

## UNDERSTANDING FINANCIAL DISTRESS AMONG LISTED FIRMS IN NAIROBI STOCK EXCHANGE: A QUANTITATIVE APPROACH USING THE Z-SCORE MULTI-DISCRIMINANT FINANCIAL ANALYSIS MODEL

**F. G. Maina and M. M. Sakwa**

*Jomo Kenyatta University of Agriculture and Technology, Nairobi, Kenya*

*E-mail: [mfaithgathon@gmail.com](mailto:mfaithgathon@gmail.com)*

### **Abstract**

The paper assesses the financial distress among listed firms in Nairobi Stock Exchange in Kenya. The Capital Market Authority (CMA) has a regulatory responsibility to keep surveillance of firms listed in Nairobi Stock Exchange (NSE) with regards to capital, liquidity and other aspects with overall aim of ensuring financial stability of these firms. The expectation is therefore that the firms will be financially prudent and healthy which in turn will attract investors. The recent crisis where a number of NSE listed companies' including stock brokers experienced financial distress is an indication that there is a missing link between surveillance and the management of these firms. If this is not rectified the public can loose interest in investing in Nairobi Stock Exchange. There is therefore a need to critically assess the financial position of the listed firms and suggest ways of improving the performance of NSE. This study utilizes the Z'-score multi-discriminant financial analysis model which provides the framework for gauging the financial performance of the firms. This is in addition to the use of the ANOVA and correlation tests in support of the evidences from the Z-score model. The sample constituted selected firms listed in Nairobi Stock Exchange divided into five different sectors. The results clearly indicated that the financial health of the listed companies needed to be improved. In addition a disjoint was noted in the correlation between what is expected of the listed companies in terms of financial performance and the benefits to be accrued from CMA surveillance on them. On the analysis of the financial statements of the listed firms it was postulated that the financial distress experienced by the firms are emanating from functioning of these firms. On the other hand, the Capital Market and NSE role responsibility needs to be strengthened. The study recommended that the NSE should make financial stability an integral driver of its policy framework.

**Key words:** Financial distress, Governance and management, Capital Market Authority (CMA), Nairobi stock exchange, Z'-score multi-disriminant financial analysis model

## 1.0 Introduction

The importance of predicting financial distress has been increasing to corporate governance due to its severe effects on the operation of a firm, its environment (management, credit institutions, stockholders, investors, employees) and whole economy (Arnold, 2007). Evidence shows that the market value of the distressed firms declines substantially (Warner, 1977). Many managers focus on succeeding, at least in the short run, but there is much need to also focus on signals of distress, causes and its possible remedies before they reach a crisis (Harlan and Marjorie, 2002). Therefore, the use of an early warning system models is critically important to make a reliable measure of any company's financial health since companies that are strong today may not be strong tomorrow. Equally, many companies that are weak today will survive.

Financial distress is a broad concept that comprises several situations in which firms face some form of financial difficulty. The most common terms used to describe these situations are "bankruptcy," "failure," "insolvency," and "default." These terms provide a slightly different definition connected with the specific interest or condition of the firms under examination. Altman (1993) provided a complete description and definition of these terms. Bankruptcy identifies mostly with the legal definition of financial distress. As pointed out by Theodossiou et al. (1996), many financially distressed firms never file for bankruptcy, due to acquisition or privatization, whereas healthy firms often file for bankruptcy to avoid taxes and expensive lawsuits. Altman (1993) defines failure as the situation where "the realized rate of return on invested capital, with allowances for risk consideration, is significantly and continually lower than prevailing rates of similar investments." This is a term of an economic sense and does not indicate the discontinuity of a firm. Insolvency also illustrates a negative performance indicating liquidity problems. Insolvency in a bankruptcy sense indicates negative net worth. Finally, default refers to a situation where a firm violates a condition of an agreement with a creditor and can cause a legal action.

To overcome the differences among these situations, the more general term "financial distress" will be used throughout this article to describe the situation where a firm cannot pay its creditors, preferred stock shareholders, suppliers, etc., or the firm goes bankrupt according to the law. All these situations result in a discontinuity of the firm's operations, unless proper measures are employed.

Capital Markets Authority was established in 1989 through the Capital Markets Authority Act, Cap 485 A (the CMA Act) to regulate and oversee the orderly development of Kenya's capital markets. The Authority ensures the development and maintenance of an appropriate legal and regulatory framework to boost investor confidence, enhance efficiency and to create and maintain a fair and orderly market. The Authority also reviews existing policies and makes recommendations to the Government on new policy issues that could promote and enhance market development. It also provides guidance to market operators. Therefore, Capital Market Authority (CMA) has a regulatory responsibility to keep surveillance of firms listed in NSE with regards to capital, liquidity and other aspects with overall aim of ensuring financial stability of these firms.

The NSE has been operating for 50 years now, but has only been in real existence for 16 months now, in terms of capacity building. It failed to pick the growth momentum and currently the market has just about 58 listed firms which are less than what the country inherited at independent (Ngugi, Amanja and Maana, 2009). Nairobi Stock Exchange (NSE) has a double responsibility for development and regulation of the market operations to ensure efficient trading. For an efficient stock exchange, the companies listed in NSE are expected to be financially health so as to ensure economic growth of a country.

The motivation to undertake this study was provided following the many corporate failures in the Kenyan capital market and those have gone into receivership, only a handful of companies have managed to come out of it in sound financial health. There is an increasing trend of failure of Kenyan firms such as KCC, Uchumi Supermarkets, A Baumann and Company, Bulk medical limited, Nyaga stock brokers are examples of these.

The NSE has been performing poorly in recent years. The performance of the stock market indicates that the market has not managed to make significant contribution to financing economic growth (Ngugi, Amanja and Maana, 2009). While there are about 58 companies listed in NSE, not all of them are in a financially sound position. Although at the point of listing, these listed companies must meet the listing requirement of NSE, given time, the company's financial position and business direction can change for the better or for the worse. There are many reasons for these changes, such as governance, management, financial appetite, risk profile or over gearing. Therefore surveillance in the market is necessary to ensure efficient trading.

However, some listed companies seem to be able to survive and therefore the question remains why some are performing poorly while others are failing. This appears that NSE and CMA are abrogating their mandate to instill discipline in the market players and to protect investors' funds as evidenced in collapse of many stockbrokerage firms. This can result in the loss of investors' confidence in the capital market and in turn equity market becoming outperformed by other markets such as real estate market.

