

**VALIDITY OF ALTMAN'S Z-SCORE MODEL IN PREDICTING
FINANCIAL DISTRESS OF LISTED COMPANIES AT THE
NAIROBI SECURITIES EXCHANGE**

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DECLARATION

I hereby declare that this project is my original work and has not been presented to any university or an institution of higher learning for a degree award.

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DEDICATION

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LIST OF ACRONYMS AND ABBREVIATIONS

CMA	Capital Markets Authority
EBITDA	Earnings Before Interest Taxes Depreciation and Amortization
MDA	Multiple Discriminant Analysis
NN	Neural Networks
NSE	Nairobi Securities Exchange
USA	United States of America

ABSTRACT

Financial distress prediction has been of concern to management and other stakeholders since the 2008 financial crisis. The impact of financial distress and bankruptcy on firms cannot be taken for granted. Financial distress is detrimental to big organizations and the small organizations alike. This study was conducted with the objective of Altman's failure prediction model in predicting financial distress of listed firms at the Nairobi Securities exchange for the period 2010 to 2014. Data was extracted from secondary sources for a period of five years. Data extracted included working capital, total assets, retained earnings, market capitalization total liabilities and sales. The collected data was then analyzed using SPSS version 20 and Microsoft excel software. In the analysis Multivariate Discriminant Statistical technique as used by Altman 1968 was adopted. Firms that were found to be distressed were Express Kenya, Kengen, Marshalls East Africa, Transcentury, Sasini, Olympia and Kenya Power and Lighting Company Ltd. The study established that the Altman's Z-score model was appropriate for predicting financial distress of listed firms at the NSE. The study recommends the adoption of Altman's failure prediction model in predicting financial distress of listed firms by not only investors but also all other stakeholders.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Mega bankruptcy proceedings have been filed on Philipp Holzman, Lehman Brothers, Enron, WorldCom, Swissair and ABB in the USA and Europe in the recent past. Other firms have been put in receivership like Uchumi supermarket and others have completely shut down. The fall of both large and small organizations in the world over has made financial distress prediction gain popularity. Indeed very few firms establish and grow without experiencing cash flow problems in their entire life. According to Sudarsanam and Lai (2001) a company starts experiencing cash flow problems when major trade customers start paying slowly, major creditors tighten credit terms for payment or sales fall below expectation. Financial distress is a situation when the firm experiences difficulties in meeting its financial obligations as they mature (John, 1993). It occurs when fair valuation of assets fall shorter than liabilities (Ijaz, Hunjira, Hemeed & Maqbool, 2013).

Some of the ways to analyze a company's financial position include: ratio analysis, comparative statement analysis, cash flow analysis, credit risk analysis, decision theory etc (Deakin, 1972). Financial distress is signified by the firm's inability to pay its obligations as they fall due thus cash management is important in every firm. This is so because it is difficult to predict cash flows accurately (Aziz & Dar, 2006). Advancement of credit facilities without consideration of the credit worthiness of the customers as well as efficient collection of customer payments will expose a firm to credit risk (Natalia, 2007). Credit risk management will help a company avoid financial distress caused by

credit risk exposure. Financial distress is not an abrupt event and by a careful look at the organization's statement of financial position and noting changes thereon, one is able to tell of the financial soundness of the company (Aziz & Dar, 2006). Several models are available for financial distress prediction but there is no consensus as to which model is the best predictor. Statistical techniques have been widely used, Artificially Intelligent expert Systems approach is relatively new and theoretical models are relatively uncommon (Aziz & Dar, 2006).

Business failure is a global phenomenon which occurs in developing countries as well as developed countries (Ijaz et al., 2013). Local firms have equally been affected by financial distress leading to delisting and or closure (Kariuki, 2012; Kipruto, 2013; Mamo, 2011; Mohamed, 2013). Financial distress is costly because it creates a tendency for firms to do things that are harmful to debt holders and non financial stakeholders, impairing access to credit and raising stakeholder relationships. Again financial distress can be costly if a firm's weakened condition induces an aggressive response by competitors seizing the opportunity to gain market share (Opler & Titman, 1994). The motivation for empirical research in corporate bankruptcy prediction is clear – the early detection of financial distress and the use of corrective measures (such as corporate governance) are preferable to protection under bankruptcy law (Aziz & Dar, 2006). If it is possible to recognize failing companies in advance then appropriate action can be taken to reverse the process before it is too late (Taffler, 1982). Natalia (2007) points out that averting financial distress effectively and efficiently is dependent on early detection since it allows more time for response. The distress state of a firm should guide management and other stakeholders on the appropriate salvage strategies. Altman and Hotchkiss

(2006); Brigham and Daves (2010) argue that if a firm is far too gone, that is beyond reorganization, it must be liquidated. Some sick companies should be allowed to die and die quickly. Brigham and Daves (2010) further state that maintaining companies on life support does not serve the interests bankruptcy laws were meant to protect. An efficient resolution of financial distress should have two goals. The first goal is to continue viable firms and liquid firms that should be liquidated. The second goal is to help a viable firm recover as quickly as possible from its financial distress (Brigham & Daves, 2010; Kahl, 2002). This research is therefore motivated in the relevance of Altman's Z-score model in predicting financial distress among listed firms at the Nairobi Securities Exchange (NSE).

1.1.1 Financial Distress

Financial distress is a situation where the liabilities exceed assets in a company and generally it happens due to under capitalization, not maintaining sufficient cash, resources are not utilized properly, inefficient management in all activities, sales decline and adverse market situation. Financial distress is a low cash flow state of a company in which it incurs deadweight losses without being insolvent (Opler & Titman, 1994; Purnanandam, 2008). The issues of financial distress are so diverse and have been approached from various disciplines and perspectives including political theory, legal theory, management, economics, accounting and finance (Gestel, Baessens, Suykens & Willekens, 2006). Financial distress and failure is the result of chronic losses which cause a disproportionate increase in liabilities accompanied by shrinkage in the asset value. Financial distress occurs when the company does not have capacity to fulfill its liabilities to the third parties (Andrade & Kaplan, 1998).

Many studies operationalize financial distress as bankruptcy (Altman, 1968; Ohlson, 1980; Gentry, Newbold & Whitford, 1987). It is important to note that bankruptcy is a legal rather than an economic decision (Dietrich, 1984). Bankruptcy is a legal proceeding which can be done voluntarily with the corporation filing the petition or involuntarily with the creditors filing the petition. Bankrupt firms must have filed for bankruptcy in the sense of Chapter X and chapter XI of Bankruptcy Act of the USA or some other notification indicating bankruptcy proceedings (Ohlson, 1980). Financial distress is a situation where the company is experiencing difficulties in meeting its financial obligations as and when they fall due. Bankruptcy can be said to be a situation in which a financially distressed company is having bankruptcy proceedings in a court of law. Eventually the company may be rendered insolvent. Whereas financial distress is a consequence of operating decisions or external forces, bankruptcy is something companies choose to do in order to protect their assets from creditors (Platt & Platt, 2006). A fall in a company's earning power will at some point create a non trivial probability that it will not be able to pay the interest and principle on its debt. The corporation is then said to be in a state of financial distress (Gordon, 1971).

A company is said to be financially distressed not only when it files for bankruptcy, but also whenever it meets both of the following conditions: First its earnings before Interest and Tax, Depreciation and Amortization (EBITDA) are lower than its financial expenses for two consecutive years, leading the firm into a situation in which it cannot generate enough funds from its operation activities to comply with its financial obligations. Second a fall in its market value occurs between two consecutive periods. A company that suffers from operational deficit is expected to be assessed negatively by the market

and its stakeholders; hence it will suffer the negative consequences of financial distress until improved economic condition is recognized. A firm is then said to be financially distressed in the year following the occurrence of these two events (Pindado et al., 2008).

The terms financial distress and bankruptcy have been used by various researchers in the general sense to mean failure. Financial distress is the inability of a firm to pay its financial obligations as they mature. Operationally a firm is said to be in financial distress when any of the following events occur; bankruptcy, bond default, an overdrawn bank account, or nonpayment of a preferred stock dividend (Beaver, 1966). Bankruptcy refers to those firms that are legally bankrupt and either placed in receivership or have been granted the right to reorganize under the provisions of the National Bankruptcy Act (Altman, 1968; Deakin, 1972; Platt & Platt, 2006). A firm is in financial distress when the liquid assets are not sufficient to meet the current requirements of its hard contracts (John, 1993).

Default is closely related to financial distress. Debtor and creditor relationship exist in technical as well as in legal default. The violation of contract terms by debtor is legally actionable and classified as technical default. As compared to temporary condition, insolvency in the sense of bankruptcy is harmful. It occurs when fair valuation of assets fall shorter than liabilities. Therefore the net worth of the company is negative. It is difficult to detect than technical solvency as it requires completer valuation analysis. Bankruptcy is a formal declaration by court as a result of petition of bankruptcy reorganization or liquidation (Ijaz et al., 2013).

