ops income/EBIT	-3099	**X3**		**X4**	
Mkt value Equity	347244	EBIT		Mkt val Eq	
Book value Equity	405569	Total Assets	-0.36 %	Total Debt	98.23 %
Total Debt	353492				
Sales	240406				
				X5	
				Sales	
				Total Assets	0.28 Times

Original "Z-Score" = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

0.90

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

De La Rey	**R000**	**a**		**b**	
Avg Total assets	768386	Total Debt		EBIT	
Curr Ass + Invest's	247073	Total Assets	41.20 %	Avg Total Ass	-0.40 %
Curr Liabilities	233747				
Pait	-38216	**c**		**d**	
Stock	84562	Curr Ass+Inves		PAIT	
Infl adj Total Assets	877252	Curr Liabs	1.06	Avg Total Ass	-4.97 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	-2.88 %	Adj TotalAss	9.64 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

-1.08

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	6025	Cash at Bank		Pait	
Total Funds employed	624285	Total Assets	0.70 %	Book Equity	-9.42 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	56.62 %	Total Assets	-4.45 %
		R5			
		Pait			
		Total Debt	-10.81 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

0.20

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

De Nim Textiles Ltd Year ended Dec 1995

Beaver

	R000		
Cash flow	17934	Cash Flow	
Total Debt Beaver	56825	Total Debt	**31.56** %

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman

	R000	X1		X2	
Working Capital	59684	Work Capital		Ret earnings	
Total Assets	127694	Total Assets	46.74 %	Total Assets	16.94 %
Retained Earnings	21636				
Ebit/Ops profit	24232	**X3**			
Mkt value Equity	0	EBIT			
Book value Equity	49052	Total Assets	18.98 %		
Total Debt	57705				
Sales	167502				
		X4		**X5**	
		Book val Eq		Sales	
		Total Debt	85.00 %	Total Assets	1.31 Times

Model A "Z-Score" = 0.007(X1)+0.008(X2)+0.031(X3)+0.0042(X4)+0.998(X5)

2.72

Bankrupt less than	1.23
Zone of ignorance	1.23-2.90
Nonbankrupt greater than	2.9

De La Rey

	R000	a		b	
Avg Total assets	127694	Total Debt		EBIT	
Curr Ass + Invest's	93866	Total Assets	45.19 %	Avg Total Ass	18.98 %
Curr Liabilities	34182				
Pait	11688	**c**		**d**	
Stock	30455	Curr Ass+Inves		PAIT	
Infl adj Total Assets	136505	Curr Liabs	2.75	Avg Total Ass	9.15 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	14.04 %	Adj TotalAss	22.31 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

0.81

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	880	Cash at Bank		Pait	
Total Funds employed	93513	Total Assets	0.69 %	Book Equity	23.83 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	61.71 %	Total Assets	9.15 %
		R5			
		Pait			
		Total Debt	20.25 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

-0.22

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

DeNim Textiles Ltd Year ended Dec 1996

Beaver	**R000**			
Cash flow	23947	Cash Flow		
Total Debt Beaver	56992	Total Debt	**42.02** %	

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman	**R000**	**X1**		**X2**	
Working Capital	64721	Work Capital		Ret earnings	
Total Assets	144454	Total Assets	44.80 %	Total Assets	26.49 %
Retained Earnings	38273				
Ebit/Ops profit	32765	**X3**			
Mkt value Equity	0	EBIT			
Book value Equity	65688	Total Assets	22.68 %		
Total Debt	57828				
Sales	212604				
		X4		**X5**	
		Book val Eq		Sales	
		Total Debt	113.59 %	Total Assets	1.47 Times

Model A "Z-Score" = 0.007(X1)+0.008(X2)+0.031(X3)+0.0042(X4)+0.998(X5)

3.17

Bankrupt less than	1.23
Zone of ignorance	1.23-2.90
Nonbankrupt greater than	2.9

De La Rey	**R000**	**a**		**b**	
Avg Total assets	136074	Total Debt		EBIT	
Curr Ass + Invest's	106535	Total Assets	40.03 %	Avg Total Ass	24.08 %
Curr Liabilities	41814				
Pait	17636	**c**		**d**	
Stock	45083	Curr Ass+Inves		PAIT	
Infl adj Total Assets	158003	Curr Liabs	2.55	Avg Total Ass	12.96 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	17.60 %	Adj TotalAss	28.53 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

1.39

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	836	Cash at Bank		Pait	
Total Funds employed	102641	Total Assets	0.58 %	Book Equity	26.85 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	56.34 %	Total Assets	12.21 %
		R5			
		Pait			
		Total Debt	30.50 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

-0.40

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

DeNim Textiles Ltd Year ended Dec 1997

Beaver

	R000		
Cash flow	22421	Cash Flow	
Total Debt Beaver	44273	Total Debt	**50.64** %

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman

	R000	X1		X2	
Working Capital	78803	Work Capital		Ret earnings	
Total Assets	148418	Total Assets	53.10 %	Total Assets	36.60 %
Retained Earnings	54326				
Ebit/Ops profit	29899	**X3**			
Mkt value Equity	0	EBIT			
Book value Equity	81742	Total Assets	20.15 %		
Total Debt	45738				
Sales	233270				
		X4		**X5**	
		Book val Eq		Sales	
		Total Debt	178.72 %	Total Assets	1.57 Times

Model A"Z-Score" = 0.007(X1)+0.008(X2)+0.031(X3)+0.0042(X4)+0.998(X5)

3.61

Bankrupt less than	1.23
Zone of ignorance	1.23-2.90
Nonbankrupt greater than	2.9

De La Rey

	R000	a		b	
Avg Total assets	146436	Total Debt		EBIT	
Curr Ass + Invest's	113042	Total Assets	30.82 %	Avg Total Ass	20.42 %
Curr Liabilities	34239				
Pait	16053	c		d	
Stock	53952	Curr Ass+Inves		PAIT	
Infl adj Total Assets	158466	Curr Liabs	3.30	Avg Total Ass	10.96 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	15.31 %	Adj TotalAss	34.05 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

1.39

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	1465	Cash at Bank		Pait	
Total Funds employed	114180	Total Assets	0.99 %	Book Equity	19.64 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	40.06 %	Total Assets	10.82 %
		R5			
		Pait			
		Total Debt	35.10 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

-0.65

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

DeNim Textiles Year ended Dec 1999

Beaver

	R000		
Cash flow	2536	Cash Flow	
Total Debt Beaver	154613	Total Debt	**1.64** %

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman

	R000	X1		X2	
Working Capital	78600	Work Capital		Ret earnings	
Total Assets	265591	Total Assets	29.59 %	Total Assets	23.57 %
Retained Earnings	62589				
Ops income/EBIT	6048	**X3**			
Mkt value Equity	0	EBIT			
Book value Equity	90004	Total Assets	2.28 %		
Total Debt	154648				
Sales	216868				
		X4		**X5**	
		Book val Eq		Sales	
		Total Debt	58.20 %	Total Assets	0.82 Times

Model A "Z-Score" = 0.007(X1)+0.008(X2)+0.031(X3)+0.0042(X4)+0.998(X5)

1.53

Bankrupt less than	1.23
Zone of ignorance	1.23-2.90
Nonbankrupt greater than	2.9

De La Rey

	R000	a		b	
Avg Total assets	265591	Total Debt		EBIT	
Curr Ass + Invest's	205397	Total Assets	58.23 %	Avg Total Ass	2.28 %
Curr Liabilities	126796				
Pait	-3704	**c**		**d**	
Stock	53724	Curr Ass+Inves		PAIT	
Infl adj Total Assets	271540	Curr Liabs	1.62	Avg Total Ass	-1.39 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	0.95 %	Adj TotalAss	19.78 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

-0.82

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	35	Cash at Bank		Pait	
Total Funds employed	138795	Total Assets	0.01 %	Book Equity	-4.12 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	111.42 %	Total Assets	-1.39 %
		R5			
		Pait			
		Total Debt	-2.40 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

0.73

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

De Nim Textiles Ltd 5 months ended May 2000

Beaver

	R000			
Cash flow	-3585	Cash Flow		
Total Debt Beaver	179324	Total Debt	**-2.00** %	

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman

	R000	X1		X2	
Working Capital	62390	Work Capital		Ret earnings	
Total Assets	282967	Total Assets	22.05 %	Total Assets	19.53 %
Retained Earnings	55254				
Ops income/EBIT	-4728	X3			
Mkt value Equity	0	EBIT			
Book value Equity	82670	Total Assets	-1.67 %		
Total Debt	179359				
Sales	73717				
		X4		X5	
		Book val Eq		Sales	
		Total Debt	46.09 %	Total Assets	0.26 Times

Model A "Z-Score" = 0.007(X1)+0.008(X2)+0.031(X3)+0.0042(X4)+0.998(X5)

0.71

Bankrupt less than	1.23
Zone of ignorance	1.23-2.90
Nonbankrupt greater than	2.9

De La Rey

	R000	a		b	
Avg Total assets	274279	Total Debt		EBIT	
Curr Ass + Invest's	202331	Total Assets	63.39 %	Avg Total Ass	-1.72 %
Curr Liabilities	139941				
Pait	-7335	c		d	
Stock	39364	Curr Ass+Inves		PAIT	
Infl adj Total Assets	297285	Curr Liabs	1.45	Avg Total Ass	-2.67 %
		e		f	
		Net Cash Flow		Stock	
		Avg Total Ass	-1.31 %	Adj TotalAss	13.24 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

-1.18

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	35	Cash at Bank		Pait	
Total Funds employed	143026	Total Assets	0.01 %	Book Equity	-8.87 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	125.40 %	Total Assets	-2.59 %
		R5			
		Pait			
		Total Debt	-4.09 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

0.91

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

LeisureNet Ltd Year end Dec 1998

Beaver

	R000		
Cash flow	143760	Cash Flow	
Total Debt Beaver	472203	Total Debt	**30.44** %

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman

	R000	X1		X2	
Working Capital	246298	Work Capital		Ret earnings	
Total Assets	920665	Total Assets	26.75 %	Total Assets	18.75 %
Retained Earnings	172644				
Ebit/Ops Profit	150149	**X3**		**X4**	
Mkt value Equity	835862	EBIT		Mkt val Eq	
Book value Equity	301116	Total Assets	16.31 %	Total Debt	160.39 %
Total Debt	521128				
Sales	879874				

