

**APPLICATION OF MULTIPLE DISCRIMINANT ANALYSIS IN
PREDICTING FINANCIAL DISTRESS OF COMMERCIAL AND
MANUFACTURING STATE CORPORATIONS IN KENYA**

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**A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENT FOR THE AWARD OF THE DEGREE OF
MASTER OF SCIENCE IN FINANCE, SCHOOL OF BUSINESS
UNIVERSITY OF NAIROBI**

2016

DECLARATION

I hereby affirm that this research project is the product of my own work and it has not been accepted for the award of degree or professional qualification in any institution of higher learning.

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This Research project has been presented for examination with my approval as University Supervisor.

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ACKNOWLEDGEMENT

I start by appreciating the Almighty for giving me an opportunity to chase my dreams of accomplishing my post graduate degree in MSc Finance. He has given me strength to soldier on despite many challenges that came my way.

My greatest appreciation goes to Dr. Winnie Nyamute, whose able supervision, guidance and patience has significantly contributed to the eventual completion of my research project.

Special thanks are addressed to the companies which granted me access to their documents and information for purposes of the project.

Lastly, I cannot forget to thank my mother Rachael and brothers Godfrey, Arthur and Paul for their tremendous support, encouragement and their constant prayers.

DEDICATION

This project is dedicated to my mother Rachael who has guided and shaped my academic progress since childhood. To my brothers Godfrey, Arthur and Paul for providing moral support which has seen me through the challenges I encountered while undertaking my MSc Finance degree course.

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LIST OF ABBREVIATIONS

ANN	Artificial Neural Network
BVE	Book Value of Equity
CF	Cash Flow
EBIT	Earnings before Interest and Tax
EBITDA	Earnings before Interest, Depreciation and Amortization
FMCG	Fast Moving Consumer Goods
KBC	Kenya Broadcasting Corporation
KES	Kenyan Shillings
MDA	Multiple Discriminant Analysis
RE	Retained Earnings
TA	Total assets
TARDA	Tana River Development Authority
TD	Total debt
TL	Total Liabilities
WC	Working Capital

ABSTRACT

Commercial and Manufacturing state owned corporations are heavily financed by the National Treasury and they perform important functions that ensure smooth running of the nation. Instances of financial distress or failure of State Corporations normally lead to great financial implications in the economy especially in terms of job losses. This raises valid concerns to investors and all other stakeholders. Therefore, the core objective of the study is to find out whether Altman (1993) model is applicable in predicting financial distress of Commercial and Manufacturing State Corporations in Kenya. This will assist various stakeholders in the Kenyan financial industry to react to distress signals in State Corporations early enough to avoid corporate failure. Exploratory research design was adopted in this study where a census was carried out on the 27 Commercial and Manufacturing State Corporations. The period of study was five (5) years ranging from the financial year 2010-2011 to 2014-2015. The audited financial accounts of State Corporations provided secondary financial data. This data was used to extract liquidity, profitability and leverage ratios which were then summed up to arrive at the Z-Score. Data analysis was conducted through the use of MS Excel where correlation and regression tests were tabulated. The research findings indicate that Altman (1993) model is reliable in predicting financial distress of Commercial and Manufacturing State Corporations in Kenya since it predicted accurately 66.32% of non-distressed corporations and 75% of distressed firms. Further, the findings provide evidence that liquidity (WC/TA), profitability (RE/TA) and leverage (BVE/TL) ratios had a major influence on financial distress prediction. Short-term profitability ratio (EBIT/TA) did not have much influence. The outcome of this study suggests that stakeholders in a firm can predict failure before it occurs by paying close attention to liquidity, long-term profitability and leverage ratios. This will enable them avoid the losses associated with failures by taking appropriate actions in advance.

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Financial distress is a situation whereby a company is faced with a temporary lack of liquidity and has difficulties in fulfilling financial obligations on schedule and to the full extent (Gordon, 1971). Financial distress has been one of the most recurrent symptom of mismanagement and waste in State Corporations. Despite the fact that they are heavily financed and subsidized by the government, they have continued to record poor performance. A worryingly large number of State Corporations whose accounts have been examined by Public Investment Committee have been described as being technically insolvent.

State corporations have been such a drain on the public purse since the 1980s. Further, they have continued to report numerous financial distress cases thus raising the need for prediction of their financial soundness and the likely occurrence of financial distress.

Financial distress and failure of State Corporations such as Pan Paper Mills and Kisumu Cotton Mill has motivated the need to determine whether Multiple Discriminant Analysis is reliable in predicting financial distress in Commercial and Manufacturing State Corporations. Predicting financial distress as early as possible with sound accuracy will enable State Corporations take corrective measures to mitigate costs associated with bankruptcy and failure thus improving financial stability of the economy.

1.1.1 Multiple Discriminant Analysis

MDA is a statistical model which is used to classify an observation into one of several a priori groupings dependent upon the observation's individual characteristics. In the analysis, explicit groupings are first established, next data is collected for the various objects and then a linear combination of these characteristics is computed. MDA is able to determine a set of discriminant coefficients from a set of quantifiable characteristics from a company. The following is the model;

$$Z = C_1X_1 + C_2X_2 + C_3X_3 + \dots C_nX_n$$

Where $C_1, C_2, C_3 \dots C_n$ are discriminant coefficients while $X_1, X_2, X_3 \dots X_n$ are independent variables. The MDA computes the discriminant coefficients, W_1-W_n while the independent variables X_1-X_n are the actual values. The results of the analysis are usually used to confirm the correctness of grouping technique. In 1968 Altman came up with a five-variable Z-Score;

$$Z = 0.012X_1 + 0.014X_2 + 0.033X_3 + 0.006X_4 + 0.999X_5$$

X_1 = working capital /total assets

X_2 = retained earnings /total assets

X_3 = earnings before interest and tax / total assets

X_4 = market value equity/ book value of debt

X_5 = sales /total assets

Z= overall index

This model was based on ratios from listed manufacturing companies. The zones of discrimination were: $Z > 2.99$ – “Non-bankrupt”, $1.81 < Z < 2.99$ -“Grey” and $Z < 1.81$ - “Bankrupt”

This model was later modified to suit privately owned companies. The resultant model was:

$$Z = 0.717X_1 + 0.847X_2 + 3.107X_3 + 0.420X_4 + 0.998X_5$$

Firms were found to be in the non-bankrupt sector if they had a Z score which was greater than 2.90. Bankrupt firms recorded a score of 1.23 and below. Grey area ranged from 1.23 to 2.90; a firm falling in this area was difficult to classify. Altman (1993) model was a modified model which was meant to apply to privately held firms and non-manufacturing firms. Sales to total assets ratio (X_5) was eliminated because it varied significantly from one industry to the other; it was higher in trading and service firms because their assets were not much, and lower in manufacturing firms which are capital intensive in terms of assets. To correct this anomaly, Altman eliminated X_5 ratio and the resultant model was as follows:

$$Z = 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4$$

Where: $X_1 = (\text{Current Assets} - \text{Current Liabilities})/\text{Total Assets}$

$X_2 = \text{Retained Earnings}/\text{Total Assets}$

$X_3 = \text{Earnings before Interest and Taxes}/\text{Total Assets}$

$X_4 = \text{Book Value of Equity}/\text{Total Liabilities}$

$Z'' > 2.60$ - "Safe" Zone

$1.1 < Z'' < 2.60$ - "Grey" Zone

$Z'' < 1.1$ - "Distress" Zone

In 1984 Fulmer et al. came up with "nine variable" MDA model:

$$H = 5.528 (X_1) + 0.212 (X_2) + 0.073 (X_3) + 1.270 (X_4) - 0.120 (X_5) + 2.335 (X_6) + 0.575 (X_7) + 1.083 (X_8) + 0.894 (X_9) - 6.075$$

Where;

$$X_1 = \text{Retained Earning/Total Assets}$$

$$X_2 = \text{Sales/Total Assets}$$

$$X_3 = \text{EBT/Equity}$$

$$X_4 = \text{Cash Flow/Total Debt}$$

$$X_5 = \text{Debt/Total Assets}$$

$$X_6 = \text{Current Liabilities/Total Assets}$$

$$X_7 = \text{Log Tangible Total Assets}$$

$$X_8 = \text{Working Capital/Total Debt}$$

$$X_9 = \text{Log EBIT/Interest}$$

If $H < 0$; then the firm is classified as "failed"

The model classified correctly the companies one year prior to failure at an accuracy rate of 98% and 81% accurate in classifying them more than one year prior to bankruptcy.

A step-wise MDA was used by Gordon Springate in 1978. From 19 financial ratios, 4 ratios that best discriminated successful from non-successful firms were selected.

Springate model:

$$Z = 1.03W + 3.07X + 0.66Y + 0.4Z$$

Where; $W = \text{Working Capital / Total Assets}$

$$X = \text{Net Profit before Interest and Tax / Total Assets}$$

$$Y = \text{Net Profit before Tax / Current Liabilities}$$

$$Z = \text{Sales / Total Assets}$$

If $Z \text{ score} < 0.862$ then; "failed company", accuracy level being 92.5%.

1.1.2 Financial Distress

Various researchers and stakeholders define financial distress in numerous ways. Baldwin and Mason (1983) and Andrade and Kaplan (1998), defined financial distress as a situation whose incidence differentiates between the period a firm is financially robust and the time it is financially weak and it demands coming up with measures to mitigate costs associated with this troubled state.

Gordon (1971) defines financial distress in terms of a process. The process starts from financial distress, then failure and is lastly followed by financial restructuring and security valuation. According to Turetsky and MacEwen (2001), financial distress is a multi-stage process, each stage having a distress point.

According to Asquith et al. (1994), if a firm's EBITDA in two consecutive years is below 80% of the firm's interest expense, then it is financially distressed. In this situation a firm usually has lower profitability levels, is heavily leveraged and has difficulty in meeting current obligations with the available cash. Financial distress is a circumstance in which a company cannot meet its current obligations using operating cash flows and it is therefore faced with the need to employ corrective measures (Wruck 1990). According to Hendel (1996), chances of a company going into bankruptcy is high if its levels of liquid assets are low and it cannot access credit. According to Outecheva (2007), a firm faces two possible conflicts when it is experiencing financial distress; either limited cash balances or high leverage levels resulting into inadequate cash flow to cover immediate obligations. Therefore, a company is forced to take corrective action such as restructuring (Outecheva, 2007).