Financial analysis is a critical way of viewing the financial position of a company. It provides a clear guide to evaluate and understand a company's position. Some of the ways to analyze a company's financial position include: ratio analysis, comparative statement analysis, cash flow analysis, decision theory etc. Financial statement analysis is the best tool to evaluate the working and performance of the company throughout the year. It is the easiest tool for the stakeholders to diagnose the financial strength of a company. Statistical techniques, particularly discriminant analysis can be used to predict business failure from accounting data (Deakin, 1972).

1.1.2 Altman's Z-Score Model

The Z-score model is a linear combination of four or five common financial ratios, weighted by coefficients (Altman, 2000). A financial ratio is a quotient of two numbers, where both numbers consist of financial statement items (Beaver, 1966). The coefficients were estimated by comparing a set of firms which had been declared bankrupt and then collecting a matched sample of firms which had survived, with matching by industry and approximating firm size. Altman (1968) applied Multiple Discriminant Analysis to a data set of 66 publicly held manufacturing firms. The MDA technique and in particular the z-score model has been applied in several financial distress and bankruptcy studies with satisfactory results (Aziz & Dar, 2006; Bellovary, Giacominio & Akers, 2007; Platt & Platt 2006; Zmijewski, 1984).

According to Altman (2000) there are three fundamental questions in financial distress prediction models. First which ratios are the most important? Secondly what weights should be assigned to each selected ratio? Thirdly how the weights should be objectively established? Altman revised the initial Z-score model and came up with Z'-model where

the market value of equity was changed to the book value of equity where the model was applicable to private and non manufacturing firms. He further revised the model and came up with Z''-score model to include emerging markets where the model could be used by both manufacturing and non manufacturing firms as well as public and private companies. All the three models have widely used by various researchers (Aziz & Dar, 2006).

1.1.3 Predicting Financial Distress using Altman's (1968) Z-score Model

Ratio analysis by Beaver (1966) set the stage for the development of financial distress and bankruptcy prediction models. In particular the univariate model contributed significantly to the multivariate model development (Altman, 2000). Altman (1968) studied 22 common financial ratios in order to determine their predictive ability. Of the 22 ratios Altman came up with five ratios as the most indicative of financial distress and used them to develop the financial distress prediction model. Altman's Z-score model is a simple statistical model that managers, investors, employees, shareholders among other stakeholders can apply to test the financial health of a firm. The Z-score model show whether a company is financially health, distressed or in the grey zone. Then stakeholders are able to make appropriate decisions.

Zavgren and Friedman (1988) developed and applied a logistic regression model in financial distress and bankruptcy prediction. This model is subjective since its interpretation depends on the user's risk preferences, knowledge about the firm and the context upon which it operates. Cash flow based models, whether combined or stand alone exhibit a superior predictive accuracy superior early warning capabilities (Aziz &

Lawson, 1989). Zeta and Z models exhibit high predictive ability compared to cash flow based models (Aziz & Lawson, 1989).

Coats and Fants (1993) compared the results of MDA techniques with the NN model and concluded that NN is more effective than MDA in for pattern classification. Charitou et al. (2004) used neural networks and logit methodology in financial distress prediction in the United Kingdom. They concluded that the model including financial ratios such as cash flow, profitability and leverage produced accurate results.

Aziz & Dar (2006) grouped the several financial distress and bankruptcy prediction models into three categories namely, statistical models, artificially intelligent expert system models and theoretical models. The statistical models have been widely used compared to the other models. The MDA received highest application generally while gambler's ruin was the least applied model. Generally all the models yielded an average of 85% predictive accuracy (Aziz & Dar, 2006). The MDA and logit models have high predictive accuracy (Aziz & Dar, 2006).

1.1.4 Nairobi Securities Exchange

This study will focus on testing validity of Altman's Z-score model in predicting financial distress in the firms listed at the Nairobi Securities Exchange. The Nairobi Securities Exchange was formed in 1954 as a voluntary organization under the Societies Act in the name Nairobi Stock Exchange and was charged with the responsibility of developing the securities market and regulating trading activities. The NSE is regulated by the Capital Markets Authority whose function is overseeing the affairs of listed companies (NSE, 2015).

The NSE currently has 62 listed firms. The NSE has the mandate to develop policies and guidelines so as to ensure efficient market operations. The companies listed are expected to be financially sound although this may change from time to time. There are so many reasons as to why companies trading at the NSE may suffer financial distress. They include corporate governance issues, management issues, credit risk exposure, intense competition and leverage among others (Natalia, 2007; Whitaker, 1999). In Kenya several firms have gone under including commercial firms, banks, manufacturing concerns among others due to financial distress and bankruptcy. Uchumi supermarket was delisted and put under receivership due to financial distress (Kipruto, 2013).

The prediction of financial distress provides early warning to impending catastrophe. The subject of financial distress prediction has gained popularity since the studies by Beaver (1966). Beaver's model utilized financial ratios in testing the financial health of firms. Altman (1968) employed several financial ratios in determining financial distress. He developed a statistical model which has gained wide usage by investors, managers, credit institutions and employees. Altman's statistical model has gained popularity in application as witnessed by various researchers in different contexts (Aziz & Dar, 2006; Zmijewski, 1984).

1.2 Research Problem

If financial distress is not detected in time and turnaround measures taken then bankruptcy is likely. The costs of bankruptcy are enormous and affect all stakeholders of the company (Altman 1984; Andrade & Kaplan, 1998; Altman & Hotchkiss, 2006; Natalia, 2007; Opler & Titman, 1994). The early the detection the better is the time allowed in making appropriate strategies (Natalia, 2007). Although companies experience

a positive change in net income, they do not seem to generate enough cash flows to satisfy their debt obligation and eventually may experience financial distress (Low, Nor & Yatim, 2001). Charitou, Neophytou and Charalambus (2001) argue that operating cash flow variables are the most significant in predicting corporate failure. Natalia (2007) points out the biggest challenge in financial distress as the ability to recognize adverse processes as early as possible in order to gain more time for response. Altman (2000) further argues that since financial distress is not an abrupt event it is possible to predict and avoid it.

Beaver (1966) used financial ratios in studying financial distress in America. He argued that cash flow to debt ratio as the best single ratio predictor. Altman (1968) argues that working capital to total asset, retained earnings to total assets, EBIT to total assets, market value of equity to book value of total liabilities and sales to total asset ratios are the best indicators of financial distress. He developed and applied the Z-score in bankruptcy prediction in America. Coats and Fant (1993) studied financial distress and bankruptcy prediction in American using neural networks while Beynon and Peel (2001) used rough sets. Ijaz et al. (2013) studied financial distress in Pakistan's sugar sector using the Z-score model. There is a great disagreement as to the suitable methodology and substantial scope for model development (Aziz & Dar, 2006). Despite the differences in the bankruptcy prediction models the statistical models have shown high predictive ability (Bellovary et al., 2007). Whichever methodology is applied in the prediction process the predictive accuracy is the most important point. The outcome identifies the distress state of a firm which consequently justifies further detailed investigation (Natalia 2007; Taffler 1982).

Kenyan companies have equally been affected by financial distress. In the recent past Uchumi Supermarket has suffered financial distress and was put under receivership (Kipruto, 2013). Companies listed at the NSE are no exception to financial distress and bankruptcy (Mohamed, 2012). These companies are expected to be health financially in order to maintain investor confidence. Miller (1991) argues that the bankruptcy on indebted firm will send a shock wave to the firm's equally indebted suppliers leading in turn to more bankruptcies until eventually the whole economy collapses in a heap. The financial health of firms listed at the NSE will influence the transactions conducted at the NSE. More recently Mumias Sugar Company, Kenya airways have been hit hard by financial distress and have asked the government for bailouts (The Standard newspaper, June 27 2015). Mamo (2011) and Kariuki (2013) studied financial distress of the banking industry in Kenya using the Z-score. Kipruto (2013) and Shisia et al. (2014) studied financial distress in Uchumi Supermarkets using the Altman's Z-score model. No significant studies have been done in Kenya on financial distress prediction. The original Z-score model (Altman, 1968) was developed to predict financial distress and bankruptcy in large manufacturing firms in the United States of America. This study therefore differs from the above studies in that it sought to test the validity of Altman (1968) model in the Kenyan context and in particular listed companies at the NSE.

1.3 Research Objective

The research's aim was to establish the validity of Altman's failure prediction model in predicting financial distress in the companies listed at the Nairobi Securities Exchange.

1.4 Value of the Study

The research will be useful to investors in making informed decisions by analyzing the financial ratios of a company before deciding on which shares to buy and which ones to dispose off. By applying the Z-score model investors will be able to predict the financial soundness of companies before investing. Managers will find the research useful in making timely responses to financial distress to avoid further losses and avert the situation. The regulators will apply the findings in designing and implementing appropriate policies in ensuring an efficient market system. The government will use the findings in designing strategies to avoid tax losses which are brought about by financial distress. This research will form a basis for further research and scholars will find the information useful in contributing to the pool of knowledge. It will also add to theory by confirming whether the Altman's Z-score model is relevant among the listed firms in the Kenyan context.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter discusses financial distress theories, causes of financial distress, and costs of corporate financial distress, financial turnaround strategies, empirical review and finally a summary of literature review.

