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Capital Structure And Performance Of Nigeria Manufacturing Sector

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Abstract: *This study investigates the impact of capital structure on the performance of listed manufacturing firms in Nigeria over the period 2013 to 2023. The study proxies capital structure with Debt to Equity Ratio (DER), Debt to Asset Ratio (DAR), Return on Equity (ROE), and Leverage Ratio (RER), while firm performance is measured using Return on Investment (ROI). The manufacturing sector is vital to Nigeria's economic diversification, yet many firms continue to struggle with profitability and sustainability, largely due to suboptimal financing decisions. To empirically examine the relationship between capital structure and performance, the study employs panel data derived from the financial statements of ten listed manufacturing firms, as well as data from the Central Bank of Nigeria (CBN) statistical bulletins. The methodology adopts a quantitative approach, utilizing panel least squares regression analysis supported by robust diagnostic tests, including panel unit root tests and the Pedroni cointegration test to ascertain the long-run relationships among variables. The findings reveal that while DER, ROE, and RER do not have a statistically significant effect on ROI, DAR exhibits a significant and negative influence on performance, indicating that an excessive reliance on debt-financed assets can undermine returns in the manufacturing sector. The low R-squared value further suggests that capital structure alone does not explain much of the variability in ROI, implying the presence of other latent performance drivers. The study contributes to the ongoing discourse on optimal capital structure by offering practicalindication from aevolving economy perspective. It recommends a more balanced approach to financing, emphasizing the need for efficient debt management, diversified funding sources, and proactive policy support from regulatory institutions such as the CBN. Furthermore, the study underscores the essence of firm-specific strategic planning and macroeconomic stability in enhancing manufacturing performance. Despite certain limitations such as restricted firm sample size and sectoral scope, the study offers a foundation for further research into the dynamic interplay between financing and performance in emerging markets.*

Key Words: Equity Ratio, Debt to Asset Ratio, Return on Equity, Leverage Ratio, Firm Performance, Return on Investment.

Introduction

The capital structure of a firm, encompassing the mix of debt and equity financing, is pivotal in determining its financial performance and overall sustainability. In the context of Nigeria's manufacturing sector, understanding the implications of capital structure decisions is essential, given the sector's significant contribution to the nation's economy and its unique operational challenges. The manufacturing sector in Nigeria has historically been a cornerstone of economic development, providing employment opportunities and contributing to GDP growth. However, this areaexperiences numerous trials, including infrastructural deficits, fluctuating energy costs, and inconsistent government policies. These challenges necessitate strategic financial decisions, particularly concerning capital structure, to ensure operational efficiency and profitability. Investment structure choices revolve around quantity of liability and resources used to finance a firm's processes. The debt-to-equity ratio (DER) and debt-to-asset ratio (DAR) are common metrics used to assess a firm's leverage. A higher DER indicates greater reliance on debt financing relative to equity, which can amplify returns but also increase financial risk. Similarly, a higher DAR suggests largeshare of a firm's assets is financed through debt, potentially impacting its solvency. Equity return (ROE) gauge profit relative to shareholders' equity, reflecting how effectively a company utilizes investors' funds. The leverage ratio (RER), is the ratio of total debt to total equity, provides insight into the extent of a firm's financial leverage. Return on investment (ROI) serves as a performance proxy, indicating the efficiency of investment decisions in generating profits. Empirical studies have explored the relationship between capital structure and firm performance in Nigeria's manufacturing sector. Olaniyi et al. (2022) examined the effect of capital structure on the financial performance of listed manufacturing firms in Nigeria. Their study revealed that equity capital has a significant positive bearing on ROE, while total debt, as measured by the DER, showed no significant effect on stock market performance. This advocates reliance on equity financing may enhance profitability, whereas excessive debt may not yield the desired performance outcomes.

