

**TESTING APPLICABILITY OF ALTMAN Z MODEL IN
PREDICTING FINANCIAL DISTRESS OF NON-FINANCIAL
FIRMS LISTED AT THE NAIROBI SECURITY EXCHANGE**

BY

STEPHEN IVUVU FRANCIS

**A RESEARCH PROPOSAL PRESENTED TO THE FACULTY OF
BUSINESS AND MANAGEMENT SCIENCE IN PARTIAL
FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF A
DEGREE OF MASTER OF BUSINESS ADMINISTRATION OF THE
UNIVERSITY OF NAIROBI**

NOVEMBER, 2022

DECLARATION

This research project is my original work, which has not been presented to any other university for award of a degree.

Signature



Date: 22nd November, 2022

STEPHEN IVUVU FRANCIS

D61/28661/2019

This research project has been submitted for examination with my approval as a University of Nairobi Supervisor.

Signature:



Date: 22nd November, 2022

DR. MORRIS IRUNGU

Department of Accounting and Finance,

University of Nairobi

DEDICATION

This project is dedicated to my wife Irine, son Liam, dad Francis, my mom Lucy and my siblings Goret, Mercy, Jessica and Peter for supporting and encouraging me during the entire journey. Lastly, the company stakeholders who are interested in learning more about forecasting financial distress.

ACKNOWLEDGEMENT

I thank God for his unfathomable favor throughout the entire journey. My Supervisor Dr. Irungu and Coordinator Dr. Onsomu for their invaluable feedback, critique, encouragement and advice. Finally, I want to express my gratitude to all lecturers in the faculty of Business and Management Science for their contribution to the project.

TABLE OF CONTENTS

DECLARATION.....	ii
DEDICATION.....	iii
ACKNOWLEDGEMENT.....	iv
TABLE OF CONTENTS	v
LIST OF TABLES	vii
LIST OF FIGURES	viii
LIST OF ABBREVIATIONS AND ACRONYMS	ix
ABSTRACT.....	x
CHAPTER ONE: INTRODUCTION.....	1
1.1 Background of the Study	1
1.1.1 Financial Distress.....	2
1.1.2 Altman’s Z –Score model	2
1.1.3 Non-Financial Firms Listed at the Nairobi Stock Exchange	3
1.2 Research Problem	4
1.3 Research Objective	6
1.4 Significance of the Study	6
CHAPTER TWO: LITERATURE REVIEW.....	8
2.1 Introduction.....	8
2.2 Theoretical Review	8
2.2.1 Entropy Theory	8
2.2.2 Gambler’s Ruin Theory	9
2.2.3 Cash Management Theory	9
2.3.4 Credit Risk Theory.....	10
2.3 Determinants of Financial Distress.....	11
2.4 Empirical Review.....	11
2.5 Summary of Literature Review and Research Gaps	14
2.6 Conceptual Framework.....	15
CHAPTER THREE: RESEARCH METHODOLOGY	16
3.1 Introduction.....	16
3.2 Research Design.....	16

3.3	Target Population.....	16
3.5	Data Collection	17
3.6	Data Analysis	17
	3.6.1 Analytical model.....	17
	3.6.2 Independent Variables of the Altman Z”	18
	3.6.3 Operationalization of Study Variables.....	18
	CHAPTER FOUR: DATA ANALYSIS, RESULTS AND DISCUSSION	19
4.1	Introduction.....	19
4.2	Descriptive Statistics of Variables	19
4.3	Correlation Analysis for Non- Distressed and Distressed Firms	20
	4.3.1 Correlation Analysis for Distressed Firms.....	21
	4.3.2 Correlation Analysis for Non -Distressed Firms	22
4.4	Altman Z” Model Prediction Accuracy Results	23
4.5	Discussion of Findings.....	24
	CHAPTER FIVE: SUMMARY OF FINDINGS, CONCLUSION AND	
	RECOMMENDATIONS.....	26
5.1	Introduction.....	26
5.2	Summary of the Findings.....	26
5.3	Conclusions.....	27
5.4	Recommendations.....	27
5.6	Suggestion for Future Studies.....	28
	REFERENCES.....	30
	APPENDICES	34
	Appendix 1: Data Collection Sheet.....	34
	Appendix 2: Computed Z-Scores for Listed Non-Financial Companies.....	35
	Appendix 3: Computed Z-Scores for not distressed Listed Non-Financial Companies.....	37
	Appendix 4: Computed Z-Scores for distressed Listed Non-Financial Companies	38

LIST OF TABLES

Table: 1.1 Altman Models	3
Table 3.6 Operationalization and Measurement of Variables	18
Table 4.1: Descriptive Statistics of Variables for Listed Non-Financial Companies	19
Table: 4.2 Pearson Correlation Analysis for distressed Firms	21
Table: 4.3 Pearson Correlation Analysis for Non - distressed Firms	22
Table: 4.4: Matrix for Revised Altman Z' Prediction Accuracy Results	23

LIST OF FIGURES

Figure 2.1 Conceptual Framework.....	15
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LIST OF ABBREVIATIONS AND ACRONYMS

AIES	Artificial Intelligence and Expert System
ANN	Artificial Neural Network
ARM	Athi River Mining Ltd
BIST	Borsa Istanbul
BVE	Book Value of Equity
CBK	Central Bank of Kenya
CMA	Capital Market Authority
EBIT	Earnings Before Interest and Tax
GA	Genetic Algorithms
IDX	Indonesia Stock Exchange
MDA	Multiple Discriminant Analysis
MOA	Magnetic Optimization Algorithm
MVE	Market Value of Equity
NSE	Nairobi Stocks Exchange
NYSE	New York Stock Exchange
PSO	Particle Swarm Optimization
RE	Retained Earnings
ROA	Return on Assets
ROS	Return on Sales
SPSS	Statistical Package for Social Sciences
SVM	Support Vector Machines
TA	Total Assets
TL	Total Liabilities
UA	Univariate Analysis
US	United States
WC	Working Capital

ABSTRACT

This project aimed at determining if Altman Z^{''} (1993) can accurately forecast the failure of non-financial firms listed on Nairobi Securities Exchange (NSE). The study was anchored on entropy, credit risk, cash management and Gamblers ruin theory. A descriptive study approach was used, as well as a purposive sampling technique. The study looked at 46 non-financial enterprises listed on the NSE from 2016-2020. The secondary data used in the analysis came from audited financial statements published NSE and Capital Markets Authority websites. SPSS version 21 and Microsoft excel were employed in analysing the data that had been collected. The data was presented in tabular and figurative form. The empirical results revealed that the model predictive accuracy for distressed and non-distressed companies was 100% and 80.6% respectively. Overall, the model correctly categorized 39 out of 46 companies as either financially distressed or not, resulting in an 84.8 % overall accuracy rate. The research also revealed that the four ratios of the model had an impact which was both positive and statistically significant in predicting financial distress for listed non-financial entities. This study recommends employing Altman Z^{''} (1993) to detect financial distress in non-financial companies early, to ensure that corrective actions are taken in a timely manner. Non-financial company management in Kenya should also develop a working capital management policy that will ensure that current liabilities are kept below current assets at all times, focus on increasing operational efficiency and lowering sales costs and operational costs, which will increase their EBIT and prudent borrowing and liability management, which will likely decrease the likelihood of insolvency. The research in addition, helps add to the body of knowledge by by expanding discussion on use of Revised Altman Z^{''}-Score model both in developed and developing countries. The research also expands on existing theories and empirical studies on financial distress by providing valuable information on the subject in regard to the Kenyan context.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Financial distress is a condition in which an entity is experiencing Managerial, financial and operational challenges (Adeyemi, 2011). Persistent financial distress may result in bankruptcy. Since a company's bankruptcy or failure will result in significant losses for creditors, investors, the government, and shareholders, detecting a company's failure as early as possible is critical. Several statistical models have been created to aid in the forecast of financial distress in businesses (Alareeni & Branson, 2013). The original approach, developed by Edward Altman in 1968, relied on MDA to forecast business failure. The function computed the z-score using five weighted ratios. The Altman model has been a good predictor of business failures in a number of contexts and markets.

