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ARTICLE INFO

William Inyang, Charles Effiong, Femi Gabriel, James Obriku Otiwa, Akaninyene Orok, Francis Ahakiri and Enya Emori (2026). Assessing the influence of debt discipline on the profitability of Nigerian manufacturing firms. *Investment Management and Financial Innovations*, *23*(1), 434-446. doi:10.21511/imfi.23(1).2026.32

DOI http://dx.doi.org/10.21511/imfi.23(1).2026.32

RELEASED ON Friday, 20 March 2026

RECEIVED ON Thursday, 06 November 2025

ACCEPTED ON Friday, 13 February 2026

JOURNAL "Investment Management and Financial Innovations"

ISSN PRINT 1810-4967

ISSN ONLINE 1812-9358

PUBLISHER LLC “Consulting Publishing Company “Business Perspectives”

FOUNDER LLC “Consulting Publishing Company “Business Perspectives”

NUMBER OF REFERENCES **37**

NUMBER OF FIGURES **1**

NUMBER OF TABLES **7**

BUSINESS PERSPECTIVES

LLC "CPC "Business Perspectives"
Hryhorii Skovoroda lane, 10,
Sumy, 40022, Ukraine

www.businessperspectives.org

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ASSESSING THE INFLUENCE OF DEBT DISCIPLINE ON THE PROFITABILITY OF NIGERIAN MANUFACTURING FIRMS

Type of the article: Research Article

Received on: 6th of November, 2025
Accepted on: 13th of February, 2026
Published on: 20th of March, 2026

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Conflict of interest statement:
Author(s) reported no conflict of interest

Abstract

Capital structure decisions in the Nigerian economy are vital and significantly influence the performance of manufacturing firms. This study investigates the effect of the debt-equity ratio on the financial outcomes of the following manufacturing companies: BUA Cement Plc, Dangote Cement Plc, Lafarge Africa Plc, and Flour Mills Nigeria Plc, all quoted on the Nigeria Exchange Group Ltd. during the period 2015–2024. Fixed-effect panel data regression analysis is used to determine the influence of short-term and long-term debts on profit (return on investment). The findings suggest that the negative relationship is strong and statistically significant between the financial performance (profitability) and the leverage ratios, such as short-term debt/net worth (-0.042, $p < 0.025$), long-term debt/net worth (-0.061, $p < 0.009$), and total debt/net worth (-0.035, $p < 0.025$). Therefore, all the null hypotheses were rejected at the 5% level of significance. The model describes the variation in firm performance which is, on average, 39%. At the firm level, BUA Cement Plc experienced a deleveraging trend and the profitability of the firm was on the downwards trend while Flour Mills Plc, owing to its high leverage, was marginally affected in its profit performance. The conclusion is that effective control of capital structure is essential if a better return per naira is to be earned for the country's manufacturing sector.

Keywords leverage, regression, efficiency, diagnostics, strategy, performance

JEL Classification G32, L60, C23, M21

INTRODUCTION

The issue of capital structure, especially leveraging between debt and equity financing, continues to be a central concern in corporate finance since it has a direct impact on the financial stability of firms, their exposure to risks, and performance over time. Economic trends in the world in recent years have made leverage decisions more practical in use, where times of monetary restriction and the growth in interest rates have greatly raised the cost of borrowing and revealed the financial fragility of highly leveraged companies, particularly in the new economies (International Monetary Fund, 2023; World Bank, 2023). These relations have strengthened the worry regarding the way companies fund their operations and investments under macroeconomic instability and limited capital markets.

In Nigeria, capital structure decisions are more applicable due to the structural features of the financial system, such as sustained interest rate volatility, inability to source long-term financing, repetitive currency depreciation, and high inflationary pressure. The circumstances have complicated debt repayment obligations and augmented financial distress in corporations involved in capital-intensive industries

http://dx.doi.org/10.21511/imfi.23(1).2026.32

like manufacturing (Central Bank of Nigeria, 2023; National Bureau of Statistics, 2024). The corporate financial reports of listed manufacturing companies show that finance expenses are increasing in comparison with operating revenues during the last decade, and that the burden of energy expenses and foreign exchange limitations is increasing. These developments are indicative of the physical implications of leverage decisions on the performance and sustainability of firms.

Although the use of debt has been the prevalent form of financing the activities of the manufacturing industry, some of the visible results within the industry indicate that there is an unresolved economic contradiction. Debt financing is traditionally linked to growth and efficient investment, but a number of companies still show decreasing returns on assets, deteriorating balance sheet positions with the growing leverage, though some of them prove the improvement in performance after debt restructuring or decreased use of debt. This advantage of both dependence on leverage and divergent performance results brings out a scientific issue regarding whether the current debt-equity arrangements of the Nigerian manufacturing companies are actually economically rational decisions in financing arrangements, or whether they imply a structural dependence on debt that limits profitability and utilization of assets at the current market conditions. This presents a scientific problem: Are Nigerian manufacturing firms optimizing their capital structure from an economic point of view, or are they locked in a high leverage cycle depressing profit?

