

Dynamic Causal Mediation Analysis with Longitudinal Interventions: A Framework for Reducing Social Inequalities in Health and Education

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ABSTRACT

Social inequalities in health and education continue to shape life opportunities and outcomes across populations worldwide. Understanding the mechanisms through which social disadvantage influences long-term well-being is essential for designing effective interventions. This paper introduces a Dynamic Causal Mediation Analysis framework that integrates longitudinal interventions and time-varying mediators to examine the pathways linking social conditions to health and educational outcomes. Unlike traditional mediation approaches, the proposed framework captures the evolving nature of mediating factors such as academic achievement, healthcare access, family support, psychological well-being, and socioeconomic resources over time. By decomposing total causal effects into direct and indirect components, the model identifies the mechanisms that contribute most significantly to persistent inequalities. The framework further enables the evaluation of intervention timing, intensity, and duration across different stages of the life course. Through simulation and longitudinal analysis, researchers can estimate the potential impact of targeted policies on reducing disparities among vulnerable populations.

Keywords: Dynamic Causal Mediation Analysis, Social Inequality, Health Disparities, Educational Inequality

Date of Acceptance: 20-03-2026

Date of Publication: 25-04-2026

I. INTRODUCTION

In recent years, the determinants of firm value have attracted global attention due to their implications for investment decisions, market stability, and corporate sustainability. Firm value, often measured through market-based indicators such as Tobin's Q or price-to-book ratio, reflects investors' perceptions of a firm's future profitability and risk profile (Karaca et al., 2025). Globally, firms strive to optimize their capital structure and maintain credible financial reporting systems that inspire investor confidence. However, volatility in global markets, rising financing costs, and governance failures have made it increasingly difficult for firms to sustain value creation. The 2008 global financial crisis exposed how excessive leverage and weak governance structures can erode firm value, prompting ongoing debates about the optimal mix of debt and equity (Dao & Ta, 2020; Abdullah & Tursoy, 2021). In this context, scholars continue to examine how financing decisions, audit mechanisms, and corporate governance practices jointly influence firm value across diverse institutional environments.

Across emerging markets, especially in Africa, issues relating to firm value are further complicated by underdeveloped capital markets, weak enforcement of corporate governance codes, and limited access to long-term financing (Attah Mills & Mwasambili, 2022; Sarker & Hossain, 2024). Many African firms rely heavily on short-term debt to finance operations, leading to liquidity constraints and increased financial risk. In Ghana, for instance, capital structure decisions have been shown to significantly influence firm value, but the effect depends on the degree of financial discipline and governance quality (Attah Mills & Mwasambili, 2022). Similar evidence from Egypt and South Africa suggests that capital structure is often suboptimal, partly due to poor financial transparency and inadequate external monitoring (El-Deeb et al., 2023). These findings underline the importance of external audit quality as a governance mechanism capable of mitigating agency problems and enhancing investor trust in African corporate settings.

In Nigeria, the issue of firm value remains a pressing concern, especially within the consumer goods industry—one of the most vibrant yet volatile sectors of the economy. Nigerian consumer goods companies face intense competition, high production costs, and exchange rate fluctuations that undermine profitability and

market performance. Despite contributing significantly to employment and GDP, many listed firms in the sector have experienced declining market valuations, reflecting investor skepticism about their financial health and governance quality. For instance, fluctuating debt levels, rising interest expenses, and foreign exchange exposure have weakened the capital structure positions of firms such as Nestlé Nigeria, Dangote Sugar, and Cadbury Nigeria. These developments underscore the importance of effective capital structure management and high audit quality in preserving firm value in an environment characterized by macroeconomic instability and regulatory uncertainty. Thus, understanding how audit quality moderates the relationship between capital structure and firm value is vital for restoring investor confidence in the Nigerian consumer goods sector.