	X5	
	Sales	
	Total Assets	0.96 Times

Original "Z-Score" = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

3.04

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

De La Rey

	R000	a		b	
Avg Total assets	920665	Total Debt		EBIT	
Curr Ass + Invest's	594902	Total Assets	56.60 %	Avg Total Ass	16.31 %
Curr Liabilities	325398				
Pait	65567	c		d	
Stock	68491	Curr Ass+Inves		PAIT	
Infl adj Total Assets	1003616	Curr Liabs	1.83	Avg Total Ass	7.12 %
		e		f	
		Net Cash Flow		Stock	
		Avg Total Ass	15.61 %	Adj TotalAss	6.82 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

0.23

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	48925	Cash at Bank		Pait	
Total Funds employed	595267	Total Assets	5.31 %	Book Equity	21.77 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	87.55 %	Total Assets	7.12 %
		R5			
		Pait			
		Total Debt	12.58 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

-0.30

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

LeisureNet Ltd Year ended 31 Dec 1999 (Restated)

Beaver	**R000**			
Cash flow	2256	Cash Flow		
Total Debt Beaver	452446	Total Debt	**0.50** %	

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman	**R000**	**X1**		**X2**	
Working Capital	598287	Work Capital		Ret earnings	
Total Assets	1641553	Total Assets	36.45 %	Total Assets	-9.62 %
Retained Earnings	-157850				
Ops Profit/Ebit	-59668	**X3**		**X4**	
Mkt value Equity	835862	EBIT		Mkt val Eq	
Book value Equity	162318	Total Assets	-3.63 %	Total Debt	134.98 %
Total Debt	619267				
Sales	911047				
				X5	
				Sales	
				Total Assets	0.55 Times

Original "Z-Score" = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

1.55

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

De La Rey	**R000**	**a**		**b**	
Avg Total assets	1641553	Total Debt		EBIT	
Curr Ass + Invest's	1003777	Total Assets	37.72 %	Avg Total Ass	-3.63 %
Curr Liabilities	405490				
Pait	-53197	**c**		**d**	
Stock	14554	Curr Ass+Inves		PAIT	
Infl adj Total Assets	1678323	Curr Liabs	2.48	Avg Total Ass	-3.24 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	0.14 %	Adj TotalAss	0.87 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

-0.87

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	166821	Cash at Bank		Pait	
Total Funds employed	156709	Total Assets	10.16 %	Book Equity	-32.77 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	395.17 %	Total Assets	-3.24 %
		R5			
		Pait			
		Total Debt	-8.59 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

2.87

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

LeisureNet 6 months 30 June 2000 (Restated)

Beaver

	R000		
Cash flow	4094	Cash Flow	
Total Debt Beaver	621094	Total Debt	**0.66** %

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman

	R000	X1		X2	
Working Capital	1158212	Work Capital		Ret earnings	
Total Assets	1925586	Total Assets	60.15 %	Total Assets	-9.47 %
Retained Earnings	-182320				
Ops Profit/Ebit	-8044	X3		X4	
Mkt value Equity	54000	EBIT		Mkt val Eq	
Book value Equity	136741	Total Assets	-0.42 %	Total Debt	7.44 %
Total Debt	725762				
Sales	538182				

X5	
Sales	
Total Assets	0.28 Times

Original "Z-Score" = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

0.90

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

De La Rey

	R000	a		b	
Avg Total assets	1635863	Total Debt		EBIT	
Curr Ass + Invest's	1158212	Total Assets	37.69 %	Avg Total Ass	-0.49 %
Curr Liabilities	443153				
Pait	-30901	c		d	
Stock	14479	Curr Ass+Inves		PAIT	
Infl adj Total Assets	2023983	Curr Liabs	2.61	Avg Total Ass	-1.89 %
		e		f	
		Net Cash Flow		Stock	
		Avg Total Ass	0.25 %	Adj TotalAss	0.72 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

-0.71

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	104668	Cash at Bank		Pait	
Total Funds employed	298358	Total Assets	5.44 %	Book Equity	-22.60 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	243.25 %	Total Assets	-1.60 %
		R5			
		Pait			
		Total Debt	-4.26 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

1.65

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

MacMed Healthcare Ltd (Group) Year ended 31 March 1995

Beaver

	R000			
Cash flow	5015	Cash Flow		
Total Debt Beaver	29346	Total Debt	**17.09**	%

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman

	R000	X1		X2		
Working Capital	22365	Work Capital		Ret earnings		
Total Assets	61470	Total Assets	36.38	% Total Assets	12.46	%
Retained Earnings	7660					
Ebit/Ops Profit	6137	**X3**		**X4**		
Mkt value Equity	61398	EBIT		Mkt val Eq		
Book value Equity	29124	Total Assets	9.98	% Total Debt	209.22	%
Total Debt	29346					
Sales	76702					

X5		
Sales		
Total Assets	1.25	Times

Original "Z-Score" = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

3.44

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

De La Rey

	R000	a		b		
Avg Total assets	50222	Total Debt		EBIT		
Curr Ass + Invest's	50807	Total Assets	47.74	% Avg Total Ass	12.22	%
Curr Liabilities	28442					
Pait	4468	**c**		**d**		
Stock	26931	Curr Ass+Inves		PAIT		
Infl adj Total Assets	59204	Curr Liabs	1.79	Avg Total Ass	8.90	%
		e		**f**		
		Net Cash Flow		Stock		
		Avg Total Ass	9.99	% Adj TotalAss	45.49	%

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

0.79

Bankrupt less than	-0.19
Zone of ignorance -	0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	0	Cash at Bank		Pait	
Total Funds employed	33028	Total Assets	0 %	Book Equity	15.34 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	88.85 %	Total Assets	7.27 %
		R5			
		Pait			
		Total Debt	15.23 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

0.22

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

Macmed Healthcare Ltd (Group) Year ended 31 March 1996

Beaver

	R000			
Cash flow	7784	Cash Flow		
Total Debt Beaver	35828	Total Debt	**21.73**	%

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman

	R000	X1		X2	
Working Capital	27926	Work Capital		Ret earnings	
Total Assets	77370	Total Assets	36.09 %	Total Assets	18.26 %
Retained Earnings	14128				
Ebit/Ops Profit	10173	**X3**		**X4**	
Mkt value Equity	257644	EBIT		Mkt val Eq	
Book value Equity	35542	Total Assets	13.15 %	Total Debt	719.11 %
Total Debt	35828				
Sales	90650				

X5		
Sales		
Total Assets	1.17	Times

Original "Z-Score" = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

6.61

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

De La Rey

	R000	a		b	
Avg Total assets	69420	Total Debt		EBIT	
Curr Ass + Invest's	62071	Total Assets	46.31 %	Avg Total Ass	14.65 %
Curr Liabilities	34145				
Pait	6843	c		d	
Stock	26269	Curr Ass+Inves		PAIT	
Infl adj Total Assets	82244	Curr Liabs	1.82	Avg Total Ass	9.86 %
		e		f	
		Net Cash Flow		Stock	
		Avg Total Ass	11.21 %	Adj TotalAss	31.94 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

0.81

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	0	Cash at Bank		Pait	
Total Funds employed	43225	Total Assets	0 %	Book Equity	19.25 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	82.89 %	Total Assets	8.84 %
		R5			
		Pait			
		Total Debt	19.10 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

0.09

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

Macmed Healthcare Ltd (Group) Year ended 31 March 1997

Beaver	**R000**			
Cash flow	16609	Cash Flow		
Total Debt Beaver	2001	Total Debt	**830.03**	%

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman	**R000**	**X1**		**X2**	
Working Capital	91291	Work Capital		Ret earnings	
Total Assets	196281	Total Assets	46.51 %	Total Assets	9.80 %
Retained Earnings	19244				
Ebit/Ops Profit	22860	**X3**		**X4**	
Mkt value Equity	633057	EBIT		Mkt val Eq	
Book value Equity	111883	Total Assets	11.65 %	Total Debt	24217.94 %
Total Debt	2614				
Sales	245536				
				X5	
				Sales	
				Total Assets	1.25 Times

Original "Z-Score" = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

147.64

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

De La Rey	**R000**	**a**		**b**	
Avg Total assets	136825	Total Debt		EBIT	
Curr Ass + Invest's	167075	Total Assets	1.33 %	Avg Total Ass	16.71 %
Curr Liabilities	75784				
Pait	17990	**c**		**d**	
Stock	83078	Curr Ass+Inves		PAIT	
Infl adj Total Assets	215045	Curr Liabs	2.20	Avg Total Ass	13.15 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	12.14 %	Adj TotalAss	38.63 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

1.97

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	0	Cash at Bank		Pait	
Total Funds employed	120497	Total Assets	0 %	Book Equity	16.08 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	2.17 %	Total Assets	9.17 %
		R5			
		Pait			
		Total Debt	688.22 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

-8.56

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

Macmed Healthcare Ltd (Group) Year ended 31 March 1998

Beaver	**R000**			
Cash flow	46434	Cash Flow		
Total Debt Beaver	91933	Total Debt	**50.51** %	

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman	**R000**	**X1**		**X2**	
Working Capital	224257	Work Capital		Ret earnings	
Total Assets	463743	Total Assets	48.36 %	Total Assets	11.42 %
Retained Earnings	52941				
Ebit/Ops Profit	44079	**X3**		**X4**	
Mkt value Equity	809352	EBIT		Mkt val Eq	
Book value Equity	264350	Total Assets	9.51 %	Total Debt	513.81 %
Total Debt	157521				
Sales	456277				

X5	
Sales	
Total Assets	0.98 Times

Original "Z-Score" = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

5.12

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

De La Rey	**R000**	**a**		**b**	
Avg Total assets	330012	Total Debt		EBIT	
Curr Ass + Invest's	377519	Total Assets	33.97 %	Avg Total Ass	13.36 %
Curr Liabilities	153262				
Pait	38182	**c**		**d**	
Stock	136057	Curr Ass+Inves		PAIT	
Infl adj Total Assets	488831	Curr Liabs	2.46	Avg Total Ass	11.57 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	14.07 %	Adj TotalAss	27.83 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

1.18

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	65588	Cash at Bank		Pait	
Total Funds employed	310481	Total Assets	14.14 %	Book Equity	14.44 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	50.73 %	Total Assets	8.23 %
		R5			
		Pait			
		Total Debt	24.24 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

-1.68

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

MacMed Healthcare Ltd (Group) Year ended 31 March 1999

Beaver

	R000		
Cash flow	58561	Cash Flow	
Total Debt Beaver	123170	Total Debt	**47.54** %

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman

	R000	X1		X2	
Working Capital	329370	Work Capital		Ret earnings	
Total Assets	733485	Total Assets	44.90 %	Total Assets	14.04 %
Retained Earnings	103001				
Ebit/Ops Profit	61590	**X3**		**X4**	
Mkt value Equity	88650	EBIT		Mkt val Eq	
Book value Equity	408563	Total Assets	8.40 %	Total Debt	33.40 %
Total Debt	265439				
Sales	672749				