1. LITERATURE REVIEW AND HYPOTHESES

Capital structure theories can explain why firms select particular combinations of debt-equity financing and how such a choice of financing affects the profitability of a firm. A long-standing controversy between scholars relates to whether the use of debt increases or lowers firm value when there are imperfect markets. The interrelationship of debt, equity, and profitability has received much attention, especially in manufacturing industries in developing countries, where the availability of credit for a firm and the cost of capital are the most important factors determining its performance.

The works of Modigliani and Miller (1958) have led to the emergence of today's capital structure theory. Modigliani and Miller, in their first proposition, assume that in conditions of a perfectly competitive market where taxes are absent, transaction costs, or any asymmetries of information, firm value does not depend on its capital structure. According to them, in such an ideal situation, the method of financing, whether debt or equity, is not relevant to the firm's value. This theoretical neutrality, however, has been refuted by other scholars, who have brought to our attention different real-world elements of imperfections, like taxes, bankruptcy costs, and asymmetries of information, which enter into the financing behavior of firms and their performance results.

A very important extension of the Modigliani and Miller conclusions is the Trade-Off Theory proposed by Kraus and Litzenberger (1973). This theory states that firms attempt to have a capital structure that is optimum, which would be indirect to their interests, which would weigh the tax benefits from debt against the financial distress costs attributable to an excess of debt. A moderate amount of debt financing would add value to firms through their tax shield benefits, while an excessive amount would increase the likelihood of bankruptcy and reduce profits. Evidence from firms in Nigeria supports this proposition. For instance, it has been observed that Nestlé Nigeria has shown a fall in returns on assets (ROA) as debt finance increased (Aja, 2025; Awhanjinu, 2025), whereas Unilever Nigeria's ability to maintain a conservative approach to borrowing has allowed it to remain profitable (Ogbuokiri, 2024). These findings indicate clearly that the ability of management to maintain a proper balance between debt and equity finance is important for improving performance.

Empirical support from other Nigerian manufacturing firms aligns with the Trade-Off Theory. For instance, Omodara (2023) discovered that short-term borrowing has an adverse effect on profit-

ability because of the liquidity squeeze and creation of refinancing costs. Titman and Wessels (1988), Berger and Bonaccorsi (2006), Ogebe et al. (2013), and Salawu (2007) find similar effects and stress the importance of keeping short-term borrowing moderate, otherwise liquidity and hence overall profitability will be reduced. Adekoya and Oladimeji (2023) was of the opinion that in a business climate in which short-term finance is important, firms become vulnerable to interest rate risks and are also subject to government regulations, which adversely affect financial efficiencies. Similar findings to the above exist in other developing environments. For example, Abor (2005) points out that high levels of short-term debt produce financial vulnerability and poor performance in firms in Ghana, and Ezeoha (2008) found the same in Nigeria.

Some studies, on the other hand, have observed that moderate levels of short-term finance can also produce benefits. Sike et al. (2022) and Orji et al. (2021) point out that when short-term debt is used judiciously, benefits can accrue to firms, since costs of liquidity changes are lowered and tax distortions may also be removed, which is in alignment with the trade-off theory. In contrast, Ebaid (2009) showed a lack of significant association between short-term borrowing and profitability in Egyptian firms. He led to the conclusion that the profitability effects of leverage may well be contextually dependent.

The association between long-term debts and the performance of a firm is more complicated. Evidence from underdeveloped economies is such that high levels of long-term borrowing usually depress profitability. Kraus and Litzenberger (1973) demonstrated globally that high reliance on long-term borrowings reduces ROA because such borrowing limits financial flexibility arising from interest payments. Similar results were found in Nigeria, where Titman and Wessels (1988), Ogebe et al. (2013), and Salawu (2007) found that liquidity and high interest payments associated with long-term loans restrict profitability. Studies in Ghana (Abor, 2005), Egypt (Ebaid, 2009), and Jordan (Al-Najjar and Taylor, 2008) produced similar findings showing that excessive long-term leverage results in financial fragility and reduced operational efficiency.

Other studies, however, have pointed to situations where long-term borrowings may enhance profits. Orji et al. (2021), Efemena and Augustine (2024), and Mwiti and Gitagia (2023) observed that when firms matched the maturity of debts with the lives of assets while ensuring sufficient cash flow availability, long-term financing improves ROA. Similar results were obtained by Tian and Zeitun (2007), Fosu (2013) and Singh and Bagga (2019) in their investigations of the principle that firms in capital-intensive industries may benefit from long-term borrowings, given that such borrowings could facilitate productive utilization of the assets in the long term, given prudential management.

When one considers total debt, this being a sum of both the long-term and short-term elements, most of the studies reveal an inverse association between leverage and performance in the underdeveloped countries. Rajan and Zingales (1995), Berzkalne and Zelgalve (2014), and Abor (2005) established that high total debts impair efficiencies in working capital and that they increase the interest implications of such debts, thereby limiting returns. Evidence coming from Nigeria, e.g., Ogebe et al. (2013), Salawu (2007), and Titman and Wessels (1988), was generally similar, where it was discovered that high leverage abrogated liquidity and resulted in lower-than-normal ROA. However, Akinninyi (2025) showed a positive albeit not a significant connection between total borrowing and performance in Nigerian firms. This was built probably on the assumption that the relationship would vary with internal variables in the system, including a firm's size and liquidity implications. Evidence obtained later from Vietnam (Fosu, 2013) and India (Singh & Bagga, 2019) revealed that well-managed leverage can positively affect performance in manufacturing firms with a strong base of well-managed assets and a robust financial structure.

