Assessing the Validity of the Altman's Z-score Models as Predictors of Financial Distress in Companies Listed on the Nairobi Securities Exchange, Kenya (A Case Study)

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Abstract

Corporate failures, insolvency and financial distresses are common phenomena across the world. Mega and small companies are closing down or experiencing operational challenges in both the developing and developed economies. Owing to the desire to estimate these events and avoid or timely remedy their possible negative consequences, several models have been developed to predict the likelihood of corporate failures. One such model is the Altman's Z-score, which falls into three versions. This paper sought to evaluate the accuracy of these models in predicting failures of companies listed on the Nairobi Securities Exchange. Two once mega companies, Mumias Sugar Company and Kenya Airways Limited, and which are currently operating in losses were selected. The data were obtained from their annual reports for the three year period (2010-2012) before they began recording losses, and quantitative methods used to analyze them. The results indicated that, indeed, the two companies' financial performance trend was entering the distress zone. The Z-score values for the Mumias Sugar Company were 3.61, 2.29, and 1.81 in 2010, 2011 and 2012 respectively, while those of the Kenya Airways were 1.13, 1.63 and 0.82 over the same periods. This paper recommends further studies to be conducted with a focus on other sectors and with a control group included.

Keywords: Altman's Z-score models, Financial distress, Bankruptcy, Corporate failures, Nairobi Securities Exchange, Financial ratios

1. Introduction

Corporate failures or financial distress is a common phenomenon in both the developing and developed economies. Corporate failures are linked to enormous financial and nonfinancial losses (Ijaz, Hunjra, Hameed, Maqbool, & Azam, 2013). Therefore, the ability to timely predict the financial healthiness of a firm is very crucial for the concerned stakeholders, including the management, customers, lenders, creditors, shareholders, and employees among others. A business faces some kind of financial difficulties, including the inability to pay debts and other obligations, and the corresponding consequences such as the liquidation, overdraft, or applying for bankruptcy (Sun, Li, Huang, & He, 2014). The terms commonly used together with the financial distress includes the failure, bankruptcy, insolvency or default. Corporations facing difficulties maintaining their liquidity and fulfilling their credit promises are ranked as financially distressed. Generally, bankruptcy in companies may arise in three different ways: economic, financial and legal. In the case of the economic bankruptcy, the firm's revenues do not cover its costs (Al-Rawi, Kiani, & Vedd, 2008) and is the same as

the failure of trade (Karamzadeh, 2013). The financial bankruptcy signifies insolvency and arises where an entity cannot meet its obligation as they fall due, showing a weakness in finances. One indicator of financial weaknesses is the lack of working capital. The legal bankruptcy is based on how various regulations define it, but it is where a firm's total assets are less than its debt.

There are many factors that cause corporate bankruptcy and include the managerial failures, financial activities weaknesses, high production costs, ineffective sales activities, and economic conditions such as economic recession, rising inflation, changes in interest rates, and fluctuations in the raw materials (Karamzadeh, 2013). The financial distress and company failures lead to both direct and indirect costs. Ijaz, Hunjra, Hameed, Maqbool, and Azam (2013) described indirect costs as those arising when the management's attention is diverted from the running of the company to initiatives necessary to save it. On the other hand, direct costs are those related to legal expenses, accountant fees, cost of advisory services for restructuring and loss of the creditors.

Following the consequences of financial distress and corporate failures, the need and ability to accurately

predict them will save shareholders fear and losses, reduce the bankruptcy costs and contribute to a healthier and stable business environment (Sori, Hamid, Nassir, & Mohamad, 2001). Efforts have been made to predict corporate bankruptcies on the premise that the failure is a gradual process. The bankruptcy goes through various phases, and the failure comes with the passage of time (Ijaz, Hunjra, Hameed, Maqbool, & Azam, 2013). Therefore, closely monitoring the financial condition and performance of a company will give early warning signals necessary to identify and avert potential failures. One of the commonly used models is the Altman Z-Score, developed by Edward Altman, and has been termed as being around 95% and 72% accurate, one year and two years prior to bankruptcy respectively (Altman, 1968; Lifschutz & Jacobi, 2010).

1.1 Objective of the Study

This study aimed at investigating the reliability of Altman Z-Score model in predicting corporate financial distress of companies listed on the Nairobi Securities Exchange.

1.2 Scope of the Study

The study covered two listed companies which were once among the big companies in the Kenyan economy, but have since been in a financial distress condition since 2013. The period analyzed covered the three years prior to their loss making episodes. It was conducted through quantitative methods, where the collected numerical data were analyzed to form a conclusion on their performance trend and insolvency state.