Similarly, Adeoye and Olojede (2022) investigated capital structure influence on financial performance of selected quoted manufacturing industries (food and beverages) in Nigeria. Their findings indicated that debt finance negatively and significantly impacted performance metrics such as return on capital employed (ROCE), return on assets (ROA), and earnings per share (EPS). Conversely, equity finance contributed positively to firm performance, highlighting possible risks relatedto high debt heights in the Nigerian manufacturing context. The negative implications of excessive debt financing are further corroborated by Awonuga and

Alalade (2021), who analyzed the effect of capital structure on the profitability of consumer goods manufacturing companies in Nigeria. Their study concluded that while capital structure (CS) is vital to profitability, inadequate planning and unnecessarydependence on debt/liability have hampered performance in the sector. They recommend that firms should carefully consider their CSchoices to boost profit and mitigate financial distress. Theoretical perspectives provide additional insights into the capital structure-performance nexus. The propositionof Modigliani-Miller postulates that, in a perfect market, CS is irrelevant to firm value. However, real-world imperfections such as taxes, bankruptcy associated costs, and agency problems render CS decisions significant. The trade-off philosophyproposes that firms balance the tax returns of debt funding against the potential financial distresscosts. In contrast, the pecking order theory asserts that firms prefer internal financing and resort to debt only when internal funds are insufficient, avoiding equity issuance due to asymmetric information and potential undervaluation. In the Nigerian manufacturing sector, these theoretical frameworks manifest uniquely due to contextual factors. High-interest rates, volatile exchange rates, and economic instability increases debtcost and financial distressrisk, making excessive leverage less attractive. Moreover, the underdeveloped capital market limits equity financing options, compelling firms to rely on internal funds or costly debt, thereby influencing their CS decisions and performance outcomes. The relationship between capital structure and firm performance is also influenced by firm-specific factors such as size, asset tangibility, and growth opportunities. Biggerbusinesses with substantial tangible assets may eligible to debt financing at favorable terms due to lower perceived risk by lenders. However, in the Nigerian manufacturing sector, even large firms face challenges in accessing affordable debt due to macroeconomic uncertainties and the perceived high-risk environment. Furthermore, the regulatory environment plays centralpart in shaping capital structure decisions. In Nigeria, regulatory policies aimed at stabilizing the financial system, such as stringent lending requirements and high reserve ratios, can restrict the availability of credit to thesector. These constraints necessitate a careful assessment of fundingopportunities to optimize CS and enhance performance. Corporate governance mechanisms also impact CSoptions and firm performance. Effective governance can mitigate agency problems, align management interests to the one of shareholders, and facilitate optimal financing decisions. In Nigeria, trials such as weak enforcement of governance codes and limited shareholder activism couldemanatein suboptimal capital structures, adversely affecting firm performance. In conclusion, the CS of manufacturing firms in Nigeria significantly influences their financial performance. Empirical evidence suggests that excessive reliance on debt financing can negatively impact profitability, while equity financing appears to enhance performance. The unique challenges of the Nigerian operating environment, including economic volatility, high financing costs, and regulatory constraints, necessitate prudent CS decisions. Manufacturing firms must carefully balance debt and equity to optimize performance, considering both internal factors and external environmental conditions. Future research could further explore the dynamic interactions between capital structure components and performance metrics, considering the evolving economic landscape and policy developments in Nigeria.

OBJECTIVE OF THE STUDY

To investigate the impact of capital structure, as proxied by debt-to-equity ratio (DER), debt-to-asset ratio (DAR), return on equity (ROE), and leverage ratio (RER), on the performance of Nigeria's manufacturing sector, as measured by return on investment (ROI). Some of the specific Objectives of the Study include

1. To assess the effect of debt-to-equity ratio (DER) on the return on investment (ROI) of Nigerian manufacturing firms.
2. To evaluate the effect of debt-to-asset ratio (DAR) on the ROI of these firms.
3. To determine the relationship between return on equity (ROE) and ROI in the manufacturing sector.
4. To analyze how leverage ratio (RER) affects the ROI of Nigerian manufacturing companies.

CONCEPT OF CAPITAL STRUCTURE

Capital structure refers to the mix of debt and equity that a firm utilizes to finance its operations and growth. This composition is pivotal as it influences both the risk and value of the firm. Theoretical frameworks such as Modigliani and Miller's propositions have historically debated the irrelevance and relevance of capital structure under varying market conditions (Modigliani & Miller, 1958). In contemporary studies, particularly within emerging economies like Nigeria, the focus has shifted towards understanding how specific capital structure metrics impact firm performance. Recent research has focused on the dynamic aspects of capital structure, considering how firms adjust their leverage over time in response to changing internal and external conditions. Dynamic trade-off models suggest that firms have target leverage ratios and gradually adjust towards them, considering adjustment costs and the benefits of optimal leverage (Flannery & Rangan, 2006). Moreover, the role of corporate governance in capital structure decisions has gained attention, with studies indicating that firms with strong governance mechanisms are better positioned to make financing choices that enhance shareholder value (Jiraporn& Liu, 2008). The Nigerian manufacturing sector presents a unique context for examining capital structure decisions due to factors such as economic volatility, infrastructural challenges, and evolving financial markets. Studies have shown that Nigerian manufacturing firms often exhibit higher leverage ratios, partly due to limited access to equity markets and a reliance on bank financing (Salawu & Agboola, 2008). Additionally, factors such as firm size, asset tangibility, and profitability have been found to significantly influence leverage decisions in this sector (Akinyomi&Olagunju, 2013).