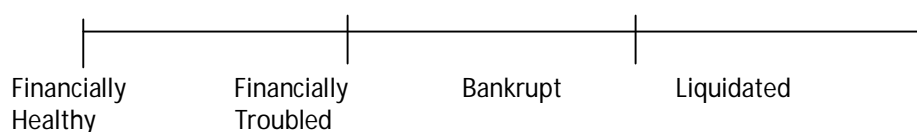
Looking at the above situation and looking at the importance of Kenyan economy, understanding financial distress of listed firms in NSE is important to investors so that, early actions could be taken as a precaution. This study utilizes the Z'-score multi-discriminant financial analysis model which provides the framework for gauging the financial structure of the firms. This is in addition to the use of the ANOVA and correlation tests to support the evidences from the Z-score model. Although these traditional techniques or models do not provide much guidance on how they should be applied to emerging market, the models have already been empirically tested in emerging markets and used with good results (Pereiro, 2006).

The purpose of this study is therefore not to test the model but use it as a tool in measuring financial distress status of the companies selected for this analysis. The results for each company can then be studied further by analysing the results of each variable in order to identify why the score is in the distress zone or the non-distress zone. Therefore, the aim of the study is to survey the financial distress status of listed firms in NSE and to map out their financial performance trend using the Z'-score model in order to come up with several important policy implications.

The paper is organized into five sections. The following section offers literature review as a discussion on previous studies. Section three provides the explanation of the data and research methodology used to answer the objectives of this study. The fourth section presents the results and a discussion of the research findings coming from Z'-score, ANOVA and correlations. The final section provides conclusions of the study, its implications and suggestions for future research.

## 2.0 Financial Distress Models

The models of financial distress are commonly referred to as bankruptcy prediction models. Financial health of a firm might be viewed along a continuum (Stickney, 1996) as follows:



Previous bankruptcy research had identified many ratios that were important in predicting bankruptcy. Among the most popular financial ratios used by researchers were; Beaver (1966) estimated a univariate financial distress model. Altman (1968) analyzed the financial distress problem of a firm by employing a multiple discriminant analysis (MDA), Matin (1977) and Ohlson (1980) investigated the profitability of a company under Logit model. The application of a financial distress models includes static univariate analysis, multivariate discriminant analysis, Logit model, Probit model and neural network, and dynamic Merton model, CUSUM and so on.

### 2.1 Multi-Discriminant Analysis (MDA)

Multi-Discriminant Analysis (MDA) model is a linear combination, so-called bankruptcy score of certain discriminatory variables. The bankruptcy score sorts firms into bankrupt and non-bankrupt groups according to their characteristics (Aziz *et al.*, 2006). It is stated that MDA still is the most popular technique in business failure identification and appears set a standard for comparison of bankruptcy prediction models (Altman *et al.*, 2000). It was concluded that MDA models ranked number 1 out of 16 model types and is expected to provide a reliable bankruptcy prediction method. The MDA model had an average accuracy of more than 85% in bankruptcy prediction (Aziz *et al.*, 2006). Avoiding Type I and Type II errors is also essential since misclassification can be costly to stakeholders. The error rates for MDA models showed 15% for Type I errors and 12% for Type II errors reassuring their significance as practical prediction models.

One of the advantages of the MDA is the reduction of the space dimensionality where it is transformed to its simplest form of one dimension since the purpose is to identify either if the companies are bankrupt or non-bankrupt. The object is

classified using a single discriminant score namely the outcome of a discriminant function that transforms individual variable values.

Altman developed several discriminant functions; the first one called Z-score was developed in 1968 using public firms stratified by industry and size. This model has high predictive power two years prior to bankruptcy. Additionally, two adaptation of the 1968's Z-score model are presented: the Z'-score and the Z''-score. These models are summarized in Table 2.1 below including the variables present to each model.

*Table 2.1: Most popular Altman's discriminant functions*

Year	Discriminant function	Decision Criteria
1968	$Z = 1.2 X_1 + 1.4 X_2 + 3.3 X_3 + 0.6 X_4 + 1.0 X_5$	$Z < 1.81$ bankrupted $Z > 2.67$ non-bankrupted $Z = 1.81$ to $2.67$ gray area
1993	$Z' = 0.717 X_1 + 0.847 X_2 + 3.107 X_3 + 0.420 X_6 + 0.998 X_5$	$Z' < 1.23$ bankrupted $Z' > 2.90$ non-bankrupted $Z' = 1.23$ to $2.90$ gray area
1993	$Z'' = 6.56 X_1 + 3.26 X_2 + 6.72 X_3 + 1.05 X_6$	$Z'' < 1.10$ bankrupted $Z'' > 2.60$ non-bankrupted $Z'' = 1.10$ to $2.60$ gray area

Where:  $X_1$  = Working Capital/Total Assets (WC/TA)  
 $X_2$  = Retained Earnings/Total Assets (RE/TA)  
 $X_3$  = Earnings Before Interest and Taxes /Total Asset (EBIT/TA)  
 $X_4$  = Market value of Equity/ Book Value of Total Liabilities MVE/TL)  
 $X_5$  = Sales/Total Asset (S/TA)  
 $X_6$  = Net Worth (Book Value)/Total liabilities (NW/TL)

Source; Altman, 1993

The models in Table 2.1 above were built to apply to privately held firms and for non-manufacturers respectively. Both models substitute the book value of equity for the market value in  $X_4$ , making these models a little less reliable than the original. The Z''-score unlike the Z'-score, does not consider the variable  $X_5$ - Sales/total assets in order to minimize the potential industry effect of asset turnover and the effects of different types of assets financing, like lease capitalization (see Table 2.1 above).

The accuracy of the Z-score models in predicting bankruptcy has been of 72-80% reliability meaning the percentage of companies that are correctly classified in a sample of estimations. These Z-score models measure the financial health of companies and are believed to be a good diagnostic tool to predict a bankruptcy of a company. The models **have** gained wide acceptance for the past two decades by auditors, management consultants, courts of law and even used in database systems used for loan evaluations (Eidleman, 1995). Eidleman (1995) stated five points that many practitioners argue for the use of Z-scores approach **and the disadvantages of these models**.