Empirical evidences have shown that financial distress is caused by factors such as high debt levels and poor management practices. Financial distress costs can be divided into two; direct costs and indirect costs (O'Neill, 1986). Direct costs may include management fees, legal fees and auditors' fees while indirect costs may come in the form of conservative managers cutting down on investments to spare cash, lack of access to new sources of capital, poor reputation, and loss of customer base.

A Company faced with financial distress can take measures such as merging with other companies, disposing major assets, reducing capital spending, negotiating with banks and other creditors, issuing new securities, and undertaking debt restructuring (Ross et al., 2002).

1.1.3 Multiple Discriminant Analysis and Financial Distress

In 1968, Altman developed the Z-score which was based on multiple discriminant analysis. Altman used this original model to predict bankruptcy in US manufacturing firms. He used a sample of 66 companies from USA with an asset range of \$0.7-\$25.9 million (for thirty three bankrupt corporations) and \$1-\$25 million (for thirty three successful corporations) over the period 1946 to 1964. The model achieved 95% accuracy in classifying firms correctly for data one year to bankruptcy, for data two years to bankruptcy the model achieved 72% accuracy in classification. Using secondary samples, the model achieved accuracy levels of 96% categorizing bankrupt firms and classified correctly 79% of non-bankrupt firms. When testing was done for more than two years the model proved unreliable.

In 1980 Dambolena and Khoury used a ratio stability measure and stepwise discriminant analysis to sample 46 US firms which were grouped into failed and non-failed categories.

Their period of study was eight (8) years ranging from 1969 to 1975. From the extracted data, four (4) major ratios were derived; turnover, profitability, indebtedness and activity ratios. They tested predictive correctness of the model with stability measures and one without stability measures. They concluded that the model with stability measures was better in predictive accuracy. In 2010, Hayes S., Hodge K. and Hughes L. applied Altman's Z-score model on US based public retail firms to determine whether the model could predict financial distress. They used the Altman's re-estimated model for non-manufacturing firms on a sample of companies in the years 2007 and 2008. They concluded that the Z' Score was 90% accurate in predicting financial distress.

Onyeiwu, C., & Aliemeke, G. (2009) investigated the applicability of Altman's model in discriminating between financially robust and weak companies in Nigeria in the year 2009. From the results they concluded that that Altman's model could accurately predict financial failure of banks in Nigeria. In 2011, Johansson & Kumbaro used the Z score and Z' score models to predict bankruptcy of 45 firms in America in the years 2007 to 2010. The models predicted accurately bankruptcy two years prior to failure. However, in 2001, studies by Grice and Ingram concluded that the Z-score gave negative results in recent periods and to manufacturing firms.

1.1.4 State Corporations in Kenya

The core roles of State Corporations are promoting or accelerating economic growth, delivery of public services, creation of employment opportunities and building of international partnerships. While State Corporations play a crucial economic role, evidence from the 1970s and 1980s from a number of countries shows that, on average, state owned corporations have performed poorly relative to private firms (Manduku, 2008). According

to Manduku (2008), State Corporations have often incurred substantial financial losses and became an unsustainable burden on the national budget and banking system.

In 2008 the global financial crisis was characterized by numerous business failures and bailouts. Locally, State Corporations such as Pan Paper Mills and Kisumu Cotton Mills have collapsed not forgetting Uchumi, Kenya Airways and Mumias Sugar Company which are financially distressed. The failure of companies normally lead to huge financially losses to the various stakeholders hence creating a need for a prediction mechanism. According to EconomicTimes.Indiatimes.com (2010), simultaneous financial failure of companies may adversely affect the economy of a country and those of her neighbors. According to Macharia (2012), parastatals are deeply implicated in most fiscal problems of African governments because of their inefficiency, losses, budgetary burdens, and provision of poor products and services. Occasionally, they achieve some non-commercial objectives, which are used to justify their poor economic performance.

The 20th Annual Report of the Public Investments Committee, (December 2015), concluded that many state owned corporations operate under financial difficulties occasioned by imprudent commercial practices and/or mismanagement, they over rely on exchequer for continued financial support and they spend beyond approved budget. In 2005, Centre for Governance and Development reviewed Kenyan State Corporations' financial reports for the period 1993 to 2002 and observed that there was a lot of waste in resources. The report concluded that apart from losses, most corporations were also unable to service loans and were working with negative capital. From these reports it is clear that state corporations need proper financial management practices so as to avoid financial distress and huge losses that comes with it. In 1999 McCrindell stated that financial

management and control is the bedrock of government management. Proper financial management leads to efficient, effective and proper use of public resources and improvement of national economy.

1.2 Research Problem

Various stakeholders such as citizens of a country, investors, auditors, bankers, governmental and regulatory bodies value financial strength of a company. In addition, based on the going concern principle, a company is assumed to continue to operate in the foreseeable future. Commercial and Manufacturing state owned corporations are heavily financed by the National Treasury and they perform important functions that ensure smooth running of the nation. In the event of financial distress or failure of State Corporations, the financial implications are normally felt by the greater economy especially in terms of job losses. Instances of State Corporations financial distress and failure thus raise valid concerns to all stakeholders. The expectation of this research project is to contribute to the body of knowledge in the prediction of financial distress and failure so as to assist the various stakeholders in Kenya to react to distress signals in State Corporations, early enough to avoid corporate failure.

State Corporations in Kenya provide crucial services to the public and foster wider development goals. Despite these roles, they continue to face financial difficulties. In the recent past, the government has been forced to bailout several state owned enterprises facing financial problems using taxpayers money. Among them are Mumias Sugar Company, Kenya Airways and TARDA which received KES 1 billion, KES 4.2 billion and KES 2.4 billion respectively. The state has also been servicing Kenya Broadcasting Corporation (KBC) loan of KES 32.3 billion and so far it has paid KES 7.1 billion.

Financing such corporations has put a strain on the state's resources hence, creating a need for prediction of the financial soundness and the likely occurrence of financial distress in State Corporations. Early prediction would enable various stakeholders take corrective action and mitigate costs associated with failure.

Numerous studies on prediction of financial distress and failure have relied on financial ratios. Beaver (1966) used the univariate model to predict corporate failure and he found that non-liquid asset ratios were better predictors of failure. In 1968 Altman utilized financial ratios in predicting bankruptcy and he showed significant useful results in predicting bankruptcy of manufacturing firms. Altman and Mcough (1974) carried out an analysis of the relationship between bankrupt companies and auditors reports prior to bankruptcy. They observed that Altman's model could give an early signal of going-concern problems. However, Lussier (1995) questioned the effectiveness of ratio-based corporate failure prediction models. In 1990 Gilbert et al. showed financial distress is not only affected by financial factors but also non-financial factors. Therefore, non-financial variables including firm size have been incorporated in prediction models in various studies. In 2001, Westgaard and Van der Wijst applied age and firm size with financial factors into their prediction model based on logistic regression analysis.

There has been progress in Kenya when it comes to studies in prediction of financial distress, bankruptcy and failure. In 1990, Peter Keige conducted a failure prediction study on 20 companies in Kenya with a capital base of Ksh.5 million, which had failed between 1980 and 1990. The model was 90% accurate in forecasting failure two years prior to failure. Kathanje (2000) formulated a multivariate performance predictive model for the banking sector using financial ratios. In his study, liquidity, gearing and earnings had a

significant impact on financial performance of banks. It is evident that most financial distress and failure prediction studies have focused on publicly quoted companies and not state owned corporations. Commercial and Manufacturing State Corporations are unique firms in that they heavily rely on the national treasury and they perform critical roles which ensure the smooth running of the economy. Therefore, their failure could bring negative financial implications to the nation. It is for this reason that it was important to focus on financial distress and failure prediction in Commercial and Manufacturing State Corporations. Therefore, the study sought to answer the question, can Altman (1993) model be used to predict financial distress in Commercial and Manufacturing State Corporations in Kenya?

1.3 Research Objectives

The objective of this study was to establish the applicability of Altman (1993) model in predicting financial distress in Commercial and Manufacturing State Corporations in Kenya.

1.4 Value of the Study

The following stakeholders are expected to get value from the findings of this study as follows:

Investors: This study would assist investors when assessing the ability of a company to make principal and interest payments. Investors adopting an active investment approach may develop strategies based on the assumption that distress prediction models can provide earlier warnings of financial problems than is implicit in the existing security price.

Regulatory authorities: Among the regulatory bodies' responsibilities is the function of monitoring the solvency and stability of companies. State Corporations are also monitored by regulatory bodies such as the National Treasury. From the study, these regulatory bodies will be able to monitor and formulate policies that will facilitate social and economic development and prevent financial distress.

Government: Most State Corporations usually rely heavily on government financing through treasury budgets. Also, during financial distress, governments may be forced to bailout such State Corporations and it is usually costly to the economy. This study will be useful to the government in giving timely signals associated with financial distress in State Corporations so that it can take corrective measures.

Auditors: One opinion that auditors make is whether a firm is a going concern. This judgement affects the asset and liability valuation methods that are deemed appropriate for financial reporting. Therefore, this study will assist the auditors in giving their opinion on the financial viability of a business.

Management: Bankruptcy can mean that a firm incurs both direct and indirect costs. If early warning signals of bankruptcy were observed, these costs could be reduced by management through the arrangement of a merger with another firm or adopting a corporate reorganization plan at a more propitious time.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter focuses on the previous research work done by various scholars. The first part dwells on the theoretical review, the second part looks at determinants of financial distress and the third section focuses on empirical studies. Finally the chapter ends with the summary of the literature review.

