

Examination of the Effect of Debt Ratio on the Financial Performance of Listed Industrial Goods Firms in Nigeria

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Abstract

This study examined the effect of debt ratio on the financial performance of listed industrial goods firms in Nigeria. The study adopted a panel research design using secondary data from the annual reports and audited financial statements of fourteen (14) listed industrial goods firms on the Nigerian Exchange Group covering 2016–2025. Financial performance was measured using Return on Assets (ROA), while debt ratio (DR), debt-to-equity ratio (DTER), equity multiplier (EM) and firm size (FSIZE) were used as explanatory and control variables. The study employed the Generalized Method of Moments (GMM) for data analysis. The unit root results showed that ROA, ROE, ROCE, DR, DTER and EM were stationary at level, while firm size was reported as $I(1)$. The GMM results revealed that debt ratio had a negative and statistically significant effect on ROA, with a coefficient of -0.797994 ($p = 0.0000$) at the 5% level of significance. Debt-to-equity ratio had a positive and significant effect on ROA, with a coefficient of 0.112080 ($p = 0.0000$), while equity multiplier had a negative and significant effect, with a coefficient of -0.265923 ($p = 0.0000$). Firm size had a positive and significant effect, with a coefficient of 1.803112 ($p = 0.0000$). The lagged ROA was also negative and significant (-0.267189 ; $p = 0.0000$). The J-statistic of 9.255646 ($p = 0.414018$) indicated valid instruments, while the Arellano-Bond tests showed no significant serial correlation at $AR(1)$ ($p = 0.4719$) and $AR(2)$ ($p = 0.2221$). The study concludes that excessive reliance on debt adversely affects financial performance, while appropriately managed debt may support performance. It recommends prudent debt management and a balanced capital structure.

Keywords: debt ratio; capital structure; financial performance; debt-to-equity ratio; equity multiplier; return on assets (ROA); listed industrial goods firms; Nigeria; generalized method of moments (GMM)

1 Introduction

Debt financing is an important component of corporate financing decisions, particularly among firms operating in capital-intensive sectors such as industrial goods. Companies in this sector often require substantial funds to acquire machinery, expand production capacity, maintain operations and respond to changing market conditions. Since internally generated funds may not always be sufficient to meet these requirements, firms frequently rely on debt as an alternative source of finance. However, while borrowing can provide the resources needed for expansion, excessive dependence on debt may increase financial obligations and expose firms to greater financial risk. This makes the relationship between debt financing and firm performance an important issue for corporate managers and investors.

Debt ratio is one of the commonly used measures of a firm's reliance on debt financing. It expresses the proportion of a firm's total assets that is financed through debt and therefore provides an indication of the extent to which the company depends on borrowed funds to support its operations.

A relatively high debt ratio suggests greater financial leverage and a higher level of financial obligations, whereas a lower ratio may indicate greater reliance on equity and internally generated funds. The level of debt carried by a firm can influence its cost of financing, solvency, financial flexibility and ability to withstand adverse economic conditions. Consequently, the debt ratio can have important implications for the financial outcomes of firms (Bello et al., 2024; Madumere and Ukaegbu, 2023).

Financial performance reflects the extent to which a firm is able to utilise its available resources efficiently to generate returns. Among the measures commonly used to assess financial performance are Return on Assets (ROA) and Return on Equity (ROE). ROA evaluates the efficiency with which a firm uses its assets to generate profit, while ROE indicates the return generated on shareholders' invested capital. These measures provide useful indications of profitability, managerial efficiency and the ability of firms to create value from their available resources (Isicheli et al., 2024; Gara et al., 2025). Examining these measures in relation to debt ratio can therefore provide evidence on whether greater dependence on debt supports or constrains the financial performance of industrial goods firms.

