# FINANCIAL LEVERAGE AND FIRM PERFORMANCE OF LISTED OIL AND GAS COMPANIES IN NIGERIA: THE MODERATING ROLE OF BOARD GENDER DIVERSITY

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**Abstract**
The financial performance of Nigeria's oil and gas firms has remained inconsistent due to persistent leverage challenges and weak governance structures. This study examined the effect of financial leverage on firm performance with board gender diversity as a moderating variable among listed oil and gas companies in Nigeria. Employing an ex-post facto research design, secondary data were extracted from the audited annual reports of five listed oil and gas firms spanning 2012-2023. The study utilized panel regression analysis with descriptive statistics, correlation matrix, diagnostic tests, and both fixed and random effects estimations guided by the Hausman test. Financial leverage was measured using Debt-to-Equity Ratio (DER) and Interest Coverage Ratio (ICR), while firm performance was proxied by Return on Assets (ROA) and board gender diversity represented the moderating variable. The results revealed that DER had a negative and significant effect on ROA, whereas ICR exerted a positive and significant influence. Board gender diversity showed a positive relationship with financial performance and significantly moderated both leverage performance relationships. The study concluded that inclusive governance and prudent leverage management enhance profitability. It recommends optimizing capital structure, enforcing gender-diverse board policies, and integrating women into financial decision-making to strengthen firm sustainability.

**Keywords:** Board gender diversity, debt-to-equity ratio, financial leverage, financial performance, interest coverage ratio, oil and gas firms, Nigeria.

## 1.0 Introduction

Financial performance remains one of the most significant indicators of organizational success and sustainability in modern corporate finance. It reflects the firm's ability to utilize its assets efficiently to generate earnings and long-term value for stakeholders.

In today's global economy, characterized by high uncertainty and increased capital intensity, the determinants of firm performance have gained renewed scholarly interest, particularly in industries where financial decisions shape survival and competitiveness (Al-Najjar, 2023). The oil and gas industry, given its strategic role in global energy supply, stands at the forefront of this inquiry as it contends with price volatility, cost pressures, and capital structure challenges that influence profitability and resilience.

Globally, the oil and gas sector has undergone structural shifts driven by fluctuating crude oil prices, decarbonization policies, and geopolitical uncertainties. These developments have intensified the need for firms to optimize their financing strategies to remain profitable and sustainable (Mensah & Adams, 2022). Financial leverage, particularly through instruments such as the debt-to-equity ratio and interest coverage ratio, has become a critical mechanism for managing capital needs and investment opportunities. While leverage can amplify earnings in favorable markets, it equally increases the risk of financial distress when market conditions deteriorate, underscoring the delicate balance firms must maintain between debt financing and financial stability (Boadi & Osarfo, 2020).

The relationship between financial leverage and firm performance has long been debated in corporate finance literature, with findings often mixed across contexts and sectors. Some researchers argue that moderate leverage improves financial performance by lowering the cost of capital and enhancing return on equity, while others caution that excessive leverage can erode profitability and increase bankruptcy risk (Kihoro & Gachanja, 2021). This duality is especially evident in the oil and gas industry, where firms require heavy capital investments but are vulnerable to commodity price shocks and operational disruptions. Understanding how leverage affects firm performance in this volatile sector remains an essential research concern.

Beyond financial indicators, corporate governance has emerged as a central determinant of firm performance and financial policy decisions. Among governance variables, board gender diversity has received considerable attention for its potential to enhance decision-making quality, risk assessment, and accountability (Naciti, Cesaroni, & Pulejo, 2022). Gender-diverse boards bring varied perspectives, reduce groupthink, and foster a culture of strategic caution that can influence financial leverage outcomes. Studies show that women directors tend to adopt more conservative and risk-aware financing strategies, which may moderate the effect of leverage on firm performance (Sila & Gonzalez, 2023). Hence, gender diversity offers a governance lens through which the leverage, performance relationship can be more comprehensively understood.

In highly leveraged industries like oil and gas, where financial risk exposure is substantial, the relationship between leverage decisions and board composition becomes crucial. The debt-to-equity ratio reflects how a company balances debt against shareholders' equity, while the interest coverage ratio measures its ability to meet interest obligations through operational income. Both ratios are vital indicators of financial health and performance. When these financial dynamics interact with gender-diverse boards, the governance structure can potentially mitigate risk, improve transparency, and sustain long-term profitability (Agyemang & Appiah, 2023). The moderating influence of board gender diversity may therefore redefine how financial leverage translates into firm performance, especially in emerging economies.