2.2 Theoretical Review

The theories we shall concentrate on are the ones that describe financial distress by focusing on the conditions that are present in the firms. These theories include;

2.2.1 Gambler's Ruin Theory

This theory is based on the concept of profitability. According to Feller (1968), a gambler or speculator has a likelihood of gaining or losing when he is betting. The gambler bets an arbitrary amount of money where he has a chance of either winning or losing in each bet. Similarly, a company can be viewed as a bettor in its daily operations where it has a probability of making gains or losing until it goes bankrupt. Liquidity level of a company is very important as it needs cash for its normal operations. In its daily activities, a company would experience either positive or negative cash flows. Cash inflows may be in form of inventory sales, sale of property and equipment, loans and legal settlements while cash outflows may be in form of purchase of inventory and capital assets, settlement of debts and payment of cash dividends. When a company experiences prolonged periods

of negative cash flows, it may get into financial distress and eventually bankruptcy.

According to this theory, the solvency of a company is guaranteed when its value exceeds zero. The major limitation of this theory is that it makes an assumption that a company normally has a certain amount of money which it can use to gamble.

2.2.2 Cash Management Theory

Cash management is concerned with cash forecasting, collecting, disbursing, investing and planning for the smooth running of a firm (Zimmerer et al, 2008). According to Watson and Head (2007), cash management is a theory which entails the optimization of available cash, maximizing interest on investments and reducing losses occasioned by delays in transmission of monies. Cash management is concerned with three issues; amount of liquid resources to hold, determination of how much liquid resources should be held as cash and marketable securities and finally maturity of marketable securities portfolio.

The main worry of every business, especially small businesses is the short-term management of cash flows. Forecasting cash flows perfectly is a challenging task, especially cash inflows (Aziz & Dar, 2006). In the normal business operations cash inflows sometimes are surpassed by cash outflows due to increased expenses such as payment of dividends, salaries, taxes and restocking of the business. If the function of cash management collapses, this may lead to financial distress and eventual bankruptcy of the firm (Aziz & Dar, 2006).

2.2.3 Entropy Theory

Financial distress of a firm can be predicted by carefully looking at the changes occurring in the statement of financial position (Aziz and Dar, (2004). It would be difficult for a firm

to maintain an equilibrium state if the structure of assets and liabilities in the statement of financial position significantly change over a prolonged time period. If these changes become uncontrollable in future, financial distress can be predicted (Aziz & Dar, 2006). The major assumption of this theory is that failing companies have volatile financial performance. This volatility leads to greater degrees of change in the books of accounts. Successful firms tend to have stable performance, hence stable books of accounts.

2.3 Determinants of Financial Distress

2.3.1 Liquidity

According to Keynes (1936), the motives for holding cash are for transaction, precaution and speculation purposes. These motives can be extended to companies as they require liquid assets for daily operations, to pay unexpected debt, for acquisitions and expansions and other profitable investment opportunities. Lack of liquidity may reflect a fall in asset prices, deterioration in external sources of finance and reduction in market base. Keige (1991) and Kiragu (1993) demonstrated that liquidity, leverage, and debt service ratios were crucial in predicting financial distress and bankruptcy.

2.3.2 Leverage

Leverage, refers to the amount of debt or borrowing of a company to finance operations. In 1994, Titman and Opler observed the significant positive relationship between leverage and financial distress. Other studies which have similar conclusions are Keige (1991), Theodossiou et al. (1996) and Tan (2012) among others.

2.3.3 Profitability

Altman (1968) concluded that profitability is one of the significant ratios in predicting failure. According to Wang and Li (2007), profitability has a positive and significant influence on corporate financial distress. Their study on prediction of financial distress employed the rough set model and they focused on a sample of 424 Chinese listed companies, 212 were financially distressed while 212 were non-distressed. Their period of study was from the years 1998 to 2005. Geng, Bose and Chen (2015) concluded that financial distress can be predicted by looking at the effect of a firm's profitability.

2.3.4 Firms Growth

The main factors which indicate a firm's growth are increase in earnings (profitability) and sales volume. A study by Altman in 1984 concluded that one of the major signals of financial trouble was a fall in sales volume. Whitaker (1999) observed that profitability of a firm drops below that of the industry as financial distress starts to occur.

2.3.5 Management Inefficiency

According to Ooghe & Prijcker (2008), business failures and bankruptcy occur because of management characteristics including deprived management qualities and skills, poor corporate policy and inadequate strategies. Jahur and Quadir (2012) carried out a study on the causes of financial distress in Bangladesh and they found poor management to be a major cause of financial distress.

2.4 Empirical Studies

Financial distress and bankruptcy prediction is an area that has elicited a lot of interest from academicians and researches since the late 1960s. In 1967 Beaver pioneered the building

of a corporate failure prediction model with financial ratios. In his study he noted that CF/TD ratio had a great influence on corporate bankruptcy. In 1968 Altman used financial ratios and MDA to develop a model to predict corporate bankruptcy. He utilized 66 companies from USA with an asset range of \$0.7-\$25.9 million (for thirty three bankrupt corporations) and \$1-\$25 million (for thirty three successful corporations) over the period 1946 to 1964. Using the firm's balance sheet and income statement he calculated solvency, profitability, liquidity, leverage, and activity ratios. Using data from the initial sample, the model achieved 95% accuracy in classifying firms correctly for data one year to bankruptcy, for data two years to bankruptcy the model achieved 72% accuracy in classification.

Logit analysis was pioneered by Ohlson (1980). From his results, financial structure, firm size, short-term liquidity and performance were found to have a great influence on bankruptcy. In 2001, Shumway came up with a solution to logit analysis shortcomings by suggesting hazard model. He concluded that hazard model was better than MDA and logit model in predicting bankruptcy.

Kiege (1991), formulated a model to predict business failure among Kenyan companies. The model achieved a prediction accuracy of 90% two years prior to actual failure. Sitati and Odipo (2009) used MDA to predict business failure in Kenya. The target population of 20 firms was composed of the companies listed in the Nairobi Stock exchange in the years 1989 to 2008. This study revealed that the model was 80% successful in predicting failure and 90% accurate in predicting success.

2.5 Summary of Literature Review and research gaps

Financial distress prediction models are numerous and each model has its advantages and

disadvantages. Because of this, the level of accuracies among the models differ. The simplicity of the univariate model is appealing, however, one of its shortcomings is that only one variable can be tested at a time in the analysis.

Multiple Discriminant Analysis has its weaknesses, however, it still compares favorably to other various techniques. Therefore, this study aims at contributing to the body of knowledge by applying Altman (1993) to Commercial and Manufacturing State Corporations in Kenya.

2.6 Conceptual Model

The conceptual model outlines the independent and dependent variables of the study and how they interact. The independent variables are liquidity, profitability and leverage while the dependent variable is financial distress. According to Gilbert et al. (1990), financial distress is characterized by negative cumulative earnings over at least a few consecutive years, losses, and poor performance. Further, according to Outecheva (2007), financial distress is broken down into four sub-stages: performance decline, economic failure, technical insolvency, and default. Therefore, in this study we shall base financial distress on these definitions given above.

Independent Variables

Dependent Variable

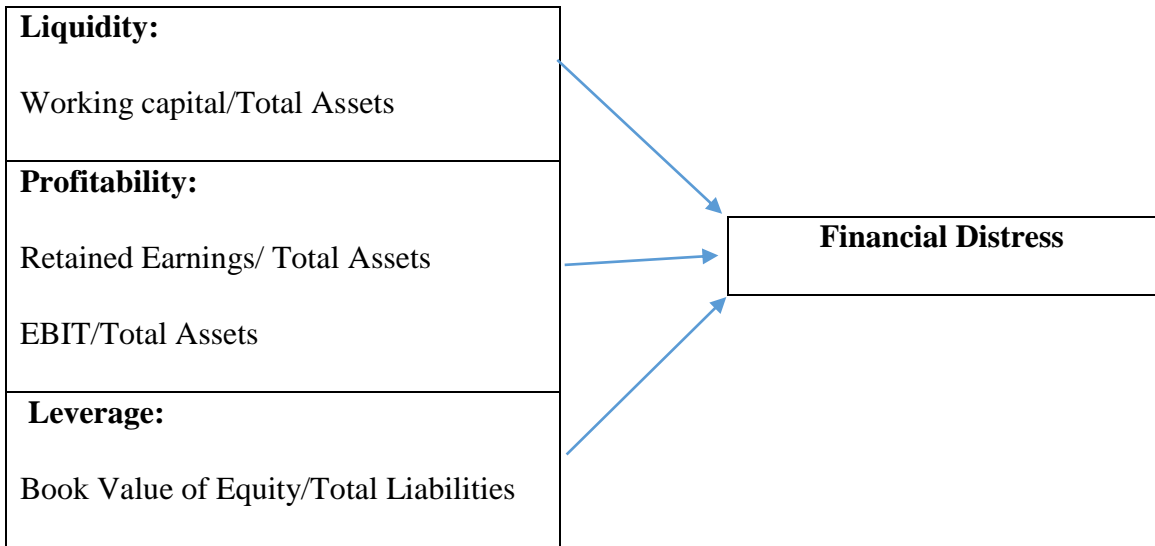


Table 2.6 Conceptual Model

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the research design, target population of study, the basis of sampling, data collection as well as the data analysis techniques employed in the study.

3.2 Research Design

Exploratory design was employed in the study. This is because little is known about prediction of financial distress in State Corporations. Many financial distress prediction studies have dwelt on publicly listed companies, however, less focus has been given to state owned corporations. Therefore, the study was important for obtaining more information on applicability of the Altman's model on Kenyan State Corporations.

3.3 Population

The target population was 27 State Corporations categorized under Commercial and Manufacturing corporations.

3.4 Sample

Census study was applied on the target population where all corporations were considered for analysis (Appendix I). Five financial years were studied, these were 2010/2011 to 2014/2015. Census was preferred to sampling because the target population was small and at the same time a census solved the accuracy problems associated with sampling. Therefore, there was no sampling.