2.2 Theoretical Review

This section discusses theories of financial distress. Theories explaining financial distress in corporations include entropy theory, credit risk theory, cash management theory, and gambler's ruin theory.

2.2.1 Entropy Theory

One way of identifying a firm's financial distress is by a careful analysis of the changes occurring in its balance sheets. By examining the amount of change in a firm's balance sheet between two points in time one can note the financial health status of firm. The theory uses both univariate and multiple discriminant analysis. Univariate analysis uses financial ratios and in particular accounting ratios to predict financial distress. However single ratios calculated are subject to time variation of the ratios and their interrelatedness. Multiple discriminant analysis uses more than one ratio in predicting financial distress. If significant changes are observed in the composition of the balance sheet the firm is likely to suffer financial distress (Aziz & Dar, 2006).

Stakeholders can use financial decomposition in helping spot checking the financial health of a company. The symptoms of financial distress can be seen long before failure

and this should guide interested parties in decision making (Aziz & Dar, 2006). Natalia (2007) argues that financial distress is not an abrupt event but a process that a company moves from one state to another in deterioration. Then the point at which financial distress is detected is significant in decision making.

2.2.2 Credit Risk Theory

Credit is the provision of goods and services to a person or entity on agreed terms and conditions where the payments are to be made later with or without interest. During the contract period, violation of contract terms by the debtor is legally actionable and classified as technical default (Ijaz et al., 2013). When the debtor does not pay their dues on the due date, the lender is exposed to credit risks which may in turn lead to default. Credit risk is therefore the investor's risk of loss, financial or otherwise, arising from a borrower who does not pay his or her dues as agreed in the contractual terms (Natalia, 2007). If a company is exposed to credit risk then financial distress is a reality unless measures are taken to avert the situation (Ijaz et al., 2013).

Credit management is a fundamental role in any organization that should be taken seriously. Unless this is observed bad debts and associated costs will set in and once this happens a company is exposed to credit risk. If a company is exposed to credit risk for sometime then financial distress is likely to set in (Natalia, 2007). Credit should only be advanced to credit worth customers after a careful evaluation to avoid credit risk and its associated consequences (Ijaz et al., 2013).

2.2.3 Cash Management Theory

Beaver (1966) viewed an organization as a reservoir of liquid assets which is supplied by inflows and drained by outflows. The reservoir serves as a cushion or buffer against variations in the inflows. Accordingly the solvency of a firm can be defined in terms of the probability that the reservoir will be exhausted at which point the firm will be unable to pay its obligation as they mature (Beaver, 1966; Blum 1974). Cash management theory is concerned with the managing of cash flows into and out of the firm; cash flows within the firm and cash balances held by the firm at a point in time by financing deficit or investment surplus cash. Short-term management of corporate cash balances is a major concern of every firm. This is so because it is difficult to predict cash flows accurately, particularly the inflows, and there is no perfect coincidence between cash outflows and inflows (Aziz & Dar, 2006). During some periods cash outflows will exceed cash inflows because payments for taxes, dividends or seasonal inventory will build up. At other times, cash inflow will be more than cash sales and debtors may realize in large amounts promptly. An imbalance between cash inflows and outflows would mean failure of cash management function of the firm. Persistence of such an imbalance may cause financial distress to the firm and hence, business failure (Aziz & Dar, 2006).

In order to avoid financial distress the management should maintain cash balance in the organization. Neither too much cash nor negative cash level is advantageous to the firm (Aziz & Dar, 2006). Too much investment in illiquid assets deprives the company the much needed cash to finance operation. When operations are negatively affected, sales as well as profitability are also negatively affected which in turn cause financial distress (Blum, 1974). Financial distress can be avoided through proper cash management.

2.2.4 Gambler's Ruin Theory

Gambler Ruin theory was developed by Feller in 1968 who based it on the probability theory where a gambler wins or loses money by chance. The gambler starts out with a positive, arbitrary, amount of money where the gambler wins a dollar with probability p and loses a dollar with a probability $(1-p)$ in each period. The gambler is very optimistic of winning until he loses everything. The theory is based on the premise of random walk, that if something happens more frequently than normal during some period, it will happen less frequently in the future. The firm can be thought of as a gambler playing repeatedly with some probability of loss, continuing to operate until its net worth goes to zero. When the company's net assets are negative the company is said to be in a financial distress state (Aziz & Dar, 2006).

Companies which do not check or test their financial health state can be viewed as gamblers who are operating on chances. Decisions made should be guided by suitable criteria in order to run the affairs of the company. Management must anticipate future conditions both externally and internally which should guide them through careful analysis using set criteria in making informed operating, financing and investing decisions (Ndirangu, 2011).

2.3 Determinants of Financial Distress

Determinants of financial distress are in many instances mixed, interrelated and should be analyzed in all their complexity. Financial distress results from deterioration of a firm's financial performance and can have many causes. Poor management, unwise expansion, intense competition, too much debt, massive litigation, and unfavorable contracts are just

a few of the possible causes (Natalia, 2007). Poor management is the most significant cause of financial distress (Whitaker, 1999). Factors causing financial distress can be divided into external and internal factors. Internal factors include poor financial management, excessive debt, incompetent management and corruption while external factors include excessive expansion and competition, falling prices, change in public demand and political instability (Ndirangu, 2011). Financial distress in a firm is caused by high leverage levels (Andrade & Kaplan, 1998; Modiglian & Miller, 1958). Hotchkiss (1995) examined the relationship between management changes and post-bankruptcy performance. Over 40% out of 197 public companies that emerged from between 1979 and 1988 continued to experience operating losses in three years following bankruptcy, 32% re-enter bankruptcy or privately restructure their debt.

Hotchkiss (1995) argued that the continued involvement of pre-bankruptcy management in the restructuring process is strongly associated with poor post-bankruptcy performance. Her results show that retaining pre-bankruptcy management is strongly related to worse post-bankruptcy performance. In this a company can return to bankruptcy situation if poor restructuring is done in the first bankruptcy. Natalia (2007) summarizes the causes of financial distress in a continuum as failure of corporate strategy, poor operations, non profitability, cash flow problem and finally insolvency.

2.4 Empirical Literature Review

Several empirical studies have been done on financial distress in various contexts. This section provides a critical review of empirical literature both in the global and local context.

2.4.1 Global Studies on Financial Distress

Prediction of corporate financial distress and bankruptcy is a subject which has gained a great deal of interest by researchers in finance since 1960s. Beaver (1966) compared the financial ratios of 79 failed firms with the ratios of 79 matched firms up to five years before the matched firms actually failed. Using univariate discriminant analysis, he studied large asset size firms that failed between 1954-1964 and a stratified sample of successful firms. He tested debt/total assets, earnings after taxes/total assets and cash flow/total debt and concluded that cash flow to total debt had the highest discriminatory power of the ratios examined. Five years before failure, an optimal prediction criterion (i.e., cutoff value) based on the single accounting ratio misclassified only 22% of the validation; one year prior to failure the criterion misclassified only 13% of the validation sample. His study concluded that a single financial ratio can help predict financial distress. Although ratio analysis is important in financial distress detection no single financial ratio can accurately predict financial distress and as Altman (2000) observes a firm with poor profitability and/or solvency record may be taken as a potential bankrupt, notwithstanding its above average liquidity situation.

In order to overcome the weaknesses of the univariate model, Altman (1968) developed a multiple discriminant model. An MDA is a linear equation containing more than one financial ratio as detectors of financial distress. Altman used the MDA model in studying financial distress in the USA. He applied the model on 33 paired firms in the period 1946-1965. The results showed that the MDA model is an accurate predictor of bankruptcy. The discriminant model correctly classified 95% of the sample one year prior to failure and 72% two years prior to failure.

Estimation biases both conceptually and empirically were studied by (Zmijewski, 1984). The biases can result when financial distress models are estimated on non random samples i.e. choice based sample biases and sample selection biases. The first one results when a researcher first observes the dependent variable and then selects a sample based on that knowledge. The second bias results when only observations with complete data set are used to estimate the model and incomplete data observations occur non random. The results indicated the existence of a bias for choice based sample when unadjusted probit model is used, decrease in the bias as the sample composition approaches the population. However the bias does not affect statistical inferences or the overall classification rates for the financial model and the samples tested.

Coats and Fant (1993) studied the usefulness of neural networks in predicting financial distress on a sample of 188 firms (two viable firms to one distressed firm) in America. They were interested in answering the question: How successful can neural networks discern patterns or trends in financial data and use them as early warning signals of distressful conditions in currently viable firms? They used auditor's report (the firm has the intent and ability to operate as a going concern) on classifying a firm as financially distressed or health. They established that the NN approach is more effective than MDA for pattern classification.

