

## **Analyzing Financial Health of Manufacturing Companies in Nigeria Using Multiple Discriminate Analysis**

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**Abstract:** *The study examines the usefulness of multiple discriminate analysis model in analyzing the financial health of manufacturing companies in Nigeria. The main objective of the study is to conduct a comparative study to analyze the extent of the relationship between the financial ratios and the solvency or insolvency of the manufacturing companies. Data were collected from the annual reports of the selected manufacturing companies while the analysis was conducted using ratio analysis, correlation analysis, student test and the Altman multiple discriminate analyses model for forecasting bankrupt. The finding of the study shows that there is sapient relationship between the selected financial ratios and the solvency or insolvency prediction model. The study also revealed that the Altman discriminate analysis model is able to discriminate failing from non failing companies. The study recommended that manufacturing companies in Nigeria should use the Altman discriminate analysis model to help them detect signs of bankruptcy several years before it occurs, as this lag allows time to take corrective measures.*

**Keywords:** *Altman, Financial, Health, Manufacturing Companies, Nigeria.*

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### **1. INTRODUCTION**

Pandey (2006) states that the absolute accounting figures reported in the financial statements do not provide a meaningful understanding of the performance and financial position of a company. Accounting figures conveys meaning when it is related to some other relevant information. The relationship between two accounting figures expressed mathematically is known as a financial ratio (or simply as ratio). According to Van Horne (2004), ratio analysis is one of the most important tools of financial analysis. Diverse groups of people are interested in analyzing the financial information to indicate the operating efficiency and various aspects of the company's financial position. Some groups use accounting ratios to determine the particular financial characteristics of the company in which they are interested to analyze. Financial ratios if properly computed can be used in comparative analysis such as cross sectional analysis, time series analysis, as well as providing stoppages in accounting gimmickry as practiced by unscrupulous management with unwholesome accountants in connivance.

Pasanna (2004) noted that if properly analyzed and interpreted, financial statement can provide valuable insight into a company's financial performance. Ratio analysis of a company's financial statement is of interest to a number of parties, especially current and prospective shareholders (investors), creditors and the company's own management. The nature of analysis will differ depending on the purpose of the analyst. Ratio analysis may be done for a variety of purpose, which may range from simple analysis of the short-term liquidity position of the company to a comprehensive assessment of the strengths and weaknesses of the company in various areas. It is helpful in assessing corporate excellence, judging credit worthiness, forecasting bond ratings evaluating intrinsic value of equity shares, predicting corporate bankruptcy and assessing market risk.

Studies (Beaver, 1968; Altman, 1993 & George, 1986) have shown that financial ratios have predictive power. A number of empirical studies have been undertaken that test the predictive power of financial ratios. Beaver (1968) tested the ability of financial ratios to predict failure. He discovered that ratio analysis can help to predict failure at least five years before it occurs. Altman (1993) also used financial ratios to predict corporate bankruptcy through the use of multiple discriminate analyses (MDA). George (1986) similarly established that appropriate ratios can be quite successfully employed to predict business failure before it actually occurs. The focus of this study is to examine the financial health of manufacturing companies in Nigeria using Altman's multiple Discriminate Analysis model. In view of the absence of up -to-date data, only two manufacturing companies

(GlaxoSmithKline Nig Plc and Cement Company of Northern Nigeria Plc) were studied which is a serious limitation of the study, as such the result of the study cannot be generalize to mean Nigerian Manufacturing Companies.

### **1.1. Statement of the Problem**

In a developing economy like Nigeria, businesses are faced with increasing risks if they must grow. These risks include political instability, fierce competition from foreign companies and fiscal and monetary policy instability to mention but a few. A period of growth even in established businesses can be a period of danger. The risk of failure or the risk of default or bankruptcy is the most important risk in any business. As observed by Fadel and Hentz (1994), this risk, though cannot be totally avoided, can be identified and properly managed. Signs of potential corporate failure are evident months before the actual bankruptcy materializes. Accurate prediction of declining business activities that lead to bankruptcy allows time for managers and creditors to take corrective action. It is against this background that this study examined the financial health of two companies using Altman's Multiple Discriminate Analysis Model.

### **1.2. Research Objectives**

The main objective of the study is to conduct a comparative study to analyze the extent of the relationship between the financial ratios and the solvency or insolvency of the selected manufacturing companies. The specific objectives are:

- To compare the financial strength of Glaxosmithkiline Nigeria Plc with that of the Cement Company of Northern Nigeria Plc.
- To ascertain the likelihood or otherwise of any financial distress amidst the two manufacturing companies.
- To evaluate the application of the Altman Multiple Discriminate Analysis Model in forecasting bankruptcy in both the building and the healthcare sub-sectors.