3.5 Data Collection

The study employed secondary source data. Financial data was collected from the annual financial statements and audit reports of the State Corporations. For liquidity, financial data on receivables, inventory, short-term investments, cash in hand and bank, short term debt and accounts payable was collected from the balance sheet. Financial data on profitability included EBIT, retained earnings, and operating revenue while financial data on leverage included book value of equity, current liability and long term liability. To get the total assets, data on non-current assets such as property, plant and equipment was combined with current assets. The financial data collected was then used to derive a Z-Score for estimating financial distress.

3.6 Data Analysis

Data analysis was done using multiple discriminant analysis. It is a model that seeks to determine whether a set of variables significantly differentiate among two or more sets of data, as well as determine specific combination variables that most efficiently differentiate among groups. Altman (1993) model was adopted in the study since it was modified to suit firms which are not publicly traded, manufacturing, non-manufacturing and firms which are in emerging markets.

In this study, financially distressed State Corporations were identified and they were matched with those that had not experienced financial distress, matching was done by the type of industry. The resultant ratios for each of the firms in the periods of interest were objectively weighted and summed up to arrive at an overall score that then became the basis for classification of firms into one of the prior groupings (distressed and non-distressed).

The testing model discriminated eight (8) financially distressed Commercial and manufacturing State Corporations against nineteen (19) non-distressed corporations. For the purpose of the study, a financially distressed State Corporation was considered to be one that had been declared technically insolvent, had defaulted and one that had continued to experience performance decline and economic failure in the period of study.

3.6.1 Analytical Model

In this study, this MDA model will be applied:

$$Z'' = 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4$$

Where:

Z'' = Score of discrimination

X₁ = Current (Assets-Current Liabilities)/ Total Assets

The ratio measures financial strength of a company in the short-term. Working capital plays a significant role in a firm because it is used in the daily operations of the firm. A positive working capital is a good sign to the firm while a negative working capital shows that the firm will experience difficulties in meeting its obligations. Altman (1968) proved that this liquidity ratio was the most valuable in predicting financial distress.

X₂ = Retained Earnings/ Total Assets

Retained earnings refer to the profits which have been accumulated over time by a company. Young companies tend to have lower levels of retained earnings and sometimes they record nil or negative earnings. However, well established firms tend to record high levels of accumulated profits.

$X_3 = \text{Earnings before interest and tax} / \text{Total assets}$

The ratio measures assets efficiency in generating profits. Low EBIT/TA ratio indicates that the firm is not using the assets efficiently in generating profits.

 $X_4 = \text{Book Value of equity} / \text{Total liabilities}$

The ratio is appropriate where a company is not publicly traded. This private firm model may be appropriate in a smaller, less liquid and informational less efficient market.

Once these ratios had been derived, the Z'' score was computed for each observation and the observations were assigned to one of the groups based on this score. The proximity of this score to the various group centroids predicted the degree of financial distress or non-distress of the State Corporation. This model had the following discrimination zones: $Z'' > 2.60$ - "Safe" Zone, $1.10 < Z'' < 2.60$ - "Grey" Zone, $Z'' < 1.10$ - "Distress" Zone.

A Z-Score of 2.60 and above indicates that a company is financially robust and it is less likely to enter bankruptcy. Z-Scores of between 1.10 and 2.60 are within the grey area. A Z-Score of 1.10 and below indicates that a company is financially distressed and it is likely to go bankrupt.

Therefore, in this study, for purposes of classification or prediction, if a State Corporation's Z-Score was 2.60 and above, it was categorized as financially healthy. However, if the score was 1.10 and below then the corporation was financially distressed. State Corporations with scores ranging between 2.60 and 1.10 fell in the grey area. These discriminating zones will be relevant in providing early warning signals of financial distress and for appropriate corrective measures to be taken especially for State Corporations that are categorized in the grey and distress zones.

Further analysis was done through MS Excel application and findings were presented as descriptive statistics and tables.

3.6.2 Tests of Significance

To determine the significance of the relationship, the following tests were done; the coefficient of determination (R^2), ANOVA analysis and coefficient of correlation (r) analysis. R^2 measured the proportion of deviation in the response variable (Z'') with the deviations of the predictor variables (X_1 , X_2 and X_3). ANOVA analysis was conducted to test whether there were significant variances among the variables. Finally, correlation coefficients (r) was used to determine the strength and direction of the linear relationship between the dependent variable (Z'') and independent variables (X_1 , X_2 and X_3).

CHAPTER FOUR

DATA ANALYSIS, FINDINGS AND DISCUSSIONS

4.1. Introduction

The chapter looks into data analysis and interpretation of the results. The objective of this study is to assess the applicability of Altman (1993) model in predicting financial distress in Commercial and Manufacturing State Corporations in Kenya. MS Excel application will be used to analyze quantitative data and the findings will be presented as descriptive statistics and tables.

4.2 Descriptive Analysis

4.2.1 Non-distressed State Corporations

Table 4.2.1: Non-distressed State Corporations

	X1	X2	X3	X4	Z''
	WC/TA	RE/TA	EBIT/TA	BVE/TL	
Mean	0.15	0.17	0.06	3.77	5.86
Standard Deviation	0.19	0.25	0.07	4.45	5.22
Minimum	-0.97	-0.46	-0.04	-0.16	-7.91
Maximum	0.52	0.74	0.48	24.00	24.98
Count	95	95	95	95	95

Source: Research findings

Zones of discrimination:

$Z > 2.60$ -“Safe” Zone; $1.10 < Z < 2.60$ -“Grey” Zone, and $Z < 1.10$ -“Distress” Zone

Table 4.2.1 above shows an average of 5.86 for the independent variable (Z) and 5.22 as the standard deviation from 95 observations made from 19 non-distressed State Corporations in the financial years 2010/11 to 2014/15. The average X_1 is 0.15 with a standard deviation of 0.19 varying from a minimum of -0.97 to a maximum 0.52; the average X_2 is 0.17 with a standard deviation of 0.25 varying from a minimum of -0.46 to a maximum 0.74; the average X_3 is 0.06 with a standard deviation of 0.07 varying from a minimum of -0.04 to a maximum of 0.48. X_4 had an average of 3.77, standard deviation was 4.45 was the standard deviation varying from -0.16 to 24.

4.2.2 Analysis of Non-distressed State Corporations

Table 4.2.2: Altman (1993) Z'' Score for Non-distressed State Corporations

N	Name	Year	X_1	X_2	X_3	X_4	Z''	Zone
1	EA Portland Cement	2010/11	0.08	0.25	0.05	0.73	2.42	Grey
		2011/12	0.02	0.18	-0.04	0.52	0.98	Distress
		2012/13	0.02	0.25	0.02	0.79	1.92	Grey
		2013/14	-0.01	0.24	0	0.75	1.48	Grey
		2014/15	-0.01	0.48	-0.02	1.51	2.95	Safe
2	Kenya Airports Authority	2010/11	0.07	0.5	0.1	4.66	7.64	Safe
		2011/12	0.12	0.53	0.11	4.23	7.74	Safe
		2012/13	0.12	0.53	0.14	3.19	6.84	Safe
		2013/14	0.15	0.55	0.14	3.19	7.07	Safe
		2014/15	0.21	0.5	0.07	2.67	6.29	Safe
3	Kenya Ordinance Factories Corporation	2010/11	0.24	-0.12	0.01	12.86	14.79	Safe
		2011/12	0.25	-0.15	0.02	8.42	10.11	Safe
		2012/13	0.26	-0.16	0.02	8.52	10.21	Safe
		2013/14	0.25	-0.17	-0.02	8.61	10.00	Safe
		2014/15	0.28	-0.14	0.03	8.47	10.49	Safe

4	Kenya Ports Authority	2010/11	0.14	0.11	0.09	4.79	6.95	Safe
		2011/12	0.02	0.18	0.15	3.38	5.22	Safe
		2012/13	0.03	0.23	0.08	2.62	4.24	Safe
		2013/14	0.09	0.28	0.04	3.3	5.25	Safe
		2014/15	0.09	0.38	0.06	3.56	5.96	Safe
5	Kenya Literature Bureau	2010/11	0.43	0.23	0.06	10.44	14.97	Safe
		2011/12	0.48	0.28	0.06	10.63	15.65	Safe
		2012/13	0.49	0.15	0.06	8.93	13.48	Safe
		2013/14	0.5	0.18	0.08	6.8	11.58	Safe
		2014/15	0.42	0.29	0.05	7.96	12.43	Safe
6	Jomo Kenyatta Foundation	2010/11	0.26	0.19	0.48	3.84	9.60	Safe
		2011/12	0.12	0.03	0.38	1.59	5.10	Safe
		2012/13	0.07	0.03	0.25	2.2	4.57	Safe
		2013/14	0.06	0.02	0.05	4.86	5.91	Safe
		2014/15	0	0.06	0.07	8.9	10.03	Safe
7	Kenya Railways Corporation	2010/11	-0.97	-0.46	0.02	-0.16	-7.91	Distress
		2011/12	0.05	-0.37	0.03	6.47	6.08	Safe
		2012/13	0.13	-0.35	0.01	24	24.98	Safe
		2013/14	0.11	-0.31	0.01	23.49	24.49	Safe
		2014/15	0.07	-0.08	0	0.29	0.54	Distress
8	Kenya Electricity Generating Company	2010/11	0.05	0.19	0.04	0.76	1.99	Grey
		2011/12	0.04	0.2	0.04	0.75	2.04	Grey
		2012/13	0.04	0.2	0.04	0.64	1.84	Grey
		2013/14	0.01	0.16	0.03	0.44	1.24	Grey
		2014/15	0	0.15	0.03	0.7	1.45	Grey
9	Kenya Power and Lighting Company	2010/11	0.06	0.11	0.06	0.53	1.69	Grey
		2011/12	-0.02	0.12	0.06	0.56	1.22	Grey
		2012/13	-0.01	0.11	0.05	0.39	1.05	Distress
		2013/14	0.01	0.12	0.07	0.37	1.30	Grey
		2014/15	0.09	0.13	0.06	0.32	1.75	Grey