	X5	
	Sales	
	Total Assets	0.92 Times

Original "Z-Score" = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

2.13

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

De La Rey

	R000	a		b	
Avg Total assets	598614	Total Debt		EBIT	
Curr Ass + Invest's	584570	Total Assets	36.19 %	Avg Total Ass	10.29 %
Curr Liabilities	255200				
Pait	59709	**c**		**d**	
Stock	161075	Curr Ass+Inves		PAIT	
Infl adj Total Assets	791797	Curr Liabs	2.29	Avg Total Ass	9.97 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	9.78 %	Adj TotalAss	20.34 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

0.81

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	142269	Cash at Bank		Pait	
Total Funds employed	478285	Total Assets	19.40 %	Book Equity	14.61 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	55.50 %	Total Assets	8.14 %
		R5			
		Pait			
		Total Debt	22.49 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

-2.12

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

Paradigm Capital Holdings Ltd Year ended 30 June 1997

Beaver

	R000			
Cash flow	11362	Cash Flow		
Total Debt Beaver	23408	Total Debt	**48.54** %	

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman

	R000	X1		X2	
Working Capital	29158	Work Capital		Ret earnings	
Total Assets	104375	Total Assets	27.94 %	Total Assets	9.77 %
Retained Earnings	10195				
Ebit/Ops Profit	15367	**X3**		**X4**	
Mkt value Equity	423830	EBIT		Mkt val Eq	
Book value Equity	38942	Total Assets	14.72 %	Total Debt	649.24 %
Total Debt	65281				
Sales	184646				
				X5	
				Sales	
				Total Assets	1.77 Times

Original "Z-Score" = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

6.62

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

De La Rey

	R000	a		b	
Avg Total assets	104375	Total Debt		EBIT	
Curr Ass + Invest's	92694	Total Assets	62.54 %	Avg Total Ass	14.72 %
Curr Liabilities	63536				
Pait	11747	c		d	
Stock	11426	Curr Ass+Inves		PAIT	
Infl adj Total Assets	113549	Curr Liabs	1.46	Avg Total Ass	11.25 %
		e		f	
		Net Cash Flow		Stock	
		Avg Total Ass	10.89 %	Adj TotalAss	10.06 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

0.40

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	41873	Cash at Bank		Pait	
Total Funds employed	40839	Total Assets	40.12 %	Book Equity	30.17 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	159.85 %	Total Assets	11.25 %
		R5			
		Pait			
		Total Debt	17.99 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

-3.03

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

Paradigm Capital Holdings Ltd (Group) Year ended 30 June 1998

Beaver

	R000		
Cash flow	46822	Cash Flow	
Total Debt Beaver	65009	Total Debt	**72.02** %

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman

	R000	X1		X2	
Working Capital	85193	Work Capital		Ret earnings	
Total Assets	197059	Total Assets	43.23 %	Total Assets	22.28 %
Retained Earnings	43897				
Ebit/Ops Profit	56752	**X3**		**X4**	
Mkt value Equity	716154	EBIT		Mkt val Eq	
Book value Equity	109717	Total Assets	28.80 %	Total Debt	826.77 %
Total Debt	86621				
Sales	256051				

	X5	
	Sales	
	Total Assets	1.30 Times

Original "Z-Score" = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

8.04

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

De La Rey

	R000	a		b	
Avg Total assets	150717	Total Debt		EBIT	
Curr Ass + Invest's	164249	Total Assets	43.96 %	Avg Total Ass	37.65 %
Curr Liabilities	79056				
Pait	43392	**c**		**d**	
Stock	24213	Curr Ass+Inves		PAIT	
Infl adj Total Assets	207227	Curr Liabs	2.08	Avg Total Ass	28.79 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	31.07 %	Adj TotalAss	11.68 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

2.87

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	21612	Cash at Bank		Pait	
Total Funds employed	113655	Total Assets	10.97 %	Book Equity	39.55 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	76.21 %	Total Assets	22.02 %
		R5			
		Pait			
		Total Debt	50.09 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

-1.50

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

Paradigm Capital Holdings Ltd (Group) Year ended 1999

Beaver	**R000**			
Cash flow	63428	Cash Flow		
Total Debt Beaver	103753	Total Debt	**61.13** %	

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman	**R000**	**X1**		**X2**	
Working Capital	148940	Work Capital		Ret earnings	
Total Assets	282236	Total Assets	52.77 %	Total Assets	36.73 %
Retained Earnings	103676				
Ebit/Ops Profit	64494	**X3**		**X4**	
Mkt value Equity	119132	EBIT		Mkt val Eq	
Book value Equity	178483	Total Assets	22.85 %	Total Debt	114.82 %
Total Debt	103753				
Sales	281060				
				X5	
				Sales	
				Total Assets	1.00 Times

Original "Z-Score" = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

3.59

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

De La Rey	**R000**	**a**		**b**	
Avg Total assets	239648	Total Debt		EBIT	
Curr Ass + Invest's	246907	Total Assets	36.76 %	Avg Total Ass	26.91 %
Curr Liabilities	97967				
Pait	50008	**c**		**d**	
Stock	30452	Curr Ass+Inves		PAIT	
Infl adj Total Assets	302782	Curr Liabs	2.52	Avg Total Ass	20.87 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	26.47 %	Adj TotalAss	10.06 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

2.12

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	0	Cash at Bank		Pait	
Total Funds employed	184269	Total Assets	0	Book Equity	28.02
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	56.31	Total Assets	17.72
		R5			
		Pait			
		Total Debt	48.20		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

-0.58

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

Paradigm Capital Holdings Ltd (Group) Year ended 30 June 2000

Beaver

	R000		
Cash flow	44474	Cash Flow	
Total Debt Beaver	291827	Total Debt	**15.24** %

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman

	R000	X1		X2	
Working Capital	285833	Work Capital		Ret earnings	
Total Assets	453289	Total Assets	63.06 %	Total Assets	16.31 %
Retained Earnings	73923				
Ebit/Ops Profit	71643	**X3**		**X4**	
Mkt value Equity	61363	EBIT		Mkt val Eq	
Book value Equity	153025	Total Assets	15.81 %	Total Debt	20.44 %
Total Debt	300264				
Sales	269182				

X5		
Sales		
Total Assets	0.59	Times

Original "Z-Score" = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

2.22

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

De La Rey

	R000	a		b	
Avg Total assets	367763	Total Debt		EBIT	
Curr Ass + Invest's	430280	Total Assets	66.24 %	Avg Total Ass	19.48 %
Curr Liabilities	144447				
Pait	40680	**c**		**d**	
Stock	29233	Curr Ass+Inves		PAIT	
Infl adj Total Assets	476452	Curr Liabs	2.98	Avg Total Ass	11.06 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	12.09 %	Adj TotalAss	6.14 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

0.43

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	8437	Cash at Bank		Pait	
Total Funds employed	153025	Total Assets	1.86 %	Book Equity	26.58 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	196.22 %	Total Assets	8.97 %
		R5			
		Pait			
		Total Debt	13.55 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

1.17

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

Roadcorp Pty Ltd Year ended July 1996

Beaver

	R000			
Cash flow	6306	Cash Flow		
Total Debt Beaver	45595	Total Debt	**13.83** %	

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman

	R000	X1		X2	
Working Capital	-7545	Work Capital		Ret earnings	
Total Assets	72653	Total Assets	-10.38 %	Total Assets	-21.60 %
Retained Earnings	-15694				
Ebit/Ops profit	9937	**X3**		**X4**	
Mkt value Equity	55950	EBIT		Mkt val Eq	
Book value Equity	27041	Total Assets	13.68 %	Total Debt	122.67 %
Total Debt	45611				
Sales	82130				

X5	
Sales	
Total Assets	1.13 Times

Original "Z-Score" = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

1.89

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

DeLaRey

	R000	a		b	
Avg Total assets	72653	Total Debt		EBIT	
Curr Ass + Invest's	17284	Total Assets	62.78 %	Avg Total Ass	13.68 %
Curr Liabilities	24829				
Pait	3632	**c**		**d**	
Stock	435	Curr Ass+Inves		PAIT	
Infl adj Total Assets	77782	Curr Liabs	0.70	Avg Total Ass	5.00 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	8.68 %	Adj TotalAss	0.56 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

-0.34

Bankrupt less than	-0.19
Zone of ignorance -	0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	16	Cash at Bank		Pait	
Total Funds employed	47823	Total Assets	0.02 %	Book Equity	13.43 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	95.37 %	Total Assets	5.00 %
		R5			
		Pait			
		Total Debt	7.96 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

0.38

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

Roadcorp Pty Ltd Year ended July 1997

Beaver	**R000**			
Cash flow	8067	Cash Flow		
Total Debt Beaver	44992	Total Debt	**17.93** %	

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman	**R000**	**X1**		**X2**	
Working Capital	-1496	Work Capital		Ret earnings	
Total Assets	100076	Total Assets	-1.49 %	Total Assets	-11.59 %
Retained Earnings	-11597				
Ebit/Ops profit	112693	**X3**		**X4**	
Mkt value Equity	69545	EBIT		Mkt val Eq	
Book value Equity	65659	Total Assets	112.61 %	Total Debt	154.50 %
Total Debt	45014				
Sales	112901				

X5	
Sales	
Total Assets	1.13 Times

Original "Z-Score" = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

5.59

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

DeLaRey	**R000**	**a**		**b**	
Avg Total assets	86365	Total Debt		EBIT	
Curr Ass + Invest's	25353	Total Assets	44.98 %	Avg Total Ass	130.48 %
Curr Liabilities	26849				
Pait	4117	**c**		**d**	
Stock	565	Curr Ass+Inves		PAIT	
Infl adj Total Assets	109183	Curr Liabs	0.94	Avg Total Ass	4.77 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	9.34 %	Adj TotalAss	0.52 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

1.26

Bankrupt less than	-0.19
Zone of ignorance -	0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	22	Cash at Bank		Pait	
Total Funds employed	73227	Total Assets	0.02 %	Book Equity	6.27 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	61.47 %	Total Assets	4.11 %
		R5			
		Pait			
		Total Debt	9.15 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

0.02

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

Roadcorp Pty Ltd Year ended July 1998

Beaver	**R000**			
Cash flow	30480	Cash Flow		
Total Debt Beaver	111605	Total Debt	**27.31** %	
Average solvent ratio	18%			
Nonbankrupt greater than	10%			
Zone of ignorance	5%-10%			
Bankrupt less than	5%			

