

## Using Altman's Z score (Sales/Total Assets) Ratio Model in Assessing Likelihood of Bankruptcy for Sugar Companies in Kenya

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### Abstract

The purpose of this study was the use of sales/total assets as one of the z score ratios model in predicting likelihood of bankruptcy of sugar companies in Kenya. The focus of the study was on the following public owned sugar companies: Mumias sugar, Nzoia sugar, Miwani sugar, South Nyanza Sugar Company, Muhoroni Sugar Company and Chemelil Sugar Company. And the following private owned sugar companies: West Kenya sugar, Butali Sugar Company, Kibos sugar and Allied Industries and Sukari Industries Limited. This study was prompted by continued financial difficulties in sugar companies in Kenya, and more so a few related studies have been carried out in this area in Kenya. A descriptive research design which seeks to determine and report the way things are was used to conduct the study. The population of the study comprised of the 12 sugar companies in Kenya both Public Owned and Private Owned as per Sugar Directorate year book 2016. Using purposive sampling technique all public owned sugar companies from western and south Nyanza were selected for the study and the 4 private owned sugar companies out of 6 whose secondary data were available for the study. Secondary data which was obtained from the company's financial statements which include the statement of financial position and statement of comprehensive income with the help of data collection sheets for a period of ten years period from (2007-2016) for Public owned Sugar Companies and for a period of five years from (2011 - 2015) for Private owned Sugar Companies the study was enriched with the following theories: resource dependence theory and entropy theory. The study concluded that

sales/total assets ratio does not significantly influence the likelihood of bankruptcy of sugar companies in Kenya.

**Keywords:** Likelihood of Bankruptcy, Discriminant Z Score, Sales/Total Assets ratio, Kenya Sugar Companies, Cut off Score.

### **Introduction**

Bankruptcy is the inability of a person, business or firm to repay its outstanding debt (Aliakbari, 2009). Bankruptcy happens when the company's current liabilities exceed the fair value of its current assets (Mohammed & Soon, 2012). The importance of prior diagnosis of financial failure is becoming more important in Kenya because of the increasing number of financial stressed sugar companies in Kenya (KSB Strategic Plan, 2006 – 2010). The Government of Kenya is planning to privatize the public owned sugar companies since expansion of capacity cannot take off easily under the current financial situation. Muhoroni and Miwani Sugar Companies are under receivership where Chemilil Sugar Company is struggling with immature cane supplies, as Mumias Sugar Company struggles to pay its debts, as per the Baseline study for sugar agribusiness in Kenya (2014). There is need for a model that could predict the financial failure of companies in time which would be useful for lenders, customers, stockholders, different regulators, managers, supplies employees, government and other stakeholders.

Altman (1968) moved significantly forward since he developed a multiple discriminant analysis model (MDA) called the z score ratios model with 5 ratios. This study used the sales/total assets ratio as one of the ratios of the Altman's z score ratios model to establish the use of z model ratios to predict the likelihood of bankruptcy of sugar companies in Kenya and therefore provide an early warning signal of probable failure which will enable the stakeholders to take corrective action (Fawad, Iqtidar, Shakir, & Madad, 2014). Financial Viability is also checked by shareholder in knowing whether the firm has the ability to pay off their expected rate of return. Firm's Creditors are interested in knowing the firm's debt paying ability. Firm's Performance assessment is also a matter of interest for other firms related with them. Petersen and Plenborg (2012), described financial ratio analysis as useful in evaluating a company's economic performance and financial health hence the need of this study which used sales/total assets ratio to predict likelihood of bankruptcy of sugar companies in Kenya. According to Alareeni & Branson (2013) most statistical failure prediction models have been developed for and tested in developed countries like USA and European countries). Among the most common statistical models are the Altman Z-scores. In this research we focused on the influence of sales/total assets ratio as one ratio of the Z score model ratios to predict the likelihood of bankruptcy of sugar companies in Kenya which will enable the various stakeholders to take early corrective action before the actual bankruptcy, for example salvage those that can be salvaged and liquidate those that cannot be salvaged Bragham and Daves (2010).

### **Statement of the Problem**

Companies are assumed to have perpetual life but in reality they have become bankrupt and others are financially distressed and this has made this assumption meaningless (Gibson, 2011). Most of them experience financial constraints from time to time and some of these financial constraints do result to bankruptcy (Gibson, 2011; Sormunen & Laitinen, 2012).

Financial distress refers to situations where a company faces financial difficulty. Financial distress can be evidenced by bankruptcy, insolvency and failure (Maina and Sakwa,

2012). According to Senbet and Wang, (2012), financial distress is a situation where the company's contractual obligations to creditors are not met or met with difficulties. If no proper intervention mechanisms are not put in place early, these situations can lead into liquidation (Hu, 2011), hence the need of this study. Financial distress affects many stakeholders and a lot of cash is lost as a result of financial distress, Baker (2012). According to Alareeni and Branson (2013), most statistical failure prediction models have been developed tested and used in developed countries like USA and European countries. Among the most common statistical model is the Altman z score model hence the need of this study to apply the model in developing country Kenya.

Bhatt (2012) carried a study to test the reliability of the z score model in Indian market and established that the model was a reliable tool, Alkhatib and Bzour (2011) carried out a study to establish the predictability of the z score model in the Jordanian listed companies and concluded that the model was a reliable tool for predicting bankruptcy. Uchenna and Okelue (2012), applied the z score model in Nigerian banks and concluded that the model was a reliable tool of predicting business failure in the Nigerian banking industry. Kidane (2004), used the z score model to predict financial distress in IT and service companies in South Africa listed on the Johannesburg security exchange where the model achieved 74% correct classification.

Past researchers who applied the z score model in Kenyan companies concluded that the model was appropriate in Kenyan industries. However the studies focused on other sectors for example Mamo (2011), Taliani (2010), and Kariuki (2013) carried out studies on financial distress of the banking industry in Kenya using the z score ratios model where they established that the model was appropriate in Kenyan industry with over 80% correct classification. Kinivo and Olweny (2014) carried out a study on financial performance of Kenya Sacco's using the financial statements of Sacco's from 2008-2013 and established that the model was a reliable predictor of financial distress in Kenya sacco's.