10	Kenya Pipeline Company	2010/11	0.26	0.66	0.15	2.17	7.16	Safe
		2011/12	0.24	0.73	0.16	2.94	8.06	Safe
		2012/13	0.19	0.66	0.13	6.3	10.89	Safe
		2013/14	0.26	0.68	0.14	6.08	11.23	Safe
		2014/15	0.29	0.74	0.12	7.98	13.53	Safe
11	Kenya Electricity Transmission Company	2010/11	0.23	0.04	0.03	0.05	1.90	Grey
		2011/12	0.09	0.03	0	0.03	0.73	Distress
		2012/13	0.08	0.03	0.01	0.03	0.72	Distress
		2013/14	-0.02	0.02	0	0.02	-0.04	Distress
		2014/15	-0.08	0.02	0.01	0.02	-0.40	Distress
12	Kenya Wine Agencies	2010/11	0.38	0.29	0.05	2.94	6.85	Safe
		2011/12	0.37	0.31	0.09	2.74	6.91	Safe
		2012/13	0.39	0.2	0.08	3.9	7.83	Safe
		2013/14	0.29	0.2	0.07	1.88	4.99	Safe
		2014/15	0.25	0.19	0.07	1.97	4.83	Safe
13	Kenya Seed Company Limited	2010/11	0.52	0.64	0	6.47	12.29	Safe
		2011/12	0.5	0.62	0.04	4.21	9.98	Safe
		2012/13	0.51	0.63	0.06	3.55	9.51	Safe
		2013/14	0.52	0.62	0.07	2.97	9.01	Safe
		2014/15	0.56	0.64	0.07	3.31	9.72	Safe
14	Kenyatta International Convention Centre	2010/11	0.13	0.02	0.02	10.82	12.44	Safe
		2011/12	0.12	0.04	0.02	11.82	13.47	Safe
		2012/13	0.15	0.05	0.03	8.85	10.63	Safe
		2013/14	0.12	0.07	0.03	9.45	11.13	Safe
		2014/15	0.14	0.09	0.03	7.57	9.33	Safe
15	National Water Conservation and Pipeline Corporation	2010/11	0.13	0.02	0	5.82	7.06	Safe
		2011/12	0.07	0.01	0	9.98	11.04	Safe
		2012/13	0.11	0.01	0	0.1	0.86	Distress
		2013/14	0.11	0.01	0.01	0.08	0.88	Distress
		2014/15	0.15	0	0.01	0.06	1.16	Grey

16	Postal Corporation of Kenya	2010/11	0.05	0.06	-0.01	0.57	1.07	Distress
		2011/12	0.05	0.06	0.03	0.54	1.25	Grey
		2012/13	0.06	0.12	0.04	0.65	1.70	Grey
		2013/14	-0.01	0.06	-0.04	0.45	0.35	Distress
		2014/15	-0.06	0.06	-0.02	0.58	0.29	Distress
17	New KCC	2010/11	0.14	0.24	0.07	1.94	4.18	Safe
		2011/12	0.1	0.32	0.08	2.36	4.68	Safe
		2012/13	0.17	0.25	-0.03	2.16	4.04	Safe
		2013/14	0.19	0.27	0.03	2.22	4.64	Safe
		2014/15	0.23	0.27	-0.01	2.41	4.84	Safe
18	Pyrethrum Board of Kenya	2010/11	0.24	0.04	0.04	1.33	3.34	Safe
		2011/12	0.21	0	0.02	1.18	2.74	Safe
		2012/13	0.12	0	0	1.97	2.85	Safe
		2013/14	0.1	-0.06	-0.01	1.73	2.80	Safe
		2014/15	0.1	-0.08	-0.01	1.63	2.60	Safe
19	UNES	2010/11	0.26	0.18	0.14	0.28	3.54	Safe
		2011/12	0.24	0.17	0.1	0.26	3.10	Safe
		2012/13	0.13	0.1	0.05	0.14	1.68	Grey
		2013/14	0.09	0.09	0.05	0.11	1.39	Grey
		2014/15	0.12	0.1	0.01	0.12	1.29	Grey

Source: Research findings

Table 4.2.2 above shows the different values of X_1 , X_2 , X_3 , X_4 and Z' scores as well as the discriminating zones of the nineteen (19) non-distressed State corporations.

Table 4.2.3: Accuracy of Altman (1993) model on Non-distressed State Corporations.

Classification	Frequency	% Frequency
Safe Zone	63	66.32%
Grey Zone	19	20.00%
Distress Zone	13	13.68%
Total	95	100.00%

Source: Research findings

Zones of discrimination:

$Z > 2.60$ -“Safe” Zone; $1.10 < Z < 2.60$ -“Grey” Zone, and $Z < 1.10$ -“Distress” Zone

It can be noted in table 4.2.3 above that the model correctly categorized 66.32% of the observed State Corporations, 13.68% were classified in the distress zone while 20% were classified in the grey zone.

4.2.4 Distressed State Corporations

Table 4.2.4: Distressed State Corporations

	X₁	X₂	X₃	X₄	Z”
	WC/TA	RE/TA	EBIT/TA	BVE/TL	
Mean	-0.89	-1.46	-0.003	0.89	-9.68
Standard Deviation	1.64	1.46	0.20	1.95	15.25
Minimum	-5.79	-5.37	-0.48	-0.83	-50.95
Maximum	0.56	0.04	0.80	6.87	3.61
Count (N)	40	40	40	40	40

Source: Research findings

Zones of discrimination:

$Z > 2.60$ -“Safe” Zone; $1.10 < Z < 2.60$ -“Grey” Zone, and $Z < 1.10$ -“Distress” Zone

Table 4.2.4 above shows that the dependent variable (Z'') has a mean of -9.68 and standard deviation of 15.25 from 40 observations made from 8 non-distressed State Corporations in the financial years 2010/11 to 2014/15. The average X_1 is -0.89 with a standard deviation of 1.64 varying from a minimum of -5.79 to a maximum 0.56; the average X_2 is -1.46 with a standard deviation of 1.46 varying from a minimum of -5.37 to a maximum 0.04; the average X_3 is -0.003 with a standard deviation of 0.20 varying from a minimum of -0.48 to a maximum of 0.80 and finally 0.89 was the average of X_4 1.95 was the standard deviation varying from a minimum of -0.83 to a maximum X_4 of 6.87.

4.2.5 Analysis of distressed State Corporations

Table 4.2.5: Altman (1993) Z'' Score for Distressed State Corporations

N	Name	Year	X_1	X_2	X_3	X_4	Z''	Zone
1	Kenya Broadcasting Corporation	2010/11	-3.66	-3.93	0.02	-0.78	-37.53	Distress
		2011/12	-4.28	-4.17	-0.01	-0.79	-42.51	Distress
		2012/13	-4.59	-4.12	0.05	-0.77	-44.06	Distress
		2013/14	-5.79	-5.37	0.8	-0.83	-50.95	Distress
		2014/15	-2.64	-2.41	0.31	-0.63	-23.79	Distress
2	Agro-Chemicals and Food Company	2010/11	0.28	-2.28	-0.11	-0.63	-6.99	Distress
		2011/12	0.27	-2.2	0.21	-0.62	-4.61	Distress
		2012/13	0.29	-2.06	0.1	-0.6	-4.76	Distress
		2013/14	-2.03	-1.88	0.1	-0.58	-19.42	Distress
		2014/15	-1.99	-1.84	0.07	-0.58	-19.21	Distress
3	Chemelil Sugar Company	2010/11	-0.25	-0.28	0	0.12	-2.47	Distress
		2011/12	-0.34	-0.53	-0.22	-0.11	-5.54	Distress
		2012/13	-0.24	-0.5	-0.16	0.16	-4.11	Distress
		2013/14	-0.24	-0.59	-0.05	0.08	-3.76	Distress
		2014/15	-0.28	-0.69	-0.1	-0.05	-4.76	Distress

4	Kenya Safari Lodges and Hotels	2010/11	-0.14	0.03	0.11	0.88	3.61	Safe
		2011/12	-0.05	0.04	0.03	2.87	3.04	Safe
		2012/13	-0.1	0.01	-0.03	2.13	1.35	Grey
		2013/14	-0.14	-0.12	-0.13	2.07	-0.02	Distress
		2014/15	-0.31	-0.29	0.36	0.96	0.45	Distress
5	National Cereals and Produce Board	2010/11	0.06	-0.47	-0.04	2.83	1.55	Grey
		2011/12	0.06	-0.51	-0.01	2.51	1.25	Grey
		2012/13	0.02	-0.6	-0.06	1.97	-0.19	Distress
		2013/14	0.02	-0.5	-0.01	1.08	-0.4	Distress
		2014/15	0.03	-0.43	0	0.76	-0.4	Distress
6	National Oil Corporation	2010/11	0.14	-0.02	0.08	0.61	2.05	Grey
		2011/12	0.15	0.01	0.1	0.63	2.37	Grey
		2012/13	0.17	0.03	0.08	0.58	2.33	Grey
		2013/14	-0.03	-0.04	-0.05	0.36	-0.29	Distress
		2014/15	-0.03	-0.03	0.04	0.48	0.48	Distress
7	Numerical Machining Complex	2010/11	0.14	-3.37	-0.01	1.79	-8.2	Distress
		2011/12	0.19	-3.02	-0.01	1.51	-7.14	Distress
		2012/13	0.53	-1.98	-0.48	5.12	-0.83	Distress
		2013/14	0.56	-1.57	-0.35	6.87	3.44	Safe
		2014/15	0.42	-1.4	-0.25	5.12	3.06	Safe
8	Nzoia Sugar Company	2010/11	-1.49	-1.6	0.05	-0.48	-15.15	Distress
		2011/12	-1.41	-1.46	0.05	-0.45	-14.16	Distress
		2012/13	-3.26	-3.07	-0.09	-0.73	-32.76	Distress
		2013/14	-3.7	-3.48	-0.19	-0.76	-37.7	Distress
		2014/15	-2.38	-2.25	-0.05	-0.64	-23.99	Distress

Source: Research findings

Table 4.2.5 above shows the different values of X_1 , X_2 , X_3 , X_4 and Z' scores as well as the discrimination zones of the eight (8) distressed State Corporations.

Table 4.2.6: Accuracy of Altman (1993) model on Distressed State Corporations.