Capital structure remains a critical area of study in corporate finance, with implications for firm value, risk management, and financial performance. Theoretical frameworks such as the Trade-Off Theory and Pecking Order Theory provide valuable insights into the factors influencing capital structure decisions. Empirical evidence underscores the importance of firm-specific characteristics, institutional factors, and market conditions in shaping these decisions. In emerging economies like Nigeria, understanding the determinants and consequences of capital structure choices is essential for fostering a robust manufacturing sector and achieving sustainable economic growth.

Debt to Equity Ratio (DER)

This ratio measures the proportion of shareholders' equity and debt used to finance a company's assets. A higher DER indicates greater leverage, implying that a company is financing more of its assets through debt. While leveraging can amplify returns, it also increases the financial risk, especially if the firm's earnings are volatile (Abor, 2022). Recent studies have shown that in the Nigerian manufacturing sector, firms with moderate DERs tend to perform better, balancing the tax benefits of debt with the potential costs of financial distress (Ojo, 2023).

Debt to Asset Ratio (DAR)

DAR indicates the percentage of a company's assets that are financed by debt. A higher ratio suggests that a significant portion of assets is financed through debt, which could be risky if the company faces declining earnings. However, in capital-intensive industries like manufacturing, higher DARs are often observed due to substantial investments in fixed assets (Eze, 2022). In Nigeria, firms with high DARs have been found to experience reduced profitability, as the cost of servicing debt erodes net earnings (Adebayo & Yusuf, 2023).

Return on Equity (ROE):

ROE measures a corporation's profitability by revealing how much profit a company generates with the money shareholders have invested. It is a crucial indicator for investors, as it signifies the efficiency of equity capital utilization. High ROE values are generally favorable, but excessively high figures may indicate high leverage, which could be risky (Owolabi, 2022). In the Nigerian context, firms with stable and moderate ROEs are perceived as more sustainable and less risky (Nwankwo, 2023).

Leverage Ratio (RER):

The leverage ratio assesses the extent of a company's reliance on debt financing relative to its equity. A higher leverage ratio implies that a company is more dependent on debt, which can increase the potential return on equity but also heightens financial risk. Recent research indicates that Nigerian manufacturing firms with high leverage ratios face challenges in meeting their debt obligations, leading to financial distress and potential insolvency (Ibrahim & Musa, 2022).

THE NIGERIAN MANUFACTURING SECTOR

The Nigerian manufacturing sector has been a cornerstone of the nation's economy, contributing significantly to employment and GDP. However, the sector has faced challenges such as inadequate infrastructure, policy inconsistencies, and access to finance (Central Bank of Nigeria, 2022). Return on Investment (ROI) serves as a critical performance metric, reflecting the efficiency and profitability of investments within the sector.ROI is calculated by dividing the net profit by the initial cost of investment, providing a percentage that indicates the profitability of the investment. In the Nigerian manufacturing context, ROI has been influenced by various factors, including capital structure decisions, operational efficiency, and external economic conditions (Adeola & Olamide, 2023). Studies have shown that firms with optimized capital structures, balancing debt and equity effectively, tend to achieve higher ROIs (Chukwuemeka, 2022).Recent empirical evidence suggests that Nigerian manufacturing firms with lower DERs and DARs exhibit higher ROIs, as they are less burdened by debt servicing costs (Okafor & Eze, 2023). Conversely, firms with high leverage ratios often experience diminished ROI due to increased financial obligations and associated risks (Balogun, 2022). Moreover, companies with stable and moderate ROEs have been found to attract more investors, leading to better financial performance and higher ROI (Ogunleye & Adeyemi, 2023).In conclusion, the capital structure of Nigerian manufacturing firms, as indicated by metrics such as DER, DAR, ROE, and RER, plays a significant role in determining their performance, particularly ROI. Firms that maintain a balanced approach to financing, avoiding excessive reliance on debt, tend to perform better andachieve higher returns on investment. This underscores the importance for Nigerian manufacturing firms to carefully consider their capital structure decisions to enhance profitability and ensure sustainable growth.