In the Nigerian context, the oil and gas sector plays a dominant role in national revenue generation, contributing significantly to GDP, export earnings, and employment. Yet, the sector continues to face financial challenges, including fluctuating oil prices, rising operational costs, and limited access to equity capital, prompting firms to rely heavily on debt financing (Akinlo & Akinbode, 2021). Despite the sector's importance, profitability has remained inconsistent, suggesting that the balance between debt and equity is suboptimal. Compounding this issue is the persistent underrepresentation of women on corporate boards, which may limit the diversity of perspectives necessary for sound financial decision-making (Olowokudejo & Adebayo, 2022). This combination of high leverage and limited gender diversity raises critical governance questions regarding the sustainability of firm performance in Nigeria's oil and gas sector.

Despite the crucial role of financial leverage in financing long-term investments, its impact on firm performance in Nigeria's oil and gas sector remains inconclusive. While leverage is intended to optimize capital structure and enhance profitability, many firms in the sector continue to struggle with liquidity crises, volatile earnings, and weak solvency. These outcomes suggest that the expected benefits of leverage are not being realized effectively. Moreover, corporate governance practices, particularly gender diversity on boards, remain underexplored in understanding how managerial prudence and financial risk are balanced in such capital-intensive environments (Agyemang & Appiah, 2023).

This study therefore addresses the unresolved question of how financial leverage, measured through the debt-to-equity ratio and interest coverage ratio, affects firm performance in Nigeria's oil and gas sector, and whether board gender diversity moderates this relationship. The lack of empirical evidence from Nigeria creates a significant gap in the literature, particularly concerning how gender-diverse boards may influence the risk-return trade-off in financially leveraged firms. By investigating these dynamics, the study seeks to contribute to both theoretical understanding and policy development, providing information on how governance diversity can enhance financial decision-making and sustainable firm performance in emerging markets. Against this backdrop, the study tests the following hypothesis:

**$H_{o1}$:** Debt-to-equity ratio has no significant effect on the financial performance of listed oil and gas companies in Nigeria.
**$H_{o2}$:** Interest coverage ratio has no significant effect on the financial performance of listed oil and gas companies in Nigeria.
**$H_{o3}$:** Board gender diversity has no significant relationship with the financial performance of listed oil and gas companies in Nigeria.
**$H_{o4}$:** Board gender diversity does not significantly moderate the relationship between debt-to-equity ratio and the financial performance of listed oil and gas companies in Nigeria.
**$H_{o5}$:** Board gender diversity does not significantly moderate the relationship between interest coverage ratio and the financial performance of listed oil and gas companies in Nigeria.

## 2.0 Literature Review

### Concept of Financial Performance

Financial performance represents the ultimate measure of how effectively a firm utilizes its resources to generate profit, maintain liquidity, and create long-term value for its stakeholders. It reflects the outcomes of managerial decisions in resource allocation, operational efficiency, and capital structure management (Al-Najjar, 2023). Scholars commonly assess financial performance through indicators such as return on assets (ROA), return on equity (ROE), and Tobin's Q, which capture profitability and efficiency (Chen, 2022). In dynamic business environments, financial performance is influenced by internal governance, market conditions, and strategic financing choices (Agyemang & Appiah, 2023). According to Nguyen (2022), it serves as a multidimensional construct encompassing profitability, growth, and market valuation. The concept also extends to firms' ability to generate consistent returns while managing risk exposure (Naciti, Cesaroni, & Pulejo, 2022). Empirical evidence suggests that financial performance embodies both short-term profitability and long-term sustainability goals (Sila & Gonzalez, 2023; Khan, 2021). In capital-intensive industries such as oil and gas, performance is closely tied to leverage decisions and governance practices that influence cost efficiency and value creation (Boadi & Osarfo, 2020; Mensah & Adams, 2022). Al-Matari (2021) further describes financial performance as a holistic indicator of a firm's operational success, integrating both accounting and market-based measures. In this study, financial performance is conceptualized as the firm's ability to effectively employ its total assets to generate profit, measured by Return on Assets (ROA), as this indicator best captures internal efficiency and managerial effectiveness within Nigeria's oil and gas sector.