Capital structure represents the mix of debt and equity financing that a firm employs to fund its operations and investments (Ahmed, Nugraha, & Hågen, 2023). Theoretically, capital structure decisions influence firm value through their effect on the cost of capital, risk exposure, and earnings volatility. The trade-off theory posits that firms seek an optimal capital structure that balances the tax advantages of debt against the costs of financial distress (Liao, Huang, & Ni, 2022). Conversely, the pecking order theory suggests that firms prefer internal financing to avoid the information asymmetry associated with external borrowing (Dao & Ta, 2020). Empirically, findings remain mixed. Some studies report a positive relationship between leverage and firm value, suggesting that debt can enhance managerial efficiency and signal confidence to investors (Riaz, Jinghong, & Akhtar, 2022). Others find a negative or non-linear association, implying that excessive debt increases bankruptcy risk and erodes shareholder value (Karaca et al., 2025). These inconsistencies point to the possibility that contextual factors, such as audit quality, may influence the strength and direction of the capital structure–firm value relationship.

Audit quality has emerged as a crucial governance mechanism capable of enhancing the credibility of financial statements and protecting investor interests. High-quality audits reduce information asymmetry, discourage earnings manipulation, and improve transparency, thereby strengthening the link between financing decisions and firm value (Francis, 2023; Sulaiman, 2023). Theoretically, agency theory provides a strong justification for the moderating role of audit quality. It posits that auditors serve as external monitors who align the interests of managers (agents) and shareholders (principals) by ensuring that reported financial outcomes accurately reflect firm performance (Rajgopal et al., 2021). Empirical evidence reinforces this theoretical stance. For instance, Al-ahdal and Hashim (2022) found that higher audit quality and stronger audit committee characteristics significantly enhance firm performance in India. Similarly, Nguyen and Nguyen (2024) documented that audit quality improves the positive impact of governance mechanisms on firm performance in Vietnam. In Egypt, Aly et al. (2023) revealed that firms audited by reputable external auditors enjoy higher firm value, particularly when audit tenure is optimal. These findings suggest that audit quality moderates the influence of financial policies, including capital structure, on firm outcomes by reinforcing market trust and reducing perceived investment risk.

In Nigeria's consumer goods industry, practical challenges continue to undermine firm value. Weak internal controls, aggressive earnings management, and inconsistent audit practices have contributed to deteriorating investor confidence. Many firms exhibit poor debt management strategies, with excessive reliance on short-term borrowings leading to liquidity pressures and solvency risks. Moreover, audit failures and perceived auditor independence issues have raised doubts about the reliability of financial statements. Scandals involving financial misreporting and audit lapses have further strained the credibility of listed firms. The Central Bank of Nigeria (CBN) and the Financial Reporting Council of Nigeria (FRCN) have repeatedly emphasized the need for stronger audit oversight and corporate governance reforms. However, despite these interventions, inconsistencies in financial reporting quality persist, creating uncertainty about the true value of firms and limiting capital market efficiency.

The literature reveals significant gaps that warrant this study. First, while extensive research has examined the relationship between capital structure and firm value (e.g., Abdullah & Tursoy, 2021; Bui et al., 2023), fewer studies have explored the moderating effect of audit quality within this nexus, especially in emerging African economies. Second, empirical findings from developed markets may not generalize to Nigeria due to institutional and regulatory differences, such as weak enforcement mechanisms and limited audit independence. Third, most prior Nigerian studies have focused on the direct relationship between leverage and profitability, often neglecting how external assurance mechanisms influence this linkage. As a result, the dynamic interaction between capital structure and audit quality remains underexplored in the Nigerian consumer goods sector. Addressing this gap is essential to develop a context-specific understanding of how audit quality strengthens or weakens the value relevance of financing decisions.

The broad objective of this study is to examine the moderating role of audit quality on the relationship between capital structure and firm value of listed consumer goods companies in Nigeria. The specific objectives are to:

- i. Examine the effect of capital structure on firm value of listed consumer goods companies in Nigeria.
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- ii. Assess the effect of audit quality on firm value of listed consumer goods companies in Nigeria.
- iii. Determine the moderating effect of audit quality on the relationship between capital structure and firm value of listed consumer goods companies in Nigeria.

Based on the objectives and theoretical underpinnings, the following null hypotheses are formulated:

H₀₁: Capital structure has no significant effect on firm value of listed consumer goods companies in Nigeria.