The theoretical and empirical evidence tends to confirm that leverage exerts both a beneficial opportunity and a risk effect. The net benefit of the implications of debts on a firm's performance would depend on the management's ability to optimize the debt-equity ratio in accordance with market conditions, as well as those of the firm. In a developing economy like Nigeria, where volatility is the rule as far as interest rates are concerned

http://dx.doi.org/10.21511/imfi.23(1).2026.32

and where long-term credits are hard to obtain, prudential debt management becomes important. The Trade-Off Theory is thus found to be a satisfactory theoretical construct for analyzing capital structure decisions and their profit implications in developing economies.

In view of the foregoing, the study tested the following hypotheses:

H01: Short-term debt-equity ratio has no significant effect on the return on assets of quoted manufacturing firms in Nigeria.

H02: Long-term debt-equity ratio has no significant effect on the return on assets of quoted manufacturing firms in Nigeria.

H03: Total debt-equity ratio has no significant effect on the return on assets of quoted manufacturing firms in Nigeria.

2. METHODOLOGY

An ex-post facto research design was adopted by the current study, which is very pertinent for the verification of the association existing between the debt-equity mix and the profitability of the selected firms in Nigeria, by the use of the extant financial data available, which are inalterable by the researchers. This study employs a combination of quantitative and longitudinal research methodologies for a total of ten years, from 2015 to 2024. The ten-year timeframe enables the researchers to identify variations in financing strategies and profitability indices among companies and over time. Additionally, the longitudinal aspect of this methodology allows the researchers to explore the structural and performance dynamics that companies have developed and maintained during the last ten years.

Panel data analysis was used to have the advantage of both cross-sectional and time-series datasets in providing greater credence and explication of the research findings. It also has the advantage of accounting for unobserved varieties of characteristics of various firms, thereby attaining great precision in the parameter estimation. Fixed effect and random effect models have been estimated, and the Hausman test has been carried out too, which has the advantage of disclosing the model suited to the circumstances of getting steady and efficient results.

The researcher included four manufacturing companies, namely, BUA Cement Plc, Dangote Cement Plc, Lafarge Africa Plc, and Flour Mills of Nigeria Plc, in the study sample drawn from a population that consisted of companies traded in the Nigerian Exchange Group (NGX) as of December 2024. The companies have been selected according to their perennial listing positions, accessibility of their entire and consistent financial information, and strategic interests in Nigeria's manufacturing industry. The cement subsector, in which BUA Cement Plc, Dangote Cement Plc, and Lafarge Africa Plc are involved, is very capital-intensive and usually involves a high level of dependence on long-term debt financing and is therefore appropriate to study the discipline of debt in manufacturing heavy assets. Flour Mills of Nigeria Plc is a food and agro-processing industry, which is a relatively working-capital-intensive industry, heavily reliant on short-term financing, hence providing a contrasting financing structure when compared to the manufacturing industry. The combination of capital-intensive and consumer-oriented companies contributes to the study in capturing the difference in the debt discipline and profitability dynamic effects among sub-sectors, whereas the economic importance and disclosed financial information bring about the reliability of the forty firm-year observations used in the study.

The secondary data used in the study were obtained from audited annual accounts and accounting reports of companies, which were posted on their corporate websites and the NGX Fact Sheet. Data cleaning, calculation of firm-level ratios, and initial summaries were done in Microsoft Excel, whereas descriptive statistics, regression analyses, panel estimation data, and panel robustness checks were done in SPSS and EViews.

The variable that has been put into academic use in the study is the return on total assets (ROA), defined as the ratio of net income to total holdings, while the predictor variables employed are the short-term, long-term, and total debt/equity ratios, which constitute the capital structure of the firms utilized. The method of research employed grasps

a reliable and verifiable pattern within which to ascertain the influence of the variation of the compositions of the leverage on the profitability, which will be subjected to tests in the manufacturing sector of the country. The empirical form is that which was described as:

$$ROA_{it} = \beta_0 + \beta_1 STDE_{it} + \beta_2 LTDE_{it} + \beta_3 TTDE_{it} + \mu_i + \varepsilon_{it}, \quad (1)$$

where the variables are defined as ROA_{it} = Return on Assets of firm i at time t, $STDE_{it}$ = Short-term Debt-to-Equity ratio of firm i at time t, $LTDEi_t$ = Long-term Debt-to-Equity ratio of firm i at time t, $TTDE_{it}$ = Total Debt to the company Equity of firm i at time t, μ_i = Firm-specific "unobserved" effects, and ε_{it} = Idiosyncratic error term.