The relationship between debt ratio and financial performance is not necessarily uniform across firms or economic conditions. Debt may contribute positively to performance when borrowed funds are invested in productive activities that generate returns greater than the associated financing costs. In such circumstances, debt can provide firms with the resources required for expansion and may improve the returns available to shareholders. On the other hand, a high level of debt can increase interest and repayment obligations, reduce financial flexibility and place pressure on profitability, particularly when firms operate under difficult economic conditions or face high borrowing costs (Olowookere et al., 2022; Alhassan, 2021). Thus, the effect of debt ratio on financial performance remains an empirical issue that requires examination within specific sectors and economic environments.

This issue is particularly relevant to listed industrial goods firms in Nigeria, where companies operate in an environment characterised by substantial capital requirements, changing financing costs and economic uncertainties. The financing decisions of these firms can therefore have significant consequences for their profitability and the returns generated for shareholders. Although previous studies have examined the broader relationship between capital structure and firm performance, the specific effect of debt ratio on the financial performance of listed industrial goods firms in Nigeria requires further empirical attention.

Against this background, this study examines the effect of debt ratio on the financial performance of listed industrial goods firms in Nigeria. By focusing specifically on debt ratio and financial performance, the study seeks to provide evidence on whether the extent of debt financing contributes to or constrains the financial outcomes of firms within the sector. The findings are expected to be useful to corporate managers in making appropriate financing decisions, to investors in assessing the financial risk and performance of industrial goods firms, and to other stakeholders interested in the sustainable financial management of listed companies in Nigeria.

2 Literature review

2.1 Theoretical review

2.1.1 Modigliani–Miller theorem

The Modigliani-Miller (M-M) Theorem, developed by Modigliani and Miller (1958), explains that under perfect market conditions, a firm's capital structure does not affect its overall value. It assumes the absence of taxes, bankruptcy costs and information asymmetry, suggesting that firm value depends mainly on operating income rather than the combination of debt and equity. However, these assumptions are difficult to achieve in Nigeria's industrial goods sector because of high corporate taxes, borrowing costs and other market imperfections (Effiong and Ukpung, 2024).

The theorem's Proposition I maintains that a firm's value remains unchanged regardless of its financing structure, while Proposition II explains that increased debt raises the cost of equity because of higher financial risk, although the overall cost of capital remains constant. In Nigeria, these propositions face practical limitations due to high interest rates, restricted access to finance and borrowing costs. Nevertheless, debt financing can provide tax benefits, making an appropriate debt-equity balance important to corporate financial decisions (Ekokotu, 2025).

Despite its limitations, the M-M Theorem provides a theoretical foundation for understanding how financing decisions influence firm value and financial performance. Its assumptions are not entirely consistent with Nigeria's economic environment, where taxation, financial distress and transaction costs affect financing choices (Abdullahi et al., 2023). Therefore, the theory serves as a starting point for examining capital structure decisions, while highlighting the need to consider practical market conditions when assessing the financial performance of listed industrial goods firms in Nigeria.

2.1.2 Agency theory

The Agency Theory, developed by Jensen and Meckling (1976), posits that conflicts between managers and shareholders influence capital structure decisions, as debt disciplines managers by imposing repayment obligations. In Nigeria's industrial goods sector, where governance challenges persist, this theory is critical, with 30% of firms reporting agency conflicts due to managerial entrenchment (Effiong and Ukpung, 2024).

The theory also considers equity-related agency costs, as concentrated ownership in Nigeria deters equity issuance, with only 20% of firms issuing shares in 2020–2023 (Abdullahi et al., 2023). This aligns with the theory's focus on minimizing conflicts through financing choices.

Empirical studies show a 1% significance level for agency effects, with debt reducing costs by 7% and boosting performance (Effiong and Ukpung, 2024). Larger firms like Lafarge Africa leverage debt to align interests, achieving 10% higher valuations (Ekokotu, 2025).

Gaps include limited research on agency effects across sub-sectors, with cement firms showing stronger debt discipline (Effiong and Ukpung, 2024). Future studies could explore these variations.

In conclusion, the Agency Theory explains how debt aligns interests in Nigeria's industrial sector, enhancing performance but requiring governance reforms to maximize benefits.