Ng'ang'a, I.K.(2006) conducted a study on financial distress of insurance company in Kenya using the z score model and concluded that the model was appropriate to Kenyan insurance companies since it yielded up to over 80% correct classification one year prior to failure. Kipruto (2013) and Shisia et al (2014) used the z score model to predict financial distress in Uchumi supermarket and the study revealed that the z score model was capable of predicting failure up to over 90% one year prior to failure.

Limited studies have been done in Kenya on the use of the z score ratios model in predicting likelihood of bankruptcy especially in the sugar industry despite the fact that the privatization commission of Kenya report (2015), indicates that the Government of Kenya seeks to privatize a significant public sector shareholding/interest in five sugar companies which included (South nyanza, Miwani, Chemelil, Muhoroni and Nzoia), this is because they believe that privatization will assist in enhancing profitability and cash flows of the sugar companies. The Kenya national assembly eleventh parliament (Third session-2015), report of the departmental committee on Agriculture, livestock and co-operatives on the crisis facing the sugar industry in Kenya agreed that one of the problem facing sugar companies in Kenya is high cost of production because on average the cost of producing a ton of sugar in Kenya was USD 870 compared to USD 350 in Malawi, USD 400 in Zambia, Swaziland and Egypt and USD 450 in Sudan and USD 300 in Brazil. Also the market price per share of Mumias sugar company which is the only public quoted sugar company in the Nairobi stock exchange has been decreasing over the 10 years of the study from kshs.29 in 2007 to kshs.1.30 in 2016 which was

an indication that the shareholders of the company have no confidence with the company. Muhoroni and Miwani sugar companies have been put under receivership, Chemelil sugar is struggling with immature canes while Nzoia and Mumias sugars are struggling to pay their debts (Sugar Directorate strategic plan,2006-2010) and Baseline study for sugar agribusiness in Kenya (2014),hence the need of this study to establish likelihood of bankruptcy of sugar companies in Kenya so that corrective actions can be taken to salvage those that can be salvaged and liquidate those that cannot be salvaged (Brigham and Daves,2010).The study by (Omete, Asakania and Amwayi,2015),on the impact of financial health and continuity of a firm: The case study of Mumias sugar company for the period (2003-2011)where the study established that the company was in grey area, the study by(Kungu,2015) on creative accounting and financial distress Using the Altman's model: The case study of Mumias sugar company for the period (2009-2013) established that the company was financially distressed and hence the need of this study which took a comprehensive view of all the public owned sugar companies and more than 50% of the private owned sugar companies in Kenya. The fact which made this study to be different from the prior studies. The results of the study of either likelihood of bankruptcy high or low will assist the various stakeholders of the companies to put mitigating factors early to salvage those sugar companies which can be salvaged and liquidate those that cannot be salvaged Brigham and Daves (2010).

Limited studies have been done in Kenya on the use of the z score ratios model in predicting likelihood of bankruptcy especially in the sugar industry despite the fact that Muhoroni and Miwani sugar companies have been put under receivership where Mumias sugar is struggling to pay its debts (Sugar Directorate strategic plan,2006-2010) and Baseline study for sugar agribusiness in Kenya (2014),hence the need of the study to establish if the likelihood of bankruptcy for these sugar companies are low or high so that mitigating factors can be put early to salvage those sugar companies which can be salvaged and liquidate those that cannot be salvaged Brigham and Daves ,(2010).

### **Objective and Hypothesis**

The general objective of the study was to model the likelihood of bankruptcy of sugar companies in Kenya using Altman's Z score ratios approach. The specific objective of the study was to determine the influence of sales/total assets ratio to predict the likelihood of bankruptcy of sugar companies in Kenya. The study achieved the above objectives by testing the null hypothesis which stated that

**H<sub>01</sub>:** The ratio (Sales / Total Assets) has no significant influence in predicting the likelihood of bankruptcy of sugar companies in Kenya?

### **Theories**

The study was supported by the following two theories.

#### **Resource Dependence Theory**

Resource dependence theory's basic assumption is that organizations survive by acquiring and maintaining resources from their environment. Brettel & Voss, (2013) argue that according to resource dependence theory an organization is subjected to external control when it depends on its external environment for a big part of its key resources such as funding. If firm cannot obtain the proper mix of resources, it will eventually fail. Resources will be considered as valuable when they enable a company to formulate and implement strategies that improves its efficiency and effectiveness (Henry, 2011).Organizations can minimize the effects of external dependencies and thus increase their likelihood of survival

by: selecting more profitable and controllable domains/niches in which to do business (Pfeffer and Salancik, 1978; Ehreth, 1987) by so doing it will increase their sales volume which will in turn increase profitability and cash flows. Companies are required to obtain resources from the external environment, however companies are required to act in such a way that will reduce or increase their reliance in the external environment, through such actions as alliances and joint ventures (Hessels & Terjesen, 2010).

In this study through effective use of the resources to generate more sales will increase profitability and retained earnings which will also be added to book value of equity and hence increase the discriminant z score and reduce the likelihood of going into bankruptcy. Resource based theory is geared towards explaining the internal sources of a company's sustained competitive advantage and hence the more the competitive advantage the less the likelihood of the company going into bankruptcy (Kraaijenbrink, Spender, & Groen, 2010). A firm's operating domains 'can play a vital role in its survival. (Schimalensee 1985), found that industry effects account for more than 75% of the variability in the company rates of return. In addition, Pfeffer and Salancik (1978), asserts that the presence of conflict in the organization's, environment "signifies a lack of ability to coordinate interdependent activities between organizations and its environment. Lack of ability to coordinate such activities mean that the likelihood that the organization can achieve desired outcomes (survival) is diminished. In this sense one could say that various organizations come into conflict over access to resources. Resource based theory puts a lot of weight on such resources that can positively contribute to achieving competitive advantage hence leading to optimal use of the resources (Barney and Clark, 2007). Competitive advantage can be defined as creating more value for the customer, increased more value than other firms operating in the same sector (Barney and Clark 2007). And when this is done it will reduce the likelihood of bankruptcy. Resource dependence theory is based on the prediction that the company will continuously scan the environment and adopt strategic responses to better manage acquisition of resources (Johnson, 2009). Internal and external resources are crucial for the company's strategic decision making, but external resources are not under the control of the company but internal resources are. Therefore the best strategies will be the combination of both resources by assessing the threats, opportunities and making the decisions according to the situations (Nemati et al, 2010). Resource dependence theory understand the influence of external factors on companies, although management can act to mitigate against environmental uncertainty and dependence (Hillman, Withers and Collins, 2009).