### 2.1.1 Advantages of using MDA (Eidleman's five points)

- It is more precise and leads to clearer conclusions than contradictory ratios as well as they measure the extent of uncertainty.
- It is uniform and leaves less room for inaccuracies of judgment.
- It is more reliable and can be evaluated statistically. This approach is based on past experience rather than on someone's unverified opinion.
- It is faster and less costly to work with than traditional tools.
- They can weed out the two extremes if the spectrum in an economical fashion. This allows the analyst to focus on the grey area where experience and judgment are needed to compensate for what the computer misses.

### 2.1.2 Disadvantages of using MDA

Eidleman also mentioned several pitfalls in using this approach; such as that models do not always give a clear result. The outcome is also never better than the numbers it is based on but people can be blinded by the model's clear accuracy if they do not fully understand how inaccurate information can be.

The Z-score models **are** not recommended for predicting corporate failure of financial companies. This is because the ratios that are used in the model are based on financial statements and financial firms often have off-balance sheet items that are not captured by the ratios used in the Z-score model.

The Z'-score model developed by Altman for companies in United States of America has demonstrated potential to predict bankruptcy in Argentinean companies. The researcher find it's more appropriate to use Altman's privately held company model (Z'-score) since it has worked in Argentineans companies which is believed to have the same economic condition like in Kenya. In addition, it is possible to see the different strength and performance of the companies using this model (Porporato *et al.*, 2008).

## 3.0 Materials and Methods

### 3.1 Data Collection and Methodology

The study used available data which is a set of financial ratios derived from financial statements of a sample of firms listed companies for the period from 2003 to 2007. The cut-off period was selected in order to base the analysis on as recent data as possible and capture how financially healthy these companies were in the period of economic stability and how it had developed at least five years prior to the political crisis hit in 2008.

The sample companies used in this study were selected from firms listed on the Nairobi stock Exchange (NSE) which is divided into five main sectors. The list of companies contained in the NSE Handbook (2008) was used to collect the sample that met the requirements by filtering out companies that did not fulfill the criteria that were decided. Filtering out financial and investments companies was done since the Z-score models are not applicable for financial companies because they carry off-balance sheet items as mentioned earlier. The main criteria used for sampling the firms were the firm must have been listed for the entire period of the study 2003-2007 and annual reports must be available with necessary data in the NSE Handbook (2008).

Firms that did not meet these criteria were excluded. Seven companies were excluded because they are listed after 2002 and ten were excluded because their annual reports did not provide the necessary data. The initial selection of firms was then adjusted thus;

Table 1: Sector representation

Sector	Number of Companies listed	Less Companies listed after 2002	Less Companies information with missing data	Number included in the Sample	Percentage included in the sample
Agriculture	4	-	-	4	100
Commercial and Services	12	4	1	7	58.3
Industrial and Allied	20	2	4	14	70.00
Alternative Investment market	8	-	3	5	62.5
Totals	44	6	8	30	

The selection resulted in a sample of 30 firms out of possible 58 firms. However, in view of some trends that were observed in alternative investment sector, one additional firm which was suspended in 2006 were selected from this category for inclusion in the sample for further testing. At least 58% of companies in each of the five sectors were included in the survey. Such a cohesive representation enables the research findings to be generalisable to companies listed on NSE since they operate with the same stock market.

The Independent variable that were applied comprised of the under listed financial ratios **as per** Z-score' model the chosen model for this study.

- (i)  $X_1$ , Working Capital/Total Assets (WC/TA)-X-
- (ii)  $X_2$ , Retained Earnings/Total Assets (RE/TA)
- (iii)  $X_3$ , Earnings Before Interest and Taxes /Total Asset (EBIT/TA)
- (iv)  $X_5$ , Sales/Total Asset (S/TA)
- (v)  $X_6$ , Net Worth (Book Value)/Total liabilities (NW/TL)

These ratios formed the coefficient applied to the Z-function, as detailed in the literature review in order to obtain a final Z-score. The Z –function used in the research is Z'-score as follows;

$$Z' = 0.717 X_1 + 0.847 X_2 + 3.107 X_3 + 0.420 X_6 + 0.998 X_5$$

According to the Altman's Z'-Score analysis:

- (i) When  $Z'$  is less than 1.23, the company is very likely to have financial trouble.
- (ii) When  $Z'$  is between 1.23 and 2.90, the company's financial situation is fair, and there is risk of getting into financial trouble.
- (iii) When  $Z' > 2.90$ , the company is financially strong.

The collected data were analyzed with the help of ratio analysis, and also through the application of Statistical Package of Social Science to run T-test and F-test. The annual reports for the year 2003-2007 were analyzed and Information derived from the financial statements was set out in a Microsoft excel spreadsheet. The spreadsheet was modeled in a way that facilitated the computation of coefficient applied to Altman Z'-score model equation. The coefficient was then multiplied by the constant and their totals added up to determine the firm's Z'-score.

Under the Altman's model, any firm that had a score over 2.90 was considered to be financially health. Firms that scored between 1.23 and 2.90 was deemed to fall within a gray area, thus they had some risk of financial troubles. Whereas, firms scored below 1.23 was considered financially distress. The data was presented in form of statements, tables and graphs.

Further analysis of the data was done using the computer based data analysis application Statistical Package for Social Science (SPSS) version 12.0. The hypotheses were tested using F-test and T-test due to the use of a sample which is not exhibiting normal distribution as the number of firms to be included was limited. The standard level of significant (5%) under this analysis was put under consideration. The analyzed information was statistically used to come up with a conclusive result on whether to reject the hypothesis or not.

The following hypotheses were formulated for the analysis in the study;

**H<sub>0</sub>:** Firms listed in NSE do not always exhibit a healthy financial position.

**H<sub>A</sub>:** Firms listed in NSE always exhibit a healthy financial position.

**H<sub>0</sub>:** The financial position of listed firms in NSE does not differ on the basis of sector.

**H<sub>A</sub>:** The financial position of listed firms in NSE differs on the basis of sector.

**H<sub>0</sub>:** The financial health of firms listed in NSE do not improves with age of listing.

**H<sub>A</sub>:** The financial health of firms listed in NSE improves with age of listing.

## 4.0 Results and Discussion

### 4.1 Analysis of Financial Distress Status and Financial Performance Trend

The Z'-score results are presented for each company and all years that data was available. Each ratio that the Z'-score model is based on is analysed for all companies from the sample with perspective to how they are affected by data from the financial accounts in order to identify the main reasons behind changes in the Z'-score (the dependent variable) and to identify what is causing signals of distress or the contrary. The Z'-scores in the distressed and non-distressed zone are identified as well as those in the grey zone according to the model of the study.