Classification	Frequency	% Frequency
Safe Zone	4	10.00%
Grey Zone	6	15.00%
Distress Zone	30	75.00%
Total	40	100.00%

Source: Research findings

Zones of discrimination:

$Z > 2.60$ -“Safe” Zone; $1.10 < Z < 2.60$ -“Grey” Zone, and $Z < 1.10$ -“Distress” Zone

It can be noted in table 4.2.6 above that 75% of the observed State Corporations were accurately classified while 10% were classified as non-distressed.15% was difficult to classify.

4.3 Regression analysis

Table 4.3.1: Regression Analysis Statistics

Regression Statistics	
Multiple R	0.997623732
R Square	0.995253111
Adjusted R Square	0.995144403
Standard Error	0.816967366
Observations	135

Source: Research Findings

Table 4.3.1 presents the summary of regression statistics for the State Corporations. It can be noted that R squared is 0.9952. The result demonstrates that the variation of X_1 , X_2 and X_4 explains the 99% variation in Altman’s Z” score while the Adjusted R Square score of

0.9951 indicates that adjustment in the number of predictor variables explains 99% of the variations in Altman's Z'' score.

Table 4.3.2: ANOVA Analysis

ANOVA					
	df	Sum of Squares	Mean Square	F	Significance F
Regression	3	18331.80213	6110.6	9155.34	0.00000
Residual	131	87.43407377	0.66744		
Total	134	18419.2362			

Source: Research Findings

A variable is statistically significant if its significance level is 0.05 and below while it is less significant if the significance levels are 0.05 and above.

Table 4.3.2 presents the ANOVA test. The findings show that the F test value is 9155.34 and the P value (0.000) is less than 0.05 ($P < 0.05$) which means the variables are significantly related and the model is acceptable.

Table 4.3.3: Summary of coefficients

	Coefficients	Standard Error	t Stat	P-value
Intercept	0.28116	0.09261	3.03603	0.00289
X1	6.02769	0.11821	50.99163	0.00000
X2	3.65549	0.10608	34.45921	0.00000
X4	1.05463	0.01816	58.07799	0.00000

Source: Research Findings

In the output above, we can see that an increase in liquidity ratio (X_1) by a unit leads to an increase in Z'' by 6.03, increase in profitability ratio (X_2) by a unit results into an increase in Z'' by 3.66 while an increase in leverage ratio (X_4) by a unit leads to an increase in Z'' by 1.05, holding other variables constant. It can also be observed that the predictor

variables of X_1 , X_2 and X_3 are significant because their p-values are 0.000. A true relationship therefore exists between the (Z'' Score) and the variables X_1 , X_2 and X_3 .

4.4 Correlation Analysis

Table 4.4: Correlation Analysis

	X_1	X_2	X_3	X_4	Z'' score
X_1	1				
X_2	0.798963	1			
X_3	-0.21218	0.0123	1		
X_4	0.312602	0.241069	-0.05105	1	
Z'' score	0.912233	0.850401	-0.0612	0.614293	1

Source: Research Findings

Table 4.4 summarizes the correlation analysis.

From the findings it can be noted that X_1 (WC/TA), X_2 (RE/TA) and X_4 (BVE/TL) had a great effect on the Z'' score. However, X_3 (EBIT/Total assets) was found to have very little effect on the Z'' score (Appendix IV)

4.5 Interpretation of Findings and Discussions

For the non-distressed Commercial and Manufacturing State Corporations, the Z-Score had an average of 5.86 and a standard deviation of 5.22. Liquidity ratio of WC/TA had an average of 0.15 with a standard deviation of 0.19. Long term profitability ratio of retained earnings to total assets had a mean of 0.17 and a standard deviation of 0.25. Short term profitability ratio of EBIT/TA had a mean of 0.06 and a standard deviation of 0.07. Finally the leverage ratio of BVE/TL had a mean of 3.77 and a standard deviation of 4.45. Similarly, for the distressed Commercial and Manufacturing State Corporations, the Z-Score had a mean of -9.68 and a standard deviation of 15.25. The liquidity ratio of WC/TA

had an average of -0.89 and 1.64 was the standard deviation. The long term profitability ratio of retained earnings to total assets had a mean of -1.46 and a standard deviation of 1.46. Short term profitability ratio of EBIT/TA had a mean of -0.003 and a standard deviation of 0.2 while the leverage ratio of BVE/TL recorded an average of 0.89 while 1.95 was the recorded standard deviation.

Based on the correlation analysis, the findings show that X_1 (WC/TA), X_2 (RE/TA) and X_4 (BVE/TL) had a positive relationship and great effect on the Z'' score. However, X_3 (EBIT/Total assets) was found to have a negative relationship and very little effect on the Z'' score. This observation supports the fact that state owned corporation's main goal is sustainability in the long-run. Their main aim is promoting economic growth and delivery of public services in the foreseeable future. Retained earnings normally strengthen financial stability of a firm and ensures growth when earnings are reinvested in profitable ventures. Therefore, this explains why retained earnings had more effect on financial distress than EBIT.

The regression analysis statistics produced R squared of 0.9952. The result demonstrates that the variation of X_1 , X_2 and X_4 explains the 99% variation in Altman's Z'' score while the Adjusted R Square score of 0.9951 indicates that adjustment in the number of predictor variables explains 99% of the variations in Altman's Z'' score.

Further, the ANOVA test showed that the F test value was 9155.34 and the P value (0.000) was less than 0.05 ($P < 0.05$) which means the variables are significantly related and the model is acceptable. Finally, the predictor variables of X_1 , X_2 and X_3 were found to be significant because their p-values are 0.000. A true association therefore exists between the (Z'' Score) and predictor variables X_1 , X_2 and X_3 .

In general the model correctly classified 66.32% of non-distressed State Corporations, 13.68% were categorized as distressed and 20% were difficult to classify. Similarly, for distressed corporations, Altman's (1993) Z'' score model correctly classified 75% of them, 10% were classified in the safe zone and 15% were classified in the grey zone. It can therefore be concluded that Altman (1993) prediction model was 66.32% accurate in classifying non-distressed corporations and 75% accurate in classifying distressed firms. This model has been found reliable in predicting financial distress of Commercial and Manufacturing State Corporations in Kenya.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The chapter gives a summary of the study findings, conclusions and concludes with the study recommendations.

5.2 Summary of Findings and Discussions

The objective of this study was to determine the applicability of Altman (1993) model in predicting financial distress of Commercial and Manufacturing State Corporations in Kenya. Quantitative secondary data was collected from the financial statements and audit reports of the State Corporations. The Altman's (1993) Z'' score model was used in the study due to its popularity and due to the fact that it has been modified to suit firms which are not publicly traded, manufacturing, non-manufacturing and firms which are in emerging markets. The model was also applied in the study due to its simplicity. Census study was applied on the target population where all 27 Commercial and Manufacturing State Corporations were analyzed using MS Excel for the financial period 2010/11 to 2014/15. The State Corporations were grouped into 19 non-distressed corporations and 8 distressed corporations.

The study findings show that Altman's (1993) Z'' score model correctly classified 66.32% of the non-distressed State Corporations, 13.68% were classified in the distress zone while 20% were classified in the grey zone. Similarly, for distressed State Corporations, Altman's (1993) Z'' score model correctly classified 75% of them, 10% were classified in the safe zone and 15% were classified in the grey zone. The findings also show that X_1 (Working

Capital/Total assets), X_2 (Retained earnings/Total assets) and X_4 (Book Value of Equity/Total Liability) had a great influence on financial distress prediction. However, X_3 (EBIT/Total assets) was found to have very little influence.

5.3 Conclusions

Timely forecast of financial distress is important to stakeholders in that corrective actions can be taken before corporate bankruptcy and failure. In general financial ratios can be used to predict bankruptcy. However the type of ratio that will best discriminate between non-distressed and distressed firms appears to differ from place to place. From the analysis presented, it was observed that the factors which differentiate between a non-distressed firm and a distressed firm are liquidity, profitability and leverage levels. Liquidity (Working capital/Total Assets) was observed to have the greatest influence on financial distress prediction. State Corporations with low levels of liquidity faced difficulties in their operations as they were not able to meet their immediate obligations. These conclusions are similar to observations made by Deakin (1972). He concluded that the best predictor of potential distress is liquidity (Working Capital/Total assets). However, these conclusions differ from those made by Altman (1968). Altman found this liquidity ratio to be the least predictive of the variables under his study.

In this study, profitability (RE/TA) was found to be another good predictor of financial distress in State Corporations. In 2000, Charitou et al. made the same conclusions. The third best predictor of financial distress in this study is leverage ratio of BE/TL.

However, it was noted that the short-term profitability ratio of (EBIT/Total Assets) was the least predictor of financial distress. This conclusion differs from Altman (1968) research findings which concluded that EBIT/Total Assets was

significant in predicting financial failure. He argued that the probability of a profitable firm going bankrupt is almost nil. The validity of his conclusions have been challenged especially with the collapse of once profitable companies such as Enron and WorldCom. It is possible for a profitable company to be broke and it may lack cash to meet immediate obligations. This supports the findings of this study which concludes that liquidity is the best predictor of financial distress.

In conclusion, liquidity, profitability and leverage ratios are significant in predicting financial distress in Commercial and Manufacturing State Corporations in Kenya and stakeholders should pay close attention to them.

5.4 Limitations of the Study

Only one category of State Corporations has been studied. If the other categories of State Corporations could have been included, the study could have been more conclusive.

This study relied majorly on quantitative data. In reality other non-quantifiable circumstances could lead to financial distress and failure such as court cases, poor management and high competition in the market for a corporation's products.

Another limitation encountered in the study was that the period of study was limited to only five years. The study could have been more conclusive if the period of study was increased.

Access to information was also hampered by delayed audit process. Financial statements of State Corporations are only made public after they have been audited and tabled in parliament. In few instances, there were some delayed audit reports and this slowed down the data collection process.

Another limitation of this study is that it only focused on one statistical model (MDA) for

predicting financial distress. However, comparative analysis can be done using other statistical models such as logit, probit and hazard models to determine the best predictor models for financial distress and bankruptcy.