Altman	**R000**	**X1**		**X2**	
Working Capital	-300	Work Capital		Ret earnings	
Total Assets	282448	Total Assets	-0.11 %	Total Assets	2.84 %
Retained Earnings	8035				
EBIT	34657	**X3**		**X4**	
Mkt value Equity	225159	EBIT		Mkt val Eq	
Book value Equity	146022	Total Assets	12.27 %	Total Debt	191.48 %
Total Debt	117588				
Sales	255810				
				X5	
				Sales	
				Total Assets	0.91 Times

Original "Z-Score" = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

2.50

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

DeLaRey	**R000**	**a**		**b**	
Avg Total assets	282448	Total Debt		EBIT	
Curr Ass + Invest's	63157	Total Assets	41.63 %	Avg Total Ass	12.27 %
Curr Liabilities	62399				
Pait	19967	**c**		**d**	
Stock	4714	Curr Ass+Inves		PAIT	
Infl adj Total Assets	301937	Curr Liabs	1.01	Avg Total Ass	7.07 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	10.79 %	Adj TotalAss	1.56 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

0.24

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	5983	Cash at Bank		Pait	
Total Funds employed	220049	Total Assets	2.12 %	Book Equity	13.67 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	53.44 %	Total Assets	7.07 %
		R5			
		Pait			
		Total Debt	16.98 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

-0.38

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

Tridelta Magnets Pty Ltd Year ended June 1998 Boe File

Beaver	**R000**		
Cash flow	-5695	Cash Flow	
Total Debt Beaver	210710	Total Debt	**-2.70** %

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman	**R000**	**X1**		**X2**	
Working Capital	4223	Work Capital		Ret earnings	
Total Assets	196216	Total Assets	2.15 %	Total Assets	-6.95 %
Retained Earnings	-13642				
Ebit/Ops profit	-4061	**X3**		**X4**	
Mkt value Equity	1119281	EBIT		Mkt val Eq	
Book value Equity	-13642	Total Assets	-2.07 %	Total Debt	531.16 %
Total Debt	210723				
Sales	3587				

X5	
Sales	
Total Assets	0.02 Times

Original "Z-Score" = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

3.07

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

De La Rey	**R000**	**a**		**b**	
Avg Total assets	196216	Total Debt		EBIT	
Curr Ass + Invest's	15755	Total Assets	107.39 %	Avg Total Ass	-2.07 %
Curr Liabilities	11531				
Pait	-4061	**c**		**d**	
Stock	6889	Curr Ass+Inves		PAIT	
Infl adj Total Assets	206341	Curr Liabs	1.37	Avg Total Ass	-2.07 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	-2.90 %	Adj TotalAss	3.34 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

-2.00

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	13	Cash at Bank		Pait	
Total Funds employed	185549	Total Assets	0.01	Book Equity	29.77
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	113.57	Total Assets	-2.07
		R5			
		Pait			
		Total Debt	-1.93		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

0.69

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

Tridelta Magnets Pty Ltd Year ended June 1999 Bank File

Beaver	**R000**			
Cash flow	-11518	Cash Flow		
Total Debt Beaver	275468	Total Debt	**-4.18** %	
Average solvent ratio	18%			
Nonbankrupt greater than	10%			
Zone of ignorance	5%-10%			
Bankrupt less than	5%			

Altman	**R000**	**X1**		**X2**	
Working Capital	26379	Work Capital		Ret earnings	
Total Assets	261595	Total Assets	10.08 %	Total Assets	-5.35 %
Retained Earnings	-13995				
Ebit/ Ops profit	-352	**X3**		**X4**	
Mkt value Equity	188678	EBIT		Mkt val Eq	
Book value Equity	-13995	Total Assets	-0.13 %	Total Debt	68.46 %
Total Debt	275592				
Sales	18355				
				X5	
				Sales	
				Total Assets	0.07 Times

Original 'Z-Score' = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

0.52

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

De La Rey	**R000**	**a**		**b**	
Avg Total assets	228905	Total Debt		EBIT	
Curr Ass + Invest's	34726	Total Assets	105.35 %	Avg Total Ass	-0.15 %
Curr Liabilities	8346				
Pait	-352	**c**		**d**	
Stock	14767	Curr Ass+Inves		PAIT	
Infl adj Total Assets	274335	Curr Liabs	4.16	Avg Total Ass	-0.15 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	-5.03 %	Adj TotalAss	5.38 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

-1.64

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	124	Cash at Bank		Pait	
Total Funds employed	253249	Total Assets	0.05 %	Book Equity	2.52 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	108.82 %	Total Assets	-0.13 %
		R5			
		Pait			
		Total Debt	-0.13 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

0.65

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

A.M.Moolla Group Ltd Year ended Feb 1998

Beaver	**R000**	**1**		
Cash flow	12944	Cash Flow		
Total Debt Beaver	72735	Total Debt	**17.80** %	

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman	**R000**	**X1**		**X2**	
Working Capital	139142	Work Capital		Ret earnings	
Total Assets	260225	Total Assets	53.47 %	Total Assets	4.59 %
Retained Earnings	11940				
Ebit/Ops Profit	26034	**X3**		**X4**	
Mkt value Equity	57534	EBIT		Mkt val Eq	
Book value Equity	159895	Total Assets	10.00 %	Total Debt	57.35 %
Total Debt	100329				
Sales	172020				

X5	
Sales	
Total Assets	0.66 Times

Original "Z-Score" = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

2.04

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

De La Rey	**R000**	**a**		**b**	
Avg Total assets	260225	Total Debt		EBIT	
Curr Ass + Invest's	233035	Total Assets	38.55 %	Avg Total Ass	10.00 %
Curr Liabilities	93893				
Pait	11940	**c**		**d**	
Stock	105884	Curr Ass+Inves		PAIT	
Infl adj Total Assets	274173	Curr Liabs	2.48	Avg Total Ass	4.59 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	4.97 %	Adj TotalAss	38.62 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

0.43

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	27594	Cash at Bank		Pait	
Total Funds employed	166333	Total Assets	10.60 %	Book Equity	7.47 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	60.32 %	Total Assets	4.59 %
		R5			
		Pait			
		Total Debt	11.90 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

-1.06

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

A.M.Moolla Group Ltd Year ended Feb 1999

Beaver	**R000**	**1**		
Cash flow	23912	Cash Flow		
Total Debt Beaver	111872	Total Debt	**21.37** %	

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman	**R000**	**X1**		**X2**	
Working Capital	157630	Work Capital		Ret earnings	
Total Assets	299502	Total Assets	52.63 %	Total Assets	10.30 %
Retained Earnings	30840				
Ebit/Ops Profit	39132	**X3**		**X4**	
Mkt value Equity	18706	EBIT		Mkt val Eq	
Book value Equity	186509	Total Assets	13.07 %	Total Debt	16.56 %
Total Debt	112992				
Sales	287120				
		X4		**X5**	
		Book val Eq		Sales	
		Total Debt	165.06 %	Total Assets	0.96 Times

Original "Z-Score" = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

2.26

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

De La Rey	**R000**	**a**		**b**	
Avg Total assets	279864	Total Debt		EBIT	
Curr Ass + Invest's	266689	Total Assets	37.73 %	Avg Total Ass	13.98 %
Curr Liabilities	109058				
Pait	22875	**c**		**d**	
Stock	159086	Curr Ass+Inves		PAIT	
Infl adj Total Assets	325199	Curr Liabs	2.45	Avg Total Ass	8.17 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	8.54 %	Adj TotalAss	48.92 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

0.96

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	1120	Cash at Bank		Pait	
Total Funds employed	190444	Total Assets	0.37 %	Book Equity	12.26 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	59.33 %	Total Assets	7.64 %
		R5			
		Pait			
		Total Debt	20.24 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

-0.19

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

A.M.Moolla Group Ltd Year ended Feb 2000

Beaver	**R000**	**1**		
Cash flow	7246	Cash Flow		
Total Debt Beaver	162606	Total Debt	**4.46** %	

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman	**R000**	**X1**		**X2**	
Working Capital	163750	Work Capital		Ret earnings	
Total Assets	353619	Total Assets	46.31 %	Total Assets	1.27 %
Retained Earnings	4502				
Ebit/Ops Profit	17856	**X3**		**X4**	
Mkt value Equity	25440	EBIT		Mkt val Eq	
Book value Equity	163295	Total Assets	5.05 %	Total Debt	15.65 %
Total Debt	162606				
Sales	280756				
				X5	
				Sales	
				Total Assets	0.79 Times

Original "Z-Score" = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

1.63

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

De La Rey	**R000**	**a**		**b**	
Avg Total assets	326561	Total Debt		EBIT	
Curr Ass + Invest's	323703	Total Assets	45.98 %	Avg Total Ass	5.47 %
Curr Liabilities	159953				
Pait	4502	**c**		**d**	
Stock	202839	Curr Ass+Inves		PAIT	
Infl adj Total Assets	362035	Curr Liabs	2.02	Avg Total Ass	1.38 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	2.22 %	Adj TotalAss	56.03 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

0.09

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	0	Cash at Bank		Pait	
Total Funds employed	353618	Total Assets	0 %	Book Equity	2.76 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	45.98 %	Total Assets	1.27 %
		R5			
		Pait			
		Total Debt	2.77 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

-0.05	
Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

Bearing Man Ltd Year ended June 1995

Beaver	**R000**	**1**		
Cash flow	28922	Cash Flow		
Total debt	83197	Total Debt	**34.76** %	

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman	**R000**	**X1**		**X2**	
Working Capital	59710	Work Capital		Ret earnings	
Total Assets	178176	Total Assets	33.51 %	Total Assets	11.36 %
Retained Earnings	20246				
EBIT	38358	**X3**		**X4**	
Mkt value Equity	417840	EBIT		Mkt val Eq	
Book value Equity	94979	Total Assets	21.53 %	Total Debt	502.23 %
Sales	262332				
				X5	
				Sales	
				Total Assets	1.47 Times

Original 'Z-Score' = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

5.76

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

DeLaRey	**R000**	**a**		**b**	
Avg Total assets	152309	Total Debt		EBIT	
Curr Ass + Invest's	142907	Total Assets	46.69 %	Avg Total Ass	25.18 %
Curr Liabilities	83197				
Pait	20246	**c**		**d**	
Stock	85744	Curr Ass+Inves		PAIT	
Infl adj Total Assets	193499	Curr Liabs	1.72	Avg Total Ass	13.29 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	18.99 %	Adj TotalAss	44.31 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