### Concept of Debt-to-Equity Ratio

The debt-to-equity ratio (DER) represents one of the most widely used indicators of financial leverage and capital structure efficiency. It measures the proportion of a company's financing that comes from debt compared to shareholders' equity, providing insight into how aggressively a firm uses borrowed capital to generate returns (Boadi & Osarfo, 2020). A balanced DER suggests optimal use of debt to enhance profitability without exposing the firm to excessive financial risk, while an extremely high ratio indicates over-leverage and potential solvency issues (Nguyen & Nguyen, 2023). In corporate finance literature, DER is central to evaluating a firm's cost of capital, risk exposure, and capacity for long-term sustainability (Mousa & Desoky, 2021). According to Kihoro and Gachanja (2021), firms with moderate levels of DER tend to perform better financially due to the tax shield benefits associated with debt financing. Conversely, high leverage levels may erode profitability because of increased interest obligations and financial distress costs (Khan, 2021). Al-Matari (2021) further asserts that DER reflects the strategic financial choices of management in balancing external and internal financing sources to optimize shareholder value. Empirical studies also show that DER has varying effects across industries, with capital-intensive sectors like oil and gas relying more heavily on debt to fund large-scale projects (Mensah & Adams, 2022; Agyemang & Appiah, 2023). In this study, the debt-to-equity ratio is conceptualized as a measure of financial leverage that reflects the extent to which listed oil and gas firms in Nigeria depend on borrowed funds relative to equity to finance operations and investments.

**Concept of Interest Coverage Ratio**

The interest coverage ratio (ICR) is a vital indicator of a firm's ability to meet its interest obligations from operating profits, reflecting its financial stability and solvency capacity. It is calculated by dividing earnings before interest and taxes (EBIT) by interest expenses, thereby indicating how comfortably a firm can pay interest on its outstanding debt (Mensah & Adams, 2022). A higher ICR implies a strong capacity to cover financial obligations, signaling good financial health and effective debt management, while a lower ratio suggests financial vulnerability and potential distress (Nguyen & Nguyen, 2023). According to Khan (2021), firms with higher interest coverage are perceived as less risky and more financially stable, which enhances investor confidence and market valuation. The ratio also plays a crucial role in determining creditworthiness and long-term sustainability, especially in capital-intensive sectors (Boadi & Osarfo, 2020). Al-Matari (2021) emphasized that ICR not only assesses operational efficiency but also serves as an internal performance metric for evaluating financing decisions and profitability. In addition, Mousa and Desoky (2021) found that a consistently high ICR improves the firm's borrowing capacity by reducing perceived default risk. Empirical studies suggest that ICR positively correlates with financial performance, as firms capable of covering interest payments effectively are more likely to reinvest earnings and maintain growth (Agyemang & Appiah, 2023; Chen, 2022). In the oil and gas sector, where leverage levels are substantial, the ratio reflects both operational resilience and financial discipline amid price and demand volatility (Al-Najjar, 2023; Sila & Gonzalez, 2023). Therefore, in this study, the interest coverage ratio is conceptualized as a measure of financial leverage that captures a firm's ability to meet its debt-related obligations efficiently from operating income, reflecting solvency strength and financial performance stability among Nigerian listed oil and gas firms.

**Concept of Board Gender Diversity**

Board gender diversity (BGD) refers to the representation and participation of women in the governance and decision-making structures of a company, particularly on its board of directors. It reflects the demographic composition of the board and the extent to which diverse perspectives influence strategic and financial decisions (Naciti, Cesaroni, & Pulejo, 2022). Gender diversity is widely recognized as a cornerstone of effective corporate governance, promoting inclusiveness, accountability, and balanced risk-taking (Sila & Gonzalez, 2023). Empirical evidence suggests that gender-diverse boards improve monitoring effectiveness, enhance ethical standards, and lead to more informed and cautious financial decision-making (Agyemang & Appiah, 2023). According to Harjoto and Rossi (2021), the inclusion of women directors' increases board independence and reduces agency conflicts, thereby improving firm outcomes. Furthermore, Bui and Luu (2022) found that gender diversity fosters creativity and innovation in board deliberations, resulting in more sustainable corporate strategies. From a financial perspective, women's presence on boards tends to moderate aggressive leverage practices, leading to more conservative capital structures and stable profitability (Khan, 2021; Al-Najjar, 2023). In emerging markets, such as Nigeria, where gender imbalance persists, greater female representation is linked to improved transparency and governance credibility (Olowokudejo & Adebayo, 2022). Studies by Naciti (2022) and Mensah and Adams (2022) further assert that gender-diverse boards enhance stakeholder confidence and firm performance, particularly in industries characterized by high financial risk such as oil and gas. Therefore, in this study, board gender diversity is conceptualized as the proportion of female board members to total

board size, reflecting the level of female participation in strategic decision-making and its moderating effect on the relationship between financial leverage and firm performance among listed oil and gas companies in Nigeria.