Companies can sometimes acquire resources under difficult situations and competition among companies is based on achieving competitive advantage in terms of effectiveness in the use of the required resources which results into acquisition of more pooled resources (Klein, McGahan, Mahoney, Pitelis, 2011) which in this study had the impact of increasing the value of the discriminant z score and hence reducing the likelihood of bankruptcy. Those companies that fail to continuously evaluate the quality, quantity and usefulness of their resources cannot effectively execute their mission, create value addition or respond to changes emerging in their environment (Fraczkiewicz-Wronka, 2011).

On the other side, the strategy of companies should be based on identifying stakeholders expectations and finding out what resources the company should acquire so that highest stakeholders value can be created (Bryson, Acermann, Eden, 2007) another source for potential conflict in inter-organizational fields may also result from dynamic or unstable environment which may change competitive conditions giving rise to temporary periods of resource scarcity and force unsuspecting firms into bankruptcy (Dess & Beard, 1984). This

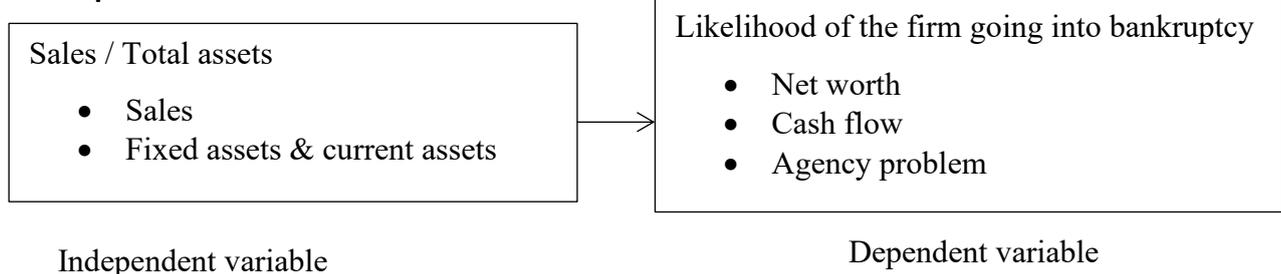
theory was important and applied to the use of sales/total assets ratio because the more the total assets the company has the more profitable the company is expected to be and the low likelihood of bankruptcy the company will be. Werner felt, (2011) used resource based theory in his journal of the use of Resources Acquisition and established that firm’s cost of acquiring a new resource and or the value it can generate with this resource depends on the resources already possessed by the firm.

**Entropy Theory**

Entropy theory is also referred to as the statement of financial position decomposition measure theory. The theory is based on the fact that it’s practical to identify the potential risks of financial distress of firm’s by carefully analyzing amount of changes in their statement of financial position (Aziz and Dar,2006).Entropy theory uses both the Univariate analysis (UA) where only one ratio is analyzed and interpreted to assess a certain situation and multiple discriminate analysis (MDA) where more than one ratios are analyzed at the same time (Slotemaker,2008) .In analyzing the changes in the structure of the statement of financial position (Balance sheet).Univariate analysis is the use of single accounting based ratio as an indication for the prediction of likelihood of bankruptcy or financial distress (Natalia,2007).The single ratio the study computed and analyzed was: Sales/Total Assets ratio and the study established that the ratio does not significantly influences likelihood of bankruptcy of sugar companies in Kenya this was because sugar companies with more sales but high cost of sales and operating costs reduced profitability and cash flows and increased their likelihood of bankruptcy.

The above ratio for the last ten years for public owned sugar companies from 2007 to 2016 and for five years from 2011 to 2015 for private owned sugar companies in Kenya were computed and the results analyzed as in figure 2 and figure 3 which the study used in order to establish the likelihood of bankruptcy of sugar companies in Kenya going into bankruptcy which was either low or high. Then the aggregated z score ratio of each company was used and the distinction of the companies by a cut-off value was used to classify sugar companies as either likelihood of bankruptcy low or likelihood of bankruptcy high (Monti and Moriano, 2010) as per table 3 below.

**Conceptual framework**



**Research methodology**

The study used both quantitative and qualitative research design because data for public owned sugar companies were collected both via questionnaires and from the company’s financial statements where the five key ratios of the Altman’s z score ratio model were computed for a period of 10 years (2007-2016) for public owned sugar companies .For private owned sugar companies the study used quantitative research design because the data

collected was financial from the company's financial statements hence quantitative in nature, the secondary data was analyzed with the help of Statistical Package for Social Sciences (SPSS). The purposive sampling technique which is a non-probability sampling was adopted by the researcher based on the researcher's knowledge on the geographical location of the sugar companies in Kenya (Freedman et al., 2007), where most of them are located in Western and Nyanza. Also the population of the study was too small (Tran and Perry, 2003), since there are 12 sugar companies in Kenya (Sugar Directorate year book, 2016). In addition, using this sampling technique only Kwale International Sugar Company Limited which operates in Kwale as a private sugar company was not selected hence the sample size of  $(n)=10$  was considered.

The target population of this study consisted of the 12 sugar companies in Kenya regulated by the Sugar Directorate. The study applied the Altman's z score ratios model in predicting the likelihood of bankruptcy of sugar companies in Kenya.

The study categorized the sugar companies in Kenya into two;

Those that are owned by the Government as public owned sugar companies which were 6 in number and those that are not owned by the Government as private owned sugar companies which were 4 in number out of the 6. For secondary data for public owned sugar companies the study used secondary data from audited financial statements from 2007 to 2016 and for private owned sugar companies from the audited financial statements from 2011 to 2015. The data was collected from the companies' websites, Sugar Directorate, Commodity Fund and personally from the sugar companies under study. The researcher collected the secondary data with the aid of data collection sheet. Likelihood of bankruptcy was adopted by the study as the dependent variable.

