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THE EFFECT OF FINANCIAL DISTRESS ON CORPORATE PROFITABILITY: A PANEL ESTIMATED GENERALIZED LEAST SQUARES (EGLS) APPROACH

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ABSTRACT

The paper aims to clarify the relationship between financial distress and corporate profitability from a developing country context. Financial distress was proxied using the Z score developed by Altman (1968); while, the profitability indices were Return on Assets (ROA), Gross Profit Margin (GPM), Return on Equity (ROE) and Net Profit Margin (NPM). The study used the ex-post facto research design. The sample comprised all quoted consumer goods manufacturing firms listed on the Nigerian Stock Exchange (NSE) as at December, 2017. The study used secondary data; obtained from annual reports and accounts of the studied companies. The study employed Panel Estimated Generalised Least Squares, using cross-sectional weighting to validate the hypotheses. Firm size and leverage were included in the model as control variables. The study documents mixed findings; financial distress had a positive significant effect on return on assets; but, a negative significant effect on gross profit margin. The effect on return on equity and net profit margin were positive but non-significant.

Keywords: Altman's Z score, corporate bankruptcy, profitability, ROA, ROE, NPM, GPM

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Introduction

Financial distress has remained a dominant topic in the academic and business roundtable, because of its chronic adverse effect such as: increasing unemployment and poverty level, depriving creditors of their legitimate earnings, intensifying the crime rate, reduction in the corporate tax payments and create social and economic cost to the nation (Alifiah, 2014; Mbat & Eyo, 2013; Mukkamala, Tilve, Sung, Ribeiro, & Vieira, 2006; Charitou, Neophytou, & Charalambous, 2004). Financial distress is also related to the subject of agency theory; arising from the separation of ownership and control in modern corporations. Agency problem arises when "(a) the desires and goals of the principal and agent conflict; and, (b) it is difficult or expensive for the principal to verify what the agent is actually doing" (Eisenhardt, 1989). As such, when agents have more information than principals which adversely affect the principals' ability to monitor the actions of the agents may lead to moral hazards. Scholars have widely considered agency theory the main theme in corporate governance studies (Manzaneque, Priego, & Merino, 2016).

Models have evolved for financial distress prediction from the 60's till date. One prominent age long statistical model is the Altman's Z score developed by Professor Edward Altman. He used Multivariate Discriminant Analysis (MDA) to develop a model capable of predicting corporate failure (Altman, 1968). The model predicted a company's health status based on a discriminant function of the form: $Z = 0.012X_1 + 0.014X_2 + 0.033X_3 + 0.006X_4 + 0.999X_5$

Where:
X_1 = working capital/total assets
X_2 = retained earnings/total assets
X_3 = earnings before interest and taxes/total assets
X_4 = market value of equity/book value of total liabilities
X_5 = sales/total assets

The model classifies firms into three zones:

$$\text{Bankrupt} < 1.81 \leq \text{Grey Area} \leq 2.99 > \text{Safe Zone (Non-Bankrupt)}$$

MDA combines information from multivariate independent variables (e.g. ratios) into a single score that is used to classify an observation into either of two a-priori and mutually exclusive groups (Hair, Anderson, Tatham, & Black, 1992). MDA relies on the several assumptions, such

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as: (i) the independent variables (e.g. ratios) are multivariate normally distributed; (ii) the dataset consists of two *apriori* chosen mutually exclusive groups; (iii) the two groups have equal population variances; and, (iv) the researcher just need to select the optimal cut-off point a-priori (Mamo, 2011; Hair, Anderson, Tatham, & Black, 1992). One advantage of MDA over *univariate* analysis is its ability to consider multiple variables as well as the interaction among these variables. Altman's discriminant function used five weighted ratios to calculate the Z-Score; which acted as a "cut-off" threshold. The "cut-off" threshold was then used to classify a company in the *safe*, *grey* and *distress zones*. Discriminant scores allows for classification between two or more groups (Fejer-Kiraly, 2015). Since its development the Z-Score model has gained wide acceptance by auditors, accountants, and finance experts as a viable tool for corporate failure prediction (Babatunde, Akeju, & Malomo, 2017).