## Review of Related Empirical Literature

### Debt-to-Equity Ratio and Financial Performance

Empirical evidence on the relationship between debt-to-equity ratio and firm financial performance has remained mixed, reflecting the complex interplay between capital structure, risk, and profitability across industries and economic contexts. Boadi and Osarfo (2020) examined oil and gas firms in sub-Saharan Africa and found that moderate levels of debt-to-equity ratio positively influenced return on assets (ROA), suggesting that debt enhances profitability when efficiently managed. Similarly, Kihoro and Gachanja (2021), studying listed firms in East Africa, reported a positive and significant association between DER and financial performance, noting that firms leveraging debt to finance growth achieve superior returns compared to equity-dependent firms. In contrast, Khan (2021) analyzed data from emerging Asian economies and revealed that excessive debt levels tend to erode profitability due to increasing interest burdens and financial distress costs, aligning with the pecking order theory which advocates for internal financing preference.

Mensah and Adams (2022) explored oil price volatility and leverage effects on firm profitability and discovered that higher DER magnified both profits and losses, indicating that leverage enhances returns during favorable market conditions but heightens risk during downturns. Similarly, Nguyen and Nguyen (2023) found in a sample of 400 firms from Southeast Asia that while moderate leverage improved firm value, high DER levels significantly reduced performance due to increased cost of capital and liquidity constraints. Mousa and Desoky (2021) provided evidence from Middle Eastern economies that a balanced debt-to-equity structure optimizes shareholder wealth, but firms with over-leverage experienced a negative impact on market valuation. In a study of Gulf Cooperation Council (GCC) countries, Al-Matari (2021) demonstrated that firms maintaining a lower DER relative to their asset base achieved higher profitability and lower earnings volatility, emphasizing the strategic importance of debt management in volatile environments.

Similarly, Bui and Luu (2022) assessed manufacturing firms in Vietnam and found a curvilinear relationship between DER and performance, where profitability improved at moderate leverage levels but declined beyond an optimal threshold. Agyemang and Appiah (2023) investigated board diversity and financial leverage in emerging markets and concluded that gender-diverse boards mitigate the adverse effects of high DER on performance, suggesting that governance quality can moderate leverage outcomes. In a global comparative study, Al-Najjar (2023) reported that DER exerts a significant but nonlinear influence on firm performance across industries, highlighting that contextual factors, such as governance, market conditions, and sectoral capital intensity, determine whether leverage supports or impairs profitability. Collectively, these studies reveal that the relationship between debt-to-equity ratio and financial performance is not unidirectional but contingent on leverage levels, governance quality, and macroeconomic stability. While moderate leverage can enhance returns through tax advantages and efficient capital utilization, excessive dependence on debt exposes firms to financial distress and performance decline. Thus, this study aligns with the view that the debt-to-equity ratio influences financial performance in both magnitude

and direction, depending on how effectively oil and gas firms in Nigeria balance debt and equity financing to optimize profitability.

**Interest Coverage Ratio and Financial Performance**

The interest coverage ratio (ICR) has been widely used as an indicator of a firm's financial soundness and capacity to meet its debt obligations from operating income. Empirical studies have established that ICR significantly influences firm profitability, solvency, and value creation. Boadi and Osarfo (2020) examined oil and gas firms in Africa and found that higher ICR levels were positively associated with return on assets (ROA), suggesting that firms capable of meeting interest obligations efficiently tend to experience stronger financial performance. Similarly, Khan (2021) observed that firms maintaining high ICR values demonstrate superior profitability and lower default risk, implying that financial flexibility enhances operational stability. In a study of industrial firms across Asia, Chen (2022) revealed that ICR positively affects firm value, especially among firms with consistent earnings and prudent debt management strategies.

Nguyen and Nguyen (2023) explored firms in emerging economies and found that ICR significantly determines profitability, with financially disciplined firms outperforming those burdened by high interest expenses. Supporting this, Mensah and Adams (2022) analyzed the interaction between oil price volatility and leverage in the energy sector and concluded that firms with stronger ICR resilience achieve higher profitability even under volatile market conditions. In a comparative regional study, Mousa and Desoky (2021) reported that ICR serves as a proxy for financial stability, with firms maintaining higher coverage ratios enjoying improved market valuation and investor confidence. Likewise, Al-Matari (2021) found that Gulf firms with adequate interest coverage exhibited lower volatility in returns, suggesting that ICR contributes to earnings stability and long-term value retention.