Beynon and Peel (2001) studied the applicability of rough set theory and data discretisation on corporate failure prediction. The results show variable precision rough sets (VPRs) is a promising addition to the existing methods in that it is a practical tool, which generates explicit probabilistic rules from a given information system with the rules offering a decision maker informative insights into classification problems.

In their study Charitou et al (2004) examined the incremental information content of operating cash flows in predicting financial distress. They used neural networks and logit methodology and a data set of fifty one matched pairs of failed and non failed UK public industrial firms over the period 1988-1997. They developed a parsimonious model with three financial ratios, financial leverage, profitability and operating cash flow which yielded an overall classification accuracy of 83%.

Ijaz et al. (2013) conducted a study in Pakistan for the period 2009-2010. The objective of the study was to test the reliability of the Z-score and current ratio in predicting financial distress among the 35 listed companies of the Karachi Stock Exchange. The results indicated that current ratio and Altman's Z-score are reliable tools of assessing financial health of sugar sector listed companies of Karachi Stock Exchange.

2.4.2 Local Studies on Financial Distress

In his MBA project, Mamo (2011) conducted a study on financial distress of Kenyan banking industry. He used Altman (1968) model of predicting financial distress on 43 banks. The model was found to be an accurate predictor on 8 out of 10 failed firms, 80% validity for the model. On the sampled non failed firms majority of them proved the Edward Altman's financial prediction model to be 90% valid.

Kipruto (2013) adopted the Multivariate Discriminant Analysis (MDA) statistical technique as used by Altman. He was concerned with testing the validity of Altman's failure prediction model in predicting corporate financial distress in Uchumi supermarkets. He found out that the model was a good predictor. The company recorded

declining Z-score values indicating that it was experiencing financial distress and that is why it was delisted from the NSE in 2006.

The Altman Z score multi discriminant analysis model was used by Mohamed (2013) in his study of bankruptcy prediction of firms listed in the NSE adopted. He used convenient sampling technique and descriptive research design. He established that Altman (1993) Z''-score model was not sufficient to differentiate between failed firms and non failed firms as compared to that of Altman's Z score of 1968. Altman (1993) Z'' – score was intended for manufacturing and retailing firms. He suggested that investors and stakeholders should pay attention to liquidity and activity ratios.

In another study in the banking industry Kariuki (2013) sought to establish the impact of financial distress on commercial banks performance. She sought to know whether they are in distress, if so how their performance is affected and how to rectify the situation. A descriptive research design was employed and a sample of 22 banks, 11 listed and 11 unlisted out of the population of 40 banks was selected. Altman's Z-score model was used to measure financial distress while return on assets ratio was used to measure performance. Data was then analyzed using regression model. The findings indicate that most banks under study had financial distress, non listed banks suffered more. Financial distress had significant impact on financial performance. There is a negative relationship between financial distress and financial performance. The study established the need to reduce financial distress by ensuring financial stability in banks to ensure shareholders confidence.

Shisia et al. (2014) conducted a study with the objective of Altman failure prediction model in predicting financial distress in Uchumi Supermarket in Kenya. They used secondary data for a period of five years from 2001-2006. The study established that Altman failure prediction model was appropriate for Uchumi supermarket as it recorded declining Z-score values indicating that it was suffering financial distress.

2.5 Summary of Literature Review

There are disagreements generally as to the definition of the term financial distress. The term financial distress has been used to mean failure, bankruptcy and insolvency. On the other hand the terms financial distress, bankruptcy and insolvent have used interchangeably in the context of failure. Nevertheless financial distress in this study is applied in the context of inability of a firm to pay its obligations as they fall due. Financial distress and bankruptcy prediction models have got strengths and weaknesses making selection between among them a difficult exercise (Aziz & Dar, 2006). However the application of these models seems to yield almost same predictive power (Agarwal & Taffler, 2008). Altman's failure prediction model is more popular evidenced by regular application in empirical studies.

Many studies on financial distress have been conducted in developed countries unlike in developing countries like Kenya. Kariuki (2013) studied the impact of financial distress on commercial banks performance. Mamo (2011) also conducted a study on financial distress prediction in banks. Kipruto (2011) used MDA in studying financial distress of Uchumi supermarket. Shisia et al. (2014) also conducted a study on applicability of Altman's Z-score model in predicting financial distress in Uchumi Supermarket. Mohamed (2012) did a study on financial distress prediction on NSE firms using Altman

(1993) Z'-score model and concluded that it is not a good predictor. These studies have been done on single firms or a sector of listed firms and using different models. The results could be different if all listed firms were incorporated and other models applied. This study therefore endeavors to bridge the gaps by applying Altman (1968) Z-score model on NSE listed firms. This study therefore will add to literature on financial distress prediction among firms listed at the NSE. The findings will guide management and other stakeholders in decision making.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

The chapter contains the methodology applicable in this research. In this chapter research methodology is presented in research design, data collection techniques and data analysis techniques respectively.

3.2 Research Design

The study applied descriptive research design. It is concerned with specific prediction and narration of facts. Descriptive research design was used by Shisia et al. (2014) in their study of financial distress in Uchumi supermarkets limited. This study applied Altman (1968) Z-score model in prediction of financial distress in corporations. The MDA technique has been used by Kariuki (2013), Mamo (2011), Shisia et al. (2014) and Mohamed (2012) in studying financial distress with positive results.

3.3 Population

Population refers to the entire set of elements that a researcher wishes to study. The population of this study consist all firms listed at the NSE. There are 62 companies listed at the NSE and this study sought to test the validity of Altman's Z-score model in predicting financial distress among these companies. The study adopted a census for the companies listed at the NSE as at 31st December 2014.

3.4 Data Collection Techniques

The study used secondary data for the period 2010 to 2014 financial years. The data used was sourced from financial reports, library, company website, journals as well as publications relevant to the firms listed at the NSE.

3.5 Data Analysis Techniques

Data analyses involve the preparation of collected data, coding, and arranging data in order to process it. The data was processed using windows excel and SPSS version 20 software. The analytical model used in the study is Altman (1968) Z-score model. It is a linear equation in the form:

$$Z=1.2X_1+1.4X_2+3.3X_3+0.6X_4+0.999X_5$$

Where;

Z=overall index

X_1 =Working Capital/Total Assets (WC/TA)

X_2 =Retained earnings /Total Assets (RE/TA)

X_3 =Earnings before Interest and Taxes/Total Assets (EBIT/TA)

X_4 =Market Value of Equity/Book Value of Total Liabilities

X_5 =Sales/Total Assets(S/TA)

Discrimination zones:

$Z > 2.99$, "Safe" zone,

$1.81 < Z < 2.99$ “Grey” zone,

$Z < 1.81$ “Distress” zone

3.6 Operationalization of Variables

This section covers the relevant variables that were used to measure financial distress.

These variables are the dependent and independent variables.

3.6.1 Dependent Variable

Z is the discriminant variable whose value will allocate a firm as either financially distressed or healthy. It is a dichotomous variable that is used in classification of mutually exclusive events e.g male or female, bankrupt or non bankrupt etc.

3.6.2 Independent Variables

X_1 – Working Capital/Total Assets (WC/TA)

Working capital refers to current assets net of current liabilities. Working capital plays a significant role as because it is used in the day – to – day operations of the firm. Current assets include cash in hand, accounts receivable and inventory. Current liabilities consist of a firm’s financial obligations, short term debt and accounts payable which will be met during the operating cycle. A positive working capital is a sign of the firm’s ability to pay the bills. A negative working capital shows that the firm will experience difficulties in meeting its obligations. The working capital to total assets ratio is a measure of liquid assets of the firm in relation to total capitalization.

X_2 – Retained Earnings/Total Assets (RE/TA)

Retained earnings are earnings not distributed to shareholders, instead reinvested in the firm. The RE to TA ratio measures the degree of financing of total assets via surplus profits. It also measures the degree of leverage of a company. The ratio measures cumulative profitability of a firm and indicates the firm's earning power as well as age.

X_3 – Earnings Before Interest and Taxes/Total Assets (EBIT/TA)

Earnings before interest and taxes refer to the earnings generated from the operating activities of the firm. The ratio EBIT/TA measures the efficiency of assets in generating profits. Low EBIT/TA ratio indicates that the firm is not using the assets efficiently in generating profits. This ratio estimates the cash supply available for allocation to the creditors, government and shareholders.

X_4 – Market Capitalization/Book Value of Total Liabilities (MC/TL)

Equity is measured by the total value of preference shares and ordinary shares. The ratio MC/TL measures the proportion by which assets must decline in value before the firm is rendered insolvent. This ratio incorporates the market dimension to the model of financial distress prediction.

X_5 – Sales/Total Assets (S/TA)

Sales are the revenues generated by the company. The ratio S/TA shows the ability of the firm in utilizing assets in generation of revenues. It is measures the management's capacity to deal with competitive conditions (Altman 2000).

CHAPTER FOUR: DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

This chapter outlines the data analysis, results and discussion of the results according to the findings. The chapter articulates the financial distressed firms which were seven in number, the trend of the variables of the distressed firms in the study period, analysis of descriptive statistics, correlation and finally discussion of the findings.