5.5 Recommendations

5.5.1 Policy Recommendations

Financial audit of State Corporations normally takes three months from October 1st to December 31st. There should be strict adherence to these timelines so that timely audit reports can be relayed to various stakeholders for their consumption. Causes of any delays such as financial resources and limited access to information for audit purposes should be dealt with to ensure smooth audit process.

State Corporations heavily rely on the government for funding. The government can use the findings of this study to determine the best candidates for financial bailouts in case they suffer financial distress.

Finally, the outcome of this study suggests that stakeholders in a business firm can predict failure before it occurs by paying close attention to liquidity, profitability and leverage ratios. This will enable stakeholders in a firm avoid the losses associated with failures by taking appropriate actions in advance.

5.5.2 Suggestions for Further Research

From the insights gained in this research, the following are suggestions for future research: more studies on financial distress should be conducted on state owned companies. It has been noted that most studies have majorly focused on publicly listed companies and State Corporations have been least researched on. Therefore, my suggestion is that financial

distress research studies should be done on other categories of State Corporations which include Financial, Public Universities, Training and Research, Service corporations, Regional Development, Tertiary Education and regulatory State Corporations.

Most financial distress prediction studies have focused on quantitative financial data. A major drawback of financial data is its susceptibility to manipulation by management. Therefore, one of the solutions is to base studies on qualitative factors such as firm size, age of the company, management characteristics and government's influence on the operations of State Corporations.

It has been noted that most studies range from two to five years due to lack of time, financial resources and lack of data. However, studies on financial distress would be more credible, and conclusive if the period of study was increased.

Research studies can be conducted to determine the influence of delayed information on investor decision making process especially for listed State Corporations. It has been noted that audit process of some State Corporations are normally delayed especially where they are audited by private audit firms on behalf of the government.

Further research can be done to investigate the applicability of other statistical models such as logit, probit and hazard analysis in forecasting financial distress in State Corporations. Non-statistical financial distress prediction models such as chaos theory can also be used to determine the best predictor model of financial distress.

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APPENDICES

Appendix I: Commercial and Manufacturing State Corporations

1.	Agro-Chemicals and Food Company
2.	Chemelil Sugar Company
3.	East African Portland Cement Company
4.	Jomo Kenyatta Foundation
5.	Kenya Airports Authority
6.	Kenya Broadcasting Corporation
7.	Kenya Electricity Generating Company
8.	Kenya Literature Bureau
9.	Kenya Ordinance Factories Corporation
10.	Kenya Pipeline Company
11.	Kenya Ports Authority
12.	Kenya Power and Lighting Company
13.	Kenya Railways Corporation
14.	Kenya Safari Lodges and Hotels
15.	Kenya Seed Company Limited
16.	Kenya Wine Agencies
17.	Kenyatta International Convention Center
18.	National Cereals and Produce Board
19.	National Oil Corporation of Kenya
20.	National Water Conservation and Pipeline Corporation
21.	Numerical Machining Complex
22.	Nzoia Sugar Company
23.	Postal Corporation of Kenya
24.	Pyrethrum Board of Kenya
25.	University of Nairobi Enterprises and Services Limited
26.	New Kenya Co-operative Creameries Ltd
27.	Kenya Electricity Transmission Company

Appendix II: Non- Financially Distressed State Corporations

Ref	Name	Year	Total Assets	Current Assets	Current Liabilities	Total Liabilities	Retained Earnings	EBIT	Book Value of Equity
			KES 000'	KES 000'	KES 000'	KES 000'	KES 000'	KES 000'	KES 000'
1.	EA Portland Cement	2010/11	13,530,871	3,172,070	2,100,179	7,827,953	3,362,871	653,640	5,702,918
		2011/12	14,091,006	2,570,423	2,275,422	9,241,968	2,528,148	(610,479)	4,839,390
		2012/13	16,160,364	3,626,405	3,302,093	9,026,061	4,086,892	314,546	7,134,303
		2013/14	15,790,733	3,395,142	3,509,386	9,009,679	3,716,438	(59,909)	6,781,054
		2014/15	23,112,582	3,157,336	3,351,461	9,302,989	11,024,102	(451,532)	14,001,007
2.	Kenya Airports Authority	2010/11	28,193,720	4,464,556	2,458,062	4,980,110	14,064,691	2,737,437	23,213,610
		2011/12	30,938,104	5,790,612	1,992,929	5,918,981	16,529,856	3,489,300	25,019,124
		2012/13	37,298,049	7,598,621	3,004,948	8,897,235	19,587,984	5,398,607	28,400,810
		2013/14	47,644,336	11,197,782	4,105,163	11,364,277	26,201,868	6,736,407	36,280,060
		2014/15	60,986,078	16,847,561	4,054,994	16,601,751	30,529,505	4,333,067	44,384,324
3.	Kenya Ordinance Factories Corporation	2010/11	4,676,825	1,470,264	337,340	337,340	(550,716)	52,940	4,339,485
		2011/12	4,930,203	1,775,024	523,528	523,528	(753,526)	77,196	4,406,675
		2012/13	4,850,432	1,756,265	512,440	512,440	-787,943	80,930	4,367,992
		2013/14	5,008,391	1,736,265	502,440	502,440	-832,209	-87,930	4,327,992
		2014/15	4,830,432	1,900,172	529,141	529,141	-680,950	139,664	4,479,250
4.	Kenya Ports Authority	2010/11	58,175,388	12,742,812	4,555,173	10,052,815	6,595,013	5,463,463	48,122,573
		2011/12	69,264,537	7,200,159	5,991,715	15,829,372	12,514,705	10,065,872	53,435,165
		2012/13	80,327,539	8,247,217	6,076,828	22,186,110	18,727,740	6,594,000	58,141,429
		2013/14	121,731,005	16,378,871	5,567,531	28,285,512	34,253,139	5,168,000	93,445,493
		2014/15	130,662,090	16,712,160	4,637,648	28,661,624	49,353,730	7,404,000	102,000,466
5.	Kenya Literature Bureau	2010/11	1,618,766	842,249	141,501	141,501	370,377	102,704	1,477,265
		2011/12	1,739,284	987,636	149,507	149,507	482,889	109,152	1,589,777
		2012/13	1,871,482	1,101,323	188,472	188,472	276,122	117,988	1,683,010
		2013/14	2,045,007	1,291,593	262,292	262,292	375,827	164,685	1,782,715
		2014/15	2,640,595	1,405,741	294,679	294,679	765,795	143,531	2,345,916

6.	Jomo Kenyatta Foundation	2010/11	544,911	253,877	112,524	112,524	103,837	262,702	432,387
		2011/12	580,061	291,335	223,652	223,652	19,577	220,427	356,409
		2012/13	783,274	301,973	245,219	245,219	22,765	197,457	539,005
		2013/14	1,198,670	275,450	204,388	204,388	25,708	62,060	994,282
		2014/15	1,171,953	118,335	118,335	118,335	67,671	86,190	1,053,618
7.	Kenya Railways Corporation	2010/11	51,870,661	9,333,343	59,447,694	61,421,405	(24,078,183)	804,381	(9,550,744)
		2011/12	53,570,083	9,358,048	6,934,180	7,169,970	(19,828,747)	1,578,844	46,400,113
		2012/13	54,068,523	8,920,580	1,929,568	2,162,565	(19,148,124)	680,623	51,905,958
		2013/14	61,601,660	9,199,553	2,136,079	2,515,485	(19,032,278)	710,770	59,086,176
		2014/15	232,868,761	72,761,588	55,878,169	180,129,085	(18,091,623)	429,333	52,739,676
8.	Kenya Electricity Generating Company	2010/11	160,993,290	19,539,034	11,256,593	91,574,703	30,513,173	5,648,258	69,418,587
		2011/12	163,144,873	22,288,066	15,000,957	92,965,319	33,319,646	7,017,498	70,179,554
		2012/13	188,673,282	25,127,810	17,672,629	114,714,766	37,728,726	7,027,726	73,958,516
		2013/14	250,205,524	27,630,643	25,196,229	173,495,851	41,071,239	6,745,467	76,709,673
		2014/15	342,519,995	21,368,973	22,479,973	200,925,904	52,482,236	11,700,671	141,594,091
9.	Kenya Power and Lighting Company	2010/11	121,171,515	35,150,676	28,130,511	74,092,227	13,227,779	7,082,447	39,606,376
		2011/12	134,131,983	28,159,384	31,383,138	78,258,103	16,739,064	7,808,520	43,511,553
		2012/13	184,212,535	37,727,982	38,875,140	120,974,981	20,249,921	8,939,610	47,149,807
		2013/14	220,109,352	50,411,859	48,847,728	147,223,069	27,305,683	14,987,067	54,205,569
		2014/15	275,493,150	66,062,475	40,197,934	192,030,542	34,549,142	15,837,548	61,449,028
10.	Kenya Pipeline Company	2010/11	42,074,260	14,727,996	3,794,648	13,264,404	27,634,101	6,463,320	28,809,856
		2011/12	45,731,978	15,342,584	4,525,850	11,608,675	33,247,548	7,163,737	34,123,303
		2012/13	61,490,995	14,362,998	2,545,997	8,428,034	40,327,952	8,049,605	53,062,961
		2013/14	70,059,342	22,071,604	3,987,896	9,901,106	47,394,969	9,964,529	60,158,236
		2014/15	73,875,571	24,266,630	2,606,541	8,230,063	54,787,041	8,909,069	65,685,508
11.	Kenya Electricity Transmission Company	2010/11	18,992,244	6,659,826	2,225,308	18,139,186	851,058	495,563	853,058
		2011/12	28,743,231	7,145,895	4,607,143	27,855,871	885,360	57,910	887,360
		2012/13	43,687,743	8,223,271	4,728,572	42,509,089	1,176,654	491,356	1,178,654
		2013/14	50,127,707	4,535,983	5,693,882	48,944,181	1,181,526	63,508	1,183,526
		2014/15	71,260,895	2,589,938	8,206,011	69,838,467	1,420,428	370,571	1,422,428