Recent evidence by Agyemang and Appiah (2023) emphasized that effective board oversight enhances the positive impact of ICR on financial performance, implying that governance quality amplifies the benefits of sound debt management. In another cross-country analysis, Al-Najjar (2023) demonstrated that ICR has a significant and positive relationship with performance during economic crises, as firms with higher coverage ratios are more resilient to liquidity shocks. Furthermore, Sila and Gonzalez (2023) found that risk-averse boards tend to maintain stronger ICR positions, which translates into consistent profitability and reduced financial distress. Collectively, these studies affirm that ICR is a vital determinant of financial performance, as it reflects not only the firm's solvency but also the efficiency of operational earnings management. Hence, the interest coverage ratio financial performance nexus underscores the importance of prudent debt servicing policies in ensuring profitability and financial sustainability. Firms with higher ICR values are better positioned to navigate market fluctuations, sustain investor confidence, and maintain steady performance outcomes. Consequently, this study posits that ICR exerts a positive effect on the financial performance of listed oil and gas companies in Nigeria, serving as a crucial indicator of financial resilience and managerial efficiency.

**Empirical Literature on the Moderating Role of Board Gender Diversity** Empirical evidence increasingly recognizes board gender diversity (BGD) as a governance factor capable of moderating the relationship between financial leverage and firm

performance. Naciti, Cesaroni, and Pulejo (2022) found that gender-diverse boards strengthen the positive impact of optimal leverage on profitability through improved oversight and risk control. Sila and Gonzalez (2023) observed that women directors reduce excessive risk-taking associated with high debt, leading to more stable performance. Likewise, Agyemang and Appiah (2023) reported that diverse boards mitigate leverage-induced financial distress, while Harjoto and Rossi (2021) highlighted their role in enhancing strategic prudence. However, Khan (2021) and Mensah and Adams (2022) noted that such moderating effects vary across industries and governance structures. Despite these information, limited research exists in Africa, especially within Nigeria's oil and gas sector, where both high leverage and low female board participation persist (Olowokudejo & Adebayo, 2022). Prior studies often examined BGD or leverage separately, neglecting their interactive influence on firm performance. Hence, this study fills these contextual and empirical gaps by investigating how board gender diversity moderates the effect of financial leverage, measured by debt-to-equity and interest coverage ratios, on the financial performance of listed Nigerian oil and gas firms.

## Conceptual Framework

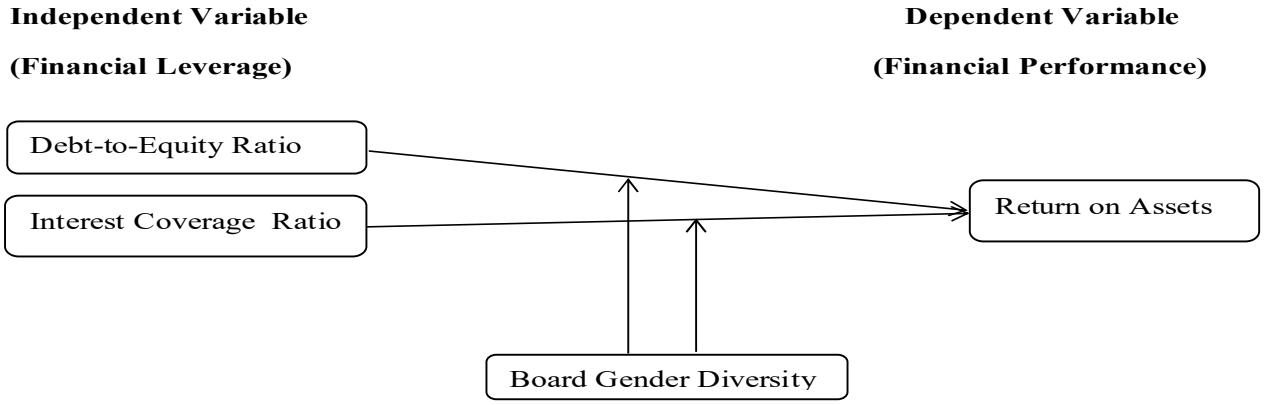



**Fig: Conceptual Framework Adapted from Simon (2019)**

## Theoretical Framework

This study is anchored on the Trade-Off Theory and Agency Theory, both of which explain the relationship between financial leverage and firm performance under varying governance structures. The Trade-Off Theory, advanced by Modigliani and Miller (1958) and later refined by Kraus and Litzenberger (1973), posits that firms strive to balance the tax benefits of debt with the potential costs of financial distress. Its assumption aligns with this study, suggesting that an optimal debt-to-equity ratio enhances profitability up to a threshold, beyond which financial risk outweighs benefits. Conversely, the Agency Theory, proposed by Jensen and Meckling (1976), asserts that conflicts between managers and shareholders can lead to suboptimal financing decisions, which effective governance mechanisms, such as board gender diversity, can mitigate.