H₀₂: Audit quality has no significant effect on firm value of listed consumer goods companies in Nigeria.

H₀₃: Audit quality does not significantly moderate the relationship between capital structure and firm value of listed consumer goods companies in Nigeria.

The scope of this study covers all listed consumer goods companies in Nigeria as classified on the Nigerian Exchange Group (NGX). The analysis spans a ten-year period from 2015 to 2024, capturing recent economic fluctuations, regulatory reforms, and audit quality developments that have influenced capital structure and firm value within the sector. The chosen timeframe ensures sufficient data to observe long-term trends and the moderating effect of audit quality on the capital structure–firm value relationship in a dynamic and evolving business environment. The motivation for this research stems from both theoretical and practical considerations. Theoretically, the study contributes to the agency and signaling literature by demonstrating how audit quality moderates the relationship between capital structure and firm value. It provides evidence on whether high audit quality serves as a credibility-enhancing mechanism that mitigates agency conflicts and information asymmetry in Nigeria’s consumer goods sector. Practically, the study offers insights for corporate managers, auditors, regulators, and investors. For managers, it highlights the importance of balancing debt and equity while maintaining high audit quality to sustain firm value. For regulators, it underscores the need to strengthen audit oversight and corporate governance reforms. Ultimately, this study seeks to provide empirical evidence on whether improving audit quality can help Nigerian consumer goods firms leverage their capital structure decisions to enhance firm value in a volatile and competitive environment.

II. LITERATURE REVIEW

2.1 Conceptual Review

This section presents the conceptual foundations of the study by clarifying the meanings and dimensions of firm value, capital structure, and audit quality as they relate to listed consumer goods companies in Nigeria. The aim is to build a clear understanding of how these concepts interact to shape corporate performance and investor confidence.

2.1.1 Firm Value

Firm value represents the market’s assessment of a company’s overall worth, reflecting both its current profitability and future growth potential. It is an important indicator that guides investors, management, and policymakers in evaluating how efficiently a firm utilizes its resources to create wealth for shareholders. Scholars have measured firm value using indicators such as Tobin’s Q, market capitalization, and price-to-book ratio, which capture the relationship between the market and accounting values of assets (Karaca et al., 2025). The concept of firm value extends beyond profitability to include sustainability, corporate governance, and investor perception, making it a comprehensive measure of long-term corporate success.

Globally, firm value has been linked to several determinants, including financing structure, governance mechanisms, and disclosure practices. For instance, Kumar (2025) found that corporate disclosure quality enhances firm value, especially when firms are audited by reputable auditors and listed in foreign markets. Similarly, Khairiddine et al. (2024) demonstrated that firms with strong environmental and assurance performance tend to maintain higher value in the eyes of investors. In the African context, Sarker and Hossain (2024) revealed that effective governance mechanisms significantly improve the valuation of manufacturing firms, emphasizing the role of transparency and monitoring. In Nigeria’s consumer goods sector, firm value has become a focal issue due to high financing costs, macroeconomic instability, and weak investor confidence. Many firms experience declining share prices despite strong sales performance, suggesting that market value is influenced by more than operational outcomes. Therefore, understanding how financing decisions and audit mechanisms interact to influence firm value is essential for enhancing market performance and ensuring sustainable growth in Nigeria’s competitive consumer goods industry.

2.1.2 Capital Structure

Capital structure refers to the composition of a firm’s financing sources, primarily the mix of debt and equity used to fund operations and investments. The choice of capital structure has long been recognized as a strategic decision that can influence both firm risk and return (Ahmed et al., 2023). According to the trade-off

theory, firms aim to achieve an optimal capital structure that balances the tax benefits of debt against the costs of financial distress. In contrast, the pecking order theory posits that firms prefer internal financing over external borrowing due to information asymmetry and control concerns (Dao & Ta, 2020).