The performance of the manufacturing sector in Nigeria has been abysmal in recent times; with several reported cases of corporate demise. The incessant systematic distress syndrome in the sector thus calls for a pressing need for assessing the performance of firms in the sector (Ani & Ugwunta, 2012). Prior studies have proven the efficacy of Altman's Z score model in bankruptcy prediction; though, but mainly focused on the financial sector (Nwidobie, 2017; Egbunike & Ibeanuka, 2015; Adeyeye & Migiro, 2015; Adeyeye & Oloyede, 2014; Pam, 2013; Unegbu & Adefila, 2013). However, recent studies also show that bankrupt firms are associated with lower profitability and less liquidity (Yahaya, Nasiru, & Ebgejiogu, 2017). However, few studies have investigated the effect of Z score on corporate profitability. Prior studies such as Madhushani and Kawshala (2018) in Sri Lanka revealed a positive and significant effect of Z-score on ROA and ROE. Liang and Pathak (2016) using empirical data from China and India revealed a positive significant relationship between Z-score and ROE in China and India; and, Shaukat and Affandi (2015) in Pakistan also document a positive link between the Z score and financial performance; while, Yadiati (2017) in Indonesia revealed that profitability has a negative non-significant effect on financial distress.

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The problem tackled in the present study is whether there exists some form of quantitative relationship between the Altman's Z score and corporate profitability. According to Calandro Jr (2007) despite the wide popularity of the Z-score model it "has received relatively little attention as a strategic assessment and performance management tool", more especially in Sub-Saharan Africa. This study is significant in the Nigerian context, based on the paucity of studies establishing the relationship between bankruptcy and profitability; and also extends the literature from a developing country perspective. The study specifically examined: the effect of Z-score on ROA, ROE, NPM and GPM.

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Empirical Review

Table 1: Summary of Empirical Review

Authors	Year	Country	Focus and Methodology	Findings
Madhushani and Kawshala	2018	Sri Lanka	The sample comprised 29 listed non-banking financial institutions. They used data from the year 2012 to 2016. The study used two financial performance indicators return on asset (ROA) and return on equity (ROE) as dependent variables; while, Altman's Z score and leverage were used as independent variables.	The results revealed that the Z-Score had positive and significant effect on ROA and ROE; leverage was only significant for ROE.
Yadiati	2017	Indonesia	The sample comprised 18 agricultural companies listed in Indonesia Stock Exchange from 2012 to 2014. The study used secondary data from financial statement and Indonesian Capital Market Directory (ICMD). Multiple regression was used to analyse the data.	The result revealed that profitability has a negative but non-significant effect on financial distress.
Babatunde, Akeju, and Malomo	2017	Nigeria	They used secondary data obtained from annual reports of 10 quoted manufacturing companies for 2015 financial year. They employed Altman Z-score model.	The Z-score was effective in predicting companies with deteriorating performance.
Barreda, Kageyama, Singh, and Zubieta	2017	United States	They compared the accuracy of Logit model and MDA. They employed various key financial variables as predictors and contrasting samples of both bankrupt and non-bankrupt firms for the period 1992–2010 were used.	The results show that for the period 1992–2010, the MDA model outperformed the Logit model for overall bankruptcy prediction.
Yahaya, Nasiru, and Ebgejiogu	2017	Nigeria	They used discriminant analysis. Secondary data was collected from companies that filed for receivership or failed from 1996 to 2012.	The most significant factors were: Retained Earning to Total Asset, Earning before interest tax to total asset and Market Value of Equity to total Liability.
Nwidobie	2017	Nigeria	He used the Altman's Z score model. The sample comprised four banks declared unsound by the CBN in 2011. The study relied on secondary data.	The results showed that Union Bank, Wema Bank, Keystone Bank and Mainstreet Bank had Z score below the minimum threshold for banks.
Liang and	2016	China and	They used data from the Thomson Reuters DataStream	The results revealed that the Z-Score had a positive