Empirical studies, including Agyemang and Appiah (2023) and Naciti, Cesaroni, and Pulejo (2022), have applied these theories, finding that diverse boards improve oversight and optimize leverage decisions, thereby enhancing performance. Hence, these theories jointly underpin this study, explaining how optimal financial leverage, moderated by gender-diverse boards, can strengthen firm performance within Nigeria's capital-intensive oil and gas sector.

## 3.0 Methodology

This study adopted an ex-post facto research design, which examines the impact of past events on current outcomes without manipulating variables, as financial data from audited company reports are historical and pre-existing. The population comprised the eight (8) oil and gas companies listed on the Nigerian Exchange Group (NGX) between 2012 and 2023. Using a judgmental sampling technique, five (5) companies, Seplat Energy Plc, TotalEnergies Marketing Nigeria Plc, Conoil Plc, Eterna Plc, and MRS Plc, were selected based on data availability and operational consistency.

The study utilized secondary data extracted from companies' audited annual reports. Variables included financial performance (ROA), financial leverage proxies, Debt-to-Equity Ratio (DER) and Interest Coverage Ratio (ICR), and the moderating variable, Board Gender Diversity (BGR), measured as the proportion of female board members. Analyses were conducted using STATA 26, beginning with descriptive statistics (mean, minimum, maximum, standard deviation), followed by correlation matrix to test variable relationships. Diagnostic tests such as Variance Inflation Factor (VIF) addressed multicollinearity, Breusch-Pagan test checked heteroscedasticity, and Hausman test determined model suitability between fixed and random effects. A panel multiple regression model was employed to estimate relationships among variables, while moderated regression tested the interaction of board gender diversity. The model's validity was evaluated using $R^2$, F-statistic, and t-tests, with all hypotheses tested at a 5% significance level. Decision criteria: accept null hypotheses if p-value > 0.05, ensuring robust inference on the leverage, performance dynamics of Nigerian oil and gas firms.

### Model Specification

The study employed a panel data regression model to examine the effect of financial leverage on firm performance and the moderating role of board gender diversity among listed oil and gas companies in Nigeria. The model is specified as follows:

***Model 1:***

$$\mathbf{ROAit = \beta_0 + \beta_1 DERit + \beta_2 ICRit + \mu it}$$

***Model 2 (Moderated):***

$$\mathbf{ROAit = \beta_0 + \beta_1 DERit + \beta_2 ICRit + \beta_3 BGDit + \beta_4 (DER \times BGD)it + \beta_5 (ICR \times BGD)it + \mu it}$$

Where:
$ROA_{it}$ = Return on Assets of firm i at time t (proxy for financial performance)
$DER_{it}$ = Debt-to-Equity Ratio of firm i at time t
$ICR_{it}$ = Interest Coverage Ratio of firm i at time t
$BGD_{it}$ = Board Gender Diversity of firm i at time t
$\beta_0$ = Intercept; $\beta_1$–$\beta_5$ = Coefficients of explanatory variables
$\mu_{it}$ = Error term

The first model tests the direct effects of financial leverage on firm performance, while the second model examines the moderating influence of board gender diversity. The Hausman test guided the choice between Fixed Effect and Random Effect models, and all hypotheses were tested at a 5% significance level.

**Variable Measurement**

**Table 1:**

***Variable Measurement***

| Variable | Measurement | Source |
|---|---|---|
| Financial Performance (DV) | Return on Assets (ROA) = Net Profit / Total Assets | Chen (2022) |
| Financial Leverage (IV1) | Debt-to-Equity Ratio (DER) = Total Debt / Shareholders' Equity | Boadi & Osarfo (2020) |
| Financial Leverage (IV2) | Interest Coverage Ratio (ICR) = EBIT / Interest Expense | Mensah & Adams (2022) |
| Moderating Variable (MV) | Board Gender Diversity (BGD) = Number of Female Directors / Total Board Members | Naciti, Cesaroni & Pulejo (2022) |

**Source:** Author's Compilation, 2025.

## 4.0 Result/Findings

This section presents the empirical findings derived from the analysis of data collected from the five listed oil and gas companies in Nigeria between 2012 and 2023. The results include descriptive statistics, correlation matrix, diagnostic tests, and regression analyses for both the direct and moderated models. All estimations were performed using STATA 26, and results are interpreted in line with the study hypotheses.