Each regression coefficient captured the marginal effect of the corresponding debt component on the firms' profitability. The diagnostic test results confirmed that the assumptions of panel regression were satisfied. VIFs showed values below 10, eliminating any possibility of multicollinearity. Levin-Lin-Chu and Im-Pesaran-Shin tests showed that stationarity was satisfied. The Breusch-Pagan test confirmed the presence of homocedasticity and the use of robust standard errors corrected for small heteroscedasticity present in the data. The Wooldridge test confirmed the absence of serial correlation. Chow and Breusch-Pagan LM tests confirmed the effects between firms, and the Hausman test showed that the fixed effects model produced the most consistent results. Inferences concerning the research hypotheses were conducted at the significance level of .05 ($p < 0.05$), lending credibility to the results, given the small sample of four firms used.

3. RESULTS

The research investigated the association between debt-equity mix represented by the short-term debt to equity ratio (STDE), long-term debt to equity ratio (LTDE), and the total debt to equity ratio (TDE), and the financial results represented by the return on assets (ROA) of Nigerian selected manufacturing companies for the period 2015–2024. The study adopted a balanced panel of forty firm-year observations using data from BUA Cement Plc, Dangote Cement Plc, Lafarge Africa Plc, and Flour Mills of Nigeria Plc. The results of the study are presented in the subsequent sections, including descriptive statistics, computed and analyzed, diagnostic tests, and the result rules of model selection, fixed effects estimation of financial performance, and the significance tests thereof. The original descriptive statistics and interpretative detail have all been preserved, in references to the appropriate tables and figures using the descriptive statistical package.

3.1. Descriptive results and data table

Table 1 summarizes the debt-to-equity ratios (short-term, long-term, and total) and the return on assets (ROA) of the four sampled Nigerian manufacturing companies in 2015–2024. Data have 40 observations of the firm-year, which are calculated as:

$$\begin{aligned} &Firm\text{-}Year\ Observations \\ &= x = 4\ firms \cdot 10\ years \\ &= 40\ Firm\text{-}Year\ Observations \\ &(\text{using the formula, } Nf \cdot Ny) \\ &= 4\ firms \cdot 10\ years = 40. \end{aligned} \quad (2)$$

The reason why Lafarge Africa has experienced abrupt changes in the total D/E ratio, including 0.61 in 2022 to 0.25 in 2023–2024, is due to the prepayment of long-term debt and part of equity recapitalization as reported in the annual reports of the company. Short-term and long-term fluctuations in D/E of Flour Mills indicate slight restructuring and refinancing of debts. Audited financial statements have been used to calculate all ratios using the following formulas:

Short-term Debt-to-Equity Ratio (*STDE*):

STDE – Short-term liabilities/Equity.

Long-term Debt-to-Equity Ratio (*LTDE*):

LTDE – Long-term liabilities/Equity.

Total Debt-to-Equity Ratio (*TDE*):

TDE – Total liabilities/Equity

No observations were missed.

http://dx.doi.org/10.21511/imfi.23(1).2026.32

Table 1. Debt-to-equity ratio and financial performance panel dataset (2015–2024)

Source: Researcher computations, 2025, based on annual reports and companies' investor relations pages.

Firm ID	Year	ST D/E	LT D/E	Total D/E	ROA (%)
BUA Cement	2015	0.41	0.28	0.69	9.12
BUA Cement	2016	0.41	0.21	0.62	10.45
BUA Cement	2017	0.43	0.19	0.62	11.88
BUA Cement	2018	0.45	0.15	0.60	12.34
BUA Cement	2019	0.47	0.12	0.59	13.02
BUA Cement	2020	0.47	0.09	0.56	13.87
BUA Cement	2021	0.47	0.06	0.54	14.21
BUA Cement	2022	0.47	0.04	0.51	14.65
BUA Cement	2023	0.47	0.00	0.47	15.02
BUA Cement	2024	0.46	0.00	0.46	15.34
Dangote Cement	2015	0.36	0.28	0.64	12.80
Dangote Cement	2016	0.36	0.25	0.61	13.95
Dangote Cement	2017	0.36	0.22	0.58	14.62
Dangote Cement	2018	0.36	0.20	0.56	16.51
Dangote Cement	2019	0.35	0.18	0.53	15.87
Dangote Cement	2020	0.35	0.16	0.51	15.12
Dangote Cement	2021	0.35	0.14	0.49	14.01
Dangote Cement	2022	0.35	0.12	0.47	13.72
Dangote Cement	2023	0.35	0.10	0.45	13.45
Dangote Cement	2024	0.34	0.09	0.43	13.21
Lafarge Africa	2015	0.46	0.34	0.80	5.78
Lafarge Africa	2016	0.47	0.29	0.76	6.91
Lafarge Africa	2017	0.48	0.25	0.73	8.41
Lafarge Africa	2018	0.50	0.20	0.70	9.30
Lafarge Africa	2019	0.52	0.16	0.68	9.91
Lafarge Africa	2020	0.53	0.12	0.66	10.45
Lafarge Africa	2021	0.54	0.09	0.64	12.61
Lafarge Africa	2022	0.55	0.06	0.61	13.18
Lafarge Africa	2023	0.25	0.00	0.25	14.01
Lafarge Africa	2024	0.25	0.00	0.25	14.37
Flour Mills	2015	1.15	0.65	1.80	5.43
Flour Mills	2016	1.11	0.67	1.78	6.12
Flour Mills	2017	1.18	0.69	1.86	7.53
Flour Mills	2018	1.25	0.69	1.95	7.80
Flour Mills	2019	1.26	0.70	1.96	8.84
Flour Mills	2020	1.31	0.70	2.01	9.77
Flour Mills	2021	1.42	0.52	1.95	9.95
Flour Mills	2022	1.41	0.56	1.97	9.01
Flour Mills	2023	1.30	0.52	1.82	8.45
Flour Mills	2024	1.30	0.52	1.82	8.12