## **2. LITERATURE REVIEW**

In most treatment of financial ratio analysis the focus is normally on the important ratios used in analyzing financial performance, which ratio an analyst relies on depend upon his perception of their predictive power relative to the problem at hand, a perception based upon either subjective beliefs or empirical analysis. In helping him predict the future value of a stock for example, an investor might feel that the return on investment ratio is the most important. Most estimates of the predictive power of financial ratios are based upon the analyst's past experience with them. By their very nature, then these estimates tend to be subjective and to differ from one analyst to the next.

A number of empirical studies have been undertaken that test the predictive power of financial ratios. In one, Beaver (1968) tested the ability of financial ratios to predict failure. The study encompassed a sample of seventy nine relatively large firms that failed. For each of these companies another firm was selected that did not fail but was in the same industry and was approximately the same size as the firm that failed. The data collected for the non failed companies were for the same years as those for the failed firms. These samples were used to test the predictive ability of thirty financial ratios. The mean values of the ratios for the two samples were compared over the five year period to failure. It was found that for the non failed firms, not only were they lower but the ratios deteriorate markedly as failure approaches.

In addition to a comparison of mean values Beaver (1968) tested the samples using a form of discriminate analysis and then went onto analyze the evidence using likelihood ratios. Although not all of the financial ratios examined predict failure equally well many showed excellence predictive power. In a companion article Beaver investigated the ability to predict failure from changes in market prices of stocks. He found that the median market prices of the failed companies declined at an increasing rate as failure approached relative to that, for the non failed companies. The largest price decline occurred in the final year. Beaver concluded that investors adjust stock prices to the declining condition of ailing companies. Moreover he found the evidence to be consistent with failure on the basis of financial ratios.

In a similar type of study Altman (1968) employed multiple discriminate analyses to predict bankruptcy using various financial ratios. Altman worked with a sample of thirty three corporations

that filed for bankruptcy during the 1946 – 1965 periods. Like Beaver, he collected a paired sample of thirty three non bankrupt firms on a stratified random basis. Starting with twenty two financial ratios he selected the five that did the best combined job of predicting bankruptcy. As expected the predictive accuracy of the multiple discriminate models declined with the number of years prior to bankruptcy. However, the model was able to forecast failure quite well up to two years before bankruptcy.

Altman (1993) also test the model with secondary samples of bankrupt and non bankruptcy firms. Using the parameter estimates obtained in the original sample, he found the model have considerable predictive accuracy when used in conjunction with the secondary samples in his investigation. Altman like Beaver found that the financial ratios of bankrupt firms deteriorate as bankruptcy approached, the greatest deterioration occurring between the third and the second year. Altman concluded that through discriminate analysis a creditor can predict potential bankruptcy successfully.

Using multiple discriminate analyses, Altman produced the following function:

$$Z = 0.012X_1 + 0.014X_2 + 0.33X_3 + 0.006X_4 + 0.999X_5$$

Where

$X_1$  = working capital/total assets

$X_2$  = Retained earnings/total assets

$X_3$  = Earning before interest and taxes/total assets

$X_4$  = Market value of equity/Book value of total debt

$X_5$  = Sales/total assets

The first four ratios are all expressed as percentages and the final one is the assets turnover ratio. In ratio  $X_2$  retained earnings means the total amount of retained profit appearing in the balance sheet and ratio  $X_3$  measures the pre-tax and interest profit for the year as a percentage of total asset. Ratio  $X_4$  used the capitalization of the company (the number of shares issued multiplied by their market value) divided by the liabilities of the company excluding shareholders interest. If the five ratios are calculated for a company using the formula, Altman (1993) maintained that the z factor can be used as an indicator of the future financial health of the company. If the z factor is over 3, the firm is unlikely to go bankrupt in the coming year, if under 2; the firm is likely to have severe financial problems.

In a study similar to those of Beaver (1968) and Altman (1993), Deakin (1996) used a paired sample of thirty two failed and non failed firms over the 1946 – 1970 periods. Using discriminate analysis in conjunction with fourteen financial ratios he found that bankruptcy could be predicted with a fairly high degree of accuracy as far ahead as three years. (The error rates increased sharply in the fourth and fifth years). In essence Deakin replicated Beavers sampling method and found that discriminate analysis did a better job of predicting. Mayer (1992) also tested the usefulness of discriminate analysis in predicting bankruptcy. He concluded that caution was necessary when applying the original Altman (1968) model with alternative predictive models of failure. Mayer concluded that it stood up rather well with respect to discriminatory ability.