2.2 Empirical review

Dauda and Abubakar (2023) examined the effect of ownership structure on the financial performance of listed industrial goods firms in Nigeria. The research employs a quantitative approach,

analyzing financial data from annual reports and books of accounts of listed industrial goods firms in Nigeria. Stratified sampling was adopted based on the fact that the study population is classified into strata of industrial goods, the study covers the twenty-one (21) industrial goods firms quoted on the floor of the Nigeria Stock Exchange (NSE) now known as the Nigerian Exchange Group (NGX) as at 31st December 2022 out of which nineteen (19) are selected and used as a sampled size. The technique of analysis used in the study was the Ordinary Least Square (OLS) multiple regression technique. The findings offer deeper insights into the mechanisms through which ownership structure influences financial performance. The study recommends that industrial goods firms adopt long-term strategic planning, aligning ownership structures with corporate objectives. This involves developing sustainable business models that prioritize long-term value creation over short-term gains, reducing the volatility associated with certain ownership structures.

Okoye (2025) examined the effect of capital structure on financial performance, measured by return on assets (ROA), return on equity (ROE), and Tobin's Q. An ex post facto research design with a quantitative approach was adopted. Secondary data were sourced from audited financial reports of listed industrial goods companies between 2013 and 2022. Descriptive statistics, correlation analysis, and multiple regression techniques were applied to evaluate the impact of short-term debt, long-term debt, and equity financing on firm performance. Findings show that short-term debt significantly improved ROA, suggesting effective support for liquidity and operational efficiency. Long-term debt negatively affected ROE, reflecting high borrowing costs, inflationary pressures, and foreign exchange risks. Equity financing positively influenced Tobin's Q, indicating that stronger equity bases enhance resilience and market valuation during macroeconomic shocks. The study concludes that capital structure decisions materially influence firm performance in Nigeria's industrial goods sector. Firms are advised to adopt an optimal capital mix, minimize long-term debt, and strengthen equity financing. Regulators such as the Central Bank of Nigeria (CBN) and the Securities and Exchange Commission (SEC) should deepen capital market participation and promote equity financing to ensure financial sustainability.

Dibua and Ikilidih (2023) assessed the effect of Debt Ratio on Earnings Per Share of listed Manufacturing Firms in Nigeria. Earnings Per Share was used to measure Shareholders Wealth Creation. Based on the objectives of the study, five hypotheses were formulated. *Ex-post facto* research design was adopted. Twenty one (21) listed manufacturing companies constituted the sample size of this study between 2010 and 2020. Secondary data were extracted from the annual reports and accounts of the sampled firms and were analyzed using E-Views 10 statistical software. The study employed descriptive statistics and inferential statistics. Panel Least Square (PLS) regression analysis and Hausman test was used to test the Hypothesis. Findings from the empirical analysis showed that a significant and positive relationship exists between Debt Ratio and Earnings Per Share. It is recommended inter alia that firms should adopt low cost operation strategies that limit borrowing; this will enable firms to avoid over dependence on debt.

Sambo and Onmonya (2024) evaluated the effect of debt financing on profitability of listed manufacturing companies in Nigeria. The sample of the study comprised of 37 listed manufacturing companies in Nigeria. The study's data was gathered from annual reports and financial statements that had been submitted in to Nigeria Exchange Limited over a ten-year period (2013–2022). Results showed that Long Term Debt to Total Asset ratio, Total Debt to Total Equity ratio and firm size had a significant impact on Return on Equity of listed manufacturing companies in Nigeria. However, Current Ratio and Total Debt to Total Equity returned insignificant effects on Return on Equity of listed manufacturing companies in Nigeria. The study recommended that in making a decision on

what the composition of their debt financing will be, management of listed manufacturing companies in Nigeria should assess critically and make comparison between the cost of obtaining a particular source of debt and the benefit that can be derived from it. This will help managers ensure that there will be a positive impact on their profitability.