### **Sales/Total assets ratio and likelihood of bankruptcy**

The study sought to determine the influence of the sales/total assets ratio to predict likelihood of bankruptcy of sugar companies in Kenya. The findings of the study as indicated in figure 2 below indicates that the average sales/total assets ratio for all the public owned sugar companies in Kenya ranged between 0 to 0.7723. While the private owned sugar companies had an average range of between 0 to 0.569 of sales/total assets ratio. Which meant that public owned sugar companies are more effective in utilizing the resources they have employed in the business to generate sales because for every one unit of total assets employed it generates 0.7723 unit of sales on average, while for private the private owned sugar companies it generates 0.569 unit of sales as per figure 2 below, but despite the fact that public owned sugar companies were more effective in utilizing total assets to generate sales the study established that their likelihood of bankruptcy was on average high this was because they were not effective in controlling cost of sales and operating expenses in order to maximize profitability and cash flows. Therefore the study found this ratio insignificant in influencing likelihood of bankruptcy of sugar companies in Kenya because despite all the public owned sugar companies having more of this ratio their likelihood of bankruptcy was high compared to private owned sugar companies. The results of the findings also agrees with Kenya national assembly eleventh parliament (third session-2015), report of the departmental committee on Agriculture, livestock and co-operatives on the crisis facing the sugar industry in Kenya and established one of the problem facing Kenya sugar companies is the high cost of production.

SALES OVER TOTAL ASSETS PER COMPANY STATUS

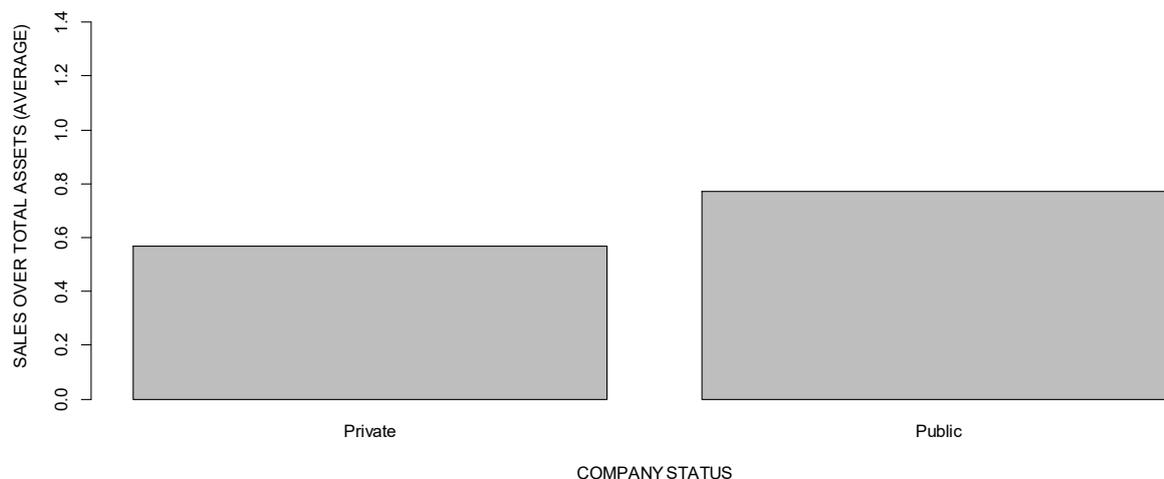


Figure 2: Sales / total assets per company status

Group

1. Private 0.5690476
2. Public 0.7723333

Table 1 below also gave the results of canonical discriminant coefficient where sales/total assets ratio had the coefficient of -0.011 which meant that the ratio was not a good discriminator in terms of predicting the likelihood of bankruptcy of sugar companies in Kenya.

Table 1

Standardized Canonical Discriminant Function Coefficients

	Function 1
Sales / total assets	-.011

Standardized Canonical Discriminant function coefficients was as shown in table 1 above. The Canonical relation is a correlation between the discriminant scores and the level of the dependent variable. A high correlation indicates a function that discriminates well. Sales/Total assets ratio which had a correlation index of -0.11 which was the lowest and also below the minimum cut off score of 0.382, an indication that the sales/total assets ratio does not discriminates well.

Table 2

Structure Matrix

	Function 1
Sales / Total Assets	-.050

Pooled within-groups correlations between discriminating variables and standardized canonical discriminant functions

Variables ordered by absolute size of correlation within function.

Table 2 above gave the output of the structure matrix of each independent variable sales/total assets ratio where the factor loading of the ratio was -0.050 which was below the minimum cut off score of 0.30 (Hair, Black & Babin, 2010 & Kothari, 2004). An indication that the ratio does not significantly influence the likelihood of bankruptcy of sugar companies in Kenya.

Table 3

*Tests of Equality of Group Means*

	Wilks' Lambda	F	df1	df2	Sig.
Sales / Total assets	.997	.205	1	79	.0452

Table 3 above gave the findings of the test of equality of the group means, where the Wilks' Lambda (which is similar to F-test) gave the value of the ratio sales/total assets to be 0.997 which was closer to 1 an indication that the ratio does not discriminate well, the P-value was also 0.0452 which was closer to 0.05, meaning that there was no significant relationship between the ratio sales/total assets and likelihood of bankruptcy of sugar companies in Kenya.

Table 4

*Canonical Discriminant Function Coefficients (z - score)*

	Function 1
Sales / Total Assets	-.016
(Constant)	-.205

Unstandardized coefficients

Table 4 gave the output of canonical discriminant function coefficient (z score) and the coefficient of sales/total assets ratio which was -0.016 which was not significant in influencing likelihood of bankruptcy of sugar companies in Kenya, an indication that for every increase by one unit of sales/total asset ratio the z score value reduces by 0.016 unit which in turn increases the likelihood of bankruptcy. These results concur with (Mbanwie & Edmond, 2009; Alman Sour, 2015) who argued that sales/total assets ratio and other turnover ratios are not significant in predicting likelihood of bankruptcy or financial distress because sales may be high, but if the company is not able to control cost of sales and operating costs still the company will experience low profits and insufficient cash flows which will increase the likelihood of bankruptcy. The results of table 4 above give the discriminant z score equation which was modelled as follows;