In a recent study, Altman, Hableman and Narayanan (1996) extended the original Altman discriminate function model and updated its application to the 1969 – 1975 periods. A sample of fifty three bankrupt firms and a matched sample of fifty three non bankrupt firms were employed. Included in the samples were both manufacturing and retailing companies. This study represents the first to include retailing firms. On the basis of discriminatory ability, twenty seven original variables were reduced to seven.

- The return of an asset ratio
- The stability of earning
- The interest coverage ratio
- The retained earnings to total asset ratio
- The current ratio

- The common equity to total capital ratio; and
- The size of total asset

Using a linear discriminate model, the authors were successful in predicting bankruptcy up to five years prior to failure. Successful classification ranged from 96 percent one year before failure to 70 percent five years before failure. In comparing their model with alternative models, including the original Altman model, the authors found it to be more accurate.

Edmister (1999) tested the usefulness of financial ratio analysis for predicting the failures of small business. Similar to others he employed multiple discriminate analyses and found it to be an accurate predictor of failure, if ratios were averaged over a three year span. Unlike the result of Beaver and Altman however an analysis based upon one year financial statement was not sufficient to discriminate failing from non failing firms. Consecutive financial statements were necessary for the successful analysis of small business failures. One the basis of empirical studies discussed above it would appear that signs of potential failure are evident, well before actual failure occurs. For the creditor the lag allows time to take corrective actions.

### 3. RESEARCH METHODOLOGY

As part of the methodology for this study, effort was made to gather a comprehensive data on the financial health condition of most manufacturing companies quoted on the Nigerian Stock Exchange as at December 2014. This effort was inhibited by so many factors ranging from the lack of the availability of up -to-date data to the lack of time, funds and disclosure of important information by the targeted companies which confines the study to only two companies with readily available data. One company each with available data was randomly selected from the Lagos industrial Zone and Kano Industrial Zone of the Nigerian Manufacturing sub-sector to make up the population of the study. The two selected manufacturing companies are GlaxoSmithKline Nig Plc, Lagos, South-West-Nigeria and the Cement Company of Northern Nigeria, Sokoto State. Secondary data was collected from the annual reports of the two companies for the period 2010 – 2014. The period which so many manufacturing companies witnessed serious financial health challenges in view of the poor economic performance which threatens manufacturing activities in the country (Esiele, 2008). The relevant financial ratios were analyzed from the five years financial summary of the two companies. The Altman Model for forecasting bankruptcy popularly known as the Z-score equation is used in analyzing the computed relevant financial ratios. This is specified as:

$$Z = 0.012 X_1 + 0.014X_2 + 0.33X_3 + 0.006X_4 + 0.01X_5$$

Where

$X_1$  = working capital/total assets (a liquidity ratio)

$X_2$  =Retained earnings/total assets (a measure for reinvestment of earnings)

$X_3$  = Earnings before interest and taxes/total assets (a profitability measure)

$X_4$  = Market value of equity/book value of total debt (a leverage measure)

$X_5$  = Sales/total assets (a turnover measure)

Z = Solvency (insolvency) which is the dependent variable.

Altman found in this multivariate bankruptcy forecasting model that companies which had a z-score below 1.81 almost went bankrupt, companies with z-score value above 2.99 remained healthy and firms which had a z-score between 1.81 and 2.99 fell in the grey area. The Z – Scores for each company for each year is calculated and presented in tabular form. These are compared with Altman's limits and are interpreted accordingly. The Pearson product moment correlation coefficient is used to test the efficiency of Altman's model of corporate bankruptcy forecasting. The correlation coefficient determined if there is relationship at all between the z-score and average of the relevant financial ratios used. If the correlation coefficient (r) is positive signifying a relationship, the t-test is then used to test if the relationship is significant at 5% level.

$$t = \frac{\sqrt{n-1}}{\sqrt{1-r^2}}$$

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Within 2 degrees of freedom

Where  $t$  = level of significance

$r$  = average correlation coefficient for five years

$n$  = Period size (5years)

Decision rule

If the calculated  $t$ -value at 5% level of significance falls outside  $\pm 2.447$ , we strongly reject the Null hypothesis ( $H_0$ ) and accept  $H_1$

### 4. RESULTS AND DISCUSSIONS

This section deals with the analysis of the data collected from the published financial statement of the Cement Company of Northern Nigeria Plc and GlaxoSmithKline Nigeria Company Plc. The computation of the z-scores for the two companies is presented in appendix 1 (Table 1 & 2). Table 3 and 4 (appendix 2), we present the analysis of the correlation coefficient between z-scores and averages of selected financial ratios for the two companies to ascertain the efficiency of Altman Corporate Bankruptcy predicting model.