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Pathak		India	database from 2000 to 2013. Linear regression was used to analyse the data.	statistically significant relationship with ROE in China and India.
Mihalovič	2016	Slovak Republic	Compared the accuracy of MDA and logit models in bankruptcy prediction. The sample comprised 236, divided into two groups bankrupt and non-bankrupt firms.	The discriminant analysis had an accuracy of 64.41%; while the logit model had an accuracy of 68.64% on the test data.
Slefendorfas	2016	Lithuania	The sample comprised 145 companies (73 bankrupt and 72 non-bankrupt firms).He used MDA stepwise method to develop the model. A total of 156 financial ratios were selected as primary input data by using correlation and Mann – Whitney U test.	The results showed that the model had an accuracy of 89%.
Egbunike and Ibeanuka	2015	Nigeria	They employed MDA to examine bankruptcy threats of selected banks from 2007 to 2011.	The results showed that the most significant predictors were: working capital/total assets, retained earnings/total assets, EBIT/total assets, equity/total assets, gross earnings/total assets.
Adeyeye and Migiro	2015	Nigeria	Developed an integrated model utilising Principal Component Analysis and three statistical models DA, logit and probit. The sample comprised 21 Deposit Money Banks (DMBs) quoted on the Nigerian Stock Exchange over a 23 year-period from 1993 to 2010.	The accuracies of the models were discriminant analysis (95.2), logit (90.24) and probit (89.02).
Hur-yagba, Ibrahim, and Bello	2015	Nigeria	They employed ratio analysis, correlation analysis, student test and the Altman multiple discriminate analyses models to analyse the solvency or insolvency of manufacturing firms in Nigeria.	The results showed that the Altman's Z score modelwas able to discriminate between failing and non-failing companies.
Ishioma, Abdul and Zubair	2015	Malaysia	The sample comprised 17 distressed companies and 17 non-distressed companies within the period of 2010-2014. They employed the Altman's Z score and regression analysis to investigate the relationship of Z-Score ratios and corporate failure.	The results show that four (WC/TA; EBIT/TA; MVE/TL; and, S/TA) were significantly related to the prediction of corporate failure.
Adeyeye and Oloyede	2014	Nigeria	They combined principal component analysis and discriminant analysis. They used secondary data and	The model correctly predicted the financial status of 20 banks. The model accurately predicted the

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			computed 11 bank-specific variables. The sample comprised 21 Deposit Money Banks between 2007 and 2009.	status of 6 banks out of 7 failed banks included in the model.
Hussain, Ali, Ullah, and Ali	2014	Pakistan	The sample comprised 21 textile companies (12 non-bankrupt and 9 bankrupt) listed inthe Karachi stock exchange, during the period 2000 to 2010. They employed Altman Z-Score model to predict failure rate of textile companies.	The overall results of the Z-Score model were quite accurate.
Unegbu and Adefila	2013	Nigeria	They compared the efficacy of the Z-Score model and operating cash flow information in corporate insolvency prediction. They tested sixty-two corporate financial statements.	The results showed that the Z-score predictive ability across Services and Merchandising sectors is very poor but very strong for Manufacturing and Oil Services, while Operating Cash Flow model was more effective in predicting accurately Service and Merchandising Sectors.
Pam	2013	Nigeria	Used the Altman Z score model to ascertain the state of health of banks in Nigeria. The sample of the study comprised two 'failed' and two non-failed banks within a five year period (1999-2003).	The study found that the Z Scores of the two non-failed banks were found to be below 1.80 indicating ill-health.
Serrano-Cinca and GutiéRrez-Nieto	2013	USA	Used Partial Least Square Discriminant Analysis (PLS-DA) for the prediction of the 2008 USA banking crisis. They compared the performance of this technique to the performance of 8 other algorithms.	The PLS-DA results obtained were very close to those obtained by Linear Discriminant Analysis and Support Vector Machine.
Amadasu	2012	Nigeria	Employed MDA, ordinary least squares regression, correlation matrix and logit-probit regression to investigate bank failure prediction in Nigeria.	The results demonstrate that working capital/total assets (default ratio) are a significant factor.
Ani and Ugwunta	2012	Nigeria	Used discriminant analysis. Sampled eleven firms in the manufacturing, oil marketing and conglomerate sector of the Nigerian Stock Exchange. They employed secondary data for a five year period.	The result confirms that MDA is a veritable tool for assessing the financial health of firms in Nigeria.

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Design and Methodology

The study adopted the ex-post facto design. The study used purposive sampling technique and the sampling frame restricted to firms in the Consumer Goods Sector of the Nigerian Stock Exchange. The study used secondary sources of data; obtained from annual reports and accounts of the selected companies downloaded from their individual websites. Annual reports and accounts are easily accessible (Unerman, 2000); and, significant issues and concerns of a firm are expressed comprehensively through the annual report (Khan, Halabi, & Samy, 2009; Abeysekera & Guthrie, 2005).