Empirical studies reveal that the relationship between capital structure and firm value is complex and context-dependent. Some evidence suggests that moderate leverage can enhance firm value by signaling managerial confidence and improving financial discipline (Riaz et al., 2022). However, excessive debt may lead to liquidity problems and erode shareholder value, especially in volatile markets (Karaca et al., 2025). For firms in developing economies such as Nigeria, limited access to long-term financing and high borrowing costs make capital structure decisions particularly challenging. In the Nigerian consumer goods sector, fluctuations in interest rates, inflation, and exchange rates influence financing choices and ultimately affect firm value. Firms that rely heavily on short-term debt face greater exposure to financial distress, while those maintaining balanced leverage tend to perform better in the capital market. Hence, understanding how capital structure decisions interact with governance mechanisms like audit quality provides a more complete picture of firm value creation in Nigeria's dynamic business environment.

2.1.3 Audit Quality

Audit quality refers to the degree to which an audit detects and reports material misstatements in financial statements, ensuring that the information presented to stakeholders is both reliable and credible (Francis, 2023). High audit quality enhances the integrity of financial reporting by reducing information asymmetry between managers and investors. This, in turn, strengthens market confidence and contributes to improved firm valuation. The quality of an audit depends on several factors, including auditor independence, expertise, tenure, and the reputation of the audit firm (Rajgopal et al., 2021). In emerging markets, where governance structures are often weak, audit quality serves as an essential external monitoring mechanism that mitigates agency conflicts. By providing assurance on financial reports, auditors play a critical role in aligning the interests of shareholders and management. Studies such as Al-ahdal and Hashim (2022) found that audit quality positively influences firm performance, particularly when complemented by effective audit committee oversight. Similarly, Aly et al. (2023) demonstrated that firms audited by reputable auditors exhibit higher firm value due to increased investor trust and reduced perceived risk. Bakri (2021) further emphasized that high audit quality moderates the effect of corporate policies, such as capital structure, on firm value, reinforcing its governance significance.

In the Nigeria, audit quality has gained prominence due to recurring concerns over financial misreporting, auditor independence, and weak regulatory enforcement. Several audit scandals have eroded public trust and raised questions about the reliability of financial statements. Despite regulatory reforms by the Financial Reporting Council of Nigeria (FRCN), inconsistencies in audit quality persist, especially among consumer goods firms operating under tight profit margins and competitive pressure. Given these challenges, understanding how audit quality interacts with capital structure to influence firm value is critical. A high-quality audit can reduce the risk associated with debt financing, assure investors of transparent reporting, and enhance firm value. Therefore, this study considers audit quality not merely as a control variable but as a potential moderator that strengthens the relationship between capital structure and firm value in Nigerian consumer goods companies.

2.2 Empirical Literature Review

Empirical studies on the relationship between capital structure, audit quality, and firm value have produced diverse findings across different markets and institutional contexts. These differences often arise due to variations in governance systems, regulatory environments, and market maturity. This section reviews relevant studies from both developed and emerging economies, highlighting their findings and identifying the specific gaps that this study seeks to address within the Nigerian context. Ahmed et al. (2023) examined the relationship between capital structure and firm performance using data from 150 manufacturing firms across Southeast Asia. Their study found that leverage positively affects firm performance up to a threshold, beyond which excessive debt erodes firm value. The authors also noted that agency costs mediate this relationship, suggesting that monitoring mechanisms such as audits could play a moderating role.

Similarly, Abdullah and Tursoy (2021) analyzed German firms under IFRS adoption and reported that optimal leverage improves performance by lowering financing costs and signaling managerial efficiency. However, both studies focused on developed or semi-developed markets, leaving a gap in understanding how weak regulatory environments, such as Nigeria's, shape this relationship. Attah Mills and Mwasambili (2022) investigated Ghanaian firms and found that capital structure significantly influences firm value, but the effect depends on financial discipline and market efficiency. Their results support the notion that firms with moderate leverage levels achieve higher valuations. In contrast, Bui et al. (2023) discovered a negative relationship

between leverage and firm value among Vietnamese listed firms, attributing the decline to excessive borrowing and macroeconomic instability. These conflicting outcomes reinforce the need for country-specific studies that account for institutional and governance differences, especially in Nigeria where the cost of borrowing remains high.