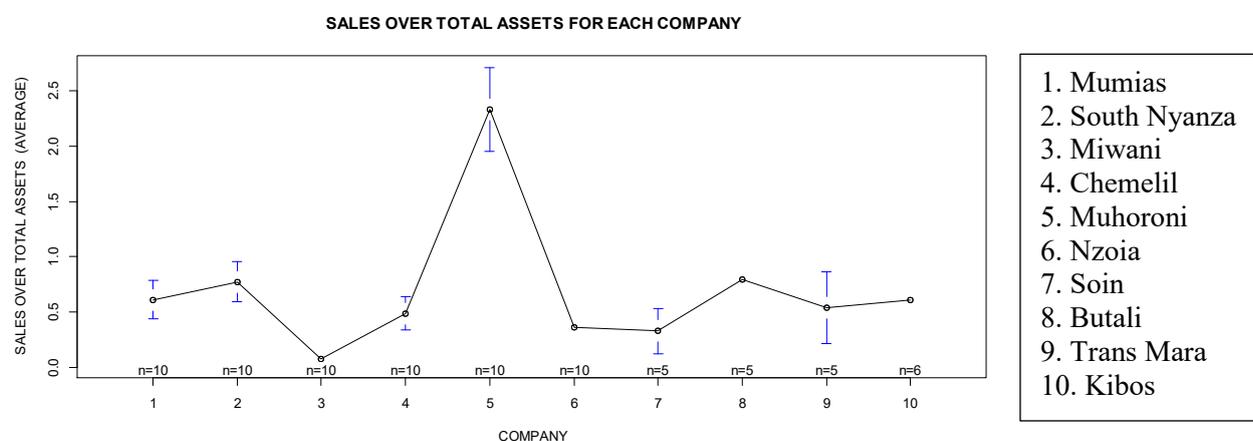
$Z = -0.205 - 0.016x_5$ , where z was the discriminant z score and  $x_5$  was the sales/total assets ratio.

**Sales/Total Assets Ratio**

Nweze (2011) states that total assets turnover measure the level of capital investment relative to the sales volume so that when level of capital investment increases, sales volume should increase. It therefore tells the firm how better it manages its overall assets. Sales

arising from the sale of goods is recognized when all of the following criteria have been satisfied as per IAS18: the significant risks and rewards of ownership are transferred, seller does not have continuing managerial involvement to the degree usually associated with ownership nor effective control over the goods sold, the amount of revenue can be measured reliably, it is probable that the economic benefits associated with the transaction will flow to the seller as well as the costs incurred or to be incurred in respect of the transaction can be measured reliably.

Ball (2013) asserts that if a company's revenue or sales are not increasing, it will make investors feel that they are disadvantaged since the company may not be able to pay its interest and capital obligations in the future and for this study this will reduce the x5 (Sales/Total Assets) ratio which will increase the likelihood of the sugar company going into bankruptcy in the next few years. According to Poghosyan and Cihak (2009), inadequate capitalization, poor asset quality and insufficient earnings are key factors contributing to financial distress of companies or increasing likelihood of bankruptcy of companies.



**Figure: 3 sales/total assets for each company**

From figure 3 above average Sales/total assets ratio for both public owned sugar companies and privately owned sugar companies were computed as shown in figure 3 above. In the public owned sugar companies Muhoroni Sugar Company has the greatest average Sales/total assets ratio of 2.328 for the 10 years period of study. This is because Muhoroni sugar company has been having a positive Sales/total assets ratio for all the ten years of the study period (2007-2016), except for the last year from 2016 when the Sales/total assets ratio was negative an indication that among the public owned sugar companies Muhoroni sugar was better within the study period in using the assets they have employed in the business to generate sales. South Nyanza was second with 0.7708, Mumias was third with 0.611, Chemelil was fourth with 0.4867, Nzoia was fifth with 0.359 and Miwani was the last with 0.0757.

The average Sales/total assets ratio for private owned sugar companies was computed and the results were as in figure 3 above. Butali sugar company had the greatest average Sales/total assets ratio of 0.795, Kibos sugar was second with 0.6065, Transmara was third with 0.537 and Soin sugar was last with 0.327. Table 4.71 gave the discriminate z score coefficient of -0.016 which meant that there was a weak negative relationship between the Sales/total assets ratio and the discriminate z score value and for every increase by one unit of Sales/total assets ratio the value of the discriminate z score reduces by 0.016 unit.

As indicated in figure 3 above, Muhoroni Sugar Company had the highest sales / total assets ratio followed by South Nyanza Sugar Company and Miwani Sugar Company was the last with the lowest sales / total assets ratio.

**Sales/Total assets and Likelihood of bankruptcy**

Bankruptcy is a situation where a company finds itself in a situation of not able to operate as a going concern, hence not able to meet its obligations when they fall due (Bhunia and Sarkar, 2011). The study used Altman's Z score ratios model to predict the likelihood of bankruptcy of sugar companies in Kenya. Data were analyzed using SPSS where discriminant analysis was used and (0) was taken as low likelihood of bankruptcy and (1) was taken as high likelihood of bankruptcy. Table 5 below gave the results of the findings of the group centroids where likelihood of bankruptcy low was 1.449 and likelihood of bankruptcy high was -0.685 and the cut off score was 0.382.