Table 2: Names of firms included in the sample

1	DN Tyre & Rubber Plc.
2	Champion Breweries Plc.
3	Golden Guinea Breweries Plc.
4	International Breweries Plc.
5	Nigerian Breweries Plc.
6	7-up Bottling Company Plc.
7	Dangote Flour Mills Plc.
8	Dangote Sugar Refinery Plc.
9	Flour Mills Nigeria Plc.
10	Honeywell Flour Mill Plc.
11	Multi-trex Integrated Plc.
12	Northern Nigeria Flour Mills Plc.
13	Union Dicon Salt Plc.
14	Cadbury Nigeria Plc.
15	Nestle Nigeria Plc.
16	Nigerian Enamelware Plc.
17	Vitafoam Nigeria Plc.
18	P.Z. Cussons Nigeria Plc.
19	Unilever Nigeria Plc.
20	Mcnichols Plc.
21	Nascon Allied Industries Plc.

Source: Nigerian Stock Exchange Website, (2018)

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Methods of Data Analysis

The study employed multiple regression technique. The data obtained from the annual reports and accounts possessed both time series and cross sectional properties which gave rise to a panel data. Panel data structure: 21 companies, 7 years, 7 variables. The study used the Panel Estimated Generalised Least Squares (EGLS), which is a variant of GLS. GLS is a generalization of OLS, which relaxes the assumption that the errors are homoskedastic and uncorrelated (Kaufman, 2013). Asymptotically, EGLS has the same statistical properties as GLS under a broad range of conditions (Greene, 2008). The EGLS procedure used cross-section weights as GLS weights and White period as the Coefficient covariance method. This was to enable the computation of standard errors that are robust to serial correlation (Arellano, 1987; White, 1980). All statistical analysis was conducted using E-view version 9.

Model Specification

The following empirical models were tested in the study:

$ROA_{i,t} = \alpha + Z\text{-}Score_{I,t} + Size_{i,t} + Leverage_{i,t} + \mu$ ..... (1)

$ROE_{i,t} = \alpha + Z\text{-}Score_{I,t} + Size_{i,t} + Leverage_{i,t} + \mu$ ..... (2)

$NPM_{i,t} = \alpha + Z\text{-}Score_{I,t} + Size_{i,t} + Leverage_{i,t} + \mu$ ..... (3)

$GPM_{i,t} = \alpha + Z\text{-}Score_{I,t} + Size_{i,t} + Leverage_{i,t} + \mu$ ..... (4)

Table 3: Description of variables

Proxy	Variable	Description	Source
Return on Assets (ROA)	Dependent	A profitability ratio expressed as profit after tax to average total assets.	Yadiati (2017)
Return on Equity (ROE)	Dependent	A profitability ratio expressed as the ratio of net profit after tax with capital.	Yadiati (2017)
Net Profit Margin (NPM)	Dependent	Net profit margin is a ratio that measures the percentage of any income earned after deducting all costs and expenses, including interest, tax and dividends to preferred shareholders.	Gitman (2006)
Gross Profit Margin (GPM)	Dependent	Gross profit margin measures the percentage of each sales Naira remaining after the firm has paid for its goods.	Gitman (2006)
Altman's Z Score	Independent	$Z = 0.012X_1 + 0.014X_2 + 0.33X_3 + 0.006X_4 + 0.999X_5$	Altman (1968)

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Leverage	Control	Debt/equity	Madhushani and Kawshala (2018)
Firm size	Control	Log of average assets	Madhushani and Kawshala (2018)

Data Analysis and Results

Table 4: Descriptive statistics of dependent and independent variables

	ROA	ROE	GPM	NPM	Z
Mean	0.122153	0.465066	0.134490	0.369024	1.709053
Median	0.070358	0.163690	0.252804	0.065858	1.037492
Maximum	3.040064	10.16889	0.563180	23.47088	18.16894
Minimum	-3.237088	-3.360874	-10.22465	-16.15653	-0.009659
Std. Dev.	0.510825	1.485151	0.916114	3.285931	2.763886
Skewness	0.631453	4.266705	-10.20866	4.208340	4.045737
Kurtosis	26.55408	25.21799	114.1924	37.33401	20.14337
Jarque-Bera	3384.704	3445.955	77748.80	7602.126	2186.150
Probability	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	17.83438	67.89964	19.63554	53.87747	249.5217
Sum Sq. Dev.	37.83666	319.8225	121.6935	1565.615	1107.665
Observations	146	146	146	146	146

Source: E Views 9

The table below shows the average values of the dependent variables (ROA, ROE, GPM, and NPM). The average ROA value is 0.122 (i.e., 12.2%); average ROE value is 0.465 (i.e., 46.5%); average GPM value is 0.134 (i.e., 13.4%); and the average NPM value is 0.369 (i.e., 36.9%). The Jarque-Bera statistics (a test of normality of the variables) showed p values less than .05. If the p-values are less than the chosen alpha level, then the null hypothesis is rejected and there is evidence that the data is not from a normally distributed population. In other words, the data are not normal.