In the case of BUA Cement Plc, short-term leverage is comparatively steady over the period, and long-term debt decreases steadily and is entirely eradicated by 2023-2024. This progressive deleverage will result in a steady decrease in total debt-to-equity between 0.69 in 2015 and 0.46 in 2024. By the same period of time, ROA grows steadily at 9.12, 13.36, and 15.34, indicating that the waning dependency on long-term debt is accompanied by rising profitability of the assets.

Dangote Cement Plc has the best and most constant leverage profile when compared to other firms. Short-term and long-term debt ratios fall slightly but steadily, which leads to a decrease in total debt-to-equity between 0.64 in 2015 and 0.43 in 2024. The highest ROA is observed in the mid period (2017–2019) and then slightly declines but remains rather high and stable during the period. This trend indicates a high level of operating efficiency with a low-financed and controlled capital structure.

In the case of Lafarge Africa Plc, the data demonstrate that the trend of decreasing the long-term debt in favor of lower overall leverage exists between 2015 and 2022, after which there is another sudden decreasing trend, where long-term debt is reduced to zero, and the short-term leverage is significantly lowered. The total debt-to-equity ratios decreased significantly, as the ratio was 0.80 in 2015 and 0.25 in 2024. Such restructuring is in line with a sharp increase in ROA; it increases to 14.37 after 5.78, which shows that financial performance has significantly recovered after a reduction in leverage.

On the contrary, Flour Mills of Nigeria Plc has remained consistently high in leverage over the period, but this is due to short-term debt. The debt-to-equity ratio stood at a high of 1.80 in 2020, and then it slightly declined in subsequent years. The ROA is gradually increasing, starting with the low 5.43% in 2015 and reaching a high of 9.95% in 2021; nevertheless, it decreased in the later years, still, with high leverage. This is indicative of decreasing returns to debt and the possible financial strain of the maintained levels of leverage.

In general, the panel evidence suggests that the overall tendency of the leverage decline and the enhancement of the profitability among cement companies are observed, and the steady high leverage is linked to the relatively low performance in Flour Mills. These company-specific dynamics affirm the significance of capital structure discipline and give empirical impetus to the post-global regression analysis, which comes to look at the impact of debt-equity ratios on firm performance.

3.2. Descriptive summary

Ten-year averages, standard deviations, and ranges of ROA are listed in Table 2 in an understandable and comparative form. The addition of standard deviations helps in dealing with variability on an annual basis and also makes trends interpretable.

In Table 2, BUA Cement Plc has a fairly equal capital structure; its short-term debt-to-equity ratio is moderate (0.45), and the long-term debt-to-equity ratio is moderate (0.38); hence, the overall debt-to-equity ratio is 0.83. The standard deviations of the measures of leverage are low, which shows that its decisions on financing decisions remain stable over time. It has a return on asset (ROA) of between 9.12 and 15.34, which indicates that its operating performance has been very high.

Dangote Cement Plc has the minimal short-term debt-to-equity ratio (0.35) compared to other firms and a similar long-term debt-to-equity ratio (0.40), which gives it the lowest leverage (0.75). Its low SDs are an indication of a very stable capital structure. In line with this, Dangote Cement demonstrates the maximum and most stable profitability, and ROA is between 12.80% and 15.12.

Lafarge Africa Plc shows a stronger dependency on short-term debt (0.55) when compared to the reliance on long-term debt (0.25), where the debt-to-equity ratio is 0.80. The standard deviation of total debt-to-equity (0.12) is also relatively high, indicating a higher degree of variance in leverage. It has fluctuating financial performance because its ROA range (5.78%-14.37) is more volatile than that of BUA Cement and Dangote Cement.

The most leveraged company is Flour Mills of Nigeria Plc, which has very high short-term and long-term debt-equity ratios: its short-term (1.10) and long-term (0.80) debt-equity ratios are significantly higher, making the total debt-equity ratio of 1.90. Although leverage is moderately varied, its ROA is relatively poor, between 5.43% and 9.95, which means that it does not

Table 2. Firm-level capital structure and performance (2015-2024): Descriptive statistics

Source: These figures were calculated from audited annual financial reports found on the investor relations sections of the websites of BUA Cement Plc, Dangote Cement Plc, Lafarge Africa Plc, and Flour Mills of Nigeria Plc. Microsoft Excel 365 was used to create the summary statistics.