Entropy, cash management, credit risk and gambler's ruin theories are some of the theoretical models used in the study of bankruptcy and financial distress. Entropy theory identifies financial hardship by looking at changes in the statement of financial position structure, with the premise that businesses aim to keep their financial systems in balance. The cash management theory focuses on controlling an entity's cash inflows and outflows by either filling a deficiency or investing excess funds. If a mismatch between cash inflows and withdrawals persists, financial distress/bankruptcy may occur (Jahur and Quadir, 2012). The gambler's ruin theory is a probability based theory in which a gambler earns or loses money based on chance. The entity is assumed to be a gambler who starts business with a specific amount of cash which moves in and out of the business as it operates. According to Feller W. who pioneered theory, bankruptcy is likely if a company's net liquidation value (NLV) falls below zero. Credit risk theories employ a credit approach as well as risk assessment. According to this theory, any company should seek to define default procedures in credit risk aspects using structural and reduced form models.

NSE was founded in 1954 and is situated in Kenya. It provides local and international investors with a trading platform for equity and debt instruments. More than 50% of the listed companies under this segment have had financial troubles. Since independence, a

total of 21 listed firms listed on NSE had financial issues, put in receivership, undergone debt restructuring, suspended or delisted from the bourse (Roche, Tabitha & Tobias 2020).

1.1.1 Financial Distress

Financial distress denotes a corporation's incapability to settle its debts in time (Odipo & Sitati, 2011). According to Korteweg (2007), it is the reduction in financial efficiency due to cash shortage. Bankruptcy can be either voluntary (filed by the entity experiencing financial distress under the relevant jurisdiction's law) or involuntary (petitioned by creditors). An organization is in financial distress when its operating cash flows cannot cover its current liabilities warranting corrective actions such as mergers, loans restructuring and acquiring another company (Steven, Jayaraman, Shankar & Ally, 2011). Financial distress that persists may result in bankruptcy and subsequent liquidation of an entity (Altman, 2013). According to Alemu (2015), companies in financial distress often try to recover by implementing various turnaround strategies such as downsizing, eliminating loss-making product lines, employment of industry experts, re-structuring, selling off unproductive assets, and improvement of net working capital cycle.

In this study, revised Altman's Z" will be used as a financial distress early warning sign. Enterprises whose scores are below 1.1 will be considered to be financially distressed. It was chosen for this study since it is one of the extensively used bankruptcy prediction tool (Siddiqui, 2012). Internationally, Kim and Choi (2013) compared the outcomes of Altman's model to financial performance indicators like profitability (ROA) and implied cost of capital and discovered that the model can be used to determine whether or not a South Korean company is insolvent. Ernayani (2020) conducted a study aiming at determining and predicting future bankruptcy in coal mining businesses listed on IDX and obtained positive results. Kipruto (2013) deduced that the model could forecast financial distress. in Uchumi Supermarket.

1.1.2 Altman's Z –Score model

Edward I. Altman developed the first model in 1968 that employed MDA to forecast business failure. The function computed the z-score using five weighted ratios. It was made for manufacturing companies with publicly traded stocks. The model was modified in 1983

to include small and private businesses. The BVE was substituted for the MVE in this model (Altman, 1983) and the weighting of the various ratios was different. A third version was later developed taking into account companies not in the manufacturing sector and privately owned ones (Altman et al., 2017). The model used was similar to the later except that to reduce the potential industry impact, the sales/total-assets ratio was removed. It has been a good predictor of business financial distress across many different markets and contexts. The models have been summarised in table 1.1.

Table: 1.1 Altman Models

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

$X_1 = WC / TA$, $X_2 = RE / TA$, $X_3 = EBIT / TA$, $X_4 = BVE / TL$ $X_5 = Sales(S) / TA$

Source: Altman, 1993

1.1.3 Non-Financial Firms Listed at the Nairobi Stock Exchange

As at 1st January, 2020, a total 66 firms had been listed on Nairobi Security Exchange (CMA Statistical bulletin, 2020). NSE is the principal bourse in Kenya which offers a platform for trading and listing of securities. Out of 66 listed firms, there were 46 non-financial firms. For the 46 non-financial firms a total of ten listed companies were either placed in receivership, went through financial restructuring, were suspended, or were delisted entirely from the NSE during the study period of 2016-2020 while the remaining

thirty-six (36) were financially healthy (NSE, 2020). The ten companies had been had financial hardships as explained in the following paragraphs.

ARM, for example, was placed into administration under Section 534(1) of the Insolvency Act of 2015 and afterwards suspended in August of 2018. East African Cables PLC and its parent company, Trans-Century PLC, in April 2019 announced a debt restructuring transaction which was completed in July of the same year. On another occasion, Trans-Century Ltd announced its intention to delist from the NSE in 2020. (NSE 2020). It did, however, reverse course and issued five shares for every two held in order to raise \$2 billion from its shareholders to fund its turnaround strategies (Business Daily Newspaper, May 18 2021). Mumias Sugar Company's trading on the NSE was halted in 2019 after it was placed in receivership (CMA statistical bulletin 2021). After a long period of persistent losses, dwindling share prices, and other financial difficulties, the CMA suspended Express Kenya Plc from trading on the NSE in 2017. Later in 2019, the company entered into an agreement to convert a portion of its debt into equity (CMA, 2019).

In 2017, Marshall East Africa Limited was delisted. CMA suspended Nairobi Business Ventures Ltd.'s shares from trading on the NSE in October 2020 to allow the company's restructuring to be completed. Deacons (East Africa) was placed into administration in accordance with the Insolvency Act No. 18 of 2019 and was later suspended from trading on the NSE by the CMA in November, 2018. Kenya Airways suspended from trading on the NSE in July, 2020 to allow for operational and corporate restructures (NSE, 2021). Due to financial difficulties, the company had earlier been delisted and placed into receivership (Kipruto, 2013).

1.2 Research Problem

Financial distress causes a corporation's performance to deteriorate, resulting in a decrease in the firm's earnings (Muigai, 2016). As a result of insufficient resources to sustain prolonged eras of dismal performance, companies that have been in financial trouble for a long time will finally be liquidated. This could have a detrimental impact on a variety of stakeholders, including employees, creditors, government and investors, by diminishing their returns, resulting in loss of jobs, failure to pay taxes, and a decline in Gross Domestic

Product (Altman & Hotchkiss, 2010). These failures raise worries on both domestic and foreign investors (Peavler, 2017). Predicting the likelihood of financial bankruptcy so that they can respond before events occur is a major concern for stakeholders.

Between 2016 and 2020, a total of ten listed firms were either placed in receivership, suffered financial difficulties, underwent financial reorganization, or were excluded from trading on the NSE entirely (NSE, 2021). Financial distress has become frequent throughout the world, and many businesses are closing down, harming the global economy (Kumar, 2016). Financial hardship may have a significant impact on creditors, owners, and even the industry and economy, thus it is a big worry for financial analysts who are still struggling to discover a reliable instrument for assessing the risks and threats of company failure (Svabova et al., 2020). The Altman model was created using a sample of US companies. Previous research has shown that the model loses predictive effectiveness in different nations due to variations in economic conditions (Karas & Srbová, 2019). The purpose of this study is to see if it is applicable to non-financial enterprises listed on NSE.