Owolabi and Inyang (2012) examined the determinants of capital structure decisions of firms in the manufacturing industry in Nigeria. The capital structure of a firm consists of a particular combination of debt and equity issues to relieve potential pressures on its long-term financing. To examine such issues, many theories have been developed in the literature and they generally focus upon what determinants are likely to influence the leverage decisions of the firms. This paper examined directly detailed background information of manufacturing sector in Nigeria with the aim of discovering major determinants of its capital structure. And the basic determinants of capital structure in the firms identified by various studies are tangibility, size, growth opportunities, profitability and non-debt tax shields. In addition to these, issues such as corruption, political atmosphere, nature of financial markets, have also been identified as influencing seriously the capital structure of firms in Nigeria. The paper also highlighted issues such as financial distress, bankruptcy threats, solvency problem, risk of default etc due to unstable economic and political situations as possible dangers that may plague firms whose capital structure may tilt more towards debt financing.

Oyewobi and Okeke (2024) reviewed the effect of corporate reserve on the financial performance of firms in the industrial goods sector as measured by their Earnings Per Share (EPS) with firm size added as a control variable. For a period of ten (10) years, from 2013 to 2022, the study used eight (8) listed industrial goods companies in Nigeria. The study used an ex-post facto research approach and secondary data were gathered from the companies' annual reports for the period under review. E-views version 10 was used to do correlation and regression analysis. The findings show that retained earnings have a negative and insignificant effect on financial performance while capital reserves have a positive and significant effect on the financial performance of listed industrial goods firms in Nigeria. The study suggests that the firms should desist from keeping large sums as retained earnings.

Shehu (2025) investigated the effect of financial structure on the financial performance of listed industrial goods companies in Nigeria. The study adopted a population of all 13 listed industrial goods companies on the Nigerian Exchange Group and employed ex post facto research design method covering the period of 2013 to 2023. Secondary sources of data were collected, which included financial reports of the 13 listed industrial goods companies. Data collected was analyzed using Panel Least Square regression. The findings revealed that all three financial indicators have a negative and statistically significant effect on financial performance. This accounts for R^2 value of 0.78. It is then recommended that the management of industrial goods companies should first consider internal financing such as shareholder's capital and retain profit before short-term debts (short term bank loans) and long-term debts.

Abubakar (2025) aimed to understand how various elements of capital structure—short-term debt, long-term debt, equity ratio, and debt-to-equity ratio—influence key profitability indicators like Return on Assets (ROA), Return on Equity (ROE), and Return on Capital Employed (ROCE). The research focuses on listed industrial goods companies in Nigeria, a vital sector for the nation's economy, to gain insights into the financial factors driving their performance and inform optimal capital structure decisions. Using Ordinary Least Squares (OLS) regression, the study analyzed pooled panel data from 2012 to 2021 for five selected Nigerian industrial goods companies. The findings

indicate that while short-term debt, long-term debt, and equity ratio have a positive but statistically insignificant impact on Return on Equity (ROE), the debt-to-equity ratio (DER) shows a negative and statistically significant effect. This means that an increase in the proportion of debt relative to equity is associated with a notable decrease in shareholder returns. The study concludes that a high debt-to-equity ratio negatively impacts ROE, and cautions against relying solely on debt to boost shareholder returns. It recommends maintaining a balanced capital structure to optimize profitability and create sustainable value in the Nigerian industrial goods sector.

3 Model specification

The study employs a regression model to examine the effect of capital structure determinants on the financial performance of listed industrial goods firms in Nigeria. The model is adapted from the empirical studies of Ekokotu (2025) and Aondover (2025), who examined the relationship between capital structure and firm performance. While their models focused on the influence of leverage on firm profitability, the present study modifies and extends the framework to include additional capital structure indicators such as debt ratio, debt-to-equity ratio, equity multiplier, and firm size for listed industrial goods firms in Nigeria.

The general econometric model is expressed as:

$$Y_{it} = \alpha + \beta X_{it} + \mu_{it} \quad (1)$$

where Y represents the dependent variable, X represents the explanatory variables, i denotes the cross-sectional units (firms), and t denotes the time period.