1.3 Significance of the Study

The findings of this study are useful to various stakeholders. The investors will understand the value of Altman's models in predicting the perpetuity of an entity in which they want to commit their funds as investment or awaiting returns in the form of dividends or capital gains. The creditors and lenders will be using these models in analyzing companies' ability to pay them their dues. The customers will be evaluating a firm to ascertain its ability to continue providing goods and services, and the nature of involvement terms. The study will also help the policy makers, including the government and the management in taking the requisite steps to prevent failures from occurring. Finally, the study adds a wealth of knowledge to the existing literature on the use of Altman's models in predicting bankruptcy and financial distress.

2. Literature Review

2.1 Financial Reporting and Users of Financial Information

Financial reporting is the avenue through which firms communicate their economic information to the various stakeholders (Young, 2006). Al-Rawi, Kiani, and Vedd (2008) noted that the published annual reports are the most appropriate means through which an entity conveys information about its activities to the external stakeholders even where pre-announcements have been made. To make meaningful use of these annual reports, the stakeholders perform financial analysis.

Each one of these stakeholders will have varied needs from the presented reports. Shareholders need this information to assess the continuity of the firm and make decisions whether to buy, sell or hold. They perform profitability and dividend analysis to establish their investment's viability and returns (Al-Rawi, Kiani, & Vedd, 2008). The creditors are interested in establishing the ability of organization to honor its maturing short-term obligations. The long-term lenders need the information that enable them assess the company's ability to repay the loans and the accruing interest amount.

The management uses the financial reports to assess the business' efficiency in profit generation, its riskiness and safety, and its ability to realize sufficient returns for investors (FASB, 2010). Potential investors also analyze the reporting entity's financial reports so as to assess its ability to give them acceptable returns for their money. They, therefore, perform profitability analysis, dividend analysis and gearing analysis. The government is interested in information on the company's activities, allocation of resources, assess taxation, regulate the activities of a firm, and use this data for national income and economic statistics (Al-Rawi, Kiani, & Vedd, 2008). The general public including the customers are interested in the reporting firm's financial reports to determine its survival and continuance in providing them with a wide variety of services and goods.

2.2 Financial Distress, Bankruptcy and Failure Predictive Models

According to Alkhatib and Al Bzour (2011) and Chieng (2013) the modern corporate failure prediction techniques build on the work of Beaver 1966, who relied on the financial ratios selected on the basis of their popularity, predictive ability in the prior bankruptcy studies and their capability to be defined as cashflows. Yap, Yong, and Poon (2010) noted that financial ratios which include profitability, liquidity, activity, and leverage ratios were useful in appraising the firm's performance and thus, its future prospect of success. The ratios computed include the cashflows to debt ratio, net income to gross assets, total debt to gross assets, working capital to total assets with their accuracy being in the same order (Chieng, 2013). However, the work of Beaver was on a univariate model, where only one ratio was used at a time. The use of a single ratio could not capture the complexity of an entity, and it was, therefore deemed inappropriate.

To address these limitations Altman 1968 developed a multi-discriminant analysis model using a combination of

ratios with the highest prediction. The model targeted on forecasting the manufacturing corporate failures, and the companies are grouped as bankrupt and non-bankrupt. Altman combined five ratios to form a discriminant score known as the Z-Score. A higher value indicates financial healthiness while a lower one signifies bankruptcy. This model has become dominantly used for its simplicity and accuracy.

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

Where;

X_1 = working capital/total assets, which measures the liquid assets of an entity as a percentage of total assets because firms in trouble will have a shrinking liquidity

X_2 = retained earnings/total assets, and indicates the company's cumulative profitability and its ability to use internal financing sources. Basically, shrinking profitability is a warning sign and vice versa

X_3 = earnings before interest and taxes/total assets, which shows the earnings power of a company relative to its size

X_4 = market value of equity/ total debt, which shows the company's indebtedness and how quick its assets can be used before it becomes technically insolvent.

X_5 = annual sales /total assets, which shows company' efficiency in using its assets to generate sales

After some time, it was argued that this model was restricted to manufacturing companies only; hence its use was limited. In 1983, Altman adjusted this model by establishing new coefficients to estimate the bankruptcy in private firms (Lifschutz & Jacobi, 2010).