There are a minimal number of studies on the subject in Kenya, revealing a research gap on bankruptcy prediction in the country's corporate sector. Previous studies; Akeju, and Malomo (2017), Odibi et al., (2019), Colak (2019), Karas & Srbová, (2019), Svabova (2020), and Ernayani (2020) findings cannot be applied in the Kenyan industry due to governance structure disparities, financial reporting procedures and economic conditions. In addition, local studies present a contextual gap since majority of them centered on fields like supermarkets Kipruto (2013), commercial & services firms Kihooto et al. (2016) and Sugar companies (Range,2019) whose findings cannot be applied to other sectors due to regulatory system differences. Furthermore, most of the above studies focused on one sector of the NSE or a specific company unlike this study which will study 10 segments of the NSE and therefore took account of differences in regulatory, governance and accounting requirements which may impact on the findings. This research therefore addressed the question of whether Altman Z can accurately forecast financial distress for non-financial companies listed on NSE.

1.3 Research Objective

To test the applicability of Revised Altman Z'' in predicting financial distress in non-financial firms listed on NSE.

1.4 Significance of the Study

Forecasting of an entity financial situation is critical lenders, managers, investors and stockholders, as well as the country's economy at general (Alaka et al., 2018). This research's findings will be beneficial to practice, policy makers and theory in a variety of ways. This research will be useful to policymakers and regulators in developing appropriate regulations for ongoing monitoring and appraisal of financial health of entities whose shares are traded on the NSE. Regulators such as the CBK and CMA will benefit from utilizing the model to detect struggling businesses and put in place preventative measures to keep them from going bankrupt. The research findings will assist the government in building a strong legislative framework to prevent financially challenged businesses and those currently in financial problems from going bankrupt.

In regard to significance to practice the study will be important to both creditors and investors. The study will help creditors to evaluate a firm's creditworthiness since the model will predict on any likelihood of financial distress. The information can assist them in determining whether the companies qualify for Credit. Investors will profit by using the information to decide on the shares to buy, hold, or sell. The model can also be used in predicting an entity financial stability before investing. The findings of the study would benefit management because they would act as an advanced indicator of impending financial troubles. This will allow them to take the required safeguards, adjust operating policies, restructure their debts, and voluntarily wind up the company in order to minimize losses and maximize resource allocation.

Scholars and researchers can greatly benefit from this work because it will advance our understanding of the subject by demonstrating effectiveness of Altman Z'' in gauging financial distress for listed non-financial entities. Academics will benefit from the study's

new findings, which will provide them a better understanding of how financial distress affects enterprises, as well as other economic players. In addition, a broad framework will be developed to guide future research, which is extremely important to scholars and researchers. It will also provide a foundation for future research into the micro and macroeconomic factors that influence financial institutions' return on assets and financial performance.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

In this section, a review of the literature on financial distress, including both theoretical and empirical studies by other authors, as well as the literature's conceptual framework and a brief assessment of the gaps in knowledge was conducted.

2.2 Theoretical Review

Numerous theories on financial distress and bankruptcy prediction have been developed such as those highlighted in the subsequent paragraphs

2.2.1 Entropy Theory

Beaver proposed the theory for the first time in 1966. It involves detecting financial distress by looking at changes in balance sheet structure. In examining changes in the statement of financial position's structure, it employs both UA and MDA. MDA is a type of statistical analysis that examines multiple variables at once (Slotemaker, 2008). In the contrary UA involves examining one ratio at a time. UA however, is limited in that it does not account for time variations in accounting analysis. If several ratio categories are used for the same company, it can produce conflicting outcomes. Furthermore, many financial variables are strongly interconnected, so interpreting them separately may be erroneous. Likewise, it is unable to reflect the firm's multifaceted interrelationships. MDA takes care of the aforementioned flaws of univariate analysis.

In general, businesses strive to keep their financial structures in balance (Aziz & Dar, 2006). It assumes that financial accounts of a company reveal significant shifts in asset and liability mix. In that case, there is high likelihood that the firm cannot maintain its equilibrium state. Where the changes become uncontrollable, these companies may face financial difficulties in the future (Aziz & Dar, 2006). Stakeholders can utilize this theory to spot-check a company's financial condition. Entropy theory has been utilized as a theoretical underpinning for investigations on financial distress by Aziz and Dar (2004)

and Memba and Abuga (2013). This theory was determined to be pertinent to the study since Z” score values for non-financial firms were calculated and analyzed for each year by calculating and assessing the amount of change in four important ratios of the model.

2.2.2 Gambler’s Ruin Theory

This probability-based theory, developed by W. Feller in 1968, states that a gambler's capacity to win or lose money depends on chance. In an instance where a firm's net liquidation value (NLV) falls below zero, according to Feller, bankruptcy is likely. The theory assumes that the bettor commences gambling with a positive amount of cash. In each period, the bettor gains a shilling with likelihood q and loses a shilling with likelihood $(1-q)$. The bettor bets until he is out of money. Like the gambler, we assume that the firm has a certain amount of cash that is constantly entering and exiting the firm as it conducts its operations.

The corporation might be likened to a gambler who keeps wagering until his or her net worth hits zero in this case becomes bankrupt. Another constraint is that since a company does not have access to markets for securities, cash-flows are due to independent trials and thus managerial activity will not influence the outcomes (Espen, 1999). The liquidation value of stockholders' equity is used to calculate net worth. This theory's fundamental flaw is that it implies a corporation begins with a specific quantity of money. The Gambler's Ruin theory is pertinent to current research because it emphasizes the significance of having positive working capital in ensuring the financial health of a company.

2.2.3 Cash Management Theory

Beaver (1966) defined an entity as a liquid asset repository replenished by inflows and depleted by outflows. According to this theory, managing corporate cash balances is a crucial priority for every organization in the short term. It was later expanded upon by James Mao and Charlie Sarndral, who emphasized the control of cash inflows and outflows by funding a shortfall or investing excess money. A mismatch between cash inflows and outflows indicates that the firm's cash management function is failing. Financial distress/bankruptcy may follow if the above persists (Jahur and Quadir, 2012). Cash

outflows will be negative at times due to an increase in activities that use the firm's cash, such as paying taxes, dividends, or purchasing inventory, and positive at other times due to a rise in cash inflow activities, such as high cash sales and debt settlement by major debtors (Goswami, Chandra, & Chouhan, 2014).

According to Bhurnia and Sarkar (2011), a firm is in high risk of bankruptcy when its cash inflows are not enough to pay off its debts. Management should keep the organization's cash balance at a healthy level to avoid financial troubles. The company benefits from neither too much nor too little cash (Aziz & Dar, 2006). To avoid financial difficulties and subsequent insolvency, businesses should place a strong emphasis on proper cash management. The theory is however, discredited due to the fact that it focuses solely on qualitative causes for organizational failures, ignoring the quantitative factors. Despite the limitation the theory is however very vital in prediction of bankruptcy since cash problems is one of the main signals of financial distress.

2.3.4 Credit Risk Theory

Robert C Merton proposed this theory in 1974, and Darrell Duffee and Stephen Schaeffer expanded on it in 1988. According to this theory, any company should seek to define default procedures in credit risk aspects using structural and reduced form models. Structural models presume that the modeler knows everything there is to know about a firm's assets and liabilities, resulting in a predictable default time. Reduced-form models, on the contrary, assume that one is unaware of the firm's financial situation, and that default risk is an unanticipated event influenced by a variety of market conditions. Debt and interest burdens raise the danger of bankruptcy, whereas equity lowers the risk (Espen, 1999). The risk of monetary or other loss to investors if a debtor fails to honor his or her debt in accordance with the terms of a written agreement is defined as Credit risk (Nyunja, 2011).