The model used for this paper was an adaptation and modification of the works of Ekokotu (2025) thus:

$$\text{NAPS} = B_0 + B_1 \text{EF} + B_2 \text{LTDF} + B_3 \text{DEF} + B_4 \text{STDF} + \mu \quad (2)$$

The model was modified to suit the current study below:

3.1 Model: debt ratio and financial performance

Objective i: Examine the effect of debt ratio on the financial performance of listed industrial goods firms in Nigeria.

$$\text{ROA}_{it} = \beta_0 + \beta_1 \text{DR}_{it} + \beta_2 \text{DER}_{it} + \beta_3 \text{EM}_{it} + \beta_4 \text{FSIZE}_{it} + \mu_{it} \quad (3)$$

4 Sources of data and technique of analysis

The study employed secondary data obtained from the annual reports and audited financial statements of the fourteen (14) listed industrial goods firms on the Nigerian Exchange Group (NGX) covering the period 2016–2025. Additional information was obtained from the NGX fact books, company websites and other reliable financial databases. The study adopted inferential statistical techniques, regression analysis; the Generalized Method of Moments (GMM).

5 Research findings and results

Table 1. Unit root test of the variables for the effect of capital structure on the financial performance of companies listed in the industrial goods sector in Nigeria.

Variable	Levin, Lin & Chu t	Im, Pesaran and Shin W-stat	ADF-Fisher chi-square	PP-Fisher chi-square	Order of integration
ROA	0.0000	0.0000	0.0000	0.0005	I(0)
ROE	0.0000	0.0000	0.0000	0.0000	I(0)
ROCE	0.0000	0.0000	0.0002	0.0011	I(0)
DR	0.0000	0.0000	0.0000	0.0000	I(0)
DTER	0.0000	0.0000	0.0040	0.0000	I(0)
EM	0.0000	0.0000	0.0010	0.0000	I(0)
FSIZE	0.0000	0.0207	0.0080	0.0000	I(1)

Source: Author's compilation.

The unit root test was conducted to determine whether the variables used in the study were stationary and suitable for further analysis. The results were obtained using four different panel unit root tests: Levin, Lin and Chu (LLC), Im, Pesaran and Shin (IPS), ADF-Fisher Chi-square and PP-Fisher Chi-square. The use of these different tests provides stronger evidence about the stationarity of the variables and reduces the possibility of relying on the result of only one test.

The results show that ROA, ROE, ROCE, DR, DTER and EM were all stationary at level, represented as I(0). Their probability values across the different tests are generally below the 5% significance level, indicating that the null hypothesis of a unit root can be rejected. This means that these variables do not contain a unit root and their statistical properties remain stable over time. In particular, ROA recorded probability values of 0.0000, 0.0000, 0.0000 and 0.0005 across the four tests, while ROE also recorded very low probability values. Similar results were obtained for ROCE, DR, DTER and EM, confirming that these variables are stationary at level.

Firm size (FSIZE), however, differs from the other variables. Although the LLC test produced a probability value of 0.0000, the IPS, ADF-Fisher and PP-Fisher tests recorded probability values of 0.0207, 0.0080 and 0.0000 respectively. These values are all below the 5% significance level, indicating that FSIZE is also stationary based on the reported tests. The table, however, classifies FSIZE as I(1), suggesting that its stationarity was considered after first differencing in the reported classification. The unit root results indicate that the variables are suitable for the subsequent econometric analysis because none of the variables is shown to be integrated beyond the first order. Most of the variables are stationary at level, while FSIZE is reported as first-order stationary. This is important because the presence of variables integrated at levels I(0) and I(1) does not create a problem for appropriate panel regression techniques, provided that none is I(2). The results therefore provide evidence that the variables can be used to examine the relationship between capital structure and the financial performance of companies listed in the industrial goods sector in Nigeria without the results being driven by a unit root problem.

Table 2. Generalized method of moments estimates of the effect of debt ratio on the financial performance of listed industrial goods firms in Nigeria.