1.47

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	0	Cash at Bank		Pait	
Total Funds employed	94979	Total Assets	0 %	Book Equity	21.32 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	87.60 %	Total Assets	11.36 %
		R5			
		Pait			
		Total Debt	24.34 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

0.07

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

Bearing Man Ltd Year ended June 1996

Beaver	**R000**	**1**		
Cash flow	31060	Cash Flow		
Total debt	118414	Total Debt	**26.23** %	

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman	**R000**	**X1**		**X2**	
Working Capital	66796	Work Capital		Ret earnings	
Total Assets	178176	Total Assets	37.49 %	Total Assets	15.34 %
Retained Earnings	27332				
EBIT	49042	**X3**		**X4**	
Mkt value Equity	365860	EBIT		Mkt val Eq	
Book value Equity	111447	Total Assets	27.52 %	Total Debt	308.97 %
Sales	310432				
				X5	
				Sales	
				Total Assets	1.74 Times

Original 'Z-Score' = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

5.17

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

DeLaRey	**R000**	**a**		**b**	
Avg Total assets	204018	Total Debt		EBIT	
Curr Ass + Invest's	169634	Total Assets	66.46 %	Avg Total Ass	24.04 %
Curr Liabilities	102838				
Pait	27332	**c**		**d**	
Stock/Inventory	101780	Curr Ass+Inves		PAIT	
Infl adj Total Assets	248549	Curr Liabs	1.65	Avg Total Ass	13.40 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	15.22 %	Adj TotalAss	40.95 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

1.04

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	0	Cash at Bank		Pait	
Total Funds employed	127023	Total Assets	0 %	Book Equity	24.52 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	93.22 %	Total Assets	15.34 %
		R5			
		Pait			
		Total Debt	23.08 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

0.12

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

Bearing Man Ltd Year ended June 1997

Beaver	**R000**	**1**		
Cash flow	34530	Cash Flow		
Total debt	125160	Total Debt	**27.59** %	

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman	**R000**	**X1**		**X2**	
Working Capital	82147	Work Capital		Ret earnings	
Total Assets	252656	Total Assets	32.51 %	Total Assets	10.70 %
Retained Earnings	27046				
EBIT	50803	**X3**		**X4**	
Mkt value Equity	231790	EBIT		Mkt val Eq	
Book value Equity	127496	Total Assets	20.11 %	Total Debt	185.19 %
Sales	357590				
				X5	
				Sales	
				Total Assets	1.42 Times

Original 'Z-Score' = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X50
3.73

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

DeLaRey	**R000**	**a**		**b**	
Avg Total assets	220839	Total Debt		EBIT	
Curr Ass + Invest's	189021	Total Assets	49.54 %	Avg Total Ass	23.00 %
Curr Liabilities	106874				
Pait	27046	**c**		**d**	
Stock/Inventory	113413	Curr Ass+Inves		PAIT	
Infl adj Total Assets	274384	Curr Liabs	1.77	Avg Total Ass	12.25 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	15.64 %	Adj TotalAss	41.33 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811
1.22

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	0	Cash at Bank		Pait	
Total Funds employed	145782	Total Assets	0 %	Book Equity	21.21 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	85.85 %	Total Assets	10.70 %
		R5			
		Pait			
		Total Debt	21.61 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

0.09

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

Bearing Man Ltd Year ended June 1998

Beaver	**R000**			
Cash flow	29528	Cash Flow		
Total Debt	118807	Total Debt	**24.85** %	

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman	**R000**	**X1**		**X2**	
Working Capital	93378	Work Capital		Ret earnings	
Total Assets	259120	Total Assets	36.04 %	Total Assets	31.35 %
Retained Earnings	81237				
Ebit/Ops profit	40936	**X3**		**X4**	
Mkt value Equity	89794	EBIT		Mkt val Eq	
Book value Equity	59076	Total Assets	15.80 %	Total Debt	75.58 %
Sales	386296				
				X5	
				Sales	
				Total Assets	1.49 Times

Original 'Z-Score' = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

3.34

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

DeLaRey	**R000**	**a**		**b**	
Avg Total assets	272491	Total Debt		EBIT	
Curr Ass + Invest's	195236	Total Assets	45.85 %	Avg Total Ass	15.02 %
Curr Liabilities	102123				
Pait	21592	**c**		**d**	
Stock/Inventory	137819	Curr Ass+Inves		PAIT	
Infl adj Total Assets	276999	Curr Liabs	1.91	Avg Total Ass	7.92 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	10.84 %	Adj TotalAss	49.75 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

0.84

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	0	Cash at Bank		Pait	
Total Funds employed	156997	Total Assets	0 %	Book Equity	36.55 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	75.67 %	Total Assets	8.33 %
		R5			
		Pait			
		Total Debt	18.17 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

0.00

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

Bearing Man Ltd Year ended June 1999

Beaver	**R000**			
Cash flow	14421	Cash Flow		
Total debt	202757	Total Debt	**7.11** %	

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman	**R000**	**X1**		**X2**	
Working Capital	81882	Work Capital		Ret earnings	
Total Assets	339248	Total Assets	24.14 %	Total Assets	22.78 %
Retained Earnings	77265				
Ebit/Ops profit	53688	**X3**		**X4**	
Mkt value Equity	169025	EBIT		Mkt val Eq	
Book value Equity	59226	Total Assets	15.83 %	Total Debt	83.36 %
Sales	495879				
				X5	
				Sales	
				Total Assets	1.46 Times

Original 'Z-Score' = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

3.09

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

DeLaRey	**R000**	**a**		**b**	
Avg Total assets	299184	Total Debt		EBIT	
Curr Ass + Invest's	269962	Total Assets	59.77 %	Avg Total Ass	17.94 %
Curr Liabilities	188080				
Pait	5546	**c**		**d**	
Stock/Inventory	178703	Curr Ass+Inves		PAIT	
Infl adj Total Assets	363945	Curr Liabs	1.44	Avg Total Ass	1.85 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	4.82 %	Adj TotalAss	49.10 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

-0.02

Bankrupt less than	-0.19
Zone of ignorance -	0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	0	Cash at Bank		Pait	
Total Funds employed	151168	Total Assets	0 %	Book Equity	9.36 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	134.13 %	Total Assets	1.63 %
		R5			
		Pait			
		Total Debt	2.74 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

0.87

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

Bearing Man Ltd Year ended June 2000

Beaver	**R000**			
Cash flow	35112	Cash Flow		
Total debt	177415	Total Debt	**19.79** %	
Average solvent ratio	18%			
Nonbankrupt greater than	10%			
Zone of ignorance	5%-10%			
Bankrupt less than	5%			

Altman	**R000**	**X1**		**X2**	
Working Capital	101312	Work Capital		Ret earnings	
Total Assets	399681	Total Assets	25.35 %	Total Assets	23.08 %
Retained Earnings	92236				
Ebit/Ops profit	54121	**X3**		**X4**	
Mkt value Equity	174306	EBIT		Mkt val Eq	
Book value Equity	153539	Total Assets	13.54 %	Total Debt	98.25 %
Sales	560462				
				X5	
				Sales	
				Total Assets	1.40 Times

Original 'Z-Score' = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

3.06

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

DeLaRey	**R000**	**a**		**b**	
Avg Total assets	329232	Total Debt		EBIT	
Curr Ass + Invest's	262227	Total Assets	44.39 %	Avg Total Ass	16.44 %
Curr Liabilities	160915				
Pait	25535	**c**		**d**	
Stock	172830	Curr Ass+Inves		PAIT	
Infl adj Total Assets	428778	Curr Liabs	1.63	Avg Total Ass	7.76 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	10.66 %	Adj TotalAss	40.31 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

0.75

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	R000	R1		R2	
Cash at Bank	0	Cash at Bank		Pait	
Total Funds employed	303954	Total Assets	0 %	Book Equity	16.63 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	58.37 %	Total Assets	6.39 %
		R5			
		Pait			
		Total Debt	14.39 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

-0.10

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

Bearing Man Unaudited 6 months Dec 2000

Beaver	**R000**			
Cash flow	25872	Cash Flow		
Total debt	235532	Total Debt	**10.98** %	

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman	**R000**	**X1**		**X2**	
Working Capital	109402	Work Capital		Ret earnings	
Total Assets	404519	Total Assets	27.04 %	Total Assets	26.56 %
Retained Earnings	107439				
Ebit/Ops profit	38429	**X3**		**X4**	
Mkt value Equity	174306	EBIT		Mkt val Eq	
Book value Equity	168987	Total Assets	9.50 %	Total Debt	74.01 %
Sales	345798				
				X5	
				Sales	
				Total Assets	0.85 Times

Original 'Z-Score' = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

2.31

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

DeLaRey	**R000**	**a**		**b**	
Avg Total assets	360744	Total Debt		EBIT	
Curr Ass + Invest's	338843	Total Assets	58.23 %	Avg Total Ass	10.65 %
Curr Liabilities	220652				
Pait	21541	**c**		**d**	
Stock	212236	Curr Ass+Inves		PAIT	
Infl adj Total Assets	432956	Curr Liabs	1.54	Avg Total Ass	5.97 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	7.17 %	Adj TotalAss	49.02 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

0.33

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	R000	R1		R2	
Cash at Bank	0	Cash at Bank		Pait	
Total Funds employed	404519	Total Assets	0 %	Book Equity	12.75 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	58.23 %	Total Assets	5.33 %
		R5			
		Pait			
		Total Debt	9.15 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

-0.03

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

Gray Security Services Pty Ltd Year ended Feb 1995

Beaver	**R000**			
Cash flow	4278	Cash Flow		
Total Debt Beaver	27085	Total Debt	**15.79** %	

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman	**R000**	**X1**		**X2**	
Working Capital	-14267	Work Capital		Ret earnings	
Total Assets	29446	Total Assets	-48.45 %	Total Assets	4.66 %
Retained Earnings	1371				
Ebit/Ops Profit	6639	**X3**			
Mkt value Equity	0	EBIT			
Book value Equity	1372	Total Assets	22.55 %		
Total Debt	28073				
Sales	147018				
		X4		**X5**	
		Book val Eq		Sales	
		Total Debt	4.89 %	Total Assets	4.99 Times

Model A "Z-Score" = 0.007(X1)+0.008(X2)+0.031(X3)+0.0042(X4)+0.998(X5)