This theory is predicated on the notion that transaction expenses, bankruptcy fees and taxes do not exist. It also assumes that there is limitless borrowing and lending at a constant interest rate, which is not the case for the Kenyan economy where this study will be

conducted. This hypothesis is important in this research because it explains how credit affects a company's liquidity. It implies that an entity should aim at raising the amount of good debts while lowering the amount of bad debts to avoid getting into financial distress. It can employ the Merton's model to assess the firm's value prior to maturity of its debts, as well as monitor it to ensure it does not fall below minimal levels prior to the maturity of the loan. Following the Basel II standards, several attempts have been undertaken in recent years to construct internal credit risk assessment models. Credit risk is significant to current research since it explains credit effect on an entity's liquidity.

2.3 Determinants of Financial Distress

An entity financial health can be determined by liquidity, leverage, profitability and efficiency ratios. Liquidity is an entity's capacity to settle its short-term financial commitments promptly. Excessive or low liquidity is undesirable because it results in low profits due to the accumulation of idle resources, whereas low liquidity may result in insolvency. According to Thim et al. (2011), liquidity is negatively related to financial distress. Leverage indicates how heavily a company is in debt. Some of the common ratios used to measure leverage are Debt/Assets Ratio and total liabilities/Equity Ratio. According to a study conducted by Gathecha (2016), the greater a company's reliance on debt, the more likely it is to experience financial distress.

Profitability is a measure of an entity ability to generate profit and value for its shareholders. It can be measured using sales-to-total-assets ratio, earnings-before-interest-and-taxes ratio to total assets among other ratios. Profitability and financial distress are inversely related (Thim *et al.* 2011). In a business, efficiency refers to how effectively assets are utilised to generate money (Wakaisuka-Isingoma, Aduda, Wainaina & Mwangi, 2016). It is measured using activity ratios. These metrics include sales turnover, working capital to sales ratio and assets turnover.

2.4 Empirical Review

Akeju, and Malomo (2017), conducted research to forecast the bankruptcy of ten firms listed on Nigerian Stock Exchange using Altman (1968) model. They found that the model

was useful in identifying ineffective listed manufacturing firms. Kipruto (2013) investigated the Altman Z's appropriateness for forecasting financial distress of Kenya's Uchumi supermarket. Kipruto employed descriptive research design. The study period was 5 years from 2001-2006. Altman (2006) revised Z"-score model was used in Kipruto research. The company Z-score values decreased from the year 2001-2005 indicating that it was experiencing financial distress just before it delisted from the NSE and went into liquidation in the year 2006. Since only one supermarket in Kenya was sampled the results could not be generalized to other supermarkets or companies in different industries in the country.

Kihooto et al. (2016) investigated financial distress among commercial & services firms registered on NSE, to assess whether these businesses were at risk of going bankrupt. The research used secondary data from NSE covering years 2009 to 2013. According to the research findings, Z" scores for the firms ranged from -1.88 to 3.5. This means that the businesses were not in risk of entering into financial distress. Odibi et al., (2019) looked into Altman's model reliability and its relationship to business failures, as well as whether all failing businesses were listed on the Practice Note 17/2005 of KLSE, presently referred to as Bursa Malaysia. The authors sampled 34 publicly traded manufacturing companies in Malaysia, including both bankrupt and financially stable businesses for the period 2010–2014. They determined that there is a good match between the data and the model. Furthermore, Z-score model revealed that four out of five financial parameters were strongly connected in predicting company failure.

Colak (2019) utilized Altman Z score model to assess financial health of BIST-listed corporations by generating a composite index score that integrates multiple business financial ratios. The sample consisted of 54 Turkish firms (27 distressed and 27 non-distressed) listed on BIST, and the population consisted of 361 listed firms operating on BIST between 2001 and 2017. The study found that the original Altman Z scores had a 79 percent accuracy rate, whereas the customized Altman Z-score had a predictive power of around 89 percent. It is worth noting, however, that the study excludes factors such as rating firm credit risk, impact of policies on non-financial segment and reaction of businesses to global volatility, all of which may have an impact on the Score.

Ashraf (2019) evaluated by contrasting the predictive classification power of traditional distress forecasting models for companies in Pakistan that were in the initial and late stages of distress. For the analysis, the he looked at 422 companies for the period 2001-2015. Revised Altman Z” and the probit model was effective in predicting emerging economies financial distress. Ernayani (2020) conducted a study aiming at determining and predicting future bankruptcy in coal mining businesses listed on IDX between 2012 and 2016. The study used information from coal mining companies registered on IDX between 2012 to 2016. Eleven coal mining firms were chosen as a sample using the purposive sampling method. According to Z-Score values from the coal mining companies evaluated in 2016, four companies were at risk of bankruptcy, three were in the grey region, and four were in good condition.

Karas & Srbová, (2019) undertook a study to see how well five distinct models of bankruptcy might predict the failure of construction enterprises. The research included data from 2006 to 2015. They sampled 4243 non-failed construction firms and 177 failed construction firms. For testing the models, the Receiver Operating Characteristic method was used as a way of measuring of accuracy. The model developed during this study outperformed the traditional models tested by 3.6 to 8% in terms of accuracy. Svabova (2020), conducted a study with a primary goal of developing a prediction model for medium-sized and small-scale businesses in Slovakia. The research utilized secondary information from the Amadeus database in the years 2016-2018. They developed models for predicting a company's financial distress one and two years in advance. These models employed both discriminant analysis and logistic regression techniques. The combined model's overall prediction powers were 90.6 percent, 93.8 percent and 90.4 percent.

Range (2019), researched on predicting the possibility of sugar firms in Kenya going bankrupt. The study was on 12 sugar companies. The population comprised of both private and public sugars companies. The study found that Working capital as a percentage of total assets, retained earnings as a percentage of total assets, and earnings before interest and taxes as a percentage of total assets Total Liabilities/Book Value of Equity had a statistically significant relationship Altman Z. Additionally, it was discovered that the model was be effective forecasting the possibility of bankruptcy.

2.5 Summary of Literature Review and Research Gaps

Local and international studies were looked at in this chapter and several gaps identified on the studies. Globally, research was done in developed countries, such as US, India and China whose findings cannot be applied in the Kenyan companies due to dissimilarities in governance structure, financial reporting procedures and economic conditions. Kenyan studies revealed contextual gaps since they majored on sectors like banking (Taliani, 2012; Mamo, 2011; Kariuki, 2013), supermarkets Kipruto (2013), Sacco's (Kinivo & Olweny, 2014), insurance sector (Chelunget, 2014) and Sugar companies (Range et al. 2018) whose findings cannot be applied to other sectors due to regulatory system differences. In addition, most of the above studies focused on a sector of the NSE or a specific company. These research gaps will be addressed by the study. In addition, although significant research has been conducted touching on developing countries, it's vital to re-evaluate the performance of Altman model to determine whether its previous evaluations are still valid.

2.6 Conceptual Framework

The study examined relationships between Z score ratios and likelihood of financial distress in non-financial firms listed on NSE. Financial ratios presented in figure 2.1 served as the independent variables for the study while the dependent variable was the financial distress prediction overall index (Altman Z”).