The Z'-score model ( $Z' = 0.717 X_1 + 0.847 X_2 + 3.107 X_3 + 0.420 X_6 + 0.998 X_5$ ) state that if the score is below 1.23, the firm is distressed and if it above 2.90, the firm is non-distressed. Any Z'-score that fall in between the two points, the firm is said to be in the grey area. The T-test was used as an additional means of interpreting the results obtained from Z'-score.

Table 2: Sampled listed firms Z'-score results 2003-2007

Company Number	Company Number	Company Code	2003 Z'-score	2004 Z'-Score	2005 Z'-Score	2006 Z'-Score	2007 Z'-Score	Mean Z'-score
<b>Agriculture</b>	<b>1</b>	<b>Agri 1</b>	2.202	2.363	2.108	1.892	1.716	2.056
	<b>2</b>	<b>Agri 2</b>	0.57	1.488	0.989	1.64	1.847	1.307
	<b>3</b>	<b>Agri 3</b>	1.508	1.23	2.536	2.598	2.569	2.088
	<b>4</b>	<b>Agri 4</b>	2.39	2.832	1.63	2.259	1.764	2.175
<b>Commercial &amp; Services</b>	<b>5</b>	<b>Com 1</b>	5.516	3.019	2.212	1.072	0.762	2.516
	<b>6</b>	<b>Com 2</b>	1.844	1.905	1.920	1.992	2.062	1.945
	<b>7</b>	<b>Com 3</b>	1.479	1.397	1.363	1.233	1.216	1.338
	<b>8</b>	<b>Com 4</b>	1.768	1.429	1.771	1.706	1.539	1.643
	<b>9</b>	<b>Com 5</b>	3.450	3.533	3.802	3.331	3.488	3.521
	<b>10</b>	<b>Com 6</b>	2.567	2.360	2.661	2.712	2.074	2.475
	<b>11</b>	<b>Com 7</b>	1.272	1.795	1.180	1.444	1.467	1.432
<b>Industrial &amp; Allied</b>	<b>12</b>	<b>I&amp;A 1</b>	1.796	1.524	1.334	1.091	1.757	1.5
	<b>13</b>	<b>I&amp;A 2</b>	1.558	2.757	3.151	3.152	3.364	2.796
	<b>14</b>	<b>I&amp;A 3</b>	3.527	3.482	3.809	3.071	2.980	3.374
	<b>15</b>	<b>I&amp;A 4</b>	3.478	2.098	3.472	2.109	3.484	2.928
	<b>16</b>	<b>I&amp;A 5</b>	2.205	2.049	1.384	0.809	1.674	1.624
	<b>17</b>	<b>I&amp;A 6</b>	2.126	3.502	2.963	2.505	1.294	2.478
	<b>18</b>	<b>I&amp;A 7</b>	0.970	0.656	1.495	1.380	1.525	1.205
	<b>19</b>	<b>I&amp;A 8</b>	3.871	3.746	4.506	4.427	3.640	4.038
	<b>20</b>	<b>I&amp;A 9</b>	3.830	2.961	2.643	1.979	2.528	2.788
	<b>21</b>	<b>I&amp;A 10</b>	4.967	7.128	6.372	4.344	4.760	5.514
	<b>22</b>	<b>I&amp;A 11</b>	1.542	2.450	2.859	2.811	2.845	2.501
	<b>23</b>	<b>I&amp;A 12</b>	0.172	1.233	1.305	1.326	1.080	1.023
	<b>24</b>	<b>I&amp;A 13</b>	3.775	4.299	4.424	2.880	4.085	3.893
	<b>25</b>	<b>I&amp;A 14</b>	2.164	1.783	2.633	2.923	3.035	2.578
<b>Alternative Investment</b>	<b>26</b>	<b>Alt 1</b>	2.696	1.392	1.163	0.177	0.869	1.259
	<b>27</b>	<b>Alt 2</b>	1.456	1.567	1.576	1.566	1.387	1.51
	<b>28</b>	<b>Alt 2</b>	1.456	1.567	1.576	1.566	1.387	1.51
	<b>29</b>	<b>Alt 2</b>	1.456	1.567	1.576	1.566	1.387	1.51
	<b>30</b>	<b>Alt 2</b>	1.456	1.567	1.576	1.566	1.387	1.51

The above findings illustrate Z'-score obtained from each company in each sector and the mean score over the period of 5 years. In the model of the study, the centroid for distress firms is below 1.23 and non-distress firm is above 2.90 and any Z'-Score between these two centroids falls into the grey area. The overlap area is one where the distressed and non-distressed firm's financial characteristics cluster together. To interpret the Z'-Scores more meaningfully, researcher generate a cutoff point to separate the Z'-Scores for both groups.

In reality, this area is where the transition period of non-distressed firms becoming failures or vice versa occurs. Furthermore, the researcher calculated and identified the cutting score at 2.065 which were interpreted using hypotheses as follows:

*Table 3: Summary of the hypothesis used under different test values*

<i>Decision Criteria</i>	<i>Description</i>	<i>Hypothesis</i>
$\mu < 1.23$	Distress (D)	Ho: $\mu < 1.23$ HA: $\mu \geq 1.23$
$1.23 \leq \mu < 2.065$	Grey-Distress (GD)	Ho: $\mu < 2.065$
$2.065 \leq \mu \leq 2.90$	Grey Non-Distress (GND)	HA: $\mu \geq 2.065$ Ho: $\mu \leq 2.90$
$\mu > 2.90$	Non Distress (ND)	HA: $\mu > 2.90$

Where  $\mu$  represent the mean of the Z'-score over a five year period calculated from the listed firms in NSE. The results were as follows;

Before making any generalizations, the model was tested for external validity. Under this test, we introduced a thirtieth firm as which consisted a firm suspended from NSE in 2007 and named as Company No. 26. It was found that the model correctly classified the entire new sample as distressed firm in their respective distress year (2006) and also two year before the actual distress.

#### 4.1 Test of Hypothesis

The p-value approach to hypothesis testing was used and a statistical software SPSS version 12 was used. The output from the t-test, F-test and correlations were used to give a deeper insight into the study and test the hypotheses. The p-values returned by the tests were compared to the significance level ( $\alpha$ ) which was set at 0.05. The statistical decision rule was: if p-value is greater than or equal to the significance level ( $p\text{-value} \geq \alpha$ ), the Null Hypothesis is NOT rejected. Else, if the p-value is less than the significance level ( $p\text{-value} < \alpha$ ), the Null hypothesis is rejected.