**Table 1.** Z-Score for the Cement Company of Northern Nigeria Plc

Year	2014	2013	2012	2011	2010
$0.012X_1$	-0.003524	-0.0016296	-0.0043884	-0.0048612	-0.0009732
$0.014X_2$	-0.0004158	-0.002968	-0.0082446	-0.0081228	0.0000742
$0.033X_3$	-0.0008448	-0.0068145	-0.0194337	-0.1838694	0.0003399
$0.006X_4$	0.0021756	-0.00174	-0.00027	0.0029136	0.007581
$0.01X_5$	0.009071	0.005912	0.003147	0.006129	0.0054852
z-Score = $\sum$ variables x 100	0.0064136 x 100 0.64136	-0.0056741 x 100 -0.5671	-0.0291897 x 100 -2.9187	-0.1878108 x 100 -18.78108	0.0148203 x 100 1.48203

**Source:** Computed by the Authors

The calculated z-scores for the period under consideration reveal that the Cement Company of Northern Nigeria Plc is a very risky company from financial strength and performance perspective. Although there has been a consistent positive drive on its Z-score since year 2011, the Z-score as at 2014 could not reach half of 1.81 (bench mark of the grey area region). With the z-score of 0.64136, the company is considered to be very sick (distressed) and could be bankrupt.

**Table 2.** Z-Score for the GlaxoSmithKline Nigeria Company Plc

Year	2014	2013	2012	2011	2010
$0.012X_1$	0.00314	0.0024324	0.0042792	0.005322	0.005412
$0.014X_2$	0.0012936	0.0008554	0.0001204	0.000035	-0.000161
$0.033X_3$	0.007359	0.0049632	0.0022671	0.00264	0.0028116
$0.006X_4$	0.0132792	0.0036024	0.003962	0.007362	0.004032
$0.01X_5$	0.011769	0.007785	0.009492	0.010656	0.009357
Z-Score = $\sum$ variables x 100	0.0368448 x 100 = 3.68448	0.0196384 x 100 = 1.96384	0.0199207 x 100 = 1.99207	0.026015 x 100 = 2.6015	0.0216126 x 100 = 2.16126

**Source:** Computed by the Author

As shown in Table 2, the z-scores shows that GlaxoSmithKline Nigeria Plc has consistently been in the grey area with a z-score of 2.16, 2.60 and 1.99 and 1.96 in 2010, 2011, 2012 and 2013 respectively. The company achieved a great financial improvement in 2010 with a z-score of 3.68. It could be said that this company is very healthy financially and is not like to go bankrupt. Testing the efficacy of Altman's corporate bankruptcy forecasting model

#### 4.1. Hypothesis Testing

The first hypothesis is to find out if there is a relationship between the selected ratios and solvency or insolvency predication model using the Pearson Product Moment correlation coefficient. The second hypothesis is to find out whether the above relationship is significant using the student t-test.

Test of Hypothesis 1

**H<sub>0</sub>:** There is no relationship between the selected ratios and the solvency or insolvency prediction model

**H<sub>1</sub>:** There is a positive relationship between the selected ratios and the solvency or insolvency prediction model.

Using data from Appendix 1, Table 3, correlation coefficient (r) for Cement Company of Northern Nigeria Plcis:

$$\begin{aligned}
 r &= \frac{n\sum xy - \sum x \sum y}{\sqrt{(n\sum x^2 - (\sum x)^2)(n\sum y^2 - (\sum y)^2)}} \\
 &= \frac{5(21.8492) - (-0.76168)(-22.89501)}{\sqrt{5(1.4407) - (-0.76168)^2} \sqrt{5(363.5325 - (-22.89501)^2)}} \\
 &= \frac{91.80726023}{2.57358573 \times 35.96493982} \\
 &= \frac{91.80726023}{92.55885636} \\
 r &= 0.9919 \sim 0.99 \quad -
 \end{aligned}$$