4.2 Financially Distressed Firms

From the 62 firms that were listed at the Nairobi Securities Exchange, 42 firms were selected while 20 were dropped due to missing data on their respective financial statement to warrant calculation of the Altman's Z-score model. These 42 firms as shown in Appendix 1 were then used to calculate the Z-score model to determine financial distress.

Seven firms were out rightly distressed since all their Z-score values were less than 1.6 these were Express Kenya, Kenya Power and Lighting Ltd, KenGen, Marshalls E A, Olympia Capital Holdings, Sasini Ltd and Transcentury Ltd, the average Z-scores were as shown below

Table 4.1 Average Z scores

Year	Z-score
2014	0.65624
2013	0.91919
2012	0.99400
2011	0.67619
2010	0.87569

Source: Research findings

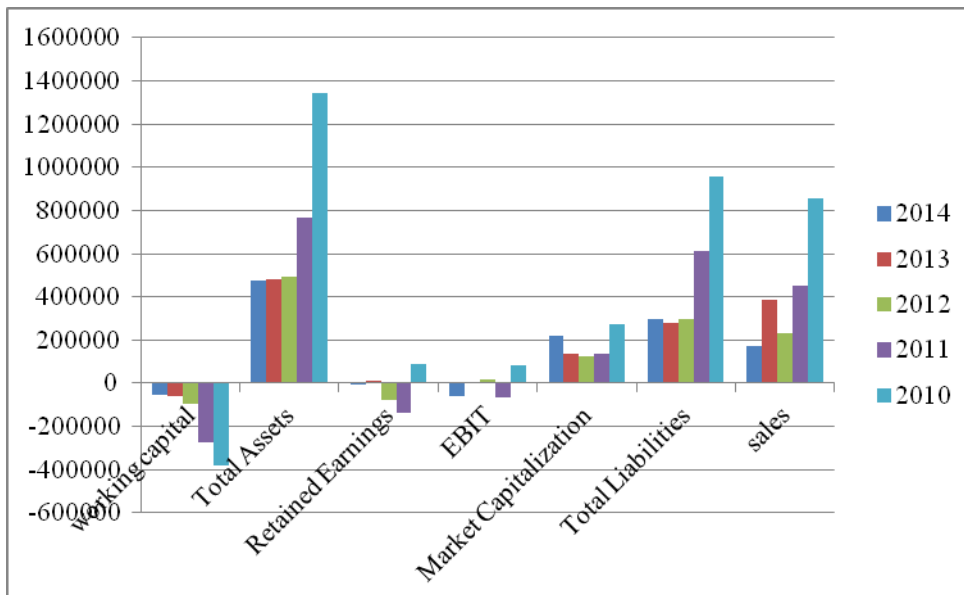
The average Z-scores of the firms indicated above show that the firms have failed in their operations. Most firms have low working capital and their earnings before interest and tax is also low. These firms could not finance their operations over the study period, 2010-2014.

4.3 Trends of the Variables

The various variables for the constitution of the Altman’s model for the distressed firms were analyzed and the findings are as here below. All the figures are in Kenya Shillings.

4.3.1 Express Kenya Ltd

Figure 1 Express Kenya Ltd



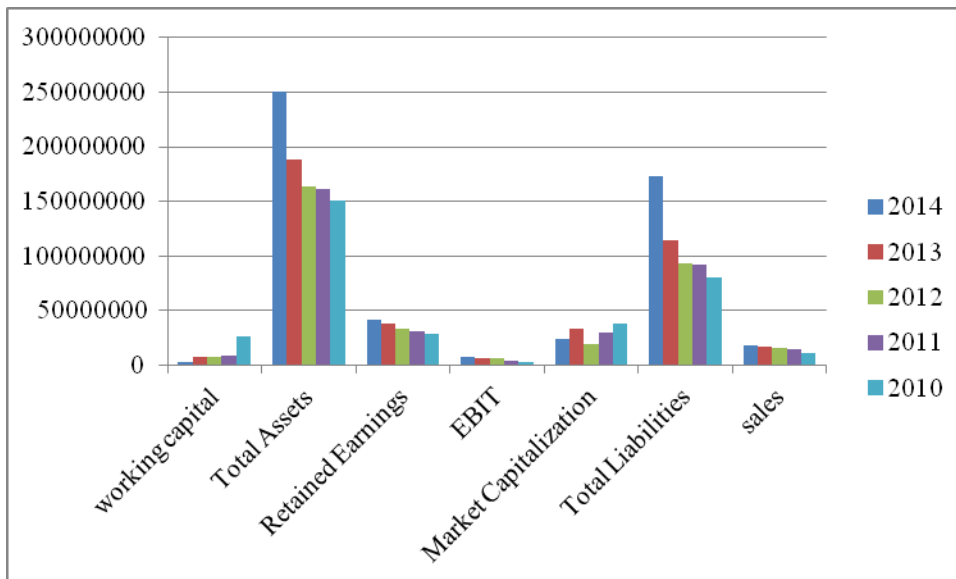
Source: Research findings

Comparatively, the working capital for this firm has been negative throughout the five year period. Implying the company could not meet its immediate demands. Although the working capital kept on improving from year to year the total assets, total liabilities and sales had been declining over the study period.

This shows that the firm had been acquiring debt but could not generate income from within, also the retained earnings kept on reducing, showing that the firm couldn't even re invest back its earnings. This trend is also shown in the Z-score values in the Appendix.

4.3.2 Kengen

Figure 2 Kengen



Source: Research findings

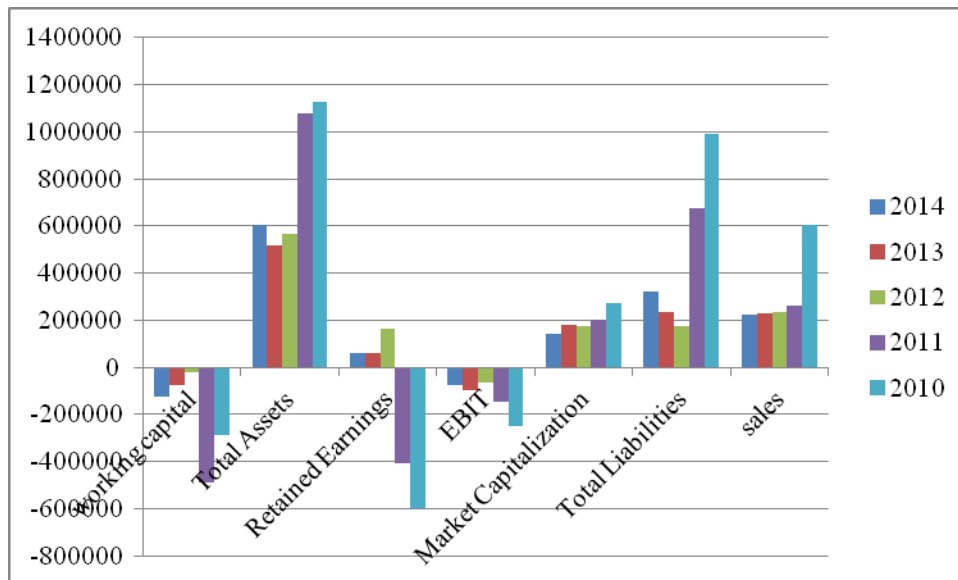
The total assets kept on increasing in the study period while the total liabilities also increased but to a lesser magnitude which explains why the working capital reduced over the study period. There is also a slight rise in the EBIT and a slight drop in the market capitalization.

These factors explain why the firm eventually can finance its operation due to the increase in assets which leads to an increase in the working capital. But due to increase in total liabilities it ends up being distressed.

4.3.3 Marshalls East Africa

As shown in the figure 3 below, the working capital hit an all-time low in the year 2011 and again reached its peak in the following year 2012 and declined again in the year 2014.

Figure 3 Marshalls East Africa



Source: Research findings

For Marshalls East Africa the year 2013 recorded the lowest value in total assets, while the year 2010 had the lowest value in retained earnings as shown in the figure 4 above. Sales were highest in the year 2010 but its corresponding total assets for the same year was equivalently high, its sales to total assets ratio started declining for the rest of the years showing that the ability of the firm to utilize its assets in generating revenues kept plummeting.