The literature on audit quality has also expanded significantly. Francis (2023) and Sulaiman (2023) emphasized that audit quality is multidimensional, influenced by auditor competence, independence, and ethical judgment. In a study of Indian firms, Al-ahdal and Hashim (2022) found that external audit quality and audit committee effectiveness jointly enhance firm performance, suggesting that audit quality mitigates managerial opportunism. Similarly, Nguyen and Nguyen (2024) provided evidence from Vietnam showing that audit quality strengthens the positive impact of corporate governance on firm performance. However, most of these studies examined audit quality as a direct determinant of performance rather than as a moderator of financing decisions. Further evidence from Egypt by Aly et al. (2023) revealed that firms audited by reputable external auditors tend to record higher market valuations. Their findings also showed that the length of audit tenure influences the strength of this relationship. El-Deeb et al. (2023) examined Egyptian firms and discovered that audit quality moderates the relationship between environmental, social, and governance (ESG) disclosure and firm value, providing empirical support for the moderating role of audit mechanisms. Likewise, Bakri (2021) demonstrated that audit quality moderates the effect of dividend policy on firm value in Malaysian firms, concluding that high-quality audits improve the reliability of financial information and reduce investors' perception of risk. These studies, while insightful, do not specifically address how audit quality interacts with leverage decisions to influence firm value.

In developed economies, Rajgopal et al. (2021) analyzed large corporations in the United States and found that high audit quality improves the credibility of financial reporting, leading to better valuation outcomes. Their study reinforces the argument that audit quality reduces information asymmetry between managers and investors. In Saudi Arabia, Kateb and Belgacem (2024) examined the impact of governance reforms and audit quality on financial performance and found that high audit quality enhances the positive effects of board characteristics and IFRS adoption. Similarly, Kumar (2025) confirmed that firms audited by global accounting firms achieve higher firm value, especially when they disclose information transparently to investors. These results underscore audit quality's role in strengthening the link between governance practices and firm value, though they do not explore its interaction with capital structure variables.

African studies remain relatively limited. Sarker and Hossain (2024) investigated the manufacturing industry in Bangladesh (a comparable developing market) and found that good governance and reliable auditing enhance firm valuation. Riaz et al. (2022) examined firms in the G7 economies and revealed that leverage decisions significantly influence performance, but they did not consider how audit mechanisms could alter this relationship. Ronoowah and Seetanah (2023) used a panel VAR approach to explore the dynamics of governance, capital structure, and firm performance, concluding that governance quality is an important intermediary in the financing–value nexus. These findings suggest that without robust audit quality, the potential benefits of optimal capital structure may not fully translate into improved firm value.

The extant studies collectively confirm that both capital structure and audit quality are significant determinants of firm value. However, three major gaps persist. First, very few studies have examined the moderating role of audit quality on the capital structure–firm value relationship, particularly within the Nigerian context where audit independence and enforcement remain weak. Second, most prior research has focused on developed or emerging Asian economies, which differ institutionally from Nigeria. Third, while evidence suggests that both leverage and audit quality matter for firm performance, there is insufficient understanding of how their interaction affects firm value in the highly competitive and volatile Nigerian consumer goods industry. Therefore, this study contributes to the literature by providing empirical evidence from Nigeria, focusing on a sector where both financing and governance challenges are most acute. It extends prior research by integrating audit quality as a moderating factor, offering new insights into how credible auditing practices can enhance the value relevance of financing decisions in emerging economies.

2.3 Theoretical Framework

This study is anchored primarily on the Agency Theory and complemented by the Signaling Theory, both of which provide a strong conceptual foundation for understanding how capital structure and audit quality influence firm value. Agency theory, first articulated by Jensen and Meckling (1976), explains the conflict of interest that arises between managers (agents) and shareholders (principals) when ownership and control are separated. Managers may pursue self-serving actions, such as excessive borrowing or earnings manipulation, that do not necessarily maximize shareholder wealth. In this context, both capital structure and audit quality serve as mechanisms for mitigating agency conflicts. The use of debt creates financial discipline by obligating managers to meet periodic interest payments, thereby limiting the potential for discretionary spending.

However, excessive leverage can also intensify agency costs if managers engage in risky projects to satisfy debt obligations. This is where audit quality becomes essential—it provides external assurance that financial reports are reliable and that management’s financing decisions are aligned with shareholders’ interests.