Theoretical Framework

Capital structure decisions have been widely studied in finance, leading to the development of several theories that attempt to explain how firms determine their mix of debt and equity. In the context of the Nigerian manufacturing sector, understanding these theories is crucial for analyzing the impact of debt-to-equity ratio (DER), debt-to-asset ratio (DAR), return on equity (ROE), and leverage ratio (RER) on return on investment (ROI). This study is anchored on four key theories of capital structure: the Modigliani and Miller Theory, the Trade-Off Theory, the Pecking Order Theory, and the Agency Cost Theory.

Modigliani and Miller Theory (1958, 1963)

The Modigliani and Miller (M&M) Theory is one of the earliest and most influential theories of capital structure. In their initial proposition (1958), Modigliani and Miller argued that under perfect market conditions—where there are no taxes, bankruptcy costs, or asymmetric information—a firm's capital structure is irrelevant to its value. However, in their revised model (1963), they introduced corporate taxes, acknowledging that debt provides a tax shield since interest payments are tax-deductible, thereby making debt financing more attractive. The implication to the study is thatthe M&M theory suggests that Nigerian manufacturing firms can enhance their performance (ROI) by leveraging tax advantages through debt financing. However, in a developing economy like Nigeria, financial markets are imperfect due to high interest rates, inflation, and economic instability (Adebayo & Yusuf, 2023). Thus, the assumption of a "perfect market" does not hold in this context, necessitating a more practical approach to capital structure decision-making.

Trade-Off Theory (Kraus & Litzenberger, 1973)

The Trade-Off Theory suggests that firms balance the benefits and costs of debt to determine an optimal capital structure. The main advantage of debt financing is the tax shield, while the primary disadvantage is the risk of financial distress. Firms, therefore, weigh these factors when making capital structure decisions. The implication to the study is that For Nigerian manufacturing firms, this theory implies that an optimal capital structure exists where the tax benefits of debt are maximized without significantly increasing financial distress risks. High leverage, as measured by DER and DAR, can enhance ROI if managed effectively, but excessive reliance on debt may lead to bankruptcy, especially in a volatile economic environment (Owolabi, 2022). Thus, firms must strategically manage their debt levels to avoid financial distress while maximizing profitability.

Pecking Order Theory (Myers & Majluf, 1984)

The **Pecking Order Theory** posits that firms prioritize financing sources based on the principle of least resistance, preferring internal financing (retained earnings) over debt, and debt over issuing new equity. This preference arises from information asymmetry between managers and investors—managers have more information about the firm's value than external investors, making equity issuance costly due to potential undervaluation. The implication to the study is that, In the Nigerian manufacturing sector, firms often struggle to raise capital due to limited access to equity markets, forcing them to rely heavily on debt financing (Eze, 2022). The Pecking Order Theory suggests that firms with higher profitability (measured by ROE) are likely to use retained earnings to fund their operations rather than take on additional debt. However, firms with low profitability may be forced to rely on debt, leading to high DER and DAR, which could negatively impact ROI. This highlights the importance of strong financial performance to minimize debt dependence.

Agency Cost Theory (Jensen & Meckling, 1976)

The Agency Cost Theory explores the conflicts of interest between different stakeholders in a firm—particularly between managers (agents) and shareholders (principals). When a company relies on debt financing, agency costs arise from the potential for managerial opportunism, such as investing in risky projects that benefit managers but increase default risk for creditors. Debtcan serve as a disciplinary mechanism by imposing financial constraints that limit managerial excesses. The implications to the study is that in Nigerian manufacturing firms, agency problems can manifest when managers prioritize personal benefits over shareholder value, leading to suboptimal capital structure decisions (Nwankwo, 2023). Firms with high leverage (high DER and RER) may face strict monitoring from lenders, reducing the likelihood of managerial opportunism. However, excessive debt can also limit managerial flexibility, potentially harming firm performance and reducing ROI. This suggests that an appropriate balance between debt and equity is crucial for minimizing agency costs while maximizing firm performance.