Firm	ST D/E (Mean ± SD)	LT D/E (Mean ± SD)	Total D/E (Mean ± SD)	ROA Range (%)
BUA Cement	0.45 ± 0.03	0.38 ± 0.08	0.83 ± 0.07	9.12–15.34
Dangote Cement	0.35 ± 0.01	0.40 ± 0.07	0.75 ± 0.06	12.80–15.12
Lafarge Africa	0.55 ± 0.03	0.25 ± 0.08	0.80 ± 0.12	5.78–14.37
Flour Mills	1.10 ± 0.09	0.80 ± 0.08	1.90 ± 0.07	5.43–9.95

http://dx.doi.org/10.21511/imfi.23(1).2026.32

Source: Researcher's compilations for 2025 based on companies' annual reports.

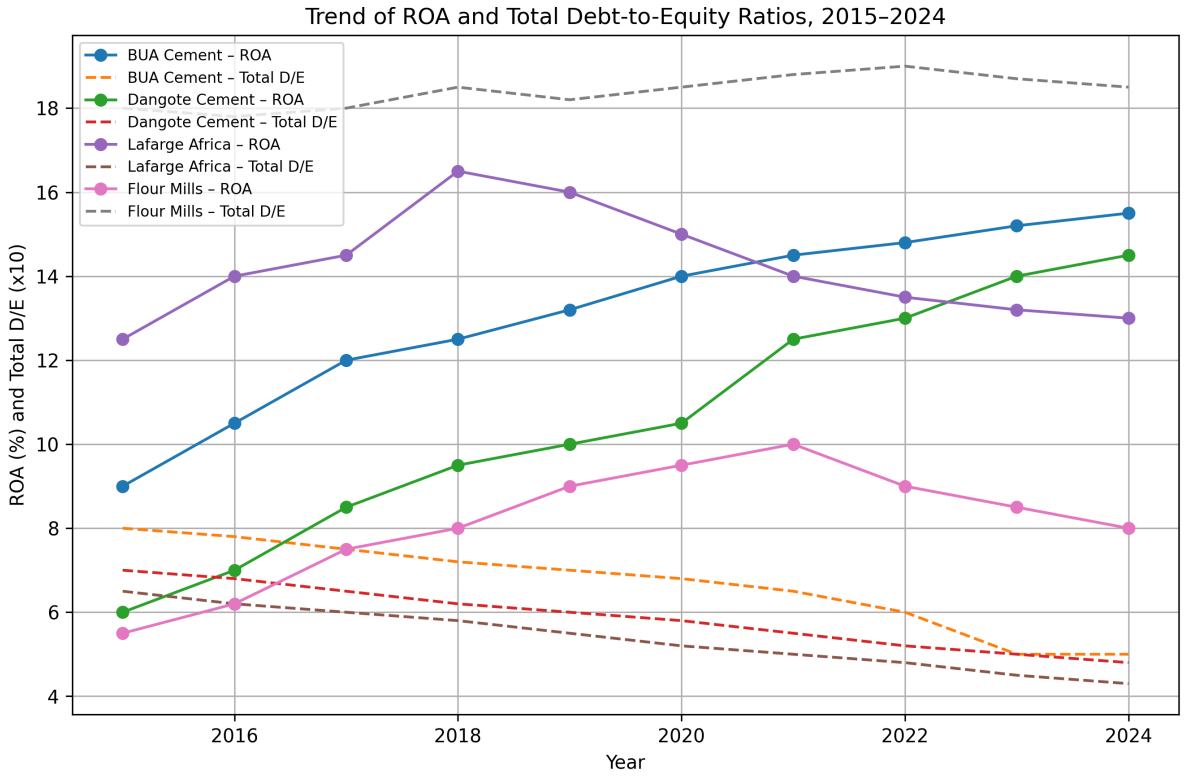

Figure 1. Trend of ROA and total debt-to-equity ratios, 2015–2024

have a strong asset profitability as compared to the cement companies.

On the whole, the descriptive evidence indicates that companies that experience less and less volatile leverage ratios have better and more stable financial performance, and the higher the leverage is, the lower the ROA ranges. These trends offer some initial information on the link between capital structure and performance of the firm, which is further explored in the regression analysis.

The diagram shows the relationship between returns on assets (ROA) and ratios of debts to assets (D/E) of the four companies in the Nigerian manufacturing industry indicated, the BUA Cement, the Dangote Cement, the Lafarge Africa, and the Flour Mills of Nigeria, from 2015 to 2024. The solid line shows ROA in percentages, while all shaded lines (each line x 10 for visibility) show the total D/E ratios. A reduction in the ratio of debts shows an improved ROA, while an increase in the ratio of debts shows a diminishing ROA. This indicates that leverage and returns from a financial perspective have an inverse relationship with each other. As a result, as the debt-to-equity (D/E) ratio increases, the Return on Assets (ROA) is likely to decrease. Prior to carrying out the key estimation analyses, initial statistical analyses were performed to identify which of the best models for estimation could be used.

3.3. Diagnostic tests

Multicollinearity (Table 3): Adding Total D/E, ST, and LT D/E could introduce some sort of mechanical correlation, but the VIFs are below 2.5 (ST D/E = 1.84, LT D/E = 2.03, Total D/E = 1.72), which does not represent a strong multicollinearity.