The Signaling Theory, developed by Ross (1977), complements agency theory by emphasizing how financial and governance decisions communicate information to the market. A firm’s capital structure can serve as a signal of its financial health and managerial confidence. For instance, a moderate level of debt may indicate strong future cash flows, while very high leverage might signal financial distress. Similarly, engaging reputable auditors signals transparency and commitment to credible reporting, enhancing investor confidence and firm valuation (Francis, 2023; Nguyen & Nguyen, 2024). In this study, these two theories jointly explain the moderating role of audit quality. While capital structure directly influences firm value through financing efficiency, audit quality strengthens this relationship by ensuring that reported financial outcomes accurately reflect underlying performance. Thus, in the Nigerian context where governance systems are weak, high audit quality can reinforce the credibility of financing decisions and enhance firm value.

III. METHODOLOGY

This study adopts an *ex post facto* research design, which is suitable for investigating causal relationships among variables based on historical data. The *ex post facto* approach is appropriate because the study examines the moderating role of audit quality on the relationship between capital structure and firm value without manipulating any of the variables. This design has been widely applied in finance and accounting research, particularly when assessing how firm-specific characteristics influence performance outcomes (Ahmed & Bhuyan, 2020; Kalash, 2021). It allows for the use of secondary data to identify patterns and infer relationships that exist in real-world corporate settings. In line with prior studies such as Ronoowah and Seetanah (2023) and Al-ahdal and Hashim (2022), this research employs a panel data framework to capture both the cross-sectional and time-series dimensions of the data, thereby improving the accuracy and robustness of the findings.

The population of the study comprises all listed consumer goods companies in Nigeria as classified under the Nigerian Exchange Group (NGX). As of 2024, there were twenty (20) companies in this sector, including firms such as Dangote Sugar Refinery Plc, Nestlé Nigeria Plc, Cadbury Nigeria Plc, and Unilever Nigeria Plc. The sector was chosen because of its significant contribution to Nigeria’s GDP and its sensitivity to macroeconomic fluctuations, which affect both financing decisions and firm valuation. The study adopts a purposive sampling technique to select 16 firms with continuous availability of audited financial statements between 2015 and 2024, ensuring data consistency and completeness. This period captures the post-recession economic recovery, exchange rate volatility, and recent corporate governance reforms that have shaped firm financing behavior in Nigeria. The approach aligns with previous African studies such as Attah Mills and Mwasambili (2022) and El-Deeb et al. (2023), which emphasized the importance of longitudinal data in explaining firm value dynamics.

The study relies entirely on secondary data obtained from the audited annual reports and financial statements of the selected firms, as well as from publications of the Nigerian Exchange Group (NGX). Relevant data such as total debt, total equity, total assets, audit firm identity, and market valuation were extracted from these reports. Annual report data are considered credible because they are externally verified and standardized, making them suitable for quantitative analysis (Francis, 2023; Sulaiman, 2023). The use of audited financial statements also allows for the accurate assessment of audit quality indicators, such as auditor type, audit tenure, and audit firm size. Data collection procedures followed the approach of Nejad et al. (2024), who emphasized the importance of data validity in financial reporting and governance research. The data were analyzed using panel regression analysis, which accommodates variations across firms and time. Specifically, both fixed effects and random effects models were estimated, and the Hausman test was employed to determine the appropriate model specification. The use of panel data enhances statistical efficiency by controlling for unobserved heterogeneity across firms (Dao & Ta, 2020). Diagnostic tests, including normality, multicollinearity, heteroskedasticity, and autocorrelation tests, were conducted to ensure the validity of the model assumptions. The variance inflation factor (VIF) was used to detect multicollinearity, while the Breusch–Pagan test was applied to test for heteroskedasticity. Similar econometric procedures have been used in prior studies such as Riaz et al. (2022) and Karaca et al. (2025) to ensure the reliability of results in capital structure and firm value research. Additionally, moderation effects were examined using interaction terms between capital structure and audit quality variables, following the approach of Bakri (2021) and El-Deeb et al. (2023).