Using data from Appendix 1: Table 4, the correlation coefficient (r) for the GlaxoSmithKline Nigeria Plc is:

$$\begin{aligned}
 r &= \frac{(6.817) - (12.403150)(2.54434)}{\sqrt{5(1.41950) - (2.54434)^2} \sqrt{5(3283925 - (12.40315)^2)}} \\
 &= \frac{2722022}{0.789831604 \times 3.218364505} \\
 &= \frac{2.52722022}{2.541966001} \\
 r &= 0.9942 \sim -
 \end{aligned}$$

The correlation coefficient (r) of 0.99 approximately (for the two companies) signifies a strong relationship between the z-score (solvency or insolvency) and the selected financial ratios by Altman. This supports the efficacy of this model still to be subjected to T-test of 5% level of significance.

Test of Hypothesis 2

**H<sub>0</sub>:** There is no significant relationship between the selected ratios and the solvency or insolvency prediction model

**H<sub>1</sub>:** There is a significant relationship between the selected ratios and the solvency or insolvency prediction model

$$\begin{aligned}
 T = r & \frac{\sqrt{n-2}}{\sqrt{1-r^2}} \\
 n &= 5 \text{ years} \\
 t &= \frac{0.99(5-2)}{\sqrt{1-(0.99)^2}} \\
 &= \frac{1.714730299}{12.155} \\
 0.141067359 &= 12.155
 \end{aligned}$$

**Decision Rule:** Reject H<sub>0</sub> if the calculated t-value falls outside ± 2.447 otherwise accept H<sub>1</sub>. Since the t-value falls outside H<sub>0</sub> – rejection area, H<sub>1</sub> is accepted. Thus, there is a significant relationship between the selected financial ratios and solvency or insolvency prediction model.

## **4.2. Summary of Findings**

The findings of the study can be summarized as follows:

- The study revealed that GlaxoSmithKline Nigeria Plc is more financially healthy than the Cement Company of Northern Nigeria Plc.
- The Cement Company of Northern Nigeria Plc is found to be very weak financially and can be classified as distressed, judging from the calculated z-scores for the period under study.
- GlaxoSmithKline Nigeria Plc is found to be financially healthy and growing during the period under study. The company was consistently above the minimum benchmark specified by Altman.
- The study also revealed that the Altman Multiple Discriminate Model is applicable in forecasting bankruptcy in the building and the health sub-sector of the manufacturing sector.
- The correlation coefficient (r) of 0.99 approximately, signifies for the two companies a strong relationship between the z-score (solvency and insolvency) and the selected financial ratios by Altman
- The result of the student t test shows there is a significant relationship between the selected financial ratios and solvency or insolvency prediction model.
- The Altman Discriminate Analysis model is able to discriminate failing from non failing company.

## **5. CONCLUSION AND RECOMMENDATIONS**

### **5.1. Conclusion**

In this study an attempt has been made to compare the financial strength of two selected manufacturing companies in Nigeria using Altman's multiple discriminate analysis model. The model is found to be useful in forecasting bankruptcy and discriminating between failing and non failing companies; it is necessary for business managers particularly, in the manufacturing sub-sector to use the Altman multiple discriminate analysis model to detect early signs of failure so as to take corrective actions. A word of caution to the users of this study not to generalize the result to mean the Nigerian manufacturing companies as the 2 studied companies did not constitute the required percentage that will lead to the generalization of the result.

### **5.2. Recommendations**

Based on findings the study made the following recommendations:

- Business managers should appreciate the importance of frequently subjecting their financial statements to ratio analysis to determine the financial health of their company.
- To enable creditors and investors identify and quantify risk, while also quantifying the management's ability to handle risks, we recommend the use of financial ratios and the Altman's discriminate analysis model.
- It is recommended that business managers should use the Altman discriminate analysis to help them detect signs of bankruptcy several years before it occurs. This lag allows time to take corrective action.
- Financial institutions should subject the financial statement of manufacturing companies applying for loan to Altman's multiple discriminate analysis before loans are granted. This will ensure that loans are not granted to weak or ailing companies.