5.40

Bankrupt less than	1.23
Zone of ignorance	1.23-2.90
Nonbankrupt greater than	2.9

De La Rey	**R000**	**a**		**b**	
Avg Total assets	29446	Total Debt		EBIT	
Curr Ass + Invest's	9687	Total Assets	95.34 %	Avg Total Ass	22.55 %
Curr Liabilities	23955				
Pait	1996	**c**		**d**	
Stock	642	Curr Ass+Inves		PAIT	
Infl adj Total Assets	32369	Curr Liabs	0.40	Avg Total Ass	6.78 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	14.53 %	Adj TotalAss	1.98 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

-0.52

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	988	Cash at Bank		Pait	
Total Funds employed	5491	Total Assets	3.36 %	Book Equity	145.48 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	511.25 %	Total Assets	6.78 %
		R5			
		Pait			
		Total Debt	7.11 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

4.24

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

Gray Security services PTY Ltd Year ended 29 Feb 1996

Beaver	**R000**	**1**		
Cash flow	6186	Cash Flow		
Total Debt Beaver	32390	Total Debt	**19.10** %	

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman	**R000**	**X1**		**X2**	
Working Capital	-17918	Work Capital		Ret earnings	
Total Assets	37147	Total Assets	-48.24 %	Total Assets	11.60 %
Retained Earnings	4308				
Ebit/Ops Profit	6886	**X3**			
Mkt value Equity	0	EBIT			
Book value Equity	4309	Total Assets	18.54 %		
Total Debt	32823				
Sales	194352				
		X4		**X5**	
		Book val Eq		Sales	
		Total Debt	13.13 %	Total Assets	5.23 Times

Model A "Z-Score" = 0.007(X1)+0.008(X2)+0.031(X3)+0.0042(X4)+0.998(X5)

5.61

Bankrupt less than	1.23
Zone of ignorance	1.23-2.90
Nonbankrupt greater than	2.9

De La Rey	**R000**	**a**		**b**	
Avg Total assets	33297	Total Debt		EBIT	
Curr Ass + Invest's	10335	Total Assets	88.36 %	Avg Total Ass	20.68 %
Curr Liabilities	28253				
Pait	2936	**c**		**d**	
Stock	451	Curr Ass+Inves		PAIT	
Infl adj Total Assets	39550	Curr Liabs	0.37	Avg Total Ass	8.82 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	18.58 %	Adj TotalAss	1.14 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

-0.19

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	R000	R1		R2	
Cash at Bank	433	Cash at Bank		Pait	
Total Funds employed	8895	Total Assets	1.17 %	Book Equity	68.14 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	369.01 %	Total Assets	7.90 %
		R5			
		Pait			
		Total Debt	8.94 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

3.05

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

Gray Security Services Pty Ltd Year ended Feb 1997

Beaver

	R000		
Cash flow	11810	Cash Flow	
Total Debt Beaver	41521	Total Debt	**28.44** %

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman

	R000				
Working Capital	-18929	**X1**		**X2**	
Total Assets	47581	Work Capital		Ret earnings	
Retained Earnings	924	Total Assets	-39.78 %	Total Assets	1.94 %
Ebit/Ops Profit	15275	**X3**			
Mkt value Equity	0	EBIT			
Book value Equity	925	Total Assets	32.10 %		
Total Debt	46656				
Sales	265589				
		X4		**X5**	
		Book val Eq		Sales	
		Total Debt	1.98 %	Total Assets	5.58 Times

Model A "Z-Score" = 0.007(X1)+0.008(X2)+0.031(X3)+0.0042(X4)+0.998(X5)

6.31

Bankrupt less than	1.23
Zone of ignorance	1.23-2.90
Nonbankrupt greater than	2.9

De La Rey

	R000				
Avg Total assets	42364	**a**		**b**	
Curr Ass + Invest's	21620	Total Debt		EBIT	
Curr Liabilities	40550	Total Assets	98.06 %	Avg Total Ass	36.06 %
Pait	7616	**c**		**d**	
Stock	282	Curr Ass+Inves		PAIT	
Infl adj Total Assets	52262	Curr Liabs	0.53	Avg Total Ass	17.98 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	27.88 %	Adj TotalAss	0.54 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

0.77

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	5135	Cash at Bank		Pait	
Total Funds employed	7031	Total Assets	10.79 %	Book Equity	823.35 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	663.58 %	Total Assets	16.01 %
		R5			
		Pait			
		Total Debt	16.32 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

3.85

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

Gray Security Services Pty Ltd Year ended 31 Aug 1998

Beaver

	R000			
Cash flow	10022	Cash Flow		
Total Debt Beaver	184453	Total Debt	**5.43** %	

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman

	R000	X1		X2	
Working Capital	-49113	Work Capital		Ret earnings	
Total Assets	187081	Total Assets	-26.25 %	Total Assets	2.67 %
Retained Earnings	4992				
Ebit/Ops Profit	32024	**X3**			
Mkt value Equity	0	EBIT			
Book value Equity	5042	Total Assets	17.12 %		
Total Debt	186053				
Sales	371937				
		X4		**X5**	
		Book val Eq		Sales	
		Total Debt	2.71 %	Total Assets	1.99 Times

Model A "Z-Score" = 0.007(X1)+0.008(X2)+0.031(X3)+0.0042(X4)+0.998(X5)

2.36

Bankrupt less than	1.23
Zone of ignorance	1.23-2.90
Nonbankrupt greater than	2.9

De La Rey

	R000	a		b	
Avg Total assets	117331	Total Debt		EBIT	
Curr Ass + Invest's	24745	Total Assets	99.45 %	Avg Total Ass	27.29 %
Curr Liabilities	73858				
Pait	4992	c		d	
Stock	184	Curr Ass+Inves		PAIT	
Infl adj Total Assets	201392	Curr Liabs	0.34	Avg Total Ass	4.25 %
		e		f	
		Net Cash Flow		Stock	
		Avg Total Ass	8.54 %	Adj TotalAss	0.09 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

-0.89

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	1600	Cash at Bank		Pait	
Total Funds employed	113225	Total Assets	0.86 %	Book Equity	99.01 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	164.32 %	Total Assets	2.67 %
		R5			
		Pait			
		Total Debt	2.68 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

0.96

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

Gray Security Services Pty Ltd Year ended 31 Aug 1999

Beaver	**R000**			
Cash flow	27974	Cash Flow		
Total Debt Beaver	68089	Total Debt	**41.08** %	

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman	**R000**	**X1**		**X2**	
Working Capital	-21312	Work Capital		Ret earnings	
Total Assets	119855	Total Assets	-17.78 %	Total Assets	10.40 %
Retained Earnings	12468				
Ebit/Ops Profit	43893	**X3**		**X4**	
Mkt value Equity	384890	EBIT		Mkt val Eq	
Book value Equity	18201	Total Assets	36.62 %	Total Debt	375.98 %
Total Debt	102371				
Sales	532328				
				X5	
				Sales	
				Total Assets	4.44 Times

Original "Z-Score" = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

7.83

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

De La Rey	**R000**	**a**		**b**	
Avg Total assets	153468	Total Debt		EBIT	
Curr Ass + Invest's	69908	Total Assets	85.41 %	Avg Total Ass	28.60 %
Curr Liabilities	91220				
Pait	20344	**c**		**d**	
Stock	665	Curr Ass+Inves		PAIT	
Infl adj Total Assets	123738	Curr Liabs	0.77	Avg Total Ass	13.26 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	18.23 %	Adj TotalAss	0.54 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

0.33

Bankrupt less than	-0.19
Zone of ignorance -	0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	34282	Cash at Bank		Pait	
Total Funds employed	28635	Total Assets	28.60 %	Book Equity	111.77 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	357.50 %	Total Assets	16.97 %
		R5			
		Pait			
		Total Debt	19.87 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

0.01

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

Gray Security Services Pty Ltd Year ended 31 Aug 2000

Beaver	**R000**			
Cash flow	44889	Cash Flow		
Total Debt Beaver	71214	Total Debt	**63.03** %	
Average solvent ratio	18%			
Nonbankrupt greater than	10%			
Zone of ignorance	5%-10%			
Bankrupt less than	5%			

Altman	**R000**	**X1**		**X2**	
Working Capital	-8417	Work Capital		Ret earnings	
Total Assets	258099	Total Assets	-3.26 %	Total Assets	15.72 %
Retained Earnings	40579				
Ebit/Ops Profit	59666	**X3**		**X4**	
Mkt value Equity	463793	EBIT		Mkt val Eq	
Book value Equity	58989	Total Assets	23.12 %	Total Debt	366.77 %
Total Debt	126455				
Sales	686169				
				X5	
				Sales	
				Total Assets	2.66 Times

Original "Z-Score" = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

5.80

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

De La Rey	**R000**	**a**		**b**	
Avg Total assets	188977	Total Debt		EBIT	
Curr Ass + Invest's	110993	Total Assets	48.99 %	Avg Total Ass	31.57 %
Curr Liabilities	119410				
Pait	40579	**c**		**d**	
Stock	1543	Curr Ass+Inves		PAIT	
Infl adj Total Assets	276346	Curr Liabs	0.93	Avg Total Ass	21.47 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	23.75 %	Adj TotalAss	0.56 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

1.78

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	55241	Cash at Bank		Pait	
Total Funds employed	184546	Total Assets	21.40 %	Book Equity	68.79 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	68.52 %	Total Assets	15.72 %
		R5			
		Pait			
		Total Debt	32.09 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

-2.42

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

McCarthy Retail Ltd (Group) Year ended 30 June 1997

Beaver

	R000		
Cash flow	58047	Cash Flow	
Total Debt Beaver	1291790	Total Debt	**4.49** %

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman

	R000	X1		X2	
Working Capital	766573	Work Capital		Ret earnings	
Total Assets	2747311	Total Assets	27.90 %	Total Assets	11.71 %
Retained Earnings	321705				
Ebit/Ops Profit	304273	**X3**		**X4**	
Mkt value Equity	1679000	EBIT		Mkt val Eq	
Book value Equity	459063	Total Assets	11.08 %	Total Debt	127.54 %
Total Debt	1316408				
Sales	9662466				

	X5	
	Sales	
	Total Assets	3.52 Times

Original "Z-Score" = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

5.14

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

De La Rey

	R000	a		b	
Avg Total assets	2536646	Total Debt		EBIT	
Curr Ass + Invest's	2082981	Total Assets	47.92 %	Avg Total Ass	12.00 %
Curr Liabilities	1316408				
Pait	148778	c		d	
Stock	967924	Curr Ass+Inves		PAIT	
Infl adj Total Assets	2988799	Curr Liabs	1.58	Avg Total Ass	5.87 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	2.29 %	Adj TotalAss	32.39 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

0.24

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	24618	Cash at Bank		Pait	
Total Funds employed	1430903	Total Assets	0.90 %	Book Equity	32.41 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	92.00 %	Total Assets	5.42 %
		R5			
		Pait			
		Total Debt	11.30 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