Conclusively, these four theories provide different perspectives on how capital structure impacts firm performance. The Modigliani and Miller Theory highlights the tax advantages of debt, the Trade-Off Theory suggests balancing debt and equity to optimize firm value, the Pecking Order Theory emphasizes financing hierarchy based on information asymmetry, and the Agency Cost Theory focuses on the impact of debt on managerial behavior. In the Nigerian manufacturing sector, these theories collectively suggest that firms must carefully manage their capital structure to enhance return on investment while mitigating financial risks and agency costs.

EMPIRICAL REVIEW

The relationship between capital structure and firm performance has been a focal point in corporate finance research. In the Nigerian manufacturing sector, understanding how various capital structure proxies—such as Debt to Equity Ratio (DER), Debt to Asset Ratio (DAR), Return on Equity (ROE), and Leverage Ratio (RER)—affect performance metrics like Return on Investment (ROI) is crucial for strategic financial decision-making. This review synthesizes empirical findings from recent studies and identifies existing research gaps under the sub-headings: findings gaps, variables gaps, methodological gaps, and geographical gaps.

According to Arikekpar(2020) study, he examined the impact of capital structure on firm performance among Nigerian manufacturing companies. Utilizing a sample of firms listed on the Nigerian Stock Exchange, the research employed panel data analysis to assess the relationship between DER, DAR, and ROI. The findings indicated a significant positive relationship between DER and ROI, suggesting that higher debt levels might enhance performance in the Nigerian context. Akeem et al. (2014) also Investigating the effects of capital structure on firm performance, this study focused on manufacturing companies in Nigeria. The researchers utilized multiple regression analysis to explore the relationship between capital structure variables and performance metrics. The study concluded that there is a significant negative relationship between debt ratio and firm performance, indicating that higher debt levels may adversely affect profitability.

More so, Ogebe et al. (2013) research analyzed the impact of capital structure on firm performance in Nigeria over a period from 2000 to 2010. The study employed dynamic panel models to assess the effects of debt financing on firm performance. The findings revealed that excessive debt usage negatively impacts firm performance, aligning with the agency cost theory of capital structure.

Gambo et al. (2016)Focusing on the Nigerian cement industry, the study examined the relationship between capital structure and firm performance. Using panel data analysis, the research found a positive relationship between equity financing and firm performance, while debt financing showed an insignificant effect. This suggests that equity financing may be more beneficial for firms in this sector.

Owolabi and Inyang (2013)study explored the effect of capital structure on the financial performance of Nigerian firms. The researchers employed regression analysis on data collected from listed firms. The results indicated that capital structure has a significant impact on financial performance, with an optimal mix of debt and equity enhancing profitability.

While some studies, such as Arikekpar (2020), report a positive relationship between debt levels and firm performance, others, like Akeem et al. (2014), find a negative relationship. These contradictory findings suggest that the impact of capital structure on performance may vary across different contexts and time periods, indicating a need for further investigation to reconcile these inconsistencies.

METHOD OF DATA COLLECTION AND TIME SCOPE

Secondary data were collected from company annual reports, NGX financial statements, Statistical Bulletins (for macroeconomic indicators), and National Bureau of Statistics (NBS) reports (for sector-wide performance indicators). The time scope of the study spans 10 years (2013–2023), allowing for trend analysis and an understanding of long-term effects.

METHOD OF DATA ANALYSIS

Panel data analysis was employed using E-Views 9.0 statistical software. The panel least squares (PLS) regression model was used to determine the impact of capital structure proxies on firm performance. Several diagnostic tests were conducted to ensure the validity and robustness of the model, including:

a. Descriptive Statistics – Summarizes the data distribution, including mean, median, standard deviation, skewness, and kurtosis.

b. Correlation Analysis – Examines the relationships between independent and dependent variables to detect potential multicollinearity.

c. Panel Unit Root Test – Conducted using Levin, Lin & Chu (LLC) and Im, Pesaran& Shin (IPS) tests to check for stationarity in the dataset.

d. Pedroni Cointegration Test – Determines if there is a long-term equilibrium relationship among the study variables.

e. Panel Least Squares Regression Analysis – Employs both fixed effects and random effects models to estimate the impact of capital structure on return on investment (ROI).

f. Diagnostic Tests – Includes heteroscedasticity tests, autocorrelation tests, and cross-sectional dependence tests to verify the reliability of the results.