Variable	Coefficient	Std. error	t-Statistic	Prob.
ROA(-1)	-0.267189	3.90E-05	-6850.740	0.0000
DR	-0.797994	9.44E-05	-8450.390	0.0000
DTER	0.112080	8.80E-05	1273.404	0.0000
EM	-0.265923	0.000473	-562.2986	0.0000
LFSIZE	1.803112	0.001785	1009.913	0.0000
Effects specification: cross-section fixed (first differences)				
Mean dependent var	1.226411	S.D. dependent var	39.92419	
S.E. of regression	24.50041	Sum squared resid	64228.90	
J-statistic	9.255646	Instrument rank	14	
Prob(J-statistic)	0.414018			

Source: Author's compilation.

The Generalized Method of Moments (GMM) result examines the effect of debt ratio on the financial performance of listed industrial goods firms in Nigeria, with Return on Assets (ROA) used as the measure of financial performance. The result shows that the lagged value of ROA has a negative and statistically significant coefficient of -0.267189 , with a probability value of 0.0000 . This suggests that previous financial performance has a significant negative relationship with current ROA. In simple terms, firms that recorded higher ROA in the previous period did not necessarily maintain the same level of performance in the current period. This may reflect changes in operating conditions, financing decisions or other firm-specific factors affecting performance over time.

The main variable of interest, debt ratio (DR), has a coefficient of -0.797994 and a probability value of 0.0000 . This indicates a negative and statistically significant relationship between debt ratio and ROA. The result implies that an increase in the proportion of debt used to finance the assets of industrial goods firms is associated with a reduction in their financial performance. The finding suggests that excessive reliance on debt may place additional pressure on firms through interest obligations and other financing costs, thereby reducing the returns generated from their assets. The result therefore provides strong evidence that debt ratio has an adverse effect on the financial performance of the firms examined.

Debt-to-equity ratio (DTER), however, has a positive coefficient of 0.112080 and a probability value of 0.0000 . This means that DTER has a positive and statistically significant relationship with ROA. Although a higher level of debt relative to equity may increase financial risk, the result suggests that debt can also support firm performance when it is properly managed and directed towards productive activities. This finding is particularly interesting because it shows that the effect of debt cannot be understood simply by assuming that all forms of borrowing reduce performance. The way debt is structured and used may determine whether it becomes a burden or contributes to improved returns.

The equity multiplier (EM) has a coefficient of -0.265923 with a probability value of 0.0000 , indicating a negative and significant relationship with ROA. This suggests that greater financial leverage, as reflected by the equity multiplier, is associated with lower financial performance. The

result may indicate that firms with greater dependence on external financing face higher financial commitments, which can reduce the benefits obtained from their assets. In contrast, firm size (LFSIZE) has a positive coefficient of 1.803112 and is statistically significant at the 5% level, with a probability value of 0.0000. This implies that larger firms tend to record better financial performance. Larger firms may benefit from economies of scale, stronger market positions, better access to finance and greater ability to spread operating costs across a wider level of business activity.

The diagnostic results provide useful information about the reliability of the GMM model. The J-statistic is 9.255646, with a probability value of 0.414018. Since the probability value is greater than 0.05, the null hypothesis associated with the validity of the instruments cannot be rejected. This suggests that the instruments used in the model are reasonably valid and that there is no evidence from the J-test that the instruments are collectively inappropriate. The instrument rank of 14 also indicates that the model was estimated with a reasonable number of instruments. The standard error of the regression is 24.50041, while the standard deviation of the dependent variable is 39.92419, showing that the model explains part of the variation in ROA, although considerable differences in firm performance remain unexplained.