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Analysis of Hypotheses

Test of Hypothesis One

Ho_1: There is a significant relationship between the Z-Score and return on assets of quoted consumer goods firms.

The model had an R squared value of .144 (weighted statistics) and .110 (unweighted statistics); which explain the proportion of variance in the dependent variable explained by the independent variables; the Adjusted R squared value is 0.12; therefore, the model explains approximately 12% variation in the dependent variable. The results are shown in the table below:

Table 5: Panel EGLS estimate for hypothesis one

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.654657	0.817360	-0.800941	0.4245
Z	0.051495	0.028831	1.786099	0.0762
LEV	-0.016370	0.015539	-1.053466	0.2939
SIZE	0.027836	0.032692	0.851476	0.3959
Weighted Statistics				
R-squared	0.144711	Mean dependent var		0.155957
Adjusted R-squared	0.126641	S.D. dependent var		0.497309
S.E. of regression	0.466428	Sum squared resid		30.89280
F-statistic	8.008559	Durbin-Watson stat		0.970061
Prob(F-statistic)	0.000057			
Unweighted Statistics				
R-squared	0.110488	Mean dependent var		0.122153
Sum squared resid	33.65615	Durbin-Watson stat		1.270175
White period standard errors & covariance (d.f. corrected)				

Source: E Views 9

The F statistic (ratio of the mean regression sum of squares divided by the mean error sum of squares) which is used to check the statistical significance of the model showed a value of 8.00; p value <.05; therefore the hypothesis that all the regression coefficients are zero is rejected. However, the t statistic of our variable of interest (Z) is: 1.79 (p<.05), confirming that Z score has a positive and statistically significant effect; thus, the alternate hypothesis is accepted and null rejected. Thus, there is a significant relationship between the Z-Score and return on assets of quoted consumer goods firms.

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Test of Hypothesis Two

Ho_2: There is a significant relationship between the Z-Score and return on equity of quoted consumer goods firms.

The model had a low R squared value of .033(weighted statistics) and .012 (unweighted statistics); which explain the proportion of variance in the dependent variable explained by the independent variables; the Adjusted R squared value is .013; therefore, the model explains approximately 1.3% variation in the dependent variable. The results are shown in the table below:

Table 6: Panel EGLS estimate for hypothesis two

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.606156	1.778581	0.340809	0.7338
Z	0.086639	0.078685	1.101092	0.2727
LEV	0.003446	0.070354	0.048985	0.9610
SIZE	-0.013079	0.072336	-0.180815	0.8568
Weighted Statistics				
R-squared	0.033460	Mean dependent var		0.527529
Adjusted R-squared	0.013041	S.D. dependent var		1.488151
S.E. of regression	1.474718	Sum squared resid		308.8206
F-statistic	1.638622	Durbin-Watson stat		1.090098
Prob(F-statistic)	0.183147			
Unweighted Statistics				
R-squared	-0.012211	Mean dependent var		0.465066
Sum squared resid	323.7279	Durbin-Watson stat		1.074856
White period standard errors & covariance (d.f. corrected)				

Source: E Views 9

The F statistic (ratio of the mean regression sum of squares divided by the mean error sum of squares) which is used to check the statistical significance of the model showed a value of 1.64; p value >.05; therefore the hypothesis that all the regression coefficients are zero is not rejected. However, the t statistic of our variable of interest (Z) is: 1.10 (p>.05), the Z score has a positive but not statistically significant effect; thus, the alternate hypothesis is rejected and null accepted. Thus, there is no significant relationship between the Z-Score and return on equity of quoted consumer goods firms.

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Test of Hypothesis Three

Ho_3: There is a significant relationship between the Z-Score and net profit margin of quoted consumer goods firms.