Table 5

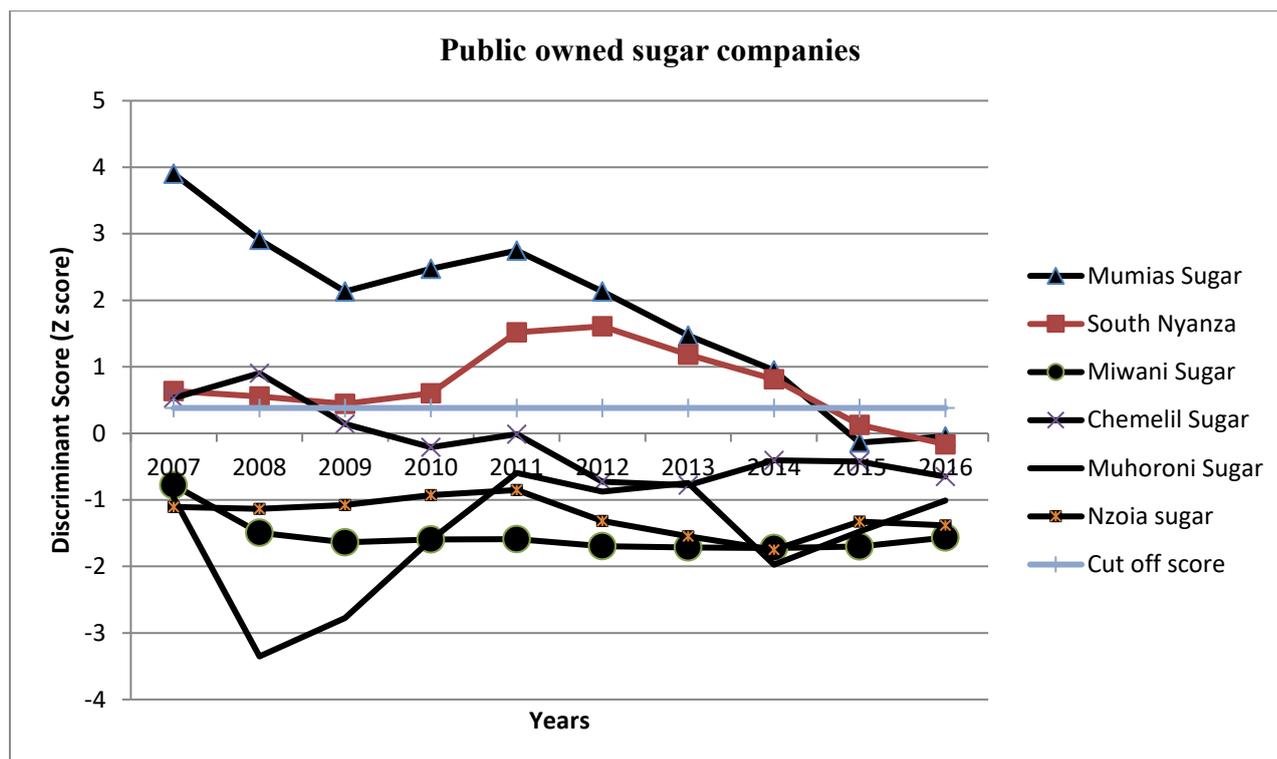
*Functions at Group Centroids*

	<b>Function 1</b>
Likelihood Of Bankruptcy	1
Bankruptcy Low	1.449
Bankruptcy High	-.685

Unstandardized canonical discriminant functions evaluated at group means

The study revealed that by removing all the independent variables from the model the value of discriminant Z score will be -0.205 an indication that the likelihood of bankruptcy will be high because the score is closer to -0.685 which is likelihood of bankruptcy high, even when the independent variable x5(sales/total assets) are included in the model as above still the value of the discriminant z score will be negative -0.221(-0.205+-.016),which is still closer to the score of -0.685.This implied that the ratio does not significantly determine the likelihood of bankruptcy of sugar companies in Kenya.

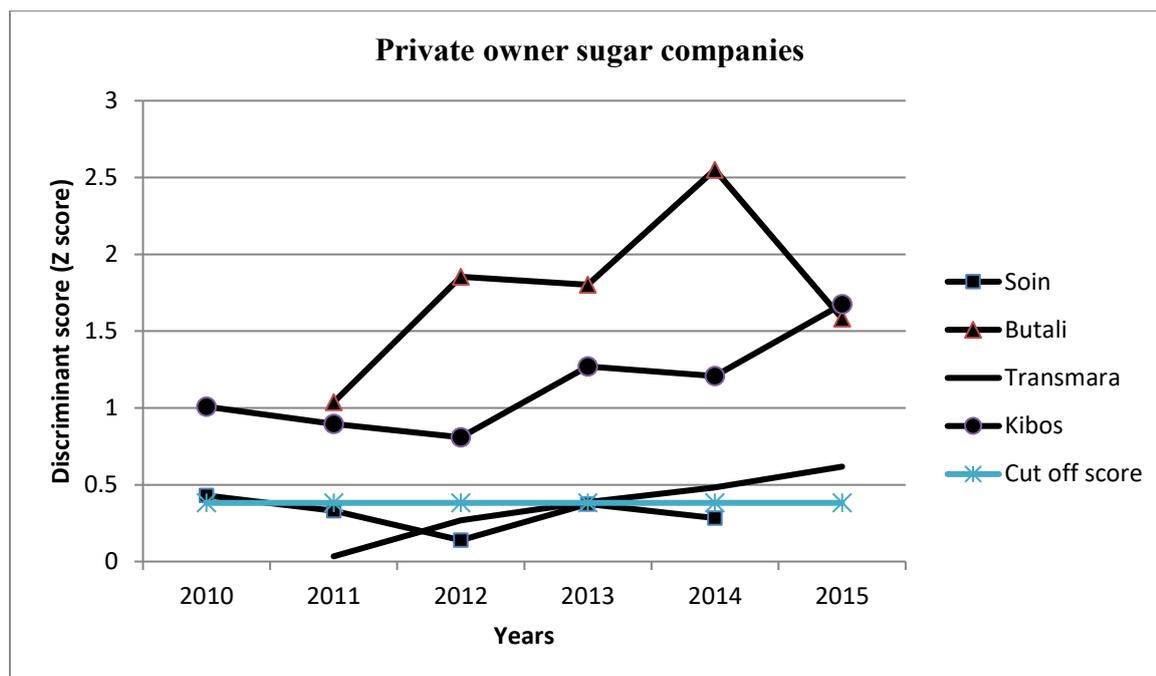
**Public owned sugar companies discriminant Z score and cut off score for the 10 years of study**



**Figure 4: Public owned sugar companies discriminate score ( Z Score)**

Figure 4 above indicated the graph of each of the public owned sugar companies and their respective discriminate score for the ten years of the study. In 2007 Mumias Sugar Company had a score of 3.903 which kept on dropping and in 2015 and 2016 the discriminant score was below the minimum cut off score of 0.382 hence the company was classified as likelihood of bankruptcy high. South Nyanza Sugar Company had a discriminant Z score of 0.638 in 2007 and the score increased up to 2013 it started a declining trend where in 2015 and 2016 the score was below the minimum cut off score of 0.382 as shown in figure 4 above, hence the study classified the company as likelihood of bankruptcy high. Miwani sugar company had a score of -0.777 in 2007 which had dropped to -1.566 in 2016, and all the years of the study the company's discriminant Z score was below the minimum cut off score of 0.382 hence was classified as likelihood of bankruptcy high for the entire period of the study. Chemelil sugar company had a discriminant Z score of 0.530 in 2007, but from 2009 to 2016 the score had been below the minimum cut off score of 0.382 as shown in the figure 4 above, hence for the last 8 years the study classified the company as likelihood of bankruptcy high. Muhoroni sugar company had a discriminant Z score of -0.968 in 2007 which had dropped to -1.010 in 2016, for the entire period of the study the score was below the minimum cut off of 0.382 hence for the entire period the likelihood of bankruptcy was high and finally in the public owned sugar company Nzoia sugar company had a discriminant Z score of -1.104 in 2007 which had dropped to -1.383 in 2016 where the entire 10 years which was the period of the study the score of the company was below the minimum thresholds of 0.382 hence the study classified the company as likelihood of bankruptcy high for the entire period.