Taken together, the findings provide clear evidence that debt ratio has a significant negative effect on the financial performance of listed industrial goods firms in Nigeria. The negative coefficient of DR means that increasing dependence on debt, particularly when it becomes excessive, may weaken firms' ability to generate returns from their assets. At the same time, the positive effect of DTER suggests that debt financing is not necessarily harmful when it is appropriately structured and put into productive use. The negative effect of the equity multiplier further supports the view that excessive financial leverage can create pressure on firm performance, while the positive effect of firm size suggests that larger firms may be in a better position to manage their financing obligations. Overall, the result indicates that industrial goods firms need to maintain a careful balance between debt and equity rather than relying heavily on debt as a source of finance.

Table 3. Arellano–Bond serial correlation test for the effect of debt ratio on the financial performance of listed industrial goods firms in Nigeria.

Test order	<i>m</i> -Statistic	ρ	SE(ρ)	Prob.
AR(1)	-0.719342	-8010.361045	11135.671742	0.4719
AR(2)	-1.221038	-17453.211421	14293.748944	0.2221

Source: Author's compilation.

The Arellano-Bond serial correlation test was conducted to determine whether the residuals from the GMM model are affected by serial correlation. This test is important because the reliability of the GMM estimates depends partly on the absence of problematic serial correlation in the transformed error term, particularly at the second order.

The result shows that the AR(1) test has an *m*-statistic of -0.719342 with a probability value of 0.4719. Since the probability value is greater than the 5% significance level, the null hypothesis of no first-order serial correlation cannot be rejected. This indicates that there is no statistically significant evidence of first-order serial correlation in the residuals of the estimated model.

The AR(2) result is more important for assessing the validity of the GMM specification. The *m*-statistic is -1.221038 and the probability value is 0.2221. This probability value is also greater than

0.05, meaning that the null hypothesis of no second-order serial correlation cannot be rejected. Therefore, the result provides no evidence of second-order serial correlation in the residuals. This is a favourable outcome for the GMM model because the presence of significant AR(2) would raise concerns about the validity of the lagged instruments used in the estimation. The Arellano-Bond test suggests that the GMM model does not suffer from significant serial correlation at either the first or second order. The particularly important AR(2) result, with a probability value of 0.2221, indicates that the model satisfies this aspect of the required GMM diagnostic conditions. Consequently, there is no evidence from this test that serial correlation is distorting the estimated relationship between debt ratio and the financial performance of listed industrial goods firms in Nigeria. When considered alongside the satisfactory J-statistic reported in the GMM estimation, the results provide reasonable support for the reliability of the estimated model.

6 Discussion of findings

The findings of the study reveal that debt ratio has a significant negative effect on the financial performance of listed industrial goods firms in Nigeria. This suggests that increasing dependence on debt financing tends to weaken the ability of firms to generate returns from their assets. One possible reason is that higher debt creates additional financial commitments, particularly interest and repayment obligations, which may reduce the funds available for productive business activities. This situation can be more serious for industrial goods firms because their operations often require substantial investment in machinery, production facilities, raw materials and other assets. When borrowing becomes excessive, the cost of servicing the debt may therefore place pressure on profitability. The finding also suggests that debt should not be viewed simply as a source of additional funds without considering its cost and the firm's ability to repay it. Borrowing can support expansion and improve business activities when properly managed, but the benefit may be lost when the level of debt becomes too high. The result therefore supports the need for firms to consider their repayment capacity and expected returns before taking on additional debt. It also shows that the relationship between capital structure and performance depends largely on how financing decisions are managed. The result for debt-to-equity ratio presents a somewhat different situation. The positive relationship found between debt-to-equity ratio and financial performance suggests that debt relative to shareholders' equity can contribute to improved performance when it is used effectively. Debt may provide firms with funds for expansion, acquisition of productive assets and other investments that can increase operating capacity. This finding indicates that the use of debt is not necessarily harmful to firms. Rather, the outcome may depend on whether the borrowed funds are directed towards activities capable of generating sufficient returns. Thus, firms may benefit from debt financing when it is kept within a manageable level and used for productive purposes.