0.19

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

McCarthy Retail Ltd (Group) Year ended 1998

Beaver

	R000		
Cash flow	-130228	Cash Flow	
Total Debt Beaver	2784217	Total Debt	**-4.68** %

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman

	R000	X1		X2	
Working Capital	1524841	Work Capital		Ret earnings	
Total Assets	3922215	Total Assets	38.88 %	Total Assets	-0.95 %
Retained Earnings	-37435				
Ebit/Ops Profit	185776	**X3**		**X4**	
Mkt value Equity	603949	EBIT		Mkt val Eq	
Book value Equity	105022	Total Assets	4.74 %	Total Debt	20.05 %
Total Debt	3012058				
Sales	11337790				

	X5	
	Sales	
	Total Assets	2.89 Times

Original "Z-Score" = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

3.62

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

De La Rey

	R000	a		b	
Avg Total assets	3334763	Total Debt		EBIT	
Curr Ass + Invest's	3083600	Total Assets	76.79 %	Avg Total Ass	5.57 %
Curr Liabilities	1558759				
Pait	-251370	**c**		**d**	
Stock	1326420	Curr Ass+Inves		PAIT	
Infl adj Total Assets	4124601	Curr Liabs	1.98	Avg Total Ass	-7.54 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	-3.91 %	Adj TotalAss	32.16 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

-1.55

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	227841	Cash at Bank		Pait	
Total Funds employed	2363456	Total Assets	5.81 %	Book Equity	-239.35 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	127.44 %	Total Assets	-6.41 %
		R5			
		Pait			
		Total Debt	-8.35 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

0.82

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

McRetail (Group) Ltd Year ended 30 June 1999

Beaver

	R000			
Cash flow	-182254	Cash Flow		
Total Debt Beaver	1771483	Total Debt	**-10.29** %	

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman

	R000	X1		X2	
Working Capital	370762	Work Capital		Ret earnings	
Total Assets	2231600	Total Assets	16.61 %	Total Assets	0.60 %
Retained Earnings	13371				
Ebit/Ops Profit	223403	**X3**		**X4**	
Mkt value Equity	484670	EBIT		Mkt val Eq	
Book value Equity	416308	Total Assets	10.01 %	Total Debt	27.01 %
Total Debt	1794096				
Sales	7915494				

X5		
Sales		
Total Assets	3.55	Times

Original "Z-Score" = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

4.24

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

De La Rey

	R000	a		b	
Avg Total assets	3076907	Total Debt		EBIT	
Curr Ass + Invest's	1334539	Total Assets	80.40 %	Avg Total Ass	7.26 %
Curr Liabilities	963777				
Pait	120427	**c**		**d**	
Stock	677757	Curr Ass+Inves		PAIT	
Infl adj Total Assets	2394060	Curr Liabs	1.38	Avg Total Ass	3.91 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	-5.92 %	Adj TotalAss	28.31 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

-0.71

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	22613	Cash at Bank		Pait	
Total Funds employed	437504	Total Assets	1.01 %	Book Equity	28.93 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	410.08 %	Total Assets	5.40 %
		R5			
		Pait			
		Total Debt	6.71 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

3.61

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

McCarthy Retail (Group) Year ended 30 June 2000

Beaver	**R000**			
Cash flow	72297	Cash Flow		
Total Debt Beaver	1963138	Total Debt	**3.68** %	

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman	**R000**	**X1**		**X2**	
Working Capital	349678	Work Capital		Ret earnings	
Total Assets	2368144	Total Assets	14.77 %	Total Assets	-3.15 %
Retained Earnings	-74535				
Ebit/Ops Profit	139000	**X3**		**X4**	
Mkt value Equity	208448	EBIT		Mkt val Eq	
Book value Equity	547593	Total Assets	5.87 %	Total Debt	10.47 %
Total Debt	1990865				
Sales	8273142				
				X5	
				Sales	
				Total Assets	3.49 Times

Original "Z-Score" = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

3.88

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

De La Rey	**R000**	**a**		**b**	
Avg Total assets	2299872	Total Debt		EBIT	
Curr Ass + Invest's	1430497	Total Assets	84.07 %	Avg Total Ass	6.04 %
Curr Liabilities	1080819				
Pait	-35303	**c**		**d**	
Stock	775581	Curr Ass+Inves		PAIT	
Infl adj Total Assets	2489156	Curr Liabs	1.32	Avg Total Ass	-1.53 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	3.14 %	Adj TotalAss	31.16 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

-1.07

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	27727	Cash at Bank		Pait	
Total Funds employed	2368144	Total Assets	1.17 %	Book Equity	-6.45 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	84.07 %	Total Assets	-1.49 %
		R5			
		Pait			
		Total Debt	-1.77 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

	0.32
Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

National Chick Ltd Year ended September 1995

Beaver	**R000**			
Cash flow	9758	Cash Flow		
Total Debt Beaver	55959	Total Debt	**17.44** %	

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman	**R000**	**X1**		**X2**	
Working Capital	2654	Work Capital		Ret earnings	
Total Assets	66906	Total Assets	3.97 %	Total Assets	14.89 %
Retained Earnings	9961				
Ebit/Ops Profit	15840	**X3**		**X4**	
Mkt value Equity	82316	EBIT		Mkt val Eq	
Book value Equity	10651	Total Assets	23.68 %	Total Debt	146.33 %
Total Debt	56255				
Sales	83665				

X5	
Sales	
Total Assets	1.25 Times

Original "Z-Score" = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

3.16

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

De La Rey	**R000**	**a**		**b**	
Avg Total assets	66906	Total Debt		EBIT	
Curr Ass + Invest's	29131	Total Assets	84.08 %	Avg Total Ass	23.68 %
Curr Liabilities	26477				
Pait	7291	**c**		**d**	
Stock	19448	Curr Ass+Inves		PAIT	
Infl adj Total Assets	71208	Curr Liabs	1.10	Avg Total Ass	10.90 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	14.58 %	Adj TotalAss	27.31 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

0.34

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	296	Cash at Bank		Pait	
Total Funds employed	40429	Total Assets	0.44	Book Equity	68.45
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	139.15	Total Assets	10.90
		R5			
		Pait			
		Total Debt	12.96		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

0.63

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

National Chick Ltd Year ended September 1996

Beaver	**R000**			
Cash flow	13635	Cash Flow		
Total Debt Beaver	36252	Total Debt	**37.61**	%

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman	**R000**	**X1**		**X2**	
Working Capital	7050	Work Capital		Ret earnings	
Total Assets	89316	Total Assets	7.89 %	Total Assets	20.55 %
Retained Earnings	18354				
Ebit/Ops Profit	15375	**X3**		**X4**	
Mkt value Equity	82316	EBIT		Mkt val Eq	
Book value Equity	52632	Total Assets	17.21 %	Total Debt	224.39 %
Total Debt	36684				
Sales	96043				

X5		
Sales		
Total Assets	1.08	Times

Original "Z-Score" = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

3.37

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

De La Rey	**R000**	**a**		**b**	
Avg Total assets	78111	Total Debt		EBIT	
Curr Ass + Invest's	29402	Total Assets	41.07 %	Avg Total Ass	19.68 %
Curr Liabilities	22352				
Pait	10646	**c**		**d**	
Stock	17963	Curr Ass+Inves		PAIT	
Infl adj Total Assets	96836	Curr Liabs	1.32	Avg Total Ass	13.63 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	17.46 %	Adj TotalAss	18.54992 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

1.21

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	432	Cash at Bank		Pait	
Total Funds employed	66964	Total Assets	0.48	Book Equity	20.23
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	54.78	Total Assets	11.92
		R5			
		Pait			
		Total Debt	29.02		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

-0.38

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

National Chick Ltd Year ended September 1997

Beaver	**R000**			
Cash flow	13790	Cash Flow		
Total Debt Beaver	56636	Total Debt	**24.35** %	

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman	**R000**	**X1**		**X2**	
Working Capital	2613	Work Capital		Ret earnings	
Total Assets	117008	Total Assets	2.23 %	Total Assets	20.71 %
Retained Earnings	24227				
Ebit/Ops Profit	16235	**X3**		**X4**	
Mkt value Equity	50656	EBIT		Mkt val Eq	
Book value Equity	59683	Total Assets	13.88 %	Total Debt	88.37 %
Total Debt	57325				
Sales	117248				

X5	
Sales	
Total Assets	1.00 Times

Original "Z-Score" = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

2.31

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

De La Rey	**R000**	**a**		**b**	
Avg Total assets	103162	Total Debt		EBIT	
Curr Ass + Invest's	42029	Total Assets	48.99 %	Avg Total Ass	15.74 %
Curr Liabilities	39416				
Pait	9964	**c**		**d**	
Stock	25538	Curr Ass+Inves		PAIT	
Infl adj Total Assets	126415	Curr Liabs	1.07	Avg Total Ass	9.66 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	13.37 %	Adj TotalAss	20.20 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

0.63

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	R000	R1		R2	
Cash at Bank	689	Cash at Bank		Pait	
Total Funds employed	77592	Total Assets	0.59	Book Equity	16.69
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	73.88	Total Assets	8.52
		R5			
		Pait			
		Total Debt	17.38		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

-0.03

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

National Chick Ltd Year ended September 1998

Beaver

	R000		
Cash flow	18325	Cash Flow	
Total Debt Beaver	68081	Total Debt	**26.92** %

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman

	R000	X1		X2	
Working Capital	2825	Work Capital		Ret earnings	
Total Assets	149450	Total Assets	1.89 %	Total Assets	25.85 %
Retained Earnings	38640				
Ebit/Ops Profit	24547	**X3**		**X4**	
Mkt value Equity	44324	EBIT		Mkt val Eq	
Book value Equity	71719	Total Assets	16.42 %	Total Debt	63.11 %
Total Debt	70228				
Sales	167337				

	X5	
	Sales	
	Total Assets	1.12 Times

Original "Z-Score"= 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

2.42

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

De La Rey

	R000	a		b	
Avg Total assets	133400	Total Debt		EBIT	
Curr Ass + Invest's	51512	Total Assets	46.99 %	Avg Total Ass	18.40 %
Curr Liabilities	48687				
Pait	12904	**c**		**d**	
Stock	33090	Curr Ass+Inves		PAIT	
Infl adj Total Assets	162975	Curr Liabs	1.06	Avg Total Ass	9.67 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	13.74 %	Adj TotalAss	20.30 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