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**Appendix1**

**Table1.** Calculation of Z-Score for the Cement Company of Northern Nigeria Plc

2014	2013	2012	2011	2010
X <sub>1</sub> = - 1,084,776 36444313 -0.2977	-439574 3237334 -0.3657	-667303 1824676 -0.3657	-355406 877241 -0.4051	93361 1199778
X <sub>2</sub> = -108,351 3644413 -0.0297	-686,382 32373334 -0.2120	-1,074,496 1824676 -0.5889	-508,961 877241 -0.5802	6,416 1199778 0.0053
X <sub>3</sub> = -93,351 3644413 -0.0256	-668,382 3237334 -0.0450	-1,064,275 1824676 -0.5889	-4,887,778 877241 -5.5718	12,409 1199778 0.0103
X <sub>4</sub> = 1076460.575 29686797 0.3626	-110781.625 3817220 -0.0290	-73323.25 1629414 -0.0450	296873.2 611351 0.4856	658679 521299 1.2635
X <sub>5</sub> = 3,305,812 3644413 0.3626	1,913,906 3237334 0.5912	574,241 1824676 0.3147	537,635 877241 0.6129	702,136 11199778 0.5852
∑(X <sub>1</sub> - X <sub>5</sub> ) 0.9167	0.0659	-1.2682	-5.4586	1.9454
$\frac{\sum(X_1 - X_5)}{N}$ 0.18142	0.01318	-0.25364	-1.09172	0.38908

**Source:** Company’s Annual Report, 2010 - 2014

Note n = 5 years

**Table2.** Calculation of Z-Score for the GlaxoSmithKline Nigeria Company Plc

2013	2013	2012	2011	2010
X <sub>1</sub> = - 1262601 4,819,560 -0.2620	1067,172 5,264,932 0.2027	1007286 2,824,688 0.3566	1100611 2,481,519 0.4435	1155417 2,481,519 0.4510
X <sub>2</sub> = 445,152 4,819,560 0.0924	321,658 5,264,932 0.0611	24,205 2,824,688 0.0086	6,211 2,481,519 0.0025	(29,580) 2,561,878 -0.0115
X <sub>3</sub> = 1,069,695 4819,560 0.2230	791,951 5,264,932 0.1504	193,997 2,824,688 0.0687	198,404 2,481,519 0.0800	218,224 2,561,878 0.0852
X <sub>4</sub> = 6591002.125 2978061 2.2132	2322544.525 3868584 0.6004	1098738 1752597 0.6270	1759013.56 1433633 1.2270	1020009.925 1517800 0.6720
X <sub>5</sub> = 5,672,213 4,819,560 1.1769	4,098,758 5,264,932 0.7785	2,681,263 2,824,688 0.9492	2,644,342 2,481,519 1.0656	2,397,083 2,561,878 0.9357

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$\sum(X_1 - X_5)$ 3.9675	1.7931	2.0101	2.8186	2.1324
$\frac{\sum(X_1 - X_5)}{n}$ 0.79350	0.35862	0.40202	0.56372	0.42648

Source: Company's Annual Report, 2010 - 2014

### Appendix 2

Computation of Correlation Coefficient between Z-Score and Average of Selected Financial Ratios to Ascertain the Efficacy of Altman's Corporate Bankruptcy Predicting Model

**Table3.** The Cement Company of Northern Nigeria Plc

Years	Z – Scores Y	Financial Ratio (Average) X	XY	Y <sup>2</sup>	X <sup>2</sup>
2014	0.64136	0.18142	0.1164	0.4113	0.0329
2013	-0.56741	0.01318	-0.0075	0.3220	0.0002
2012	-2.90049	-0.25364	0.7357	8.4128	0.0643
2011	-18.78108	-1.09172	20.5037	352.7292	1.1919
2010	1.28739	0.38908	1.6574	1.6574	0.1514
	$\sum y = -22.89501$	$\sum x = 2.54434$	$\sum xy = 6.817$	$\sum y^2 = 363.5325$	$\sum x^2 = 1.4407$

Computation of Correlation Coefficient between Z – Score and Average of Selected Financial Ratios to Ascertain the Efficiency of Altman Corporate Bankruptcy Predicting Model for the Glaxosmithkiline Nigeria Company Plc

**Table4.** The Glaxosmithkiline Nigeria Company Plc

Years	Z – Scores Y	Financial Ratio (average) X	XY	Y <sup>2</sup>	X <sup>2</sup>
2014	3.68448	0.79350	2.9236	13.5754	0.6296
2013	1.96384	0.35862	0.7043	3.8567	0.1286
2012	1.99207	0.40202	0.8009	3.9683	0.1616
2011	2.6015	0.56372	1.4665	6.7678	0.3178
2010	2.16126	0.42648	0.9217	4.6710	0.1819
	$\sum y = -12.40315$	$\sum x = 2.54434$	$\sum xy = 6.817$	$\sum y^2 = 32.8392$	$\sum x^2 = 1.41950$

Source: Computed by the Author

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