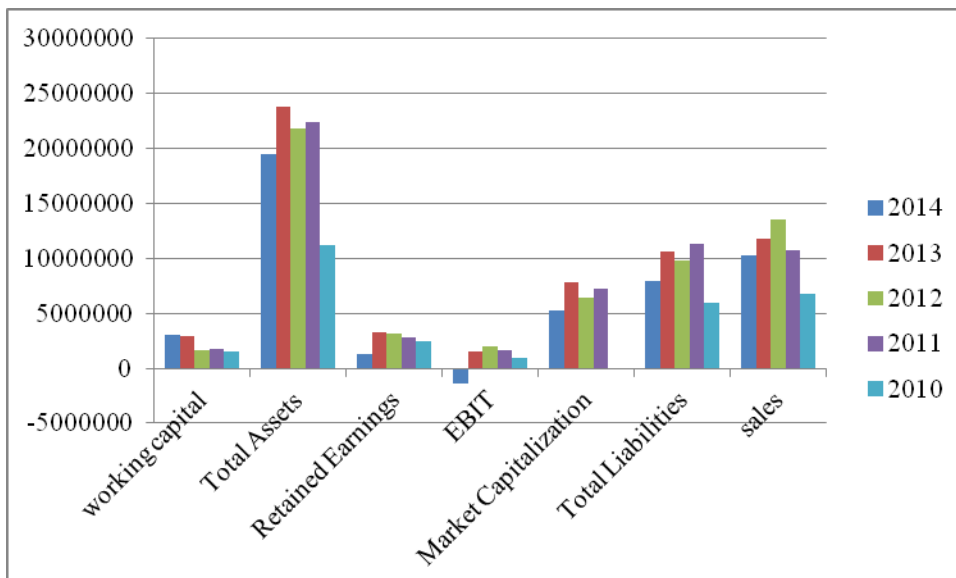
Eventually the company continued to be financially distressed in the study period. The working capital was negative throughout implying that the firm was not able to finance its operations.

4.3.4 Transcentury

According to figure 4 here below, the EBIT decreased and eventually became negative while the total assets increased over the study period implying that the firm was not using its assets efficiently to generate profits. The working capital was slowly increasing in the same period since the total assets had increased and the total liabilities had decreased.

Transcentury was able to pay its immediate obligations but due to its inability to generate profits by lack of well utilization of its resources it was financially distressed. The retained earnings kept on declining showing that the company couldn't plough back its business proceeds to the firm.

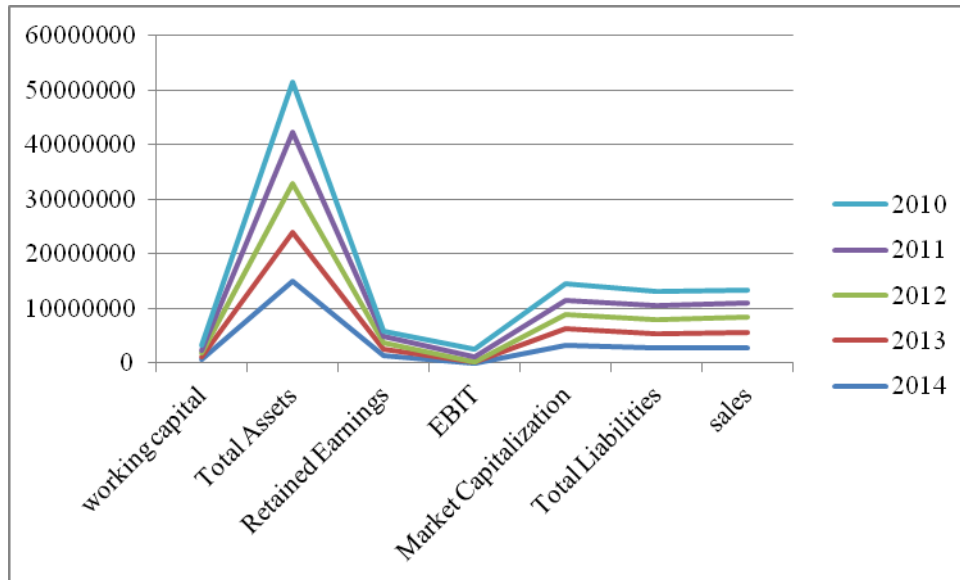
Figure 4 Transcentury



Source: Research findings

4.3.5 Sasini

Figure 5 Sasini



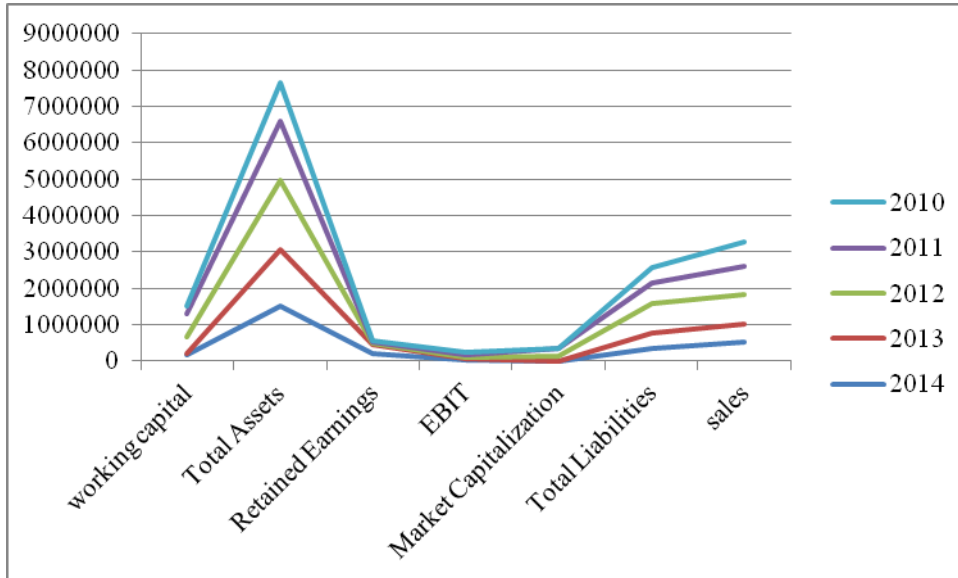
Source: Research findings

The total assets kept on declining over the study period same for the total liabilities although the two were not declining in the same magnitude that's why the working capital couldn't become negative. The earnings before interest and tax kept on declining in the study period. This implied that the firm couldn't afford to pay handsome dividends to its shareholders.

Due to the inability of the firm to clear up all its obligations it ended up being financially distressed. The sales declined too in the study period.

4.3.6 Olympia Capital

Figure 6 Olympia Capital



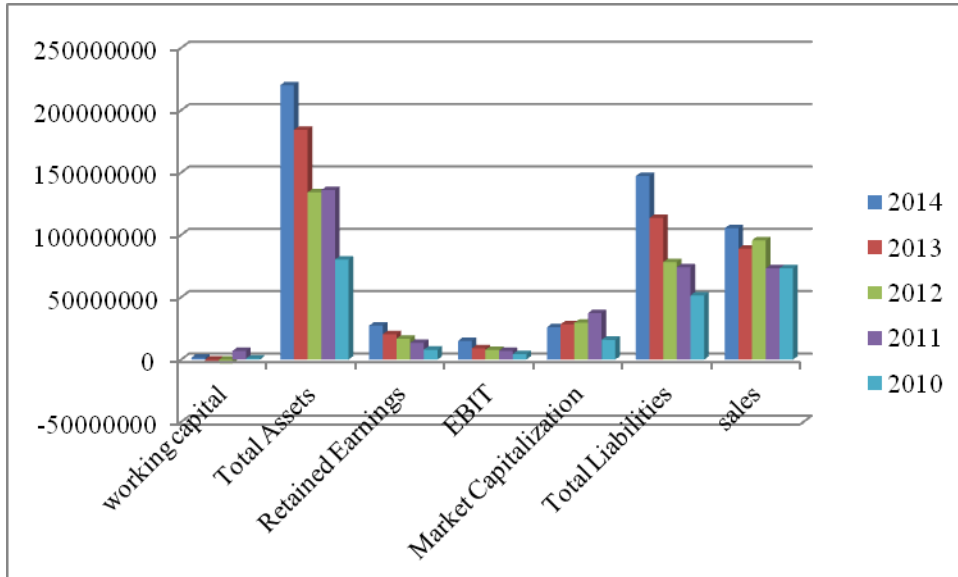
Source: Research findings

The market capitalization of the firm kept on decreasing in the study period while the total liabilities also kept on reducing but to a lesser magnitude. This shows that the proportion by which assets must decline in value before the firm is rendered insolvent was getting smaller and smaller thereby indicating that the firm was distressed.

A closer look at the EBIT indicates that for the study period this value had been decreasing and therefore firm could not re-invest any amount to its operations. The working capital also declined considerably, indicating that the firm was having difficulty in financing its operations.

4.3.7 Kenya Power and Lighting Company

Figure 7 Kenya Power and Lighting Company



Source: Research findings

The working capital for the firm was tending towards zero in the study period implying that the firm was on the verge of being unable to pay its bills. This shows that its liquidity was small. Sales are the revenues generated by the company. The sales were little compared to the total assets implying that the firm's ability in utilizing assets in generation of revenues was low.