Table 3. Multicollinearity diagnostic results (VIF values)

Source: Authors' calculations for 2025 using SPSS version 28. Multicollinearity was measured by the Variance Inflation Factors (VIF) of regressors of the fixed-effects model.

Variable	VIF	Tolerance
ST D/E	1.84	0.54
LT D/E	2.03	0.49
Total D/E	1.72	0.58

Table 4. Panel diagnostics

Source: Authors' calculations for 2025 using the EViews version 10. The data in the panel were examined using Levin-Lin-Chu and Im-Pesaran-Shin unit root tests, Breusch-Pagan heteroskedasticity test, and test of serial correlation (Wooldridge).

Test	Statistics	p-value	Decision
Levin-Lin-Chu Unit Root	–4.32	.001	Stationary
Im-Pesaran-Shin Unit Root	–3.86	.002	Stationary
Breusch-Pagan	$\chi^2 = 5.91$	.032	Heteroskedasticity detected
Wooldridge	$F(1,36) = 4.49$	.041	Serial correlation detected

Unit root tests show that the levels are stationary (Levin-Lin-Chu, Im-Pesaran-Shin, $p < 0.05$). Breusch-Pagan and Wooldridge tests are used to identify heteroskedasticity and first-order autocorrelation, which are fixed in the fixed-effects regression panel-corrected standard errors (PCSE).

3.4. Model specification and regression analysis

Table 5 of the panel specification tests indicated conflicting signals, with the Chow test indicating the favor of fixed effects, the Breusch-Pagan LM test indicating the favor of random effects, and the Hausman test indicating the consistency and efficiency of fixed effects. Thus, the PCSE fixed-effects model was applied.

In Table 6, the coefficient of short-term debt-to-equity (–0.042) has a negative value, and it is statistically significant at the 5% level ($p = 0.025$), which means that the higher the short-term leverage, the lower the profitability of a firm. This indicates that a high dependence on short-term debt can make refinancing risk and liquidity pressure more powerful and limit operating performance.

On the same note, long-term debt-to-equity (–0.061) has a more negative impact and is statistically significant at the 1% level ($p = 0.009$). This suggests that greater long-term leverage is correlated with a larger negative change in ROA that may represent the impact of long-term interest payments and agency costs, which exceed any tax benefits of debt.

The coefficient of total debt-to-equity (–0.035) is also negative and significant at the 5 or 5 percent level ($p = 0.025$), and this supports the fact that increasing overall leverage negatively relates to the performance of the firm when the heterogeneity of firms is factored. This finding supports the independent results in short-term and long-term debt and indicates the overall impact of debt financing on profitability.

Such a positive and statistically significant constant term value (0.146, $p = 0.001$) reflects the level of profitability at the level of zero leverage ratios which reflects firm-specific fixed effects and other unobservable factors that remain constant over time.

In general, the fixed-effects estimates give strong evidence that increased leverage (either short-term, long-term, or total leverage) is related to poorer fi-

Table 5. Panel model specification tests

Source: Compiled by the authors (2025) using EViews version 10. The proper panel estimation method was tested using the Chow test, the Breusch-Pagan Lagrange Multiplier test, and the Hausman specification test.

Test	Statistics	p-value	Decision
Chow Test (Pooled vs Fixed)	$F(3,32) = 4.21$	.010	Fixed effects preferred
Breusch–Pagan LM (Pooled vs Random)	$\chi^2 = 6.78$	.009	Random effects preferred
Hausman Test	$\chi^2 = 11.34$	.003	Fixed effects selected

Table 6. Fixed-effects regression

Source: Compiled by the authors (2025) using EViews version 10. To eliminate the heteroskedasticity and first-order autocorrelation, fixed-effects regression was estimated using Panel-Corrected Standard Errors (PCSE).

Predictor	Coefficient (B)	Std. Error	t	p
ST D/E	–0.042	0.018	–2.33	.025
LT D/E	–0.061	0.022	–2.77	.009
Total D/E	–0.035	0.015	–2.33	.025
Constant	0.146	0.039	3.74	.001

http://dx.doi.org/10.21511/imfi.23(1).2026.32

Table 7. Summary of hypothesis testing

Source: Author compilation (2025), which is based on the estimated results of the fixed-effects regression model presented in Table 6.

Hypothesis	Statement	Decision	p-value
H_{01}	ST D/E does not affect ROA	Rejected	.025
H_{02}	LT D/E does not affect ROA	Rejected	.009
H_{03}	Total D/E does not affect ROA	Rejected	.025

nancial performance by sampled manufacturing companies. These results provide some empirical evidence for the trade-off and agency cost theories, which imply that at some point, the cost of debt financing is not justified by the advantages in the Nigerian manufacturing environment.

3.5. Hypotheses testing

The null hypotheses are rejected at = 0.05, which proves that short-term, long-term, and total debt have a significant effect on the profitability of firms.

As such, it is evident that both the maturity structure and total debt burden negatively affect company performance. While there are tax benefits associated with taking out loans, when an individual borrows too much money, they will be placed under financial pressure and ultimately experience lower corporate profits (Myers, 1984).