#### 4.2 Hypothesis Test for Financial status

To test the financial status of the listed firms in NSE, the study used the test values under the model of the study and a cutting score generated earlier by the researcher. In the model of the study, the centroid for distress firms is below 1.23 and non-distress firm is above 2.90 and any Z'-Score between these two centroids falls into the grey area with a cutoff point of 2.065. The hypotheses were therefore stated as follows:

**H<sub>0</sub>:** Firms listed in NSE do not always exhibit a healthy financial position.

**H<sub>A</sub>:** Firms listed in NSE always exhibit a healthy financial position.

*Table 4: T-test for Agricultural Sector firms using different Test-values*

<i>Company Number</i>	<i>Mean Z'-score</i>	<i>df</i>	<i>Test Value=1.23</i>		<i>Test Value=2.065</i>		<i>Test Value=2.90</i>		<i>Remarks</i>
			<i>t-value</i>	<i>Sig. (1-tailed)</i>	<i>t-value</i>	<i>Sig. (1-tailed)</i>	<i>t-value</i>	<i>Sig. (1-tailed)</i>	
1	2.056	4	7.232	0.001	(0.077)	0.529*	**	**	GD
2	1.307	4	0.330	0.379*	**	**	**	**	D
3	2.088	4	2.890	0.022	0.079	0.471*	**	**	GD
4	2.175	4	4.332	0.006	0.504	0.320*	**	**	GD

D-Distress GD-Grey Distress

\* means no significance ( $p\text{-value} > 0.05$ ) hence we fail to reject the null hypothesis

\*\* means that there is no need for further test since the decision has already been made

Under a test value of 1.23, only Company No. 2 returned  $p\text{-value} > 0.05$  which is 0.379 at 0.05 significance level with a  $t$ -value of 0.330 at 4 degrees of freedom. Hence, we fail to reject the null hypothesis ( $H_0: \mu < 1.23$ ) and conclude that the mean  $Z'$ -score lies below 1.23. Therefore, company No. 2 was considered to be distressed. Under a test value of 2.065, company No. 1, 3, and 4 returned a  $p\text{-value} > 0.05$  hence we fail to reject the null hypothesis ( $H_0: \mu < 2.065$ ) and conclude that the mean  $Z'$ -score lies below 2.065. Therefore, Company No. 1, 3 and 4 were considered to be in the GD zone.

The agricultural sector has major bottlenecks that affect its performance as it is known that rural areas do not have the necessary infrastructure and population growth has had an impact on the possible area for agricultural activities, agro business is not well developed in Kenya. Also the agricultural sector is at the mercy of the vagrancies of the weather. In addition to that, the unpredictability of the international market as around this time the world economy was not up beat. These factors can negatively affect the financial health of the firms in this sector.

Table 5: T-test for Commercial and Services Sector firms using different Test-values

Company Number	Mean $Z'$ -score	df	Test Value=1.23		Test Value=2.065		Test Value=2.90		Remarks
			t-value	Sig. (1-tailed)	t-value	Sig. (1-tailed)	t-value	Sig. (1-tailed)	
5	2.516	4	1.510	0.103*	**	**	**	**	D
6	1.945	4	18.989	0.001	(3.199)	0.984*	**	**	GD
7	1.338	4	2.154	0.050*	**	**	**	**	D
8	1.643	4	6.064	0.002	(6.208)	0.998*	**	**	GD
9	3.521	4	29.411	0.001	18.691	0.001	7.970	0.001	ND
10	2.475	4	10.650	0.001	3.506	0.012	(3.638)	0.989*	GND
11	1.432	4	1.912	0.064*	**	**	**	**	D

D-Distress GD- Grey Distress GND-Grey Non-Distress ND- Non Distress

\* means no significance ( $p\text{-value} > 0.05$ ) hence we fail to reject the null hypothesis

\*\* means that there is no need for further test since the decision has already been made

Under a test value of 1.23, Company No. 5, 7 and 11 returned a  $p\text{-value} \geq 0.05$  hence, we fail to reject the null hypothesis ( $H_0: \mu < 1.23$ ) and conclude that the mean  $Z'$ -scores lies below 1.23. Therefore, company No. 5, 7 and 11 are considered to be distressed. Under a test value of 2.065, company No. 6 and 8 returned a  $p\text{-value} > 0.05$  hence we fail to reject the null hypothesis ( $H_0: \mu < 2.065$ ) and conclude that the mean  $Z'$ -score lies below 2.065. Therefore, Company No. 6 and 8 were considered to be in the GD zone.

Under a test value of 2.90, company No. 10 returned a  $p\text{-value} > 0.05$  hence we fail to reject the null hypothesis ( $H_0: \mu \leq 2.90$ ) and conclude that mean  $Z'$ -score lies below 2.90, Whereas Company No. 9 returned a  $p\text{-value} < 0.05$  hence we reject the null hypothesis ( $H_0: \mu \leq 2.90$ ) and conclude that mean  $Z'$ -score lies above 2.90. Therefore, Company No. 10 was considered to be in GND zone whereas, Company No. 9 was considered to be non-distressed. Kenya at this time was at a recovery path and therefore the upturn of the economy was just beginning which can imply that it would be some time before this optimism would lead to better financial position for these firms.

Table 6: T-test for Industrial and Allied Sector firms using different Test-values

Company Number	Mean Z'-score	Df	Test Value=1.23		Test Value=2.065		Test Value=2.90		Remarks
			t-value	Sig. (1-tailed)	t-value	Sig. (1-tailed)	t-value	Sig. (1-tailed)	
12	1.500	4	2.047	0.055*	**	**	**	**	D
13	2.796	4	4.823	0.004	2.252	0.044	(0.319)	0.617*	GND
14	3.374	4	13.965	0.001	8.525	0.001	3.086	0.018	ND
15	2.928	4	5.044	0.004	2.564	0.031	0.084	0.469*	GND
16	1.624	4	1.582	0.094*	**	**	**	**	D
17	2.478	4	3.329	0.015	1.102	0.166*	**	**	GD
18	1.205	4	(0.146)	0.555*	**	**	**	**	D
19	4.038	4	15.674	0.001	11.013	0.001	6.352	0.002	ND
20	2.7882	4	5.111	0.003	2.372	0.038	-0.367	0.634*	GND
21	5.5142	4	8.112	0.001	6.531	0.001	4.95	0.004	ND
22	2.5014	4	5.056	0.004	1.735	0.079*	**	**	GD
23	1.0232	4	-0.952	0.803*	**	**	**	**	D
24	3.8926	4	9.646	0.001	6.621	0.001	3.5960	0.011	ND
25	2.5076	4	5.424	0.003	1.879	0.067*	**	**	GD