0.70

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	2147	Cash at Bank		Pait	
Total Funds employed	93924	Total Assets	1.44 %	Book Equity	17.99 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	74.77 %	Total Assets	8.63 %
		R5			
		Pait			
		Total Debt	18.37 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

-0.12

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

National Chick Ltd Year ended September 1999

Beaver	**R000**			
Cash flow	19843	Cash Flow		
Total Debt Beaver	83833	Total Debt	**23.67** %	

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman	**R000**	**X1**		**X2**	
Working Capital	5321	Work Capital		Ret earnings	
Total Assets	152770	Total Assets	3.48 %	Total Assets	21.44 %
Retained Earnings	32750				
Ebit/Ops Profit	23719	**X3**		**X4**	
Mkt value Equity	53822	EBIT		Mkt val Eq	
Book value Equity	66497	Total Assets	15.53 %	Total Debt	62.39 %
Total Debt	86273				
Sales	190597				
				X5	
				Sales	
				Total Assets	1.25 Times

Original "Z-Score" = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

2.47

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

De La Rey	**R000**	**a**		**b**	
Avg Total assets	151110	Total Debt		EBIT	
Curr Ass + Invest's	58151	Total Assets	56.47 %	Avg Total Ass	15.70 %
Curr Liabilities	52830				
Pait	13767	**c**		**d**	
Stock	36688	Curr Ass+Inves		PAIT	
Infl adj Total Assets	155734	Curr Liabs	1.10	Avg Total Ass	9.11 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	13.13 %	Adj TotalAss	23.56 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

0.49

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	2440	Cash at Bank		Pait	
Total Funds employed	99940	Total Assets	1.60 %	Book Equity	20.70 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	86.32 %	Total Assets	9.01 %
		R5			
		Pait			
		Total Debt	15.96 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

0.01

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

Sun International (SA) Ltd Year ended 30 June 1996

Beaver

	R000			
Cash flow	356842	Cash Flow		
Total Debt Beaver	969739	Total Debt	**36.80** %	

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman

	R000	X1		X2	
Working Capital	-445246	Work Capital		Ret earnings	
Total Assets	2054659	Total Assets	-21.67 %	Total Assets	0.60 %
Retained Earnings	12275				
Ebit/Ops Profit	498291	**X3**		**X4**	
Mkt value Equity	3680154	EBIT		Mkt val Eq	
Book value Equity	1002396	Total Assets	24.25 %	Total Debt	358.95 %
Total Debt	1025263				
Sales	2160713				

X5	
Sales	
Total Assets	1.05 Times

Original "Z-Score" (Public manufacturer) = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

3.75

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

De La Rey

	R000	a		b	
Avg Total assets	1818449	Total Debt		EBIT	
Curr Ass + Invest's	179660	Total Assets	49.90 %	Avg Total Ass	27.40 %
Curr Liabilities	624906				
Pait	239982	c		d	
Stock	16781	Curr Ass+Inves		PAIT	
Infl adj Total Assets	219643	Curr Liabs	0.29	Avg Total Ass	13.20 %
		e		f	
		Net Cash Flow		Stock	
		Avg Total Ass	19.62 %	Adj TotalAss	7.64 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

0.98

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	R000	R1		R2	
Cash at Bank	55524	Cash at Bank		Pait	
Total Funds employed	2054659	Total Assets	2.70 %	Book Equity	23.94 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	49.90 %	Total Assets	11.68 %
		R5			
		Pait			
		Total Debt	23.41 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

-0.59

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

Sun International (SA) Ltd Year ended 30 June 1997

Beaver

	R000			
Cash flow	465459	Cash Flow		
Total Debt Beaver	1346094	Total Debt	**34.58** %	

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman

	R000	X1		X2	
Working Capital	-505766	Work Capital		Ret earnings	
Total Assets	2462452	Total Assets	-20.54 %	Total Assets	2.36 %
Retained Earnings	58111				
Ebit/Ops Profit	542404	**X3**		**X4**	
Mkt value Equity	2026063	EBIT		Mkt val Eq	
Book value Equity	1060507	Total Assets	22.03 %	Total Debt	147.36 %
Total Debt	1374945				
Sales	2336697				

	X5	
	Sales	
	Total Assets	0.95 Times

Original "Z-Score" (Public manufacturer) = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

2.35

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

De La Rey

	R000	a		b	
Avg Total assets	2258555	Total Debt		EBIT	
Curr Ass + Invest's	187120	Total Assets	55.84 %	Avg Total Ass	24.02 %
Curr Liabilities	692886				
Pait	335722	c		d	
Stock	37836	Curr Ass+Inves		PAIT	
Infl adj Total Assets	2678901	Curr Liabs	0.27	Avg Total Ass	14.86 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	20.61 %	Adj TotalAss	1.41 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

0.94

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	28851	Cash at Bank		Pait	
Total Funds employed	2462452	Total Assets	1.17 %	Book Equity	31.66 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	55.84 %	Total Assets	13.63 %
		R5			
		Pait			
		Total Debt	24.42 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

-0.41

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

Sun International (SA) Ltd Year ended 30 June 1998

Beaver

	R000		
Cash flow	535662	Cash Flow	
Total Debt Beaver	1335475	Total Debt	**40.11** %

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman

	R000	X1		X2	
Working Capital	-279104	Work Capital		Ret earnings	
Total Assets	2562531	Total Assets	-10.89 %	Total Assets	4.11 %
Retained Earnings	105206				
Ebit/Ops Profit	641001	**X3**		**X4**	
Mkt value Equity	1574948	EBIT		Mkt val Eq	
Book value Equity	1165713	Total Assets	25.01 %	Total Debt	114.97 %
Total Debt	1369818				
Sales	2609699				

	X5	
	Sales	
	Total Assets	1.02 Times

Original "Z-Score" (Public manufacturer) = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

2.46

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

De La Rey

	R000	a		b	
Avg Total assets	2512492	Total Debt		EBIT	
Curr Ass + Invest's	209890	Total Assets	53.46 %	Avg Total Ass	25.51 %
Curr Liabilities	488994				
Pait	387829	**c**		**d**	
Stock	33447	Curr Ass+Inves		PAIT	
Infl adj Total Assets	2694758	Curr Liabs	0.43	Avg Total Ass	15.44 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	21.32 %	Adj TotalAss	1.24 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

1.06

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	R000	R1		R2	
Cash at Bank	34343	Cash at Bank		Pait	
Total Funds employed	2562531	Total Assets	1.34 %	Book Equity	33.27 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	53.46 %	Total Assets	15.13 %
		R5			
		Pait			
		Total Debt	28.31 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

-0.51

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

Sun International (SA) Ltd Year ended 30 June 1999

Beaver

	R000			
Cash flow	317509	Cash Flow		
Total Debt Beaver	1743260	Total Debt	**18.21** %	

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman

	R000	X1		X2	
Working Capital	-365645	Work Capital		Ret earnings	
Total Assets	3125456	Total Assets	-11.70 %	Total Assets	1.88 %
Retained Earnings	58910				
Ebit/Ops Profit	356014	**X3**		**X4**	
Mkt value Equity	1220590	EBIT		Mkt val Eq	
Book value Equity	1335787	Total Assets	11.39 %	Total Debt	68.84 %
Total Debt	1773068				
Sales	2236616				

X5		
Sales		
Total Assets	0.72	Times

Original "Z-Score" = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

1.39

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

De La Rey

	R000	a		b	
Avg Total assets	2843993	Total Debt		EBIT	
Curr Ass + Invest's	300428	Total Assets	56.73 %	Avg Total Ass	12.52 %
Curr Liabilities	666073				
Pait	268446	c		d	
Stock	24938	Curr Ass+Inves		PAIT	
Infl adj Total Assets	3352989	Curr Liabs	0.45	Avg Total Ass	9.44 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	11.16 %	Adj TotalAss	0.74 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

0.17

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	29808	Cash at Bank		Pait	
Total Funds employed	3125456	Total Assets	0.95 %	Book Equity	20.10 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	56.73 %	Total Assets	8.59 %
		R5			
		Pait			
		Total Debt	15.14 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

-0.23

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52

Sun International (SA) Ltd Year ended 30 June 2000

Beaver

	R000		
Cash flow	240568	Cash Flow	
Total Debt Beaver	1990804	Total Debt	**12.08** %

Average solvent ratio	18%
Nonbankrupt greater than	10%
Zone of ignorance	5%-10%
Bankrupt less than	5%

Altman

	R000	X1		X2	
Working Capital	-82219	Work Capital		Ret earnings	
Total Assets	3816567	Total Assets	-2.15 %	Total Assets	2.19 %
Retained Earnings	83758				
Ebit/Ops Profit	243294	**X3**		**X4**	
Mkt value Equity	3385103	EBIT		Mkt val Eq	
Book value Equity	1760023	Total Assets	6.37 %	Total Debt	166.51 %
Total Debt	2033022				
Sales	2229204				

X5		
Sales		
Total Assets	0.58	Times

Original "Z-Score" = 0.012(X1)+0.014(X2)+0.033(X3)+0.006(X4)+0.999(X5)

1.80

Bankrupt less than	1.81
Zone of ignorance	1.81-2.99
Nonbankrupt greater than	2.99

De La Rey

	R000	a		b	
Avg Total assets	3471011	Total Debt		EBIT	
Curr Ass + Invest's	343943	Total Assets	53.27 %	Avg Total Ass	7.01 %
Curr Liabilities	426162				
Pait	83758	**c**		**d**	
Stock	19270	Curr Ass+Inves		PAIT	
Infl adj Total Assets	4011593	Curr Liabs	0.81	Avg Total Ass	2.41 %
		e		**f**	
		Net Cash Flow		Stock	
		Avg Total Ass	6.93 %	Adj TotalAss	0.48 %

K= -0.01662(a)+0.0111(b)+0.0529©+0.086(d)+0.0174(e)+0.01071(f)-0.068811

-0.50

Bankrupt less than	-0.19
Zone of ignorance	- 0.19-0.20
Nonbankrupt greater than	0.2

A-Ratio	**R000**	**R1**		**R2**	
Cash at Bank	42218	Cash at Bank		Pait	
Total Funds employed	3390405	Total Assets	1.11 %	Book Equity	4.76 %
		R3		**R4**	
		Total Debt		Pait	
		Total Funds	59.96 %	Total Assets	2.19 %
		R5			
		Pait			
		Total Debt	4.12 %		

A = -0.0979R1 - 0.00168R2 + 0.0106R3 - 0.00413R4 - 0.01166R5 - 0.49253

-0.03

Bankrupt greater than	0.52
Zone of ignorance	0.52/-0.52
Nonbankrupt less than	-0.52