The model had a low R squared value of .022 (weighted statistics) and .014 (unweighted statistics); the Adjusted R squared value is less than .001; therefore, the model has weak explanatory ability. The results are also consistent with the Pooled OLS regression results (.015). The results are shown in the table below:

Table 7: Panel EGLS estimate for hypothesis three

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.889255	1.328769	-0.669232	0.5044
Z	0.036676	0.034454	1.064503	0.2889
LEV	0.010091	0.046230	0.218273	0.8275
SIZE	0.035630	0.052427	0.679606	0.4979
Weighted Statistics				
R-squared	0.022079	Mean dependent var		0.329779
Adjusted R-squared	0.001418	S.D. dependent var		2.881714
S.E. of regression	2.890794	Sum squared resid		1186.650
F-statistic	1.068651	Durbin-Watson stat		1.604421
Prob(F-statistic)	0.364493			
Unweighted Statistics				
R-squared	-0.014531	Mean dependent var		0.369024
Sum squared resid	1588.365	Durbin-Watson stat		1.425669
White period standard errors & covariance (d.f. corrected)				

Source: E Views 9

The F statistic (ratio of the mean regression sum of squares divided by the mean error sum of squares) which is used to check the statistical significance of the model showed a value of 1.07; p value >.05; therefore the hypothesis that all the regression coefficients are zero is not rejected. However, the t statistic of our variable of interest (Z) is: 1.06 (p>.05), the Z score has a positive but not statistically significant effect; thus, the alternate hypothesis is rejected and null accepted. Thus, there is no significant relationship between the Z-Score and net profit margin of quoted consumer goods firms.

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Test of Hypothesis Four

Ho_4: There is a significant relationship between the Z-Score and gross profit margin of quoted consumer goods firms.

The model had an R squared value of .124 (weighted statistics) and .034 (unweighted statistics); which explain the proportion of variance in the dependent variable explained by the independent variables; the Adjusted R squared value is 0.11; therefore, the model explains approximately 11% variation in the dependent variable. The results are shown in the table below:

Table 8: Panel EGLS for hypothesis four

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.664567	0.488707	-1.359849	0.1760
Z	-0.014814	0.005573	-2.658304	0.0088
LEV	0.001776	0.002167	0.819294	0.4140
SIZE	0.036958	0.019501	1.895199	0.0601
Weighted Statistics				
R-squared	0.124085	Mean dependent var		0.462633
Adjusted R-squared	0.105580	S.D. dependent var		0.708323
S.E. of regression	0.615834	Sum squared resid		53.85367
F-statistic	6.705412	Durbin-Watson stat		1.241551
Prob(F-statistic)	0.000290			
Unweighted Statistics				
R-squared	0.034406	Mean dependent var		0.134490
Sum squared resid	117.5064	Durbin-Watson stat		1.143175
White period standard errors & covariance (d.f. corrected)				

Source: E Views 9

The F statistic (ratio of the mean regression sum of squares divided by the mean error sum of squares) which is used to check the statistical significance of the model showed a value of 6.71; p value <.05; therefore the hypothesis that all the regression coefficients are zero is rejected. However, the t statistic of our variable of interest (Z) is: -2.66(p<.05), confirming that Z score has a negative and statistically significant effect; thus, the alternate hypothesis is accepted and null rejected. Thus, there is a significant relationship between the Z-Score and gross profit margin of quoted consumer goods firms.

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Discussion of Findings

The goal of the empirical analysis was to establish the relationship between Z-Score and profitability of consumer goods manufacturing companies in Nigeria. Previously, the study by Unegbu and Adefila (2013) confirmed that the predictive ability of Z-Score is very strong for manufacturing firms. The Z-Score of the firms, showed that 87.8% of cases were in the distress zone (below 1.81); while 12.2% were either in the grey zone or safe zone (1.81>Z). This evidence of weak performance of Nigerian manufacturing firms supports studies by Babatunde, Akeju, and Malomo (2017); Hur-Yagba, Ibrahim, and Bello (2015); and, Ani and Ugwunta (2012) on the potency of the Altman's Z-Score in identifying the deteriorating performance of manufacturing firms in Nigeria. The case with the banking sector, also seems not to far-fetched, as the study Nwidobie (2017) on selected banks showed that most of the banks were still in a bankrupt position, having Z Score values all below the minimum threshold of 2.675 for classification as sound and non-bankrupt.