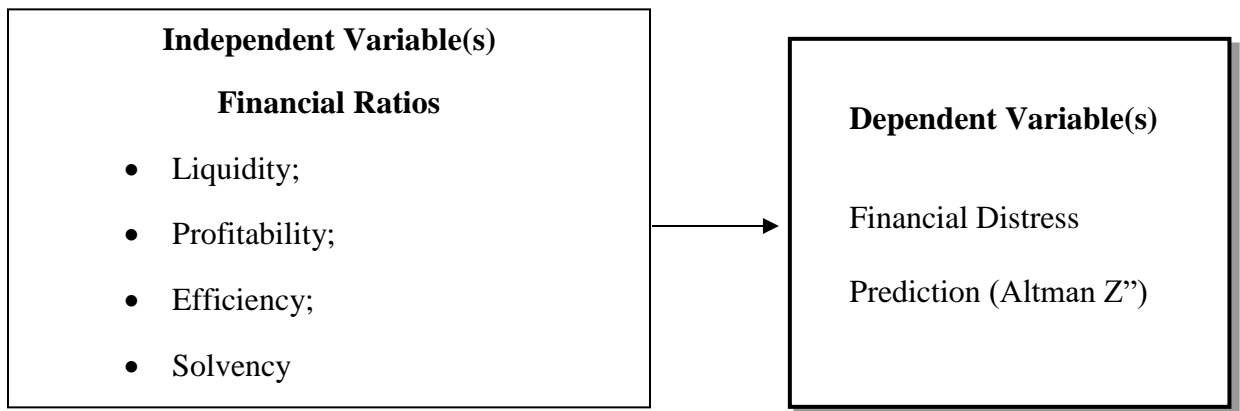


Figure 2:1 Conceptual Framework

Source: Researcher, (2022)

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter covered the following topics: research design, target population, sampling design, data collection and analysis, operationalization of study variables, diagnostic tests and test of significance.

3.2 Research Design

In this research, a descriptive study design was employed. This design was considered appropriate since it depicts the relationship and association between multiple variables within same population. Cheluget (2014) employed this design in his research on causes of financial distress in Kenyan Insurance firms. Other local studies that used this design for financial distress and related studies were Taliani (2012), Kipruto (2013), Mohamed (2013), Shisia et al., (2014), Kihotoo et al., (2016) and Range (2019). Internationally Kim, & Choi (2013) used the design to test the Model's effectiveness in forecasting bankruptcy. Other international scholars who used the design for similar studies were Kleinert (2014), Colak (2019) and Ernayani (2020).

3.3 Target Population

Since the study period was from 2016 to 2020, all non-financial organizations listed on NSE as of January 1, 2020 were included in the study population. Kenyan non-financial firms are not heavily regulated, in contrast to financial companies like insurance and banks, which are heavily regulated by IRA and CBK respectively. As a result, these entities are more vulnerable to financial distress risk than financial firms. As at 1st January, 2020, a total 66 firms had been listed on NSE (CMA Statistical bulletin 2020). Out of 66 listed firms, there were 46 non-financial firms. Distressed businesses were those that had undergone financial restructuring, receivership, suspension, or delisting from the NSE. for

the period 2016 - 2020. A census was conducted on the forty- six NSE-listed non-financial firms as at 1st January, 2020.

3.5 Data Collection

The research used accounting data derived from annual financial reports submitted by the entities on NSE, CMA and own website. Data was collected for five years spanning from 2016-2020. Because audited financial reports are made public, it was assumed that they were a true representation of the company affairs and thus assuring their authenticity and sanctity.

3.6 Data Analysis

In order to calculate financial ratios, data from firms' audited financial statements in the sample was extracted. An excel spreadsheet was used to calculate ratios of the model and subsequently Altman Z'' . Statistics such as averages, standard deviations, and Pearson correlation coefficients were calculated using SPSS version 21. Data was then presented using descriptive data analysis techniques. Finally, actual parameter results were compared to the theoretical prediction model, the findings were then interpreted and discussed.

3.6.1 Analytical model

The study made use of Altman's Z score formula, highlighted below.

$Z'' = 6.56 X1 + 3.26 X2 + 6.72 X3 + 1.05 X4$	$Z'' < 1.10$ "distress" zone
	$Z'' > 2.60$ "Safe" zone
	$Z'' = 1.10$ to 2.60 gray area

Where:

$X1 = \text{Working Capital} / \text{Total Assets}$, $X2 = \text{Retained Earnings} / \text{Total Assets}$, $X3 = \text{Earnings before Interest Tax} / \text{Total Assets}$ $X4 = \text{Book Value of Equity} / \text{Total Liabilities}$

3.6.2 Independent Variables of the Altman Z”

The Altman Z” employs four ratios that are multiplied by the model coefficients and added together. Working Capital (WC) / Total Assets (TA) ratio depicts relationship between an entities working capital and an entity total assets. It demonstrates a corporation's ability to repay current liabilities quickly. In most cases, a rising WC/TA ratio is a good signal, and vice versa. RE/TA ratio assesses a company's ability to finance total assets through excess profits, as well as its leverage and earning capacity. A high ratio indicates good financial health and vice versa. EBIT/TA is a measure of a corporation's efficiency in generating income from its assets (Pervan, Percan & Vukoja, 2011). A lower ratio presents higher chances of bankruptcy (Range, 2019). Finally, the ratio of BVE /TL quantifies amount by which a company's assets must decrease before it becomes bankrupt. When the aforementioned ratio is low the likelihood of bankruptcy is high.

3.6.3 Operationalization of Study Variables

Z” in analytical model was study's dependent variable, and its values were used to categorize a company as either financially troubled or not. X₁₋₄ were independent variables which were expected to influence Z”. The variables have been discussed in the table below:

Table 3.6: Operationalization and Measurement of Variables

Variable	Type	Operationalization	Measurement	Source
Liquidity ratio(X ₁)	Independent	<ul style="list-style-type: none"> • Working Capital • Total Assets 	(CA-CL) / TA	Altman(1993)
Solvency ratio(X ₂)	Independent	<ul style="list-style-type: none"> • Retained Earnings • Total Assets 	RE/TA	
Profitability ratio(X ₃)	Independent	<ul style="list-style-type: none"> • Earnings Before Interest Tax • Total Assets 	EBIT / TA	
Leverage ratio(X ₄)	Independent	<ul style="list-style-type: none"> • Book Value of Equity • Total Liabilities 	BVE/ TL	

CHAPTER FOUR: DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

The chapter discusses data analysis, presentation, interpretation, and discussion in accordance with the study's goal of determining whether Revised Altman Z" can predict financial distress of non-financial entities whose stocks were publicly traded on NSE. The data will be presented using both text and non-text formats.

4.2 Descriptive Statistics of Variables

A total of forty-six companies were examined from our target population in sections 3.3 and using sampling criteria discussed in section 3.4. The analysis excluded 20 companies listed in the NSE that were classified as financial companies. Means and standard deviations of X1-4 and dependent variable Z" were calculated and presented in table format in this section using SPSS version 21.

Table 4.1: Descriptive Statistics of Variables for Listed Non-Financial Companies

Variable/Category	Mean		Standard deviation	
	Distressed Firms	Non-Distressed firms	Distressed firms	Non-Distressed firms
X1	(0.337267816)	0.120554119	0.749119047	0.212633098
X2	(1.136099304)	0.23122407	4.106530255	0.326455126
X3	(0.306556098)	0.062962729	0.967087384	0.135371011
X4	0.128222821	3.275848789	0.482457135	6.020752792
Z	(7.841583622)	5.407376255	24.3799308	7.159258986

Where: X1 – Ratio of Working Capital to Total Assets

X2 - Ratio of Retained Earnings to Total Assets

X3 - Ratio of Earnings Before Interest Tax to Total Assets

X4 – Ratio of Book Value of Equity to Total Liabilities

Z - Altman score

Table 4.1 above shows that means of the retained earnings divided by total assets, working capital divided by total assets and earnings before interest and taxes divided by total assets and Altman Z” for the distressed firms were negative 0.337267816, 1.136099304, 0.306556098 and 7.841583622 respectively. The average of book value of equity divided by total liabilities was positive 0.128222821 for distressed firms. The means of the four ratios(X1-X4) and Altman Z” for non- distressed firms were positive 0.120554119, 0.23122407, 0.062962729, 3.275848789 and 5.407376255 respectively.