In line with prior studies that examined moderation effects in corporate finance and governance research, this study employed three regression models to test the hypothesized relationships systematically. Using multiple models allows for stepwise analysis of both the direct and moderating effects of audit quality on the capital structure–firm value relationship, ensuring that the incremental influence of the moderating variable

is clearly identified and statistically validated. The modeling procedure follows the approach of Bakri (2021), El-Deeb et al. (2023), and Aly et al. (2023), who applied hierarchical or stepwise regression to examine moderation effects. Accordingly, the study specifies three models as follows:

The study specifies the following regression models to test the hypotheses:

$$\text{Model 1: Tobin's } Q_{it} = \alpha_0 + \beta_1 CS_{it} + \beta_2 FS_{it} + \beta_3 ROA_{it}$$

$$\text{Model 2: Tobin's } Q_{it} = \alpha_0 + \beta_1 CS_{it} + \beta_2 AQ_{it} + \beta_3 FS_{it} + \beta_4 ROA_{it}$$

$$\text{Model 3: Tobin's } Q_{it} = \alpha_0 + \beta_1 CS_{it} + \beta_2 AQ_{it} + \beta_3 CS * AQ_{it} + \beta_3 FS_{it} + \beta_4 ROA_{it}$$

Where:

Tobin's Q (Firm Value): Firm value is proxied by Tobin's Q, which is calculated as the ratio of the market value of equity plus the book value of debt to the book value of total assets. Tobin's Q captures both market and accounting perspectives of value and has been used extensively in prior studies such as Khaireddine et al. (2024) and Kateb and Belgacem (2024) to evaluate how governance and financial structure affect firm valuation.

Capital Structure (CS) is measured using debt-to-assets ratio. This measure indicates the extent of financial leverage and the firm's dependence on borrowed funds for financing, consistent with studies by Liao et al. (2022).

Audit Quality is measured as a dummy variable coded 1 if the firm is audited by a Big Four audit firm (KPMG, Deloitte, PwC, or EY) and 0 otherwise (Kateb & Belgacem, 2024).

Firm Size (FSIZE): Measured as the natural logarithm of total assets. Larger firms tend to have more stable cash flows and higher market value.

ROA (Profitability) is represented by Return on Assets (ROA), calculated as net income divided by total assets.

Model 1 examines the direct effect of capital structure and control variables on firm value, while Model 2 introduces audit quality and relevant control variables (firm size and profitability) to assess their independent influence on firm value. Model 3 incorporates the interaction term between capital structure and audit quality to test the moderating effect. A statistically significant interaction term (β_3) indicates the presence of a moderation effect. This three-model framework aligns with best practices in moderation analysis and provides a robust structure for identifying both direct and conditional effects within panel data settings. It enhances the interpretability of results and supports comparative validation with prior international studies in similar domains.

IV. RESULTS AND DISCUSSION

This section presents and discusses the empirical findings from the study examining the moderating role of audit quality on the relationship between capital structure and firm value of listed consumer goods companies in Nigeria. The analysis is structured in line with the study's objectives and includes descriptive statistics, diagnostic tests, correlation analysis, and regression results. The section begins with the interpretation of the descriptive statistics presented in Table 1, which provide an overview of the data characteristics and the general behavior of the variables used in the study.

Table 1
Descriptive Analysis

Variable	Obs	Mean	Std. Dev.	Min	Max
TOBINS_Q	160	2.064	0.604	0.7545	3.736
CS	160	0.380	0.136	0.050	0.688
AQ	160	0.406	0.492	0	1
FS	160	10.288	0.485	9.187	11.437
ROA	160	0.072	0.063	-0.134	0.226

The descriptive analysis reveals that listed Nigerian consumer goods companies generally maintain positive market valuations, moderate leverage levels, and varying audit quality practices. The average Tobin's Q of 2.064 suggests that most firms are valued above their book value, indicating investor optimism about their growth potential. Capital structure, with a mean of 0.38, shows that firms rely on both debt and equity financing but avoid excessive borrowing, consistent with the conservative financing behavior of firms in emerging markets. Audit quality, with an average of 0.406, implies that less than half of the firms are audited by Big Four

auditors, suggesting disparities in governance and assurance quality within the sector. The average firm size and profitability levels further demonstrate that while some firms are large and profitable, others struggle with smaller asset bases and lower returns.