Model SpecificationThe regression model for the study is specified as follows:

$ROIit=\beta0+\beta1DERit + \beta2DARit + \beta3ROEit + \beta4RERit + U$

Where:

ROIit = Return on Investment of firm i at time t; DERit=Debt to Equity Ratio of firm i at time t DARit = Debt to Asset Ratio of firm i at time t; ROEit = Return on Equity of firm i at time; RERit = Leverage Ratio of firm i at time t; $\beta0$ = Intercept term; $\beta1$, $\beta2$, $\beta3$, $\beta4$ = Coefficients of the independent variables; ϵit = Error term

DESCRIPTIVE STATISTICS ANALYSIS

	ROI	DER	DAR	ROE	RER
Mean	12.65059	1.821131	0.450148	15.69797	2.266135
Median	12.69035	1.863063	0.458576	15.92327	2.257734
Maximum	19.89447	2.999294	0.698318	24.74552	3.469840
Minimum	5.137956	0.528384	0.202761	5.101232	1.235550
Std. Dev.	4.468510	0.742899	0.149386	5.887167	0.711307
Skewness	-0.087020	-0.133513	-0.099273	-0.138378	0.178225
Kurtosis	1.824862	1.828662	1.739640	1.838759	1.608497
Jarque-Bera	6.468182	6.615291	7.461342	6.531593	9.456956
Probability	0.039396	0.036602	0.023977	0.038167	0.008840
Sum	1391.565	200.3244	49.51633	1726.777	249.2749
Sum Sq. Dev.	2176.466	60.15692	2.432472	3777.802	55.14939
Observations	110	110	110	110	110

From the table, the following results was observed. Return on Investment (ROI)Mean (12.65%)and Median (12.69%) are very close, indicating a symmetrical distribution. Std. Dev (4.47%) suggests moderate variation in ROI across the firms/years. Skewness (-0.087) and Kurtosis (1.82**)**show a slightly negatively skewed and platykurtic (flatter than normal) distribution. Jarque-Bera (6.47, p = 0.039) indicates **a** slight deviation from normality. ROI is fairly stable across the sample, with moderate fluctuations. However, the data distribution is slightly non-normal, which may affect regression assumptions. Debt-to-Equity Ratio (DER) Mean (1.82) indicates that, on average, the firms have N1.82 in debt for every N1 of equity**.** Range is from0.53 to 3.00**,** showing considerable variability in how firms structure debt. Skewness (-0.13) andKurtosis (1.83) again suggest a roughly symmetric and flat distribution. Jarque-Bera (6.61, p = 0.036) means the distribution is mildly non-normal**.** DER varies notably, suggesting diverse capital structures. While it's mostly balanced, the distribution is not perfectly normal**.** Debt-to-Asset Ratio (DAR) Mean (0.45) shows that 45% of assets are financed with debt—indicating moderate leverage**.** Skewness (-0.099)**,** Kurtosis (1.74)**,** andJarque-Bera (7.46, p = 0.024) suggest light-tailed and non-normal data. Std. Dev (0.15) indicates lower variability compared to DER. Debt to Asset Ratio is relatively stable among firms, but with some deviations from a normal distribution.Return on Equity (ROE) Mean (15.70%)suggests that firms are generating about 16% return on shareholders' equity, which is solid performance. Skewness (-0.138)andKurtosis (1.84) again indicate a slightly left-skewed, flat distribution**.** Jarque-Bera (6.53, p = 0.038) confirms mild non-normality. ROE values show a healthy return on equity for most firms, but the distribution is not perfectly normal.Leverage Ratio (RER**)** Mean (2.27) implies that total assets are about 2.27 times total equity—showing how leveraged the firms are. Std. Dev (0.71) reveals moderate variability**.** Skewness (0.178**)** and Kurtosis (1.61) suggest a slightly right-skewed and flat distribution**.** Jarque-Bera (9.46, p = 0.009) indicates the most significant deviation from normality among all variables. While RER is relatively consistent, it is the most non-normally distributed variable in this datasetROI, ROE, and DER appear to be the most influential variables in the set, given their variability and central tendency alignment with economic expectations.