D-Distress GD-Grey Distress

\* means no significance (p-value>0.05) hence we fail to reject the null hypothesis

\*\* means that there is no need for further test since the decision has already been made

Under a test value of 1.23, Company No. 12, 16, 18 and 23 returned a p-value>0.05 hence, we fail to reject the null hypothesis ( $H_0: \mu < 1.23$ ) and conclude that the mean Z'-scores lies below 1.23. Therefore, company No. 12, 16, 18 and 23 was considered to be distressed. Under a test value of 2.065, company No. 17, 22 and 25 returned a p-value>0.05 hence we fail to reject the null hypothesis ( $H_0: \mu \leq 2.065$ ) and conclude that the mean Z'-score lies below 2.065. Therefore company No. 17, 22 and 25 were considered to be in the GD zone. Under a test value of 2.90, company No 13, 15, and 20 returned a p-value>0.05 hence we fail to reject the null hypothesis ( $H_0: \mu \leq 2.90$ ) and conclude that mean Z'-score lies below 2.90. Therefore, company No. 13, 15, and 20 were considered to be in the GND zone whereas, company No. 14, 17, 19, 21 and 24 were considered to be non-distressed. In comparison to the other sectors the number of firms not distresses was higher. This can be explained that the demand for these goods have been on the increase and provides a fairly stable return of investment as can be seen by the countries that are already industrialized.

Table 7: T-test for Alternative Investment Sector firms using different Test-values

Company Number	Mean Z'-score	df	Test Value=1.23		Test Value=2.065		Test Value=2.90		Remarks
			t-value	Sig. (1-tailed)	t-value	Sig. (1-tailed)	t-value	Sig. (1-tailed)	
26	1.259	4	0.071	0.473*	**	**	**	**	D
27	1.510	4	7.391	0.001	-14.619	1.000*	**	**	GD
28	2.257	4	7.584	0.001	1.418	0.115	-4.748	0.996*	GND
29	2.589	4	2.811	0.024	1.083	0.170	-0.644	0.723*	GND
30	2.490	4	5.920	0.002	1.996	0.058*	**	**	GD

D-Distress    GD- Grey Distress    GND-Grey Non-Distress    ND- Non Distress

\* means no significance (p-value>0.05) hence we fail to reject the null hypothesis

\*\*means that there is no need for further test since the decision has already been made

Under a test value of 1.23, only Company No. 26 returned a p-value>0.05 hence, we fail to reject the null hypothesis ( $H_0: \mu < 1.23$ ) and conclude that the mean Z'-scores lies below 1.23. Therefore, Company No. 26 was considered to be distressed. Under a test value of 2.065, company No. 27 and 30 returned a p-value>0.05 hence we fail to reject the null hypothesis ( $H_0: \mu < 2.065$ ) and conclude that the mean Z'-score lies below 2.065. Therefore, company No. 27 and 30 were considered to be in the GD zone. Under a test value of 2.90, Company No 28, and 29 returned a p-value>0.05 hence we fail to reject the null hypothesis ( $H_0: \mu \leq 2.90$ ) and conclude that mean Z'-score lies above 2.90. Therefore, company No 28, and 29 were considered to be in the GND zone.

### 4.3 Hypothesis Test of Financial Status on the basis of sector

Firm that belong to the same sector are related to one another in terms of their financial status given a five year period. The financial status of each firm is estimated by the mean Z'-score calculated earlier and F-test is used in mean comparison Z'-score. Further analysis was also carried out to compare the financial status among sectors. The stated hypothesis was follows;

**H<sub>0</sub>:** The financial position of listed firms in NSE does not differ on the basis of sector.

**H<sub>A</sub>:** The financial position of listed firms in NSE differs on the basis of sector.

Table 8: ANOVA table of Financial Status within Agricultural Sector

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.437	3	.812	3.204	.052
Within Groups	4.056	16	.254		
Total	6.493	19			

Table 9: ANOVA table of Financial Status within Commercial Sector

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	17.949	6	2.991	5.476	.001
Within Groups	15.295	28	.546		
Total	33.243	34			

Table 10: ANOVA table of Financial Status within Industrial and Allied Sector

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	97.069	13	7.467	18.385	.000
Within Groups	22.743	56	.406		
Total	119.812	69			

Table 11: ANOVA table of Financial Status within Alternative Investment Sector

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	7.191	4	1.798	3.830	.018
Within Groups	9.388	20	.469		
Total	16.579	24			

According to ANOVA test, the claim that companies within the same sector should have an equal financial status since they operate under the same economic environment is rejected. The Agricultural sector returned a p-value of 0.052 at 0.05 significant level and hence, the firms within this sector are deemed to have the same financial status simply because all firms in this sector had financial distress characteristics. In addition, with the p-value of 0.052, it can still be concluded that there is an element of differences in the firms' performance in the agricultural sector.

The other sectors had a p-value of 0.001, 0.000 and 0.018 among Commercial and Service sector, Industrial and Allied sector and Alternative Investment Segment respectively, which confirmed that the financial position of the firms in the same sector differs. This is because the financial health of a company is affected by various factors such as stock ratings, government policies, current legal affairs and incorporation of these factors other than economical environment factors is important in determination of financial soundness of business organizations. The implications of these results point to the already understood fact that management style of any firm does have an effect on the firms' performance which can be the best explanations of the differences above between firms in the same sector.

#### 4.4 Correlation Test between Financial Status and Age of listing

Table below shows the Pearson's correlation coefficient report between the financial status of sampled firm and age of listing. The age group categorises the companies that fall within the same range of age. Frequencies shows the number of companies within the same age group, whereas the Mean Z'-score column shows the financial status of those companies. The extreme right end reports their p-values.