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

To adapt to the changing corporate landscape and other parameters, the model was further updated in 1995 to analyze the non-manufacturing firms. In this case, the new model captures only the first four variables, but the sales/total assets variable was excluded (Chieng, 2013).

$$Z = 6.56X1 + 3.26X2 + 6.72X3 + 1.05X4$$

Table 1 Critical values of Z- Score models

Score	Zone	Result
Standard Altman's Model		
Z > 2.99	Safe zone	Safe/bankruptcy is unlikely
1.81< Z < 2.99	Gray zone	Stable/bankruptcy cannot be predicted
Z < 1.81	Distress	Likely to be bankrupt
For Private Companies		
Z > 2.9		Bankruptcy is unlikely
1.23< Z < 2.9		Bankruptcy unpredictable
Z < 1.23		Bankruptcy is likely
For Non-manufacturers		
Z > 2.6		Bankruptcy is unlikely
1.10< Z < 2.6		Bankruptcy unpredictable
Z < 1.10		Bankruptcy is likely

2.3 Empirical Review

This section of the paper presents some of the studies that have been carried out to evaluate the applicability of Altman's Z-Score in predicting the corporate failures. Ilahi, Jamil, kazmi, Ilahi, and Lodhi (2015) conducted a study on the Pakistan banking sector focusing on the use of the Altman Z Score model of corporate bankruptcy. From their analysis, the Z scores showed that all commercial banks listed on the Karachi Stock Exchange had monetary troubles whereas the fact is that they were operating successfully.

Al-Rawi, Kiani, and Vedd (2008) case studied Jordan Establishment for Marketing Durable goods, an industrial firm, to predict its bankruptcy using use of the Altman equation during 2002-2004. Their findings were that the firm was financially weak with a Z score of less than 1.81. The authors noted that these results depicted the real status of this company as it was increasing its debt and would face bankruptcy in the near future. Alkhatib and Al Bzour (2011) conducted a study on the Jordanian listed companies to predict the corporate bankruptcy using Altman and Kida models. Their results indicated that the average accuracy of Altman's model in company's bankruptcy prediction over five years before the actual liquidation was 93.8%, higher than Kida's model that was 69%.

Karamzadeh (2013) conducted a study to predict the bankruptcy of companies listed on the Tehran Stock Exchange using Altman and Ohlson models during 2007 and 2010. Their findings were that the Altman's standard model's accuracy was 74.4% in the first year before the bankruptcy and 64.4% and 50% in the second and third years respectively. A study by Lifschutz and Jacobi (2010) to investigate the accuracy of the first two Altman's models in predicting financial failures of Israel listed companies between 2000 and 2007. They established that the models were able to forecast the companies' failure with a 95% and 85% accuracy rate one year and two years respectively prior to the bankruptcy.

Diakomihalis (2012) conducted a study to test the accuracy of the three versions of Altman's model in predicting the bankruptcy of the Greece hotel sector. The author tested the hotels grouped in distressed zone and established that the accuracy of the 1st model, 2nd model and the 3rd model in predicting the failure one year prior to the bankruptcy was 88.2%, 83.33% and 80% respectively.

3. Methodology

3.1 Research Design

The study adopted quantitative method, which, according to the University of Southern California (2017), it emphasizes objective measurements and the statistical, numerical or mathematical analysis of the collected data or manipulation of the pre-existing statistical data through computational techniques. The quantitative methods fit this study because it will be used in analyzing the numbers (performance of the selected companies) and establishing their relationship to the company's bankruptcy (event).

3.2 Study Population and Sample

The study population was the trading companies listed on the Nairobi Securities Exchange. The study being a case study, the paper purposely sampled Kenya Airways Limited and Mumias Sugar Company, once blue-chip and sustainable competitive companies in Kenya and Africa. These companies were making billions of net profit, but since 2013, they have been recording billions and millions of losses, calling for the government's bailout and a further injection of capital, change of the top management as well as other restructuring activities.

3.3 Data Collection

The data used in this study are purely secondary, and were obtained from the selected companies' annual and financial reports which were retrieved from their websites. This paper collected the data for the three years before the companies exhibited signs of insolvency i.e. 2010-2012.

3.4 Data Analysis

The analysis of the obtained data was guided by the Altman's models, where the 1968 and 1995 models were used for the Mumias Sugar Company, a manufacturing concern, and a commercial and services entity respectively. To obtain the variables of these models,

the ratio analysis was carried out with the help of the Microsoft Excel spreadsheet.

4. Results and Discussion

Given that the two analyzed companies operate in different sectors, a different model of Z-score was used and the results for each firm presented separately. Table 2 below shows the Z-score results for the Mumias Sugar Company, which was analyzed using $Z = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 0.999X_5$ model, which states that if the score is above 2.9, the entity is non-distressed and if below 1.81, the firm is distressed, and when the Z-score value falls between these points, then the firm is in a gray zone where the bankruptcy prediction might be difficult. The results below indicate that in 2010, the company was very healthy, in 2011 it entered the gray area, and in 2012, it got into the distressed zone. These findings indicate that the standard Z-score model would have been 100% accurate if it was used to predict the probability of Mumias Sugar Company facing financial distress by 2013. Indeed, this trend confirms Ijaz, Hunjra, Hameed, Maqbool, and Azam (2013)'s statement that failure is a process. The company became financially distressed in 2013 and started recording losses. The company is still troubled calling for the government to inject billions to bail it out.