The negative relationship between equity multiplier and financial performance, however, reinforces the concern about excessive leverage. A higher level of financial leverage means that a greater portion of the firm's assets is being supported by obligations to outsiders. Where such financing does not generate enough returns, the firm may experience increased financial pressure. The finding therefore suggests that increasing leverage beyond a reasonable level may reduce the benefits that firms expect from debt financing. This also helps explain why the different measures of capital structure can produce different results. Debt may be beneficial when used productively, but excessive leverage can become a burden. The findings further show that past financial performance has an important relationship with current performance. The negative relationship observed suggests that good performance in one period does not automatically guarantee similar performance in the following

period. The financial performance of industrial goods firms may change because of movements in production costs, market demand, competition, interest rates, exchange rates and other economic conditions. Firms therefore need to continuously review their financial and operating strategies rather than relying on previous performance.

Firm size was found to have a positive relationship with financial performance. This suggests that larger firms may have certain advantages that help them perform better. Such advantages may include economies of scale, stronger market positions, greater access to financing, wider customer bases and better ability to absorb operating costs. Larger firms may also have more resources to withstand changes in the business environment. The result therefore indicates that the size and capacity of a firm can also play a role in determining how effectively it converts its assets into returns. The diagnostic results also provide support for the reliability of the estimated model. The validity of the instruments was not found to be a problem, while the Arellano-Bond test did not indicate the presence of significant second-order serial correlation. This gives reasonable confidence that the relationship observed between debt ratio and financial performance is not simply the result of an inappropriate instrument structure or a serious serial correlation problem in the model.

7 Conclusion and recommendations

The study concludes that capital structure is an important determinant of the financial performance of listed industrial goods firms in Nigeria. The findings indicate that excessive reliance on debt financing can adversely affect firms' ability to generate returns from their assets. This may be associated with the increasing interest expenses, repayment obligations and other financial commitments that arise when firms depend heavily on borrowed funds. Similarly, excessive financial leverage can weaken financial performance by increasing the financial risks faced by firms and reducing their flexibility to respond to changes in business conditions.

However, the findings also show that debt financing is not necessarily harmful to firm performance when it is properly structured and effectively utilised. Debt can provide firms with the financial resources required to expand their operations, acquire productive assets and improve their operating capacity. When borrowed funds are invested in productive activities that generate sufficient returns, debt financing can contribute positively to firm performance. The study also indicates that firm size contributes positively to financial performance, suggesting that larger firms may benefit from economies of scale, stronger market positions, greater operational capacity and improved access to financial resources. The reliability of the model is further supported by the diagnostic results, which indicate that the instruments used in the analysis were appropriate and that the model did not suffer from problematic second-order serial correlation.

Based on these findings, listed industrial goods firms in Nigeria should exercise caution in their use of debt financing. Firms should avoid excessive borrowing and ensure that their debt obligations remain within a level that can be comfortably serviced from operating income. Before obtaining additional loans, management should carefully consider the cost of borrowing, the expected benefits of the proposed investment and the firm's ability to meet its repayment obligations. Borrowed funds should also be directed towards productive investments that can generate sufficient returns and contribute to the long-term growth of the firm.

The positive role of appropriately structured debt further suggests that firms should not completely avoid external financing. Instead, management should adopt a balanced approach in which debt is strategically used to support expansion, acquisition of productive assets and improvement of

operating capacity. Firms should also closely monitor their overall level of leverage because excessive financial obligations may eventually reduce profitability and increase financial risk. Maintaining an appropriate balance between shareholders' equity and external financing is therefore important. Where necessary, firms should strengthen their equity base through retained earnings and other suitable equity financing options.

Furthermore, listed industrial goods firms should pursue sustainable growth and operational efficiency by taking advantage of economies of scale, improving their market position and making effective use of available financial resources without creating excessive financial obligations. Financial managers and boards of directors should regularly review their capital structure and adjust their financing strategies in response to changes in interest rates, operating costs, market conditions and the financial capacity of the firm. Overall, firms should adopt a balanced and carefully managed capital structure that allows them to benefit from debt financing while minimising the risks associated with excessive leverage. Such an approach would support financial stability, sustainable growth and improved long-term financial performance.

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