**Private owned sugar companies discriminant Z score and cut off score for the 5-6 years of study**



**Figure 5: Private owned sugar companies discriminate score ( Z Score)**

Figure 5 above gave the private owned sugar companies in Kenya and their discriminate score over the period of the study. Soin sugar company had a score of 0.430 in 2010 which had dropped to 0.282 in 2014 when the company was liquidated as can be evidenced from the figure 5 above the discriminant Z score was above the minimum thresholds of 0.382 in 2010 only from there the score had been declining till 2014 when the company was liquidated when it had a discriminant z score of below the minimum threshold of 0.382 as shown in figure 5 above. Which implied that if the z score model was applied in each year the company would have been salvaged before actual liquidation .Butali sugar company had a score of 1.037 which had increased to 1.582 in 2015, hence for the entire period of the study the score of the company was above the minimum thresholds of 0.382 hence the study classified the company as likelihood of bankruptcy low.

Transmara Sugar Company had a score of 0.034 in 2010 which had increased to 0.638 in 2015 hence for the last three years the discriminant Z score of the company was above the minimum thresholds of 0.382 hence the company was classified as likelihood of bankruptcy low. Kibos Sugar Company had a score of 1.009 in 2010 which had increased to 1.675 in 2015 where the discriminant Z score of the company had been above the minimum thresholds of 0.382 for the entire period of the study and the study classified the company as likelihood of bankruptcy low. Therefore all the private owned sugar companies in Kenya except Soin which was liquidated in 2014, had a discriminant z score of above the cut off line of 0.382 either for the entire period of the study or for the last two years of the study hence the study classified them as likelihood of bankruptcy low.

### **Sales/total Assets Ratio**

The objective of the study was to find out the influence of the sales/total assets ratio as one of the Altman's z score ratio model in predicting likelihood of bankruptcy of sugar companies in Kenya. The study concluded that the ratio sales/total assets ratio does not significantly influence the likelihood of bankruptcy of sugar companies in Kenya. This was because although public owned sugar companies had an average sales/total assets ratio ranging from

0 to 0.77263 (figure 2), while private owned sugar companies had an average sales/total assets ratio ranging from 0 to 0.569 (figure 2). The results of the study established that despite the public owned sugar companies averagely having a higher sales/total assets ratio than the average ratio of private owned sugar companies, the study classified all the public owned sugar companies as likelihood of bankruptcy being high (figure 4), where all the six public owned sugar companies for the years 2015-2016 had a discriminant z score below the minimum cut off score of 0.382 (figure 4). While all the private owned sugar companies except Soin which was liquidated in 2014 were classified as likelihood of bankruptcy low (figure 5). This was because on average the management of the public owned sugar companies were not effective in controlling cost of sales and other operating expenses in order to maximize profitability which in turn leads to improved cash flows and hence reduce the likelihood of bankruptcy. From the findings the study concluded that the ratio sales/total assets does not significantly influence the likelihood of bankruptcy of sugar companies in Kenya but the ability of the management to control cost of sales and other operating expenses which will maximize profitability and increase the cash flows which will reduce likelihood of bankruptcy. The findings agrees with those of the Kenya national parliament (third session-2015), report of the department committee on Agriculture, livestock and co-operatives on the crisis facing the sugar industry in Kenya where it was asserted that one of the problems facing sugar companies in Kenya is the cost of production which is high.

### Testing of the Hypothesis

After data has collected and analysed, the results indicated that the public owned sugar companies status although had a higher average sales/total assets ratio of 0.7723 compared to private owned sugar companies status which had an average of 0.569, the likelihood of bankruptcy for public owned sugar company status was high because they were not effective in controlling cost of sales and other operating costs in order to maximize profitability and cash flows which in turn will reduce the likelihood of bankruptcy, standardized canonical discriminant function coefficient of the ratio of sales/total asset was -0.011 which was the lowest and also below the minimum cut off score of 0.382, the structure matrix of the ratio sales/total assets was -0.050 which was also below the minimum cut off score of 0.30, the results of the test of equality of the group means showed that the Wilks' Lambda of the ratio sales/total assets was 0.997 which was closer to 1 and the P value was 0.0452 which was almost equal to 0.05 and the canonical discriminant function coefficient (Z Score) gave the output of the score of the score of the sales/total assets ratio as -0.016 which was below the score of the constant which was -0.205 and also was the lowest score. Therefore based on this findings, the null hypothesis ( $H_0$ : the ratio sales/total assets has no significant influence in predicting the likelihood of bankruptcy of sugar companies in Kenya) was accepted at 95% confidence level, meaning that there was no significant relationship between sales/total assets ratio and likelihood of bankruptcy of sugar companies in Kenya.

### Suggestions

Based on the findings and conclusion of this study the researcher wishes to make the following suggestions to the stakeholders of sugar companies in Kenya especially public owned sugar companies;

The management of public owned sugar companies in Kenya whose study results have established the likelihood of bankruptcy being high should develop appropriate strategies of reducing the cost of sales and other operating expenses this will in turn increase profitability

and hence improving cash flows. This appropriate strategies may include among others; paying promptly to suppliers of sugar canes (farmers),so as to obtain prompt payment discounts from the suppliers hence leading to improved cash flow position of the company, reducing operating expenses by paying off their loans which will reduce the interest payments in the future and hence increasing profitability and secondly increase credibility of the company hence leading to increased access to cheap credit facilities which will also reduce the interest payments hence increasing profitability and cash flows which in turn will reduce the likelihood of bankruptcy.