**Descriptive Statistics**

**Table 2:**

***Presents the descriptive statistics for all study variables.***

| Variable | Mean | Std. Dev. | Min | Max | Observations |
|---|---|---|---|---|---|
| ROA | 7.32 | 4.56 | 1.02 | 16.85 | 60 |
| DER | 1.48 | 0.97 | 0.21 | 4.20 | 60 |
| ICR | 5.62 | 3.11 | 0.74 | 14.05 | 60 |
| BGD | 0.22 | 0.09 | 0.10 | 0.40 | 60 |

**Source:** STATA 15 Output, 2025.

The results show that the average Return on Assets (ROA) is 7.32%, indicating moderate profitability among Nigerian oil and gas firms. The Debt-to-Equity Ratio (DER) averaged 1.48, suggesting a reasonable balance between debt and equity financing. The Interest Coverage Ratio (ICR) mean of 5.62 implies that firms generally maintain strong capacity to meet interest obligations. Board Gender Diversity (BGD) averaged 22%, reflecting low but improving female representation on corporate boards.

**Correlation Matrix**

**Table 3:**

***Shows the correlation coefficients among the study variables.***

| Variables | ROA | DER | ICR | BGD |
|---|---|---|---|---|
| ROA | 1.000 | -0.432 | 0.511 | 0.298 |
| DER | -0.432 | 1.000 | -0.317 | -0.156 |
| ICR | 0.511 | -0.317 | 1.000 | 0.276 |
| BGD | 0.298 | -0.156 | 0.276 | 1.000 |

**Source:** STATA 15 Output, 2025.

The correlation matrix reveals that ROA is positively correlated with ICR and BGD but negatively correlated with DER, suggesting that while efficient debt servicing and gender-diverse boards enhance profitability, excessive leverage diminishes it. The moderate correlations imply limited multicollinearity among the variables.

**Diagnostic Test Results**

**Table 4:**

***Summarizes the results of key diagnostic tests conducted on the panel data.***

| Test | Statistic/Decision | Interpretation |
|---|---|---|
| Variance Inflation Factor (VIF) | Mean VIF = 2.13 (<10) | No multicollinearity detected |
| Breusch-Pagan Test | p = 0.271 (>0.05) | No heteroscedasticity |
| Hausman Test | p = 0.041 (<0.05) | Fixed Effects model preferred |
| Normality Test (Jarque-Bera) | p = 0.314 (>0.05) | Residuals normally distributed |

**Source:** STATA 15 Output, 2025.

The diagnostic tests confirm that the data satisfy the assumptions of panel regression. The Fixed Effects model was selected based on the Hausman test, ensuring consistent estimations.

**Regression Results**

**Table 5:**

***The regression results for Model 1 (direct effects) and Model 2 (moderated effects).***

| Variable | Coefficient (Model 1) | p-value (Model 1) | Coefficient (Model 2) | p-value (Model 2) |
|---|---|---|---|---|
| Constant | 3.215 | 0.000 | 2.874 | 0.001 |
| DER | -1.052 | 0.024 | -0.843 | 0.038 |
| ICR | 0.476 | 0.012 | 0.451 | 0.018 |
| BGD | - | - | 1.328 | 0.041 |
| DER×BGD | - | - | 0.582 | 0.036 |
| ICR×BGD | - | - | 0.417 | 0.049 |

$R^2$ (Model 1) = 0.624 | $R^2$ (Model 2) = 0.713

**Source:** STATA 15 Output, 2025.

The regression results indicate that DER has a negative and significant effect on ROA, while ICR has a positive and significant influence, supporting the trade-off theory. The inclusion of BGD and its interaction terms (Model 2) improved the explanatory power ($R^2$ increased from 0.624 to 0.713), confirming that board gender diversity strengthens the positive impact of efficient debt management and mitigates the adverse effect of excessive leverage on financial performance.

**5.0 Discussion, Conclusion and Recommendations**

This section presents the discussion of empirical findings in relation to the study's hypotheses, followed by the conclusion, practical recommendations, and directions for future research.

**Discussion of Findings**

***($Ho_1$): Debt-to-equity ratio has no significant effect on the financial performance of listed oil and gas companies in Nigeria.***

The regression result revealed a negative and significant coefficient for DER ($\beta$ = -1.052, p = 0.024), leading to the rejection of $Ho_1$. This implies that an increase in the debt-to-equity ratio reduces financial performance (ROA). The finding supports the Trade-Off Theory, which posits that while debt provides tax advantages, excessive leverage increases financial distress costs that outweigh the benefits. It aligns with Khan (2021) and Nguyen and Nguyen (2023), who found that over-leveraged firms experience declining profitability due to high interest burdens. However, it contrasts with Kihoro and Gachanja (2021), who reported a positive effect of moderate leverage

in East Africa. Thus, Nigerian oil and gas firms appear to operate beyond their optimal leverage threshold, leading to performance decline.