4.4 Descriptive statistics analysis

The mean and standard deviations for the ratios of the model were calculated and the results were as shown in Table 4.2

Table 4.2 Descriptive Statistics

	N	Mean	Std. Deviation
W capital/Total Assets	5	1.3549560	.23880056
Retained Earnings/Total Assets	5	1.3496421	.25694587
EBIT/Total Assets	5	.9446306	.26262624
Market Capitalization/Book Value	5	.6895970	.13917798
Total Liabilities	5	.2712712	.17056010
Sales Total Assets	5	.7189144	.15972980
Z Score	5		

Source: Research findings

The findings in table 4.2 indicate the descriptive statistics of the variables in which the mean of the Z-score value is 0.7189 with standard deviation of 0.15972. The mean of working capital/ Total assets is 1.3550 with standard deviation of 0.2388. The findings also indicate that the means of Retained earnings/Total assets, Earnings before interest taxes/total asset and book values/total liabilities are 1.3496, 0.9446, 0.689 and 0.2712 with standard deviations 0.2626, 0.1391 and 0.1706 respectively.

		Wcapital/ Total Assets	Retained Earnings/ Total Assets	EBIT/ Total Assets	Market Capitalization/ Book Value Total Liabilities	Sales /Total Assets	Z Score
Wcapital/To tal Assets	Pearson Correlation	1	.170	.239	.578	.429	.743
	Sig. (2-tailed)		.785	.699	.307	.571	.150
	N		5	5	5	5	5
Retained Earnings/To tal Assets	Pearson Correlation		1	.623	.873	-.506	.024
	Sig. (2-tailed)			.262	.053	.494	.969
	N			5	5	5	5
EBIT/Total Assets	Pearson Correlation			1	.504	-.766	-.338
	Sig. (2-tailed)				.387	.234	.577
	N				5	5	5
Market Capitalizati on/Book Value Total Liabilities	Pearson Correlation				1	.124	.476
	Sig. (2-tailed)					.876	.417
	N					5	5
Sales Total Assets	Pearson Correlation					1	.907
	Sig. (2-tailed)						.093
	N						5
Z Score	Pearson Correlation						1
	Sig. (2-tailed)						
	N						

Table 4.3 Correlation

Source: Research findings

The correlations of the variables of the model were calculated and the results are as shown in table 4.3 above. The findings in table 4.3 indicates that there is a strong positive correlation between Z values and Working capital/Total asset ($r=0.170$). The findings indicate that the correlation is insignificant at 5% significance level given that p-value (0.785) is more than alpha (0.05) the findings in table 4.3 indicate that there is a strong positive correlation between Z values and Earnings before interest taxes/Total asset

($r=0.239$). The findings indicate that the correlation is significant at 0.05 level of significance since the p-value (0.699) is more than alpha (0.05).

Table 4.4 Co-efficients of the Model

Model	Un standardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error			
(Constant)	1.494	0.973		8.269.	.007.
W capital/Total Assets	.882	0.394	1.272	0.040	.319.
Retained Earnings/Total Assets	-.365	0.257	-.566	-1.418.	.142.
EBIT/Total Assets	-.253	0.465	-.401	-1.243.	.019
Sales Total Assets	-.742	0.789	-.764	-0.345.	.210.

Source: Research findings

The findings in table 4.4 indicate the regression model generated by the independent and the dependent variable. The model generated is given as $Z=1.494 + 0.882W_{\text{capital/Total Assets}} - 0.365R_{\text{etained Earnings/Total Assets}} - 0.253E_{\text{arnings before interest taxes/Total asset}} - S_{\text{ales Total /Assets}}$. The findings indicate that the coefficient of $882W_{\text{capital/Total Assets}}$ is positive and insignificant at 0.05 level of significance.

Table 4.5 ANOVA

ANOVA					
	<i>Df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	4	0.972	0.243	-	-
Residual	0	0	0		
Total	4	0.972			

Significance F on table 4.5 demonstrates the usefulness of the overall regression model at a 5% level of significance. Since the p-value of the F test is undefined hence it was concluded that there was a significant relationship between the dependent and independent variables used in the study. Table 4.5 also clearly indicates that the regression accounted for 100% of variations in the Z-scores; that is the Z-score can be correctly predicted by the variables in the study.

Table 4.6 Model Summary

Model	R	R Square	Adjusted Square	R	Std. Error of the Estimate	Durbin-Watson
1	1.000 ^a	1.000329

Source: Research findings

The study findings in table 4.6 indicate the R squared and the adjusted R squared. The R squared (1.000) indicates that 100% of the variation in Z is accounted for by the independent variables (Book values of equity/Total liabilities, Earnings before interest

taxes/Total asset, Retained earnings/Total asset). The adjusted R squared (1.00) indicate that if population was used instead of a sample, the variation in Z would be 0% less.

4.5 Discussion of Findings

From table 4.5 the R-value is 1.00 implying that the relationship between Z-score and the variables is very strong and positive. Also the r square value is 100% indicates that all the variations in the Z-score are caused by the variables and that there is no external variation outside the model. Therefore this model generated from this study can be used to predict the financial distress of firms listed at the NSE.

The discussions emanating from the figures 1 to 7 all lead to the assertion that the firms were all financial distressed. This shows that the Altman's Z-score model is appropriate to predict financial distress. This finding supports the study by Shisia et al. (2014) who concluded that the Z score model is suitable to predict the financial distress of firms. The results are also consistent with the findings of Ijaz et al. (2013) whose findings that the Z-score model is appropriate tool in financial distress prediction.

The results show that working capital is key in maintaining financially health firms. The working capital of financially distressed firms was low. This is in agreement with the findings of Aziz and Dar (2006) who established that cash management, entropy and credit risk theories are relevant in financial distress and bankruptcy prediction.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter gives the summary of the study findings, conclusions that were drawn by the researcher according to the findings of the study and the recommendations made by the researcher for the status improvement. The study further illustrates the recommendations that can be adopted by the relevant authority to ensure effectiveness on the management of firms effectively. Finally limitations encountered by the researcher as well as suggestions for further research stated.

5.2 Summary

This study was conducted with the objective of Altman's failure prediction model in predicting corporate financial distress in various companies listed at the Kenya. Financial distress occurs as a result of economic distress, decline in performance and the poor management of companies. It is sometimes very difficult to ascertain these factors, which could indicate that a company is experiencing financial difficulties. One of the most commonly used tools by credit managers is financial statements and ratio analysis. This process serves to predict financial distress of a company. Some of the factors that are considered during analysis are profitability ratios, ratios relating to efficiency of asset management, risk, short term cash management and debt ratios as well as stock market data. By analyzing these ratios, however do not conclusively alert a credit granter that the company is in financial difficulties.

The study has established that there was a decline in the working capital of the financially distressed companies from the year 2010 to 2014. This indicated that the companies started experiencing reduction in the working capital due to financial difficulties leading to a reduction in the profitability of the company.

5.3 Conclusion

The Z-score model is a very practical tool that can be used to predict the insolvency of companies as well as maintaining and monitoring of companies being risk managed. Company liquidations are a daily occurrence and more often than not, credit granters lose out. The Altman prediction models can effectively be used to breach that gap in the credit industry in particular for the delisted companies at Nairobi Stock Exchange. Furthermore, this tool could be used by investors when considering investing in a private company to ascertain the state of the company's financial position.

5.4 Recommendations to the Policy Makers

The Z score Altman's model may not be the only model to measure the financial distressed firms and the researcher recommends use of other models to determine the financial distressed firms. This may even expand the number of distressed firms in a given Securities Exchange.

This study highly recommends to the potential investors in companies to use the Altman failure prediction model as an assessment tool. The results could raise certain questions about the state of a company and could ultimately result in an investor investing or purchasing a company that is profitable and well managed since declining Z-score values depicts a failing company.

The study recommends that the Altman failure prediction model should use the prevailing Economic conditions such as changes in the economy, markets and industries in the economy in order to predict a true picture of the company in the economy.

5.5 Limitations of the Study

The study was limited to the NSE only. There could be a difference in results if the study was to cover various securities exchanges.

The study was limited to the financial data on financial distress prediction. There could be other measures which can be used for financial distress detection. Such information includes corporate governance, prevailing economic as well as political conditions. If such information is incorporated in financial distress prediction models then the study can be conclusive.

This study could have been conclusive if done for the whole population of the firms listed at the NSE. However due to inadequate data only 42 firms were analysed. Critical sectors like insurance and banking were totally left out in the analysis due to disclosure requirements which minimize availability of data. Such firms do not report on working capital and moreover EBIT cannot be used in the model since most of their incomes constitute interest income.

The study covered only five years. This is due to time limitation and as such results may be different if the time frame covered can be expanded.

5.6 Areas for Further Research

Further research should be undertaken in the field Logit failure prediction models to forecast the success or failure of the company and give a comparison to the Altman

failure prediction model used to simplify its usage and encourage their use by industry professionals.

Many other factors may have influenced the performance of firms, factors that cannot be measured or quantified e.g staff morale, boardroom wrangles, and occupational health etc. It would be interesting if a similar study was conducted in concomitance with this to ascertain the findings. This would expand the scope of the literature on firm performance.

Further exploration of Altman's Z score, and alternative formulas, is necessary to refine this potentially useful tool in order to develop a collection of tools useful in predicting financial distress.