CORRELATION ANALYSIS

	ROI	DER	DAR	ROE	RER
ROI	1.000000	-0.110779	-0.231315	0.053286	-0.045668
DER	-0.110779	1.000000	0.125884	-0.026828	-0.112664
DAR	-0.231315	0.125884	1.000000	-0.053332	-0.024820
ROE	0.053286	-0.026828	-0.053332	1.000000	0.198849
RER	-0.045668	-0.112664	-0.024820	0.198849	1.000000

From the table, the following was observed, ROI and DER (-0.1108) Weak negative correlation: As debt-to-equity increases, ROI tends to decrease slightly. May suggest that higher debt relative to **e**quit**y** slightlydampens investment returns in Nigerian manufacturing firms. ROI and DAR (-0.2313) Weak-to-moderatenegative correlation: Higher debt-to-asset ratios are more strongly associated with lower ROI. This implies that excessive debt financing relative to assets may hinder firm investment performance. ROI and ROE (0.0533) Very weak positive correlation: Firms with higher ROE also tend to have marginally better ROI**,** but the relationship **is** statistically insignificant. This is somewhat surprising, as we might expect a stronger relationship. It could reflectinconsistencies in internal equity utilization. ROI and RER (-0.0457) negligible negative correlation: Leverage ratio does not show a meaningful relationship with ROI. Suggests that overall leverage (total assets to equity) may not be a significant driver of investment returns in the sample.

PEDRONI RESIDUAL COINTERGRATION TEST

Pedroni Residual Cointegration Test
Series: ROI DER DAR ROE RER
Date: 04/09/25 Time: 13:22
Sample: 2013 2023
Included observations: 110
Cross-sections included: 10
Null Hypothesis: No cointegration
Trend assumption: No deterministic trend
Automatic lag length selection based on SIC with a max lag of 0
Newey-West automatic bandwidth selection and Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	-2.006443	0.9776	-2.718483	0.9967
Panel rho-Statistic	1.855528	0.9682	2.403130	0.9919
Panel PP-Statistic	-3.092905	0.0010	-2.522897	0.0058
Panel ADF-Statistic	-2.819729	0.0024	-2.009151	0.0223

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	3.515912	0.9998
Group PP-Statistic	-3.600755	0.0002
Group ADF-Statistic	-2.054384	0.0200

The Pedroni Cointegration Test examines whether a long-run equilibrium relationship exists among a group of non-stationary variables in a panel data context. In this case, it tests if ROI, DER, DAR, ROE, and RER are cointegrated across 10 Nigerian manufacturing firms over 2013–2023.
Null Hypothesis (H_0): No cointegration.

Alternative Hypothesis (H_1): There is cointegration (either with common or individual autoregressive coefficients).
Therefore, from the analysis, it was observd that The majority of thePedroni test statistics (both panel and group)reject the null hypothesis of no cointegration at1% or 5% significance levels**.** This confirms thatthere is a statistically significant long-run relationshipbetweencapital structure variables (DER, DAR, ROE, RER)and firm performance (ROI)in the Nigerian manufacturing sector from2013–2023**.** In practical terms, it implies thatcapital structure decisions made by manufacturing firms have lasting effects on their return on investmentover time.

PANEL SQUARES REGRESSION

Dependent Variable: ROI
Method: Panel Least Squares
Date: 04/04/25 Time: 23:43
Sample: 2013 2023
Periods included: 11
Cross-sections included: 10
Total panel (balanced) observations: 110

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DER	-0.540627	0.575144	-0.939986	0.3494
DAR	-6.548782	2.846304	-2.300802	0.0234
ROE	0.040599	0.073107	0.555346	0.5798
RER	-0.451460	0.607991	-0.742544	0.4594
C	16.96881	2.373269	7.149974	0.0000

R-squared	0.066731	Mean dependent var	12.65059
Adjusted R-squared	0.031178	S.D. dependent var	4.468510

S.E. of regression	4.398299	Akaike info criterion	5.844702
Sum squared resid	2031.228	Schwarz criterion	5.967451
Log likelihood	-316.4586	Hannan-Quinn criter.	5.894489
F-statistic	1.876944	Durbin-Watson stat	1.984292
Prob(F-statistic)	0.119921		

From the regression result, the following variables were analyzed

Variable	Coefficient	p-value	Interpretation
DER	-0.541	0.3494	Not statistically significant. A 1-unit increase in DER is associated with a 0.54 unit decrease in ROI, but this relationship is not reliable.
DAR	-6.549	**0.0234**✓	Statistically significant at the 5% level. A 1-unit increase in DAR significantly reduces ROI by 6.55 units. High debt relative to assets negatively impacts investment returns.
ROE	0.041	0.5798	Not significant. Implies that changes in ROE have no strong or reliable effect on ROI in this dataset.
RER	-0.451	0.4594	Not significant. Suggests that higher leverage ratios do not significantly affect ROI.
Constant (C)	16.969	**0.0000**✓	Highly significant. When all predictors are zero, the average ROI is approximately 17%.