The Government of Kenya through the ministry of Agriculture and relevant authorities should improve the infrastructure to those public owned sugar companies so that transportation of canes to the factories is made easy and reduce the cost of transportation. This will finally lead to increased profitability; the government through the commodity fund should also avail affordable credit facilities to sugar companies with zero rate of interest which will also assist in reducing the operating expenses and hence increase profitability and cash flows hence reducing likelihood of bankruptcy. Finally the study suggests to the management of sugar companies and other interested parties to be applying the z score model in predicting likelihood of bankruptcy of their respective companies since the study has found out that the model is reliable model of predicting bankruptcy. Finally the study suggest to future researchers;

Researchers should replicate the study to other sectors of the Kenya economy e.g. Hotel industry, airline industry, construction industry and supermarkets so as to establish which of this industries likelihood of bankruptcy is high so that corrective actions can be taken before the actual bankruptcy.

Researchers should carry out a similar study in the future using nonfinancial factors so as to establish if the same findings can be reached using the nonfinancial factors.

Researchers should also carry out a similar study in future using different periods so as to establish if the same findings can be reached.

### **Summary, Conclusions and Recommendations**

The results of the study show that sales/total assets ratio does not significantly influences the prediction of likelihood of bankruptcy of sugar companies in Kenya as measured by the discriminant z score ratios model. Also sales/total assets ratio had the lowest discriminating power skewed towards likelihood of bankruptcy high. The results also indicated that sales/total assets had no significant impact on the profitability and cash flows position of sugar companies in Kenya, but the ability of the company to control cost of sales and operating expenses which will enhance profitability and cash flows. This was revealed by the study because all the public owned sugar companies which had averagely high sales /total assets ratio had averagely low or negative earnings before interest and tax/total assets ratio, had also an average of negative retained earnings/total assets ratio and the value of their discriminant z score was low. The findings of the study show that all the public owned sugar companies had a high likelihood of going bankruptcy.

### **Conclusions**

The findings of the study lead to a conclusion that sales/total assets ratio was not a significant ratio in the prediction of likelihood of bankruptcy of sugar in Kenya since it had the lowest discriminating power skewed towards likelihood of bankruptcy high. Sugar companies in Kenya especially public owned are advised to reduce their costs of sales and other operating

expenses because by doing so it will reduce their likelihood of going bankrupt since it will improve profitability. The study concluded that the ratio sales/ total assets do not significantly influence likelihood of bankruptcy of sugar companies in Kenya. This was because although public owned sugar companies having an average ratio of between 0 to 0.7723 (figure 2) and private owned sugar companies having an average sales / total assets ratio ranging from 0 to 0.569 (figure 2) which was less than the public sugar companies by 0.2033 (0.7723 – 0.569). The study established that all the public owned sugar companies had likelihood of bankruptcy high while on the other hand all private owned sugar companies except Soin Sugar Company which was liquidated in 2014 had their likelihood of bankruptcy low which implied that likelihood of bankruptcy of sugar companies in Kenya was not significantly influenced by sales / total assets ratio, but how the various sugar companies are able to control and manage cost of sales and other operating costs in order to maximize profitability which in turn will improve cash flows position and hence reduce the likelihood of bankruptcy. Based on this conclusion the study suggests the following to management of public owned sugar companies; should minimize the cost of sales by paying promptly to suppliers of cane, so that they can obtain discounts from suppliers, reduce operating expenses by reducing their total liabilities which in turn will reduce the interest payment obligations hence increasing profitability and cash flows and finally, the government through the Ministry of Agriculture should avail affordable credits to these sugar companies so that they can be able to organize their operations. Finally the study concluded that the following public owned sugar companies (Miwani, Muhoroni, Nzoia and Chemelil) will require a complete overhaul for them to survive possibility of bankruptcy this was because for 8 out of 10 of the period of the study which was 10 years from (2007-2016) the company's likelihood of bankruptcy was high. While Mumias and South Nyanza sugar companies their likelihood of bankruptcy was high for the last two years (2015-2016), hence these two sugar companies can be salvaged if proper mitigating factors as recommended by the study below are initiated and implemented.

### **Recommendations**

Companies are required to assess their going concern ability for the benefits of all stakeholders. There are various methods both financial and nonfinancial which can be used to carry out the assessment. Altman's z score ratios model is one of the financial methods used to carry out such assessment and this study has recommended the model as a reliable assessment tool. The study has also revealed that likelihood of bankruptcy prediction is as a result of many ratios with different discriminant power. However the study established that sales/total assets ratio was not a significant ratio in the prediction of the likelihood of bankruptcy of sugar companies in Kenya. This was because even if sales are high, if the company is not able to control cost of sales and other operating expenses its profits will be low which will reduce profitability, cash flows and hence increasing likelihood of bankruptcy. The study therefore recommends management of sugar companies to use the z score ratios model and other models both financial and non-financial in predicting the likelihood of bankruptcy of their respective companies. The following benefits will accrue from the recommendations of this study if implemented.

The study will assist the management of the sugar companies in Kenya to come up with strategies of minimizing cost of sales and other operating costs in order to maximize profitability which will enhance cash flows and hence reduce likelihood of bankruptcy of sugar companies in Kenya. The study will also assist the Kenyan government through the Ministry of Agriculture and Sugar Directorate to intervene in the sugar industry and salvage those

public owned sugar companies that can be salvaged and liquidate those that cannot be salvaged. Finally the study will assist financial institutions and the commodity fund in making credit decisions about which sugar companies to give credit, how much to give and under what terms and conditions. Finally, this recommendation will assist the Kenya government to measure the big 4 agenda of 2018 and ensure whether the manufacturing sector is growing as per the big 4 agenda since sugar industry falls under manufacturing sector which is under the 4 agenda which the government intends to boost for the next five years.

### **Areas of Further Research**

Researchers should use other models of predicting likelihood of bankruptcy e.g Springate model, Zmijewski model and Ohlson's model to establish if they can derive the same results as the z score ratios model in the sugar industry in Kenya.

Researchers should replicate the study to other sectors of the Kenyan economy e.g. hotel industry, airline industry, construction industry and supermarkets so as to establish which of this industries likelihood of bankruptcy is high so that early mitigating factors can be initiated to save the industries before actual bankruptcy for the benefits of all the stakeholders of those companies.

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