The stated hypothesis was as follows:

**H<sub>0</sub>:** The financial health of firms listed in NSE do not improves with age of listing.

**H<sub>A</sub>:** The financial health of firms listed in NSE improves with age of listing.

Table 12: Correlation Test between Financial Health and Age of listing

Age Group	Frequency	Mean score	Z'	Correlation	P-value
5-10	1	2.501	-	-	-
11-15	5	1.829	0.883	0.470	
16-20	2	2.758	1.000	0.500	
26-30	1	2.589	-	-	
31-35	3	2.503	0.855	0.347	
36-40	9	2.465	0.362	0.338	
41-45	2	2.332	-1.000	0.000	
46-50	1	5.514	-	-	
51-55	4	1.842	-0.591	0.409	
56-60	2	1.888	-1.000	0.000	

The claim that the financial health of firms listed in NSE improves with age of listing lacks sufficient information that can tell us if these variables are correlated or not. This is because, NSE being an emerging market, became vibrant in 1996 after the largest share issue in the history of NSE, privatization of Kenya Airways, came to the market. However, the data available that can tell the relationship between financial status of listed firms and age of listing is limited in terms of age of time and therefore inadequate to make a conclusive remark on the financial status and age of listing.

## 5.0 Conclusion

The assessment of financial distress among firms listed in NSE was analysed in this paper using MDA approach. It was to be expected that firms listed in NSE would exhibit a strong health financial position. However, from the 30 companies analysed, only 5 companies in non-distress zone were considered in good financial health, 16 companies were in the gray area such that 10 were in grey area distress zone meaning they had a financial health as average minus and 6 were in grey area non-distress zone meaning they had a financial health as average plus. Nine companies were in distress zone meaning they were financially distressed. Therefore, the firms listed in NSE do not always exhibit a healthy financial position.

The Agricultural sector represented the most uncertain sector in terms of financial status. All companies in this category showed signs of financial distress. The sector operates under uncertain environment and rely heavily on export hence, this include some of the factors influencing the financial status of firms in this category. The Industrial and Allied sector represented the most stable category in the context of financial health. Out of 5 companies found to have a good and strong financial status, 4 companies emerged from this sector.

It is generally assumed that firms within the same sector should not differ in terms of financial position since they operate within the same economic environment. The findings reported in the study of firms in each sector indicates that the financial status of these firms differ from one company to the other. These is because, the financial health of a company is affected by various factors such as management styles and capacity, government policies, stock ratings, current legal affairs and largely depends on how each firm is capable of coping with such factors. Therefore it is concluded that the financial position of listed firms differs on the basis of sector.

Calculating the Z-score only gives a certain number indicating a certain financial status. Although the numbers that it is based on are correct is this measurement only one helpful tool to analyze a company's health. Understanding what is behind the numbers and what is going on in the company is also essential. During years of major changes in the company's operations can cause the Z-score model to predict corporate failure and other well-known financial indicators can support or challenge the results from the Z-score analysis like the capital ratios. How the situation will develop for many of these companies is however largely depends on how the economic situation in Kenya will turn out. These

companies can do their best to restructure and refinance their debt but for many of them the current debt level is too high to cope with in the long run.

### **5.1 Policy Implications**

Several important policy implications emerge from our analysis. First, a disjoint was noted in the correlation between what is expected of the listed companies in terms of financial performance and the benefits to be accrued from CMA surveillance on them. It has also been noted that NSE has been performing poorly as evidenced when it was suspended for 15 minutes on October 2008 after its 20-share index falling below 4,000 points. This has resulted to the loss of investors' confidence and in light of the collapse of Nyaga Stockbrokers, Francis Thuo and others, the regulator is not looking good at all in the court of public opinion. This points out that the Capital Market and NSE role and responsibility needs to be strengthened. Capital Market Authority (CMA) has an array of tools it can use to ensure its subjects do not deviate from expected ethical behavior. The NSE should make financial stability an integral driver of its policy framework through adoption of financial analysis models. Further, the government should create a separate authority something akin to the Energy Regulatory Commission to oversee the CMA and NSE.

Second, we should be aware of the fact that at times the signs of a major financial distress manifest within a very short time such that the predictive ability of financial ratios become temporarily redundant. This situation is common during an unexpected recession. Nonetheless, financial ratios would give vital information to different stakeholders under normal operating and financing business atmosphere. It is therefore recommended that the practical applicability of bankruptcy prediction models should be checked after some period of time as the economy changes.

Thirdly the industrial and the allied sector firms exhibited better financial health in comparison to the firms from the other sectors. This implies that there is need for a concerted effort for investors to focus on these groups of firms. They are capable of offering more stable dividends and equally more the Kenyan economy towards industrialization.

Fourthly it has been noted that the agricultural sector seems to be having its own woes as far as its financial health is concerned. This brings into sharp focus the need for some prioritization of this sector and the need to address the issues in this sector. For industrialization agriculture cannot be left behind as it is the sector that provides the necessary resources such as food ensuring a healthy population and earnings from export which are critical if ever industrialization is to be realized in the shortest time possible.

Lastly for the agricultural sector there is need to focus on value addition to the produce of this sector as this might ensure a better financial health for these firms as exhibited by the industrial and allied sector that had the better financial health comparatively. Value addition may involve processing thereby bringing in manufacturing and the benefits that go with it.

### **6.0 Further Research**

The study tried to strengthen the position of existing work in bankruptcy prediction, particularly based on the Altman models. Presented below are few suggestions researchers might extend this research in several directions.

- (i) Researchers should investigate development of bankruptcy prediction models using different statistical methodology other than multi-discriminant analysis, such as artificial neural networks (ANNs), logit or probit analysis, to compare and select the most efficient model.
- (ii) Another research area that could be extended is to test bankruptcy prediction models to the non-listed, relatively smaller turnover sized firms where the incidence of business failure is greater than larger corporations.
- (iii) Since the data in the study was limited to a certain period of time, researchers should also extend the research by investigating the relationship between the age of listing and financial health of sampled firms.
- (iv) Another research could be done to come up with a model suitable to investigate the financial distress among financial institutions since the Altman's Z-score models are not recommended for these institutions.