Table 2 2010-2012 Z-score results for Mumias Sugar Company (Amount in Kshs. except for ratios)

2010	2011	2012	
6,506,885,000.00	6,511,659,000.00	7,171,360,000.00	Current assets
3,250,021,000.00	2,961,691,000.00	5,720,655,000.00	Current liabilities
3,256,864,000.00	3,549,968,000.00	1,450,705,000.00	Net working capital
18,334,110,000.00	23,176,516,000.00	27,400,113,000.00	Total assets
0.18	0.15	0.05	X_1
6,404,006,000.00	7,863,551,000.00	9,312,806,000.00	Retained earnings
18,334,110,000.00	23,176,516,000.00	27,400,113,000.00	Total assets
0.35	0.34	0.34	X_2
2,548,765,000.00	2,942,110,000.00	1,905,667,000.00	EBIT
18,334,110,000.00	23,176,516,000.00	27,400,113,000.00	Total assets
0.14	0.13	0.07	X_3
19,584,000,000.00	11,000,700,000.00	9,378,900,000.00	Market value of equity
7,334,258,000.00	12,250,477,000.00	11,676,427,000.00	Book value to total debt
2.67	0.90	0.80	X_4
15,617,738,000.00	15,795,300,000.00	15,542,686,000.00	Sales
18,334,110,000.00	23,176,516,000.00	27,400,113,000.00	Total assets
0.85	0.68	0.57	X_5
0.21	0.18	0.06	$1.2*X_1$
0.49	0.48	0.48	$1.4*X_2$
0.46	0.42	0.23	$3.3*X_3$
1.60	0.54	0.48	$0.6*X_4$
0.84	0.67	0.56	$0.99*X_5$
3.61	**2.29**	**1.81**	**Z-Score**

Table 3 2010-2012 Z-score results for Kenya Airways Limited (Amount in Kshs. except for ratios)

2010	2011	2012	
17,860,000,000.00	23,622,000,000.00	21,833,000,000.00	Current assets
20,580,000,000.00	22,214,000,000.00	23,756,000,000.00	Current liabilities
(2,720,000,000.00)	1,408,000,000.00	(1,923,000,000.00)	Net working capital
73,263,000,000.00	78,743,000,000.00	77,432,000,000.00	Total assets
(0.04)	0.02	(0.02)	X_1
14,807,000,000.00	17,662,000,000.00	17,621,000,000.00	Retained earnings
73,263,000,000.00	78,743,000,000.00	77,432,000,000.00	Total assets
0.20	0.22	0.23	X_2
1,839,000,000.00	5,815,000,000.00	1,306,000,000.00	EBIT
73,263,000,000.00	78,743,000,000.00	77,432,000,000.00	Total assets
0.03	0.07	0.02	X_3
27,673,819,250.00	15,002,487,500.00	6,467,226,150.00	Market value of equity
53,290,000,000.00	55,600,000,000.00	54,409,000,000.00	Book value to total debt
0.52	0.27	0.12	X_4
(0.24)	0.12	(0.16)	$6.56*X_1$
0.66	0.73	0.74	$1.4*X_2$
0.17	0.50	0.11	$3.3*X_3$
0.55	0.28	0.12	$0.6*X_4$
1.13	**1.63**	**0.82**	**Z-Score**

Table 3 above presents the findings of Z-score of Kenya Airways Limited as were analyzed using the model: Z = $6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4$. The rule of the thumb of this version of Altman's model is that when the score value is 1.1 or less, this is a distress area, when it is 2.6 and above this is a safe zone, and where it falls between these two points, the zone is gray. Having these exclusion criteria, it is clear that in 2010 and 2011 the Kenya Airways Limited was in a gray zone with Z-score of 1.13 and 1.63 respectively. In 2012, the score fell to 0.82, which is even below the critical value of 1.1. This value indicates that the Kenya Airways Limited was in a distressed area in 2012, and this paper found that the third Altman's model would have been accurate if it was employed to forecast the failure of this company. Since 2013, the company has been in financial distress and recording over 20 billion in losses.

Conclusion and Recommendations

The purpose of this paper was to investigate the accuracy of Altman's models in predicting corporate financial distress. It has been established that the original Altman's model can be used in Kenya to forecast the possibility of financial distress and bankruptcy in manufacturing companies. Also, the study has shown that the 1995's Altman's model has the ability to forecast the bankruptcy of Kenyan non-manufacturing firms. This study recommends that further researches be carried out with a focus on the companies from other sectors and increase the sample size. In addition, the further studies should use a control group, where both failed and non-failed firms should be included.

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