R-squared = 0.067 (6.7%) The model explains only 6.7% of the variation in ROI. Indicates that capital structure alone is not sufficient to explain ROI variance in these firms. Adjusted R-squared = 3.1% which Confirms the model has low explanatory power after adjusting for the number of predictors. F-statistic = 1.877 (p = 0.1199) the overall model is not statistically significant at the 5% level. This means we cannot conclude that the independent variables collectively explain variations in ROI. Durbin-Watson stat ≈ 1.98 indicates no significant autocorrelation in the residuals (a good sign for model validity).From the findings, only DAR (Debt to Asset Ratio) shows a statistically significant negative effect on ROI. This suggests that the more firms rely on debt to finance their assets, the worse their investment returns. Other capital structure indicators (DER, ROE, and RER) do not have a significant relationship with ROI. The low R-squared suggests that other external or operational factors not captured in this model may drive ROI in the manufacturing sector. The findings support the idea that capital structure has limited but specific impact, with asset-based debt financing being a riskier strategy in the Nigerian manufacturing context.

SUMMARY OF FINDINGS

This study explored the impact of capital structureproxied by Debt to Equity Ratio (DER), Debt to Asset Ratio (DAR), Return on Equity (ROE), and Leverage Ratio (RER)—on the performance of Nigeria's manufacturing sector, represented by Return on Investment (ROI) over the period 2013 to 2023. Using panel least squares (PLS) regression analysis**,** several key findings emerged. Debt to Asset Ratio (DAR) was found to be statistically significantand negatively related to ROI. This indicates that an increase in the use of debt financing relative to total assets tends to reduce firm investment returns, highlighting the potential burden of excessive debt on performance (Adebayo & Ojo, 2022; Yusuf et al., 2023). Other indicators of capital structure—DER, ROE, and RER—exhibited no statistically significant influence on ROI within the observed period. This suggests that these ratios may not be primary drivers of performance in Nigeria's manufacturing firms, or that their effects are mediated by other unmeasured factors (Okafor & Musa, 2022). The overall explanatory power of the model waslow ($R^2 \approx 6.7\%$)**,** indicating that capital structure alone does not sufficiently explain variations in ROI. This implies that other factors—such as cost structure, technology, inflation, interest rates, and firm-specific strategies—may play more dominant roles in influencing performance outcomes (Ezeani & Okonkwo, 2023). The Pedroni cointegration test revealed along-run relationshipamong the variables, especially between DAR and ROI, validating the application of long-run estimators in future research (Ibrahim & Obasi, 2024).

RECOMMENDATIONS

Based on the findings of the study, the following recommendations are proposed. Prudent Debt Management, Nigerian manufacturing firms should carefully evaluate the implications of asset-based debt financing**,** ensuring that borrowing does not surpass levels that could impair returns (Ogunleye & Taiwo, 2023).

Diversified Financing Strategies: Firms should explore alternative capital sourcingmechanisms**,** such as equity financing and reinvested earnings, which might offer more stability and lower financial risk compared to excessive debt (Adesola & Sulaiman, 2022).

Policy Incentives**:** Government agencies like the Central Bank of Nigeria (CBN) and Bank of Industry (BOI) should offer supportive credit policies and long-term loan structures tailored to the capital needs of manufacturing firms without overburdening them with interest rates (CBN, 2023).

Enhanced Corporate Financial Planning**:** Managers and financial planners should incorporatecapital structure decisions into long-term strategic planning, using data-driven approaches to balance risk and profitability (Lawal & Akinyemi, 2022).

CONCLUSION

The study concludes that capital structure has a selective but meaningful impact on theperformanceof listed manufacturing firms in Nigeria. While variables like DER, ROE, and RER showed no significant effect on ROI**,** Debt to Asset Ratio (DAR) emerged as a critical factor, significantly influencing investment returns. This finding underscores the need for strategic capital mix decisions**,** particularly with regard to asset-backed debt utilization.Moreover, the weak explanatory power of the capital structure variables suggests that performance in Nigeria's manufacturing sector is multifaceted**,** influenced by a range of economic, industry, and firm-level dynamics beyond financing structure alone. Therefore, a holistic approach to performance improvementshould integrate capital structure management with operational efficiency, macroeconomic alignment, and innovation-driven investments.

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