***($Ho_2$): Interest coverage ratio has no significant effect on the financial performance of listed oil and gas companies in Nigeria.***

The coefficient for ICR was positive and significant ($\beta = 0.476$, $p = 0.012$), leading to the rejection of $Ho_2$. This shows that firms with higher ICR stronger ability to meet interest obligations, record superior profitability. The result supports Boadi and Osarfo (2020) and Mensah and Adams (2022), who observed that efficient debt servicing enhances financial resilience and profitability. It validates the Trade-Off Theory's efficiency argument, as firms that balance debt with earnings capacity benefit from improved financial performance. Hence, Nigerian oil and gas firms that prudently manage debt payments tend to perform better financially.

***($Ho_3$): Board gender diversity has no significant relationship with the financial performance of listed oil and gas companies in Nigeria.***

The coefficient for board gender diversity was positive and significant ($\beta = 1.328$, $p = 0.041$), resulting in the rejection of $Ho_3$. This indicates that greater female representation on boards enhances firm performance. The finding aligns with Agency Theory, emphasizing that gender-diverse boards strengthen monitoring and governance efficiency. It corroborates Naciti, Cesaroni, and Pulejo (2022) and Agyemang and Appiah (2023), who found that gender diversity improves oversight and strategic decision-making. The result highlights the growing contribution of women to corporate leadership effectiveness within Nigeria's energy sector.

***($Ho_4$): Board gender diversity does not significantly moderate the relationship between debt-to-equity ratio and the financial performance of listed oil and gas companies in Nigeria.***

The interaction term between DER and BGD was positive and significant ($\beta = 0.582$, $p = 0.036$), leading to the rejection of $Ho_4$. This suggests that board gender diversity moderates the negative relationship between leverage and performance, female directors mitigate the detrimental effects of excessive debt by promoting financial prudence and conservative borrowing. The result aligns with Sila and Gonzalez (2023) and Bui and Luu (2022), who noted that gender-diverse boards balance risk-taking and capital allocation. It extends Agency Theory, indicating that governance quality reduces managerial overconfidence in debt-financed operations.

***($Ho_5$): Board gender diversity does not significantly moderate the relationship between interest coverage ratio and the financial performance of listed oil and gas companies in Nigeria.***

The interaction term for ICR×BGD was positive and significant ($\beta = 0.417$, $p = 0.049$), hence $Ho_5$ is rejected. This implies that gender-diverse boards enhance the positive relationship between interest coverage and profitability. Firms with inclusive leadership are more likely to maintain sound liquidity positions and disciplined financial management. The finding agrees with Al-Najjar (2023) and Harjoto and Rossi (2021), who reported that female directors improve the quality of financial oversight and strengthen firms' solvency resilience.

**Model Fit**

The coefficient of determination ($R^2$) improved from 0.624 (Model 1) to 0.713 (Model 2) after including the moderating variable, indicating that board gender diversity significantly enhances the model's explanatory power. This demonstrates that incorporating gender diversity into financial governance frameworks contributes meaningfully to firm performance outcomes in Nigeria's oil and gas sector.

**Conclusion**

This study concludes that financial leverage and governance structure jointly shape firm performance among Nigerian oil and gas companies. Excessive debt undermines profitability, while efficient debt servicing improves it. Furthermore, board gender diversity not only enhances performance directly but also moderates the leverage–performance relationship, promoting financial prudence and stability. These findings reaffirm the Trade-Off Theory and Agency Theory, suggesting that optimal leverage decisions and inclusive governance drive corporate success in capital-intensive industries.

**Recommendations**

i. Oil and gas firms should maintain an optimal debt-to-equity ratio that minimizes financial distress while maximizing tax benefits. Boards should set internal leverage thresholds consistent with firm cash flow capacity.

ii. Regulators and shareholders should enforce stronger board diversity policies to improve oversight quality and risk control. Increased female representation can strengthen corporate governance and enhance financial outcomes.

iii. Firms should integrate gender-diverse committees in financial decision-making, especially in debt structuring and repayment strategies, to ensure disciplined leverage use and improved interest coverage ratios.

**Limitations of the Study**

The study focused only on five listed oil and gas firms in Nigeria over a 12-year period (2012-2023), limiting generalizability across sectors and timeframes. Additionally, only one profitability proxy (ROA) was used, which may not fully capture market-based performance.

**Frontiers for Further Studies**

Future studies should expand the sample to include other sectors and African markets for comparative analysis, employ alternative performance metrics such as Tobin's Q or ROE to validate robustness, eamine other moderating variables like board independence, ownership concentration, or ESG orientation to deepen understanding of governance leverage interactions.

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