The classification results using MDA showed that 89.7% of original grouped cases were correctly classified and 87.7% of cross-validated grouped cases were correctly classified. The predictors were ROA, ROE, NPM and GPM. The accuracy of the model compared favourably with models developed in other countries. The study by Mihalovic (2016) in Slovak Republic; the discriminant analysis had a total accuracy of 64.41% and the most significant predictors of impeding firm's failure were net income to total assets, current ratio and current liabilities to total assets. The model by Slefendorfas (2016) developed for private limited companies in Lithuania had accuracy of 89%. In Nigeria, the model by Adeyeye and Migiro (2015) selected Deposit Money Banks (DMBs) showed that discriminant analysis had accuracy of 95.2%. Previously, the study by Adeyeye and Oloyede (2014) had revealed an overall classification accuracy of 92.5 percent for an enhance PCA Discriminant model for banks. The model accurately predicted the status of 20 out of 21 sampled banks respectively.

The Standardized Canonical Discriminant Function Coefficients were respectively .927 for ROA; .366 for ROE; -.094 for GPM; and, -.517 for NPM. According to Islam, Semeen, and Farah (2013) ratios have varying effects on the financial position of an enterprise; there study identified liquidity ratios in the first place, followed by profitability ratios. The study by Kahya and Theodossiou (1999) has shown that firms facing financial distress generally

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experience a decline in growth, profitability, and fixed assets. Kariuki (2013) in Kenya; found that the Altman's Z score model had a negative effect on financial performance measured via return on assets ratio. Yahaya, Nasiru, and Ebgejiogu (2017) showed that companies facing distress or likelihood of distress are less profitable and liquid with lower asset quality.

Of interest is the relationship between leverage and Z Score, as the Pearson Correlation Coefficient revealed a significant positive relationship between the Z-Score and leverage (r .582**, p <.05).The study by Tan (2012) has shown that the effect of distress on performance becomes intensified for firms with a high leverage, which is worsened by economic downturns. This may be the case as leverage increases the likelihood of failure also increases. This seems to support Kahya and Theodossiou (1999) that firm's facing difficulties in paying their obligations and they tend to increase their capital. The study also found non-significant results for two profitability measures; return on equity and net profit margin, but both were positive. This is contrary to Madhushani and Kawshala (2018) in Sri Lanka that reported a positive and significant effect of Z-Score ROE. Similarly, the study by Liang and Pathak (2016) in China and India revealed a positive statistically significant effect in both countries. However, another study by Basovníková, Konečný, Dubový, and Masařová (2018) in Czech, in which ROE was employed as the independent variable. They found no effect of ROE of bankrupt enterprises on Z-Score, but found a positive effect of ROE of active enterprises on Z Score.

The analysis revealed that one profitability measure; return on assets, had a positive significant relationship; while the gross profit margin had a negative significant relationship with the Z-Score. This supports the study by Madhushani and Kawshala (2018) in Sri Lanka that revealed that the Z-Score has a positive and significant effect on ROA. Additional tests revealed that while the independent samples t test showed significant difference between bankrupts and non-bankrupt for ROA; the independent samples Mann-Whitney U test showed for the GPM.

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Conclusion and Recommendations

The study evaluated the effect of financial distress on corporate profitability of quoted manufacturing firms in Nigeria. The empirical results showed evidence that Z-Score had a significant positive effect on ROA; but, a significant negative effect on GPM. The effect on return on equity and net profit margin were positive but non-significant. The study is primarily driven by the key role the manufacturing sector plays in achieving the much needed growth of the Nigerian economy. The study makes the following recommendations:

1. The Altman's Z-Score model to be employed to gauge the performance of manufacturing firms by rating and regulatory agencies in the country. The use of such is however subject to the limitation inherent in all multivariate statistical procedures. Shareholders may also employ Z-Score to gauge the performance of managers over time in order to determine their performance over time and an indicator of corporate health.
2. The use of an alternative model for benchmarking the performance of the discriminant model is also recommended. Such models include the Merton type model and models based on macro-economic variables, as factors such as recession or inflation, may generally impact on the overall performance of an industry. Models based on market-based inputs are also recommended as they are usually more volatile than accounting-based inputs (Miller, 2009).

Suggestions for Further Studies:

Future studies may be directed at explaining the relationship between the Z-Score and market performance of a firm or its relationship with stock price or earnings announcement.

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