12.	Kenya Wine Agencies	2010/11	1,998,101	1,144,174	386,434	507,440	574,791	99,723	1,490,661
		2011/12	2,282,396	1,298,493	456,662	609,480	717,147	197,864	1,672,916
		2012/13	2,010,201	1,160,694	373,041	373,041	401,252	153,907	1,455,268
		2013/14	2,566,912	1,569,304	833,701	833,701	514,236	185,060	1,564,641
		2014/15	2,934,709	1,621,346	876,987	876,987	568,543	201,765	1,727,654
13.	Kenya Seed Company Limited	2010/11	6,487,366	3,639,220	290,746	868,092	4,164,535	18,191	5,619,274
		2011/12	7,086,384	4,383,669	837,391	1,359,861	4,412,046	258,420	5,726,523
		2012/13	7,648,188	5,102,008	1,185,574	1,679,548	4,789,421	429,260	5,968,640
		2013/14	8,029,088	5,704,257	1,566,691	2,021,660	4,956,274	591,431	6,007,428
		2014/15	8,245,712	6,058,196	1,459,354	1,913,198	5,281,361	612,265	6,332,514
14.	Kenyatta International Convention Centre	2010/11	2,919,036	626,816	246,994	246,994	66,245	67,235	2,672,043
		2011/12	3,168,223	630,207	247,168	247,168	115,256	70,506	2,921,054
		2012/13	3,439,339	848,372	349,059	349,059	187,934	104,326	3,090,280
		2013/14	3,498,961	692,373	271,999	334,807	261,808	93,488	3,164,154
		2014/15	3,852,492	914,419	389,919	449,644	349,401	112,223	3,402,847
15.	National Water Conservation and Pipeline Corporation	2010/11	8,286,526	2,330,224	1,214,305	1,214,305	149,676	(1,065)	7,072,221
		2011/12	11,683,317	1,936,692	1,063,617	1,063,617	156,352	31,739	10,619,700
		2012/13	13,743,321	2,390,283	936,378	10,372,754	167,736	52,723	1,023,021
		2013/14	14,176,503	2,168,267	639,512	13,177,557	150,333	128,219	998,946
		2014/15	16,237,555	2,892,243	414,917	15,316,085	72,857	202,561	921,469
16.	Postal Corporation of Kenya	2010/11	7,531,182	4,441,484	4,072,973	4,788,139	463,805	(56,358)	2,743,043
		2011/12	7,738,083	4,749,833	4,372,241	5,022,807	436,038	205,652	2,715,276
		2012/13	8,450,442	5,527,846	5,047,877	5,127,044	1,026,813	315,277	3,323,398
		2013/14	9,172,014	6,197,048	6,291,938	6,321,105	571,672	(360,086)	2,850,910
		2014/15	7,410,896	4,236,260	4,685,867	4,685,867	470,831	(138,560)	2,725,029
17.	New Kenya Cooperative Creameries Ltd	2010/11	7,323,997	2,789,583	1,758,337	2,490,534	1,732,814	486,281	4,833,462
		2011/12	6,244,256	2,050,073	1,413,676	1,859,960	1,981,590	468,361	4,384,298
		2012/13	6,866,048	3,094,303	1,896,775	2,173,304	1,747,735	-205,502	4,692,743
		2013/14	6,779,682	3,143,386	1,833,998	2,105,722	1,806,773	173,636	4,673,960
		2014/15	6,407,121	3,136,499	1,692,386	1,877,839	1,739,914	(49,150)	4,529,282

18.	University of Nairobi Enterprises Ltd	2010/11	667,384	648,642	473,727	521,544	123,281	91,452	145,840
		2011/12	863,166	843,918	635,392	683,210	145,133	88,669	179,957
		2012/13	1,242,022	1,219,603	1,059,832	1,092,999	122,323	68,301	149,023
		2013/14	1,392,817	1,360,374	1,228,785	1,251,285	128,953	73,087	141,532
		2014/15	851,238	820,878	718,189	756,839	83,192	6,493	94,399

Appendix III: Financially Distressed State Corporations

Ref	Name	Year	Total Assets	Current Assets	Current Liabilities	Total Liabilities	Retained Earnings	EBIT	Book Value of Equity
			KES 000'	KES 000'	KES 000'	KES 000'	KES 000'	KES 000'	KES 000'
1.	Kenya Broadcasting Corporation	2010/11	6,009,774	1,318,860	23,342,759	26,977,916	(23,626,321)	128,876	(20,968,142)
		2011/12	6,486,595	1,120,313	28,861,655	30,871,771	(27,043,356)	(32,780)	(24,385,176)
		2012/13	7,584,981	1,329,633	36,180,568	37,328,514	(31,253,766)	360,227	(28,595,587)
		2013/14	6,843,981	903,003	40,527,853	40,940,373	(36,754,572)	5,507,420	(34,096,392)
		2014/15	17,294,330	1,000,162	46,735,779	46,484,782	(41,735,114)	5,353,553	(29,190,452)
2.	Agro-Chemicals and Food Company	2010/11	3,182,045	1,175,200	276,774	8,645,200	(7,241,544)	(357,367)	(5,463,154)
		2011/12	3,143,828	1,047,867	197,049	8,280,512	(6,915,073)	670,875	(5,136,683)
		2012/13	3,351,469	1,192,422	216,099	8,473,806	(6,900,726)	338,802	(5,122,336)
		2013/14	3,609,071	1,291,841	8,632,740	8,632,740	(6,802,059)	366,313	(5,023,669)
		2014/15	3,704,979	1,344,856	8,728,849	8,728,849	-6,802,260	249,504	(5,023,870)
3.	Chemelil Sugar Company	2010/11	3,466,202	730,651	1,613,492	3,083,733	(955,989)	(13,188)	382,469
		2011/12	3,226,666	671,428	1,782,932	3,643,669	(1,695,701)	(694,205)	(417,002)
		2012/13	5,239,115	681,654	1,994,876	4,501,328	(2,614,543)	(840,625)	737,787
		2013/14	5,078,177	753,252	1,996,426	4,856,658	(2,974,015)	(244,177)	378,315
		2014/15	5,234,973	608,053	2,054,579	5,339,898	-3,614,050	-504,235	-261,720
4.	Kenya Safari Lodges and Hotels	2010/11	506,995	133,382	203,711	269,515	16,708	57,737	237,480
		2011/12	978,986	131,254	177,504	253,058	40,170	29,061	725,928
		2012/13	981,282	131,912	233,948	313,883	6,331	(32,282)	667,399
		2013/14	970,948	155,138	291,607	291,607	(119,943)	(125,126)	602,781
		2014/15	898,270	124,431	399,827	459,173	(257,187)	319,691	439,097
5.	National Cereals and Produce Board	2010/11	13,124,951	4,191,087	3,425,547	3,425,547	(6,194,161)	(518,127)	9,699,404
		2011/12	12,952,328	4,430,038	3,689,081	3,689,081	(6,630,318)	(187,717)	9,263,247
		2012/13	12,558,348	4,456,490	4,231,766	4,231,766	(7,566,982)	(770,023)	8,326,583
		2013/14	15,604,198	7,864,952	7,493,935	7,493,935	(7,783,302)	(155,338)	8,110,263
		2014/15	18,434,482	11,025,248	10,497,648	10,497,648	(7,956,731)	67,995	7,936,834

6.	National Oil Corporation	2010/11	7,489,202	4,382,273	3,308,281	4,658,452	(135,191)	595,118	2,830,750
		2011/12	8,101,412	4,954,231	3,741,104	4,962,914	103,524	823,653	3,138,498
		2012/13	8,893,270	5,122,786	3,612,282	5,612,776	269,871	667,668	3,280,494
		2013/14	9,689,956	4,369,875	4,627,562	7,121,700	(387,125)	(531,410)	2,568,256
		2014/15	12,469,801	4,936,823	5,289,534	8,420,298	(429,674)	500,022	4,049,503
7.	Numerical Machining Complex	2010/11	312,307	135,069	89,890	89,890	(1,052,844)	(2,106)	161,181
		2011/12	349,737	168,720	103,583	103,583	(1,057,650)	(4,806)	156,374
		2012/13	573,144	394,962	93,629	93,629	(1,132,219)	(274,464)	479,515
		2013/14	828,402	572,277	105,317	105,317	(1,303,768)	(287,579)	723,085
		2014/15	930,639	538,117	147,716	147,716	(1,298,925)	(229,785)	756,658
8.	Pyrethrum Board of Kenya	2010/11	3,911,520	1,590,158	665,968	1,679,336	150,621	159,168	2,232,184
		2011/12	3,771,024	1,509,067	719,112	1,732,480	18,386	64,703	2,038,544
		2012/13	5,435,098	1,459,799	815,089	1,828,457	18,386	(6,159)	3,606,641
		2013/14	5,359,671	1,490,487	946,700	1,960,068	-339,494	-39,422	3,399,603
		2014/15	5,314,144	1,526,898	1,006,056	2,019,424	-440,946	-39,522	3,294,720
9.	Nzoia Sugar Company	2010/11	10,762,415	4,550,142	20,553,278	20,553,278	(17,212,633)	517,753	(9,790,864)
		2011/12	11,531,129	4,851,661	21,095,692	21,095,692	(16,885,154)	573,530	(9,564,564)
		2012/13	10,333,273	2,578,722	36,213,713	38,220,593	(31,718,565)	(978,560)	(27,887,320)
		2013/14	9,663,905	2,092,304	37,856,348	39,783,251	(33,665,543)	(1,833,784)	(30,119,346)
		2014/15	15,859,469	1,624,669	39,412,512	43,476,333	(35,731,379)	(831,809)	(27,616,864)

Appendix IV: Pearson's correlation coefficient interpretations

Effect size of predictor variables on the response variable can be measured by the following scale:

Effect size	Pearson Coefficient (r)	
	+ve	-ve
Small	0.1 to 0.3	-0.1 to -0.3
Medium	0.3 to 0.5	-0.3 to -0.5
Large	0.5 to 1.0	-0.5 to -1.0

Source: Laerd Statistics