The standard deviations of WC/ TA, RE / TA, EBIT / TA, BVE / TL and Altman Z” for distressed firms was positive 0.749119047, 4.106530255, 0.967087384, 0.482457135 and 24.3799308 respectively. The standard deviations of WC/ TA, RE / TA, EBIT / TA, BVE / TL and Altman Z” for non-distressed firms were positive 0.212633098, 0.326455126, 0.135371011, 6.020752792 and 7.159258986 respectively. The distressed firms had a lower mean and higher standard deviation than non- distressed ones.

4.3 Correlation Analysis for Non- Distressed and Distressed Firms

Pearson correlation analysis was used in the study to measure the degree to which the financial distress (Z) and BVE / TL, RE / TA, EBIT / TA, WC/ TA are linearly connected. The model ratios were calculated, examined, and their correlation with the dependent variable for the years 2016 to 2020 established using Pearson correlation coefficient (R). R near +1 denotes a robustly positive association between the dependent and independent variables whereas R close to -1 indicates a weak negative correlation. A correlation value of 0 depicts no relationship between the variables (Wang, 2012).

4.3.1 Correlation Analysis for Distressed Firms

The Pearson correlation coefficients (R) for the ten firms classified as distressed were calculated to determine impact of EBIT / TA, BVE / TL, WC/ TA, RE / TA on value of Z".

Table: 4.2: Pearson Correlation Analysis for Distressed Firms

Factors		Value
X1	Pearson Correlation	.900**
	Sig. (2-tailed)	<.001
	N	34
X2	Pearson Correlation	.994**
	Sig. (2-tailed)	<.001
	N	34
X3	Pearson Correlation	.982**
	Sig. (2-tailed)	0.02
	N	34
X4	Pearson Correlation	.530**
	Sig. (2-tailed)	<.001
	N	34
Z	Pearson Correlation	1
	Sig. (2-tailed)	
	N	34

** . Correlation is significant at the 0.01 level (2-tailed).

According to table 4.2 above, the ratios RE/TA, WC/TA and EBIT/TA have a very high positive association with Altman Z" -score for distressed firms. The Pearson Correlation Coefficients were 0.982 0.900 and 0.994 and respectively. The Person Correlation between BVE/TL and z-score is 0.530, indicating a moderate positive linear association. The relation between the factors and the z-score were significant at 0.01 level of significance.

4.3.2 Correlation Analysis for Non -Distressed Firms

The Pearson correlation coefficients (R) for the thirty-six firms classified as non- distressed were calculated to determine impact of RE / TA, EBIT / TA, WC/ TA, BVE / TL on value of Z”.

Table: 4.3: Pearson Correlation Analysis for Non -Distressed Firms

Factors		Value
X1	Pearson Correlation	.484**
	Sig. (2-tailed)	<.001
	N	177
X2	Pearson Correlation	.330**
	Sig. (2-tailed)	<.001
	N	177
X3	Pearson Correlation	.175*
	Sig. (2-tailed)	0.02
	N	177
X4	Pearson Correlation	.945**
	Sig. (2-tailed)	<.001
	N	177
Z	Pearson Correlation	1
	Sig. (2-tailed)	
	N	177

** . Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Results on table 4.3 revealed that for non-distressed firms’ Z-score is weakly positively correlated with WC/ TA, RE / TA and EBIT / TA .They had Person Correlation coefficients of 0.484, 0.330 and 0.175 respectively while BVE / TL had a strong positive relationship with z-score with a Person Correlation of 0.945. The relation between the factors and z-score were significant at both 0.01 and 0.05 level of significance.

4.4 Altman Z” Model Prediction Accuracy Results

Table 4. 4: Matrix for Revised Altman Z” (1993) Prediction Accuracy Results

Predicted		Distressed	Non-Distressed	Total
Actual	Distressed	10(100%)	0(0%)	10
	Non-Distressed	7(19.4%)	29(80.6%)	36
		17	29	46
Total revised Altman Z-score performance				84.8%

The study's findings indicate that, z-scores of the ten corporations which according to NSE, 2021 were in financial distress between 2016-2020 were less than 1.1, indicating that the model correctly predicted that they were in financial distress. Seven of the thirty-six companies classified as financially healthy by the market had scores less than 1.1, implying that they were having financial difficulties and were thus classified incorrectly by the market as such. The model had an accuracy of 100 percent for firms classified as distressed and 80.6 percent for those classified as not distressed. Overall, the model correctly categorized 39 out of 46 companies, resulting in an 84.8 percent accuracy rate.

4.5 Discussion of Findings

According to table 4.1 means of retained earnings to total assets ,working capital divided by total assets, earnings before interest and taxes divided by total assets and Altman Z" under the failed firm's category was negative while that of Book Value of Equity divided by Total Liabilities was positive. In contrast, all ratios for the firm categorized as not to having failed were positive. The means of firms that had not failed were higher than those, which had failed. These findings are consistent with (Odipi, Basit & Hassan 2015) who in their study on predicting bankruptcy on listed manufacturing firms in Malaysia found out that the means of firms considered to be failed were lower than those of firms that had not been categorized as failed.

Results on table 4.2 and 4.3 revealed that for failed firms' ratios WC/ TA, RE / TA and EBIT / TA had a very strong positive relationship with the Z –score unlike those that had not been categorized as failed entities which depicted a weak positive relationship. The ratio BVE / TL had a moderate positive linear relationship with the z-score for firms categorized as failed whereas the same ration had strong positive linear relationship with the z-score for firms categorized as not having failed. The relation between the factors and the z-score for both entities that had failed and those which had not were significant. These findings concur with (Cindik & Armutlulu 2021) who found the four variables of revised Altman Z-score had significantly contributed to the model. Range (2019) in his research on financial distress on Kenya sugar industry found that the four ratios were significant in bankruptcy prediction.

The variables WC/ TA, RE / TA, EBIT / TA and BVE / TL have a positive significant effect on value of Altman Z" score. Therefore, if one of the variables increases by one unit, the Z" value increases while a decrease causes the value to fall. Waston and Head (2010) proposed the hypothesis that sufficient working capital is vital not just for the immediate success of a business, but also for its continued existence in the long run. It was also congruent with a hypothesis by Loncan and Caldeira (2014), which held that the more gearing a company has, much less liquid it is, and thus the greater the likelihood of

bankruptcy. In addition, according to according to (Stewart, Saunders & Cornett, 2011) high levels of gearing enhance the risk of insolvency by cutting into profits, cash flow, and net assets.

According to table 4.4 the model had an accuracy rate of 100% for firms classified as distressed and 80.6% for those classified as not distressed. Overall, the model correctly categorized 39 out of 46 companies as either financially distressed or not, resulting in an 84.8 % overall accuracy rate. The study results were consisted with Sitati and Odipo (2015) who found out the Edward Altman model was successful in predicting financial distress. Altman (2000) also found the Altman Z-score as having an accuracy of between 80-90% which is in line with the study finding.

CHAPTER FIVE: SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This section provides a concise summary of this study's findings and draws any necessary conclusions and recommendations. It also gives a suggestion of the areas for futures research.