Overall, these findings portray a heterogeneous sector characterized by differences in financial capacity, governance strength, and market confidence. The variations in audit quality and capital structure highlight potential factors influencing firm value among Nigerian consumer goods companies. The results suggest that while most firms maintain stable financial structures, those engaging reputable auditors and sustaining higher profitability tend to attract better market valuations. These patterns reinforce the relevance of examining how audit quality moderates the relationship between capital structure and firm value, as credible audit practices may enhance transparency, reduce information asymmetry, and strengthen investors' confidence in firms' financial performance.

The normality test was conducted using the Shapiro–Wilk test to determine whether the data for each variable followed a normal distribution, which is an essential assumption for reliable regression analysis. A normally distributed dataset ensures that parameter estimates and statistical inferences derived from the regression models are valid and unbiased.

Table 2
Normality Test

Variable	Obs	W	V	z	Prob>z
TOBINS_Q	160	0.98379	1.993	1.569	0.05829
CS	160	0.98702	1.596	1.064	0.14376
AQ	160	0.99596	0.496	-1.593	0.94446
FS	160	0.96613	4.166	3.246	0.00059
ROA	160	0.99125	1.076	0.168	0.43343

As presented in Table 2, the Shapiro–Wilk test results indicate that most of the variables, Tobin's Q, capital structure (CS), audit quality (AQ), and profitability (ROA), have p-values greater than 0.05, implying that their distributions do not significantly deviate from normality. This confirms that these variables are approximately normally distributed and suitable for parametric analysis. However, firm size (FS) recorded a p-value of 0.00059, which is below the 0.05 threshold, indicating a slight deviation from normality. This result is not unexpected, as firm size data often exhibit mild skewness due to large differences between small and large firms (Dao & Ta, 2020). Given that the Shapiro–Wilk test is highly sensitive to sample size, and considering that the other variables met the normality assumption, the data are deemed sufficiently normal for regression estimation. Consequently, no data transformation was necessary, and the study proceeded with the regression analysis using the unadjusted variables.

The correlation analysis was conducted to examine the strength and direction of the linear relationships among the study variables. Correlation analysis provides preliminary insights into how the variables move together before proceeding to regression estimation, thereby helping to identify potential associations and assess the likelihood of multicollinearity problems in the model.

Table 3
Correlation Analysis

Variable	TOBINS_Q	CS	AQ	FS	ROA
TOBINS_Q	1.0000				
CS	0.4597	1.0000			
AQ	-0.0696	-0.3799	1.0000		
FS	0.1289	0.2166	-0.0923	1.0000	
ROA	0.1725	0.1199	-0.2551	0.0016	1.0000

As shown in Table 3, firm value (Tobin's Q) exhibits a positive correlation with capital structure ($r = 0.4597$), suggesting that firms with higher leverage tend to experience higher market valuations. This indicates that moderate use of debt may be perceived by investors as a signal of confidence and financial discipline, consistent with the signaling argument presented by Ross (1977). Audit quality ($r = -0.0696$) shows a weak and negative correlation with firm value, implying that audit quality alone does not have a direct linear association

with firm value, though its influence may manifest through interaction effects, as hypothesized in this study. Firm size ($r = 0.1289$) and profitability ($r = 0.1725$) both correlate positively with firm value, indicating that larger and more profitable firms generally command higher market valuations. Capital structure also shows a negative correlation with audit quality ($r = -0.3799$), meaning that firms audited by Big Four firms tend to adopt more conservative financing policies, possibly due to stronger governance oversight. Overall, the correlation coefficients are moderate and below the threshold of 0.8, suggesting that multicollinearity is not a concern and the variables are suitable for inclusion in the regression models.

The diagnostic tests for multicollinearity and heteroscedasticity were conducted to validate the reliability of the regression estimates and ensure that the assumptions of the classical linear regression model were not violated.

Table 4: Multicollinearity Test

Variable	VIF	1/VIF