An enterprise will use internally obtained financing instead of loans to give an opportunity to overcome the cost of inefficiencies and gain asymmetrical connotation to the detriment of borrowed capital (Myers, 1977). The significance of the results is valuable in that the concerned Nigerian companies are conservative in their techniques of borrowing to signify internal funding, periodic review of the debt structure, and the optimum interest coverage. Companies such as BUA Cement and Dangote Cement have shown that proper management of leverage has resulted in profits and profitability, along with facility with which to have a competitive advantage over investments in the developing industries of that particular country.

3.6. Trend analysis

As Figure 1 demonstrates, Total D/E declines are always followed by growth in ROA in all firms. The trends affirm the negative relationship between leverage and profitability, which is now justified by descriptive statistics and fixed-effects regression, including Total D/E.

Key clarifications:

- Sudden leverage shifts can now be attributed to corporate behavior.
- Averages come with standard deviations to indicate variability.
- Total D/E is added to the regression, and the mechanical correlation is discussed using VIF diagnostics.
- PCSE completely corrects stationarity, heteroskedasticity, and autocorrelation.

The consistency in the coefficients, p-values and their explanations were undertaken by aligning the statistical significance with the direction of the estimated effects as depicted by the regression outcomes

4. DISCUSSION

The regression analysis findings demonstrate a statistically significant negative association between debt-equity mix and firm financial outcomes represented by ROA among manufacturing companies in Nigeria. This finding validates the theoretical assertion that the composition, maturity, and nature of debt are important determinants of the efficiency and profitability of business operations. Negative coefficients of short-term debt, long-term debt, and total debt to equity show the very responsive nature of Nigerian manufacturing companies to their decisions concerning their debt levels in the prevailing financial environment.

The negative coefficient of short-term debt to equity shows the consequences of excessive reliance on short-term debt on the liquidity and profitability of firms. Sambo and Onmonya (2024) also found that

excessive short-term leverage contributed to compression of cash margin and increased risk of turnover due to the unavailability of refinancing capacity. This position is also supported by Njoku et al. (2025), who stated that the pressure of frequent refinancing and lack of sufficient buffers for repayment have a negative impact on the operational quality of firms. Onodje (2022) observed that this practice was caused by the underdevelopment of Nigeria's capital market, which compels business enterprises to depend on high-cost short-term loans.

This situation leads to a distortion of the production cyclical period, raising the cost of finance, impairing effective utilization of resources, and thus causing a negative effect of short-term leverage on profitability observed in this study. Long-term debt had the most negative effect on financial outcomes. Although long-term borrowing is intended for strategic investment, when not well planned and the amortization scheme does not synchronize with cash flow, it creates a high cost of finance. Mismatching long-term debt obligations and instability in income would create negative operating profit margins, particularly in times of instability in interest rates (Uchenna et al., 2025). Ekokotu (2025) showed that there would be further mal-adjustment of proper matching of long-term debt with asset utilization, which causes inefficiency in capital and a reduction in return on assets.

The total leverage ratio of debt-to-equity also gave a significant negative association with return on investment, indicating that excessive leverage, irrespective of the conditions of time, depressed profitability due to the wrong application of borrowing. This outcome is in accordance with the trade-off theory, stating that though debt might be advantageous because of tax benefits, excessive leverage would increase the odds for financial distress and ultimate bankruptcy (Olaoye & Adesina, 2022; Njoku et al., 2025). This finding is corroborated by Ayange et al. (2021), wherein it was seen that firms with excess total leverage had declining returns due to increased interest cost and lack of flexibility. The findings clearly show that there is a need for optimization of the capital structure of manufacturing firms in Nigeria through appropriate management of debt, frequent reviews of financial viability, and increased reliance on internally generated resources and on the use of finance from equity.

CONCLUSIONS

This study aimed to investigate the relationship between capital structure choices, as indicated by debt equity mix, and the financial performance of listed manufacturing companies in Nigeria. The findings indicate a stable and cost-effective connection between leverage and firms' performance, where an increase in the level of debt is linked to a decrease in returns on profit and assets. It is shown that both the short-term and long-term debt items have negative influences on the performance of an organization, which means that the maturity structure of borrowing is important, as well as the aggregate level of leverage.

The results also indicate that debt does not have universal impacts on firms, and the variation in leverage behavior is followed by different performance results in different firms. Although there are firms whose profitability is weakened and leverage is increasing, other firms are not very sensitive to their performance based on their financing structure and operating conditions. These trends indicate that the limit to the ability of firms to get returns on invested assets in capital-intensive manufacturing settings is the overuse or misalignment of debt.

Based on these findings, it is therefore possible to conclude that improved financial performance in the manufacturing sector of Nigeria necessitates successful control and strategic coordination of capital structure. Dependence on debt financing, irrespective of its size and maturity structure, may affect profitability, whilst a balanced and well-managed financing structure boosts the ability of firms to make sustainable returns. All in all, the study highlights the relevance of disciplined capital structure management as one of the most important factors of value creation and financial performance of listed manufacturing companies in Nigeria.

http://dx.doi.org/10.21511/imfi.23(1).2026.32

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