5.2 Summary of the Findings

The research goal was to determine applicability of Revised Altman Z" (1993) in forecasting financial distress for non-financial firms listed on NSE. Altman z- scores for the selected sample were calculated using the four ratios of the model. The model was effective in categorizing the non-financial companies into either financially distressed or not category. Ten out of ten companies which according to NSE and CMA were in financial distress during the period 2016 to 2020 were correctly predicted by this model. Twenty-nine of the thirty-six firms that were considered to be financially healthy were correctly predicted as so by the model while seven were incorrectly classified. The model had an accuracy rate of 100% for firms classified as distressed and 80.6% for those classified as not distressed. Overall, the model correctly categorized 39 out of 46 companies as either financially distressed or not, resulting in an 84.8 % overall accuracy rate.

In addition, earnings before interest and taxes to total assets, working capital to total assets, retained profits to total assets and book value of equity to total liabilities ratios for listed non- financial firms had a positive and statistically significant relationship with Altman Z" (1993). Discriminant coefficients of these ratios were positive, indicating that increasing the ratio would raise Altman Z" score and decrease the probability of a listed non-financial enterprise from falling into financial distress and vice versa. Finally, the study revealed that distressed firms had negative means for the ratios of working capital/ total assets, retained earnings to total assets, earnings before interest and taxes to total assets while that of non- distressed firms was positive. The negative values reduce value of Z" increasing

likelihood of financial distress while positive value for non-distressed ones increase financial stability of the firms. The assertions of this study supports the cash management, gamblers ruin, credit risk and entropy theories.

5.3 Conclusions

The study main goal was to assess efficacy of revised Altman Z" (1993) in forecasting financial distress for non-financial entities listed on NSE. The revised Altman Z" (1993) was successful in forecasting financial distress for both financially distress non-financial firms and non-distressed companies. The research also revealed that Working Capital to Total Assets ratio had a positive and statistically significant effect in forecasting financial distress. This implies, for instance increase in one of the ratios results in increase in the Z-scores and therefore decreasing the likelihood of a firm falling into financial distress and vice versa. For example, low working capital/ total assets reduce the value of the score increasing the likelihood of financial distress while high value for non-distressed ones increase financial stability of the firms.

Retained Earnings to Total Assets had a positive and statistically significant influence on forecasting financial distress. The ratio was significant in differentiating between financially troubled companies from those in good financial standing. Earnings before interest and taxes divided by total assets and shareholders' equity to total liabilities portrayed a positive and statistically significant impact in forecasting financial distress. Low operating profit reduce value of Altman Z" score increasing the likelihood of financial distress while higher value for the non-distressed ones increase financial stability of such entities. In addition, the study found that companies with a higher shareholders equity and a lower liabilities were less likely to be in financial trouble than those with a lower book value of equity and a higher value of liabilities. These findings support the cash management, gamblers ruin, and credit risk and entropy theory.

5.4 Recommendations

This study recommends employing revised 1993 Altman Z" to detect financial distress in non-financial companies early, to ensure that corrective actions are taken in a timely

manner. Further, the study suggests that the model be used by creditors when evaluating a firm's creditworthiness. Investors should also employ the model when predicting an entity financial stability before investing. Kenyan non-financial firm managers ought to come up with a working capital management policy that will ensure that current liabilities are kept below current assets at all times.

Non-financial companies' management should focus on increasing operational efficiency and lowering sales costs and operational costs, which will increase their EBIT. The management of the listed non-financial companies should benchmark with other similar companies in both developed and developing countries to improve their operational efficiency. The research also recommends prudent borrowing and liability management. They should embrace the pecking order theory whereby they give preference to internal financing over external financing. The management should also make better investments which results in higher profits/returns and subsequently increase reserves which results in increases book value of equity. The highlighted recommendation will decrease possibility of getting into financial distress and eventual insolvency/bankruptcy.

5.6 Suggestion for Future Studies

In the study, non-financial firms listed on NSE for fiscal years 2016–2020 were evaluated. The study broadens our understanding of the subject by expanding discussion on use of Revised Altman Z'' -Score model both in developed and developing countries. The research also expands on existing theories and empirical studies on financial distress by providing valuable information on the subject in regard to the Kenyan context. Further research can be done on the effects of catastrophes and exogenous factors such as political instability and epidemics such as Covid-19 on financial distress for listed entities. Research may be repeated in the coming years to include additional years not included in the current research.

Further research is also desirable to examine the role of regulatory bodies, particularly those concerned with financial reporting such as CMA, as more companies, such as

Kenya's Uchumi Supermarket, have been involved in creative accounting. Finally, unlike in the current research which focused on publicly traded non-financial firms, future research can be conducted on non-listed financial companies. Future researchers can also study the effect of macroeconomic determinants of financial distress like Inflation, interest rates, foreign exchange currency, government policy, political stability and GDP growth.

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APPENDICES

Appendix 1: Data Collection Sheet

Year/Variable	2016	2017	2018	2019	2020
WC(CA-CL)					
TA					
RE					
EBIT					
BVE					
TL					
Sales					

Appendix 2: Computed Z-Scores for Listed Non-Financial Companies

No	Company	2016	2017	2018	2019	2020	Average	Status
1.	Athi River Mining Cement Ltd	0.5	(2.2)	n/a	n/a	n/a	(0.8)	FD
2.	B.O.C Kenya Ltd	7.8	6.6	6.5	6.7	8.3	7.2	NFD
3.	Bamburi Cement Ltd	8.0	4.8	3.5	3.8	4.5	4.9	NFD
4.	BAT(K) Ltd	5.9	5.7	5.2	3.4	5.1	5.1	NFD
5.	Car&General (K) Ltd	1.7	1.7	1.8	1.1	1.3	1.5	GA
6.	Carbacid Investments	12.4	13.2	14.9	13.5	14.0	13.6	NFD
7.	Centum Investments	3.7	2.6	2.5	2.3	2.5	2.7	NFD
8.	Crown Paints Kenya	2.4	2.6	1.4	1.8	3.3	2.3	GA
9.	Deacons (EastAfrica)	2.0	(5.1)	n/a	n/a	n/a	(1.6)	FD
10.	E.A. Cables Ltd	(0.8)	(1.6)	(3.7)	0.9	(0.8)	(1.2)	FD
11.	E.A. Portland Ltd	4.1	2.1	4.3	1.0	(0.2)	2.2	GA
12.	Eaagads Limited	11.4	13.6	10.6	10.8	7.7	10.8	NFD
13.	East African Breweries	1.6	2.3	1.3	1.9	1.1	1.7	GA
14.	Eveready East Africa	(3.6)	7.5	3.3	(1.9)	(4.1)	0.2	FD
15.	Express Kenya Ltd	(4.4)	(6.2)	(7.1)	(4.3)	(0.6)	(4.5)	FD
16.	Flame Tree Group Ltd	4.5	3.0	2.4	2.5	2.6	3.0	NFD
17.	Home Africa Ltd	(2.8)	(3.0)	(4.1)	(6.3)	(6.2)	(4.5)	FD
18.	Kakuzi Limited	8.8	8.5	9.2	10.3	10.1	9.4	NFD
19.	Kapchorua Tea Ltd	7.0	5.9	6.5	6.2	7.1	6.6	NFD
20.	KenGen Co. Ltd	1.7	2.0	2.1	2.1	2.5	2.1	GA
21.	KenolKobil Ltd	3.5	4.4	n/a	n/a	n/a	4.0	NFD
22.	Kenya Airways Ltd	(3.7)	(3.5)	(6.5)	(2.9)	(5.8)	(4.5)	FD
23.	Kenya Orchards Ltd	0.6	1.0	2.3	2.7	1.5	1.6	GA
24.	KPLC Ltd	1.0	0.7	(0.2)	(0.7)	(0.9)	(0.02)	FD
25.	Kurwitu Ventures	(0.6)	(0.4)	(0.9)	(0.8)	(0.4)	(0.6)	FD
26.	Limuru Tea Co. Ltd	0.6	1.0	2.3	2.7	1.5	1.6	GA
27.	Longhorn Kenya Ltd	3.9	3.8	3.2	3.3	0.1	2.9	NFD
28.	Marshall East Africa	(0.6)	n/a	n/a	n/a	n/a	(0.6)	FD
29.	Mumias Sugar Co.	(3.5)	(7.5)	n/a	n/a	n/a	(5.5)	FD
30.	Nairobi Business Ventures Ltd	4.5	1.8	(7.6)	(9.1)	(143.3)	(30.7)	FD
31.	NSE Ltd	17.5	26.9	22.8	17.8	23.6	21.7	NFD
32.	Nation Media Group	7.6	7.3	7.2	6.4	6.1	6.9	NFD
33.	Olympia Capital Ltd	5.0	5.6	5.1	5.1	4.7	5.1	NFD
34.	Safaricom PLC	6.3	5.1	7.0	7.5	6.4	6.5	NFD
35.	Sameer Africa PLC	1.9	3.9	(0.7)	(5.5)	(1.5)	(0.4)	FD
36.	Sasini Ltd	9.1	8.2	8.8	8.5	10.0	8.9	NFD
37.	Standard Group PLC	2.8	0.7	1.9	(1.1)	(2.0)	0.5	FD