## References

- Aiyabel, J. (2000). Financial Distress: Theory, Measurement and Consequence, *The East Africa Journal of Humanities and Science*. Vol. 1-2002.
- Altman, E. I. (1968). Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy, *Journal of Finance*, **23**.
- Altman, E. I., (1983). Corporate Financial Distress: A Complete Guide to Predicting, Avoiding and Dealing with Bankruptcy, Toronto: Wiley and Sons.
- Altman, E. I. (1993). Corporate Financial Distress and Bankruptcy. A complete guide to Predicting and Avoiding Distress and Profiting from Bankruptcy. Second Edition. USA, John Riley and Sons Inc.
- Altman, E. (2000). *Predicting Financial Distress of Companies: Revisiting the Z-Score and Zeta<sup>®</sup> Models*. (Supplement: Altman, E., 1968: Altman, E., Halderman, R., and Narayanan, P., 1977). Stern School of Business, New York University.
- Arnold, G. (2002). Corporate Financial Management. 2<sup>nd</sup> edition. Harlow: Pearson Education Limited. "Model distress and recovery predictions, *Financial Analysis Journal*.
- Aziz, M. Adnan and Dar, Humayon A. (2006). Predicting Corporate Bankruptcy: where we stand? *Corporate Governance*, Vol. 6 (1), pp. 18-33.
- Beaver, W. (1967). Financial Ratios as predictors of Failure. *Journal of Accounting Research (supplement)*, 4.
- Bruno, A. V. and Leidecker, J. K. (2001). Causes of new venture failure: 1960 vs. 1980. *Business Horizon*. November-December 1988.
- Bryman, A. and Bell E. (2007). Business Research Methods. 2nd edn. Oxford University Press.
- Charitou, A., Neophytou, E. and Charalambous, C. (2004). Predicting Corporate Failure: Empirical Evidence for the UK., *European Accounting Review*, **13** (3).
- Deakin, E. (1972). A Discriminant Analysis of Predictors of Business Failure. *Journal of Accounting Research*, vol. 10(1).
- Eidleman, Gregory J. (1995-02-01). Z-Scores - A Guide to Failure Prediction. *The CPA Journal Online*, 07328435, Feb 95, Vol. 65(2) Business Source Complete.
- Elloumi F. and Gueyie J. (2001). Financial distress and corporate governance: an empirical analysis. Corporate Governance: *International Journal of Business in Society*, **1** (1), pp 15- 23.
- Escott, P., Glormann, F., and Kocagil, F. K. (2001). Modeling Methodology. McGraw-Hill International Editions. Singapore.
- Fisher, R. A., (1936). The Use of Multiple Measurements in Taxonomic Problems, *Annals of Eugenics*, No. 7.
- Grice, J. S. and Dugan, M. T. (2001). The Limitation of Bankruptcy Prediction Models: Some Cautions for the Researchers. *Review of Quantitative Finance and Accounting*, **17**(2).
- Halim, A., Alumnad, H. and Md.Rus, R. (2008). Predicting Corporate Failure of Malaysia's Listed Companies: Comparing Multiple Discriminant Analysis, Logistic Regression and Hazard model. *International Research Journal of Finance and Economics* ISSN 140-2887 issue 15-2008. Euro Journals publishing Inc.
- Hamada, R. S. (1972). The effect of the firm's capital structure on the systematic risk of common stock, *Journal of Finance*.
- Haniffa, R. M. and Cooke, T. E. (2002). Culture, Corporate Governance and Disclosure in Malaysian Corporations. *Abacus*, vol. 38(3).

- Harlan and Marjorie. (2002). Predicting corporate financial distress: Reflections on choice – based sample bias. *Journal of Economic and Finance*, **26**(2), pp 184.
- Jones, S. and Hensher (2004). Predicting Firms Financial Distress: A Mixed Logit Model, *The Accounting Review*, **79**(4).
- Kilman, R. H. and Coven, T. J. (1988). Corporate Transformation. Revitalizing Organizations for a Competitive World. Jossey-Bass, St. Francisco, USA.
- Kothari, C. R. (2004). Research Methodology. Methods and Techniques. 2<sup>nd</sup> Edition. New age International (P) Limited, publisher.
- Libby, R. (1985). Accounting ratios and the prediction of failure: some behavioral evidence, *Journal of Accounting Research*, **13**.
- Lennox, C. (1999). Identifying Failing Companies: A Re-evaluation of the Logit, Probit and MDA Approaches, *Journal of Economics and Business*, **51** (4).
- Mugenda, O. M. and Mugenda, A. G. (2003). Research Methods. Quantitative and Qualitative Approaches. African Centre for Technology Studies (ACTS).
- Mohamed, S., Li, A. J. and Sanda A. U. (2001). Predicting corporate failure in Malaysia: An application of the Logit Model to financial ratio analysis. *Asian Academic of Management Journal*, **6**(1).
- Nam, J. and Jinn, T. (2000). Bankruptcy prediction: Evidence from Korean companies during the IMF crisis. *Journal of International Financial Management and Accounting*, **11**(3).
- Ngugi, R., Amanja, D., Maana, (2009). Capital market, financial deepening and economic growth in Kenya.
- Ohlson, J. (1980). "Financial Ratios and the Probabilistic Prediction of Bankruptcy", *Journal of Accounting Research*, vol. **18**.
- Parker, S., Peters, G. F. and Turetsky, H. F. (2002). "Corporate Governance and Corporate Failure: A survival Analysis", Corporate Governance: *International Journal of Business in Society*, Vol. **2**(2).
- Pereiro, L. (2006). The practice of Investment Valuation in Emerging Markets: Evidence from Argentina, *Journal of Multinational Financial Management*, **16**.
- Polesie, T. (1991). Continuity and Change: Corporate Identity in a Scandinavian Perspective. BAS, Gothenburg School of Economics.
- Sandin, A. R. and Porporato, M. (2008). "Corporate Bankruptcy Prediction Models Applied to Emerging Economies: Evidence From Argentina in year 1991-1998", *International Research Journal of Finance and Economics* ISSN 140-2887 issue 15-2008. *EuroJournals publishing Inc*.
- Stickney, C. P. (1996). Financial Reporting and Statement Analysis. A Strategic Perspective. 3rd Edition. Ft. Worth, TX: The Dryden Press.
- Wruck, K. (1990). "Financial Distress: Reorganization and Organization Efficiency", *Journal of Financial Economics*
- Zmijewski, E. (1984). Methodological Issues Related to the Estimation of Financial Distress Prediction Models. *Journal of Accounting Research*, vol. **20**.
- Zmijewski, E. (1984). Methodological Issues Related to the Estimation of Financial Distress Prediction Models. Mohamed , S., Li, A.J. and Sanda A.U. (2001). Predicting corporate failure in Malaysia: An application of the Logit Model to financial ratio analysis. *Asian Academic of Management Journal*, **6**(1).
- Zulkarnain, M. S., Mohamad Ali, A. H., Annuar, M. N. and Zainal A. M. (2001). Forecasting corporate failure in Malaysian industrial sector firms, *Asian Academy of management Journal*, **6**(1).