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APPENDICES

Appendix I: Data Collection Table

S. NO	Company Name	WC	TA	RE	EBIT	MC	TL	SALES
1	A.Baumann & Co Ltd							
2	ARM Cement Ltd							
3	B.O.C Kenya Ltd							
4	Bamburi Cement Ltd							
5	Barclays Bank of Kenya Ltd							
6	British American Tobacco Kenya Ltd							
7	British-American Investments Co.(Kenya) Ltd							
8	Car & General (K) Ltd							
9	Carbacid Investments Ltd							
10	Centum Investment Co Ltd							
11	CFC Stanbic of Kenya Holdings Ltd							
12	CIC Insurance Group Ltd							
13	Crown Paints Kenya Ltd							
14	Diamond Trust Bank Kenya Ltd							
15	E.A.Cables Ltd							
16	E.A.Portland Cement Co. Ltd							
17	Eaagads Ltd							
18	East African Breweries Ltd							
19	Equity Bank Ltd							
20	Eveready East Africa Ltd							
21	Express Kenya Ltd							
22	Flame Tree Group Holdings Ltd Ord							
23	Home Afrika Ltd							
24	Housing Finance Co. Kenya Ltd							
25	Hutchings Biemer Ltd							
26	I&M Holdings Ltd							
27	Jubilee Holdings Ltd							
28	Kakuzi Ltd							
29	Kapchorua Tea Co. Ltd							
30	KenGen Co. Ltd							
31	KenolKobil Ltd							
32	Kenya Airways Ltd							

33	Kenya Commercial Bank Ltd							
34	Kenya Orchards Ltd							
36	Kenya Re Insurance Corporation Ltd							
37	Liberty Kenya Holdings Ltd							
38	Longhorn Kenya Ltd							
39	Marshalls (E.A.) Ltd							
40	Mumias Sugar Co. Ltd							
41	Nairobi Securities Exchange Ltd							
42	Nation Media Group Ltd							
43	National Bank of Kenya Ltd							
44	NIC Bank Ltd							
45	Olympia Capital Holdings Ltd							
46	Pan Africa Insurance Holdings Ltd							
47	Rea Vipingo Plantations Ltd							
48	Safaricom Ltd							
49	Sameer Africa Ltd							
50	Sasini Ltd							
51	Scangroup Ltd							
52	Standard Chartered Bank Kenya Ltd							
53	Standard Group Ltd							
54	The Co-operative Bank of Kenya Ltd							
55	The Limuru Tea Co. Ltd							
56	Total Kenya Ltd							
57	TPS Eastern Africa Ltd							
58	Uchumi Supermarket Ltd							
59	Umeme Ltd							
60	Unga Group Ltd							
61	Williamson Tea Kenya Ltd							
62	Trans-Century Ltd							

Appendix II: Z-Score Values of Firms

S. NO	Company Name	YR	Z
1	ARM Cement Ltd	2014	1.49906
		2013	3.130981
		2012	2.191989
		2011	1.538801
		2010	1.871096
2	B.O.C Kenya Ltd	2014	4.766498
		2013	4.354301
		2012	4.359597
		2011	4.525628
		2010	4.858368
3	Bamburi Cement Ltd	2014	8.037081
		2013	9.31138
		2012	5.625776
		2011	5.906404
		2010	5.951623
4	British American Tobacco Kenya Ltd	2014	11.68637
		2013	7.574668
		2012	6.287978
		2011	4.904332
		2010	5.056453
5	Car & General (K) Ltd	2014	1.970237
		2013	1.909539
		2012	2.487382
		2011	2.63963
		2010	2.676909
6	Carbacid Investments Ltd	2014	2.480835
		2013	2.800662
		2012	2.493275
		2011	2.125882
		2010	2.354165
7	Centum Investment Co Ltd	2014	2.185091
		2013	2.408592
		2012	4.699066
		2011	4.151326
		2010	14.13777
8	Crown Paints Kenya Ltd	2014	2.962095
		2013	3.665967
		2012	3.881544

		2011	3.203386
		2010	3.075652
9	E.A.Cables Ltd	2014	2.892094
		2013	2.246645
		2012	2.219605
		2011	2.528247
		2010	2.566397
10	E.A.Portland Cement Co. Ltd	2014	1.331197
		2013	1.347167
		2012	1.000602
		2011	1.897269
		2010	2.281351
11	Eaagads Ltd	2014	7.52843
		2013	5.242508
		2012	4.661015
		2011	6.189905
		2010	5.432563
12	East African Breweries Ltd	2014	4.816872
		2013	5.004232
		2012	4.825108
		2011	6.073284
		2010	8.480877
13	Eveready East Africa Ltd	2014	3.009889
		2013	3.977539
		2012	2.021703
		2011	2.117217
		2010	2.227506
14	Express Kenya Ltd	2014	0.223156
		2013	1.029964
		2012	0.372611
		2011	-0.23978
		2010	0.771927
15	Home Afrika Ltd	2014	0.3177
		2013	0.422714
		2012	0.394547
		2011	0.221396
		2010	
16	Kakuzi Ltd	2014	4.328146
		2013	3.244192
		2012	3.290922
		2011	3.25844

		2010	3.121983
17	Kapchorua Tea Co. Ltd	2014	2.583688
		2013	2.625639
		2012	#REF!
		2011	5.737059
		2010	5.165987
18	KenGen Co. Ltd	2014	0.486932
		2013	0.705486
		2012	0.675479
		2011	0.701224
		2010	0.878864
19	KenolKobil Ltd	2014	4.79422
		2013	4.455222
		2012	6.13771
		2011	6.01533
		2010	4.73073
20	Kenya Airways Ltd	2014	0.500153
		2013	0.531464
		2012	1.874
		2011	1.871518
		2010	1.65161
21	Kenya Orchards Ltd	2014	10.95709
		2013	0.141155
		2012	-0.22733
		2011	-0.34419
		2010	-0.37101
22	Kenya Power & Lighting Co Ltd	2014	0.99103
		2013	0.925586
		2012	1.276389
		2011	1.209792
		2010	1.424896
23	Kenya Re Insurance Corporation Ltd	2014	1.836851
		2013	1.811906
		2012	1.374655
		2011	1.325057
		2010	1.205537
24	Longhorn Kenya Ltd	2014	4.729215
		2013	4.874999
		2012	2.577964
		2011	3.99708

		2010	2.619466
25	Marshalls (E.A.) Ltd	2014	0.126494
		2013	0.257634
		2012	0.976879
		2011	-1.10699
		2010	-1.08453
26	Mumias Sugar Co. Ltd	2014	0.123963
		2013	0.71343
		2012	1.765644
		2011	2.492347
		2010	3.54683
27	Nairobi Securities Exchange Ltd	2014	2.254633
		2013	2.606673
		2012	1.320958
		2011	2.857753
		2010	3.053529
28	Nation Media Group Ltd	2014	11.00939
		2013	12.57595
		2012	9.523555
		2011	8.318896
		2010	9.761502
29	Olympia Capital Holdings Ltd	2014	0.702133
		2013	0.703797
		2012	0.924823
		2011	1.322924
		2010	1.069476
30	Rea Vipingo Plantations Ltd	2014	3.743626
		2013	3.99427
		2012	3.623177
		2011	3.527651
		2010	2.673978
31	Safaricom Ltd	2014	9.391428
		2013	5.212012
		2012	3.490746
		2011	3.927656
		2010	5.269188
32	Sameer Africa Ltd	2014	2.708739
		2013	3.554564
		2012	3.154045
		2011	3.225247
		2010	4.15172

33	Sasini Ltd	2014	1.096208
		2013	1.321919
		2012	1.132278
		2011	1.481473
		2010	1.716332
34	Scangroup Ltd	2014	3.289885
		2013	3.439977
		2012	5.058147
		2011	3.376712
		2010	3.260959
35	Standard Group Ltd	2014	2.797912
		2013	2.811105
		2012	2.584025
		2011	2.259619
		2010	3.103955
36	The Limuru Tea Co. Ltd	2014	
		2013	
		2012	7.330474
		2011	8.914462
		2010	9.852965
37	Total Kenya Ltd	2014	5.637001
		2013	4.120798
		2012	3.769004
		2011	3.018452
		2010	2.766179
38	TPS Eastern Africa Ltd	2014	1.394291
		2013	1.872269
		2012	1.564024
		2011	1.932511
		2010	2.257038
39	Uchumi Supermarket Ltd	2014	2.752362
		2013	3.887633
		2012	3.949061
		2011	3.886095
		2010	4.044028
40	Unga Group Ltd	2014	3.536325
		2013	2.876816
		2012	3.838126
		2011	3.773745
		2010	3.632793

41	Williamson Tea Kenya Ltd	2014	2.093608
		2013	2.618193
		2012	2.632772
		2011	3.027609
		2010	2.985197
42	Trans-Century Ltd	2014	0.96773
		2013	1.489951
		2012	1.599572
		2011	1.364658
		2010	1.352869