38.	Stanlib Fahari I-Reit	31.4	42.9	31.5	35.3	37.6	35.7	NFD
39.	Total Kenya Ltd	4.3	4.8	4.9	5.9	5.9	5.2	NFD
40.	TPS Eastern Africa Ltd	2.4	1.8	0.7	1.4	0.5	1.4	GA
41.	Trans-Century Ltd	2.5	(4.1)	(6.3)	(8.7)	-	(4.2)	FD
42.	Uchumi Supermarket	(13.6)	(17.9)	n/a	n/a	n/a	(15.8)	FD
43.	Umeme Ltd	1.4	0.4	0.6	1.3	0.2	0.8	FD
44.	Unga Group Ltd	5.9	4.1	5.6	5.0	3.8	4.9	NFD
45.	Williamson Tea(K) Ltd	7.7	6.2	6.8	6.8	7.1	6.9	NFD
46.	WPP Scan group Ltd	5.3	5.2	4.3	3.8	3.8	4.5	NFD

Appendix 3: Computed Z-Scores for not distressed Listed Non-Financial Companies

No	Company	2016	2017	2018	2019	2020	Average	Status
1.	B.O.C Kenya Ltd	7.8	6.6	6.5	6.7	8.3	7.2	NFD
2.	Bamburi Cement Ltd	8.0	4.8	3.5	3.8	4.5	4.9	NFD
3.	BAT Kenya Ltd	5.9	5.7	5.2	3.4	5.1	5.1	NFD
4.	Car & General Ltd	1.7	1.7	1.8	1.1	1.3	1.5	GA
5.	Carbacid Investments	12.4	13.2	14.9	13.5	14.0	13.6	NFD
6.	Centum Investment	3.7	2.6	2.5	2.3	2.5	2.7	NFD
7.	Crown Paints Kenya	2.4	2.6	1.4	1.8	3.3	2.3	GA
8.	E.A. Portland Ltd	4.1	2.1	4.3	1.0	(0.2)	2.2	GA
9.	Eaagads Limited	11.4	13.6	10.6	10.8	7.7	10.8	NFD
10.	East African Breweries	1.6	2.3	1.3	1.9	1.1	1.7	GA
11.	Eveready East Africa	(3.6)	7.5	3.3	(1.9)	(4.1)	0.2	FD
12.	Flame Tree Group Ltd	4.5	3.0	2.4	2.5	2.6	3.0	NFD
13.	Home Africa Ltd	(2.8)	(3.0)	(4.1)	(6.3)	(6.2)	(4.5)	FD
14.	Kakuzi Limited	8.8	8.5	9.2	10.3	10.1	9.4	NFD
15.	Kapchorua Tea Ltd	7.0	5.9	6.5	6.2	7.1	6.6	NFD
16.	KenGen Co. Ltd	1.7	2.0	2.1	2.1	2.5	2.1	GA
17.	KenolKobil Ltd	3.5	4.4	n/a	n/a	n/a	4.0	NFD
18.	Kenya Orchards Ltd	0.6	1.0	2.3	2.7	1.5	1.6	GA
19.	KPLC Ltd	1.0	0.7	(0.2)	(0.7)	(0.9)	(0.02)	FD
20.	Kurwitu Ventures	(0.6)	(0.4)	(0.9)	(0.8)	(0.4)	(0.6)	FD
21.	Limuru Tea Co. Ltd	0.6	1.0	2.3	2.7	1.5	1.6	GA
22.	Longhorn Kenya Ltd	3.9	3.8	3.2	3.3	0.1	2.9	NFD
23.	NSE Ltd	17.5	26.9	22.8	17.8	23.6	21.7	NFD
24.	Nation Media Group	7.6	7.3	7.2	6.4	6.1	6.9	NFD
25.	Olympia Capital Ltd	5.0	5.6	5.1	5.1	4.7	5.1	NFD
26.	Safaricom PLC	6.3	5.1	7.0	7.5	6.4	6.5	NFD
27.	Sameer Africa PLC	1.9	3.9	(0.7)	(5.5)	(1.5)	(0.4)	FD
28.	Sasini Ltd	9.1	8.2	8.8	8.5	10.0	8.9	NFD
29.	Standard Group PLC	2.8	0.7	1.9	(1.1)	(2.0)	0.5	FD
30.	Stanlib Fahari I-Reit Ltd	31.4	42.9	31.5	35.3	37.6	35.7	NFD
31.	Total Kenya Ltd	4.3	4.8	4.9	5.9	5.9	5.2	NFD
32.	TPS Eastern Africa Ltd	2.4	1.8	0.7	1.4	0.5	1.4	GA
33.	Umeme Ltd	1.4	0.4	0.6	1.3	0.2	0.8	FD
34.	Unga Group Ltd	5.9	4.1	5.6	5.0	3.8	4.9	NFD
35.	Williamson Tea (K) Ltd	7.7	6.2	6.8	6.8	7.1	6.9	NFD
36.	WPP Scan group Ltd	5.3	5.2	4.3	3.8	3.8	4.5	NFD

Appendix 4: Computed Z-Scores for distressed Listed Non-Financial Companies

No	Company	2016	2017	2018	2019	2020	Average
1.	Nairobi Business Ventures Ltd	4.5	1.8	- 7.6	- 9.1	- 143.3	-30.7
2.	Uchumi Supermarket Limited	- 13.6	- 17.9	-	-	-	-6.3
3.	Mumias Sugar Company	- 3.5	- 7.5	-	-	-	-2.2
4.	Trans-Century Ltd	2.5	- 4.1	- 6.3	- 8.7	- 6.5	- 4.6
5.	Express Kenya Ltd	-4.4	- 6.2	- 7.1	- 4.3	- 0.6	-4.5
6.	Kenya Airways Ltd	- 3.7	- 3.5	- 6.5	-2.9	- 5.8	- 4.5
7.	Deacons (East Africa)	2.0	- 5.1	-	-	-	-0.6
8.	E.A. Cables Ltd	- 0.8	- 1.6	-3.7	0.9	- 0.8	-1.2
9.	Athi River Mining Cement Ltd	0.5	-2.2	-	-	-	- 0.3
10.	Marshall East Africa Limited	- 0.6	2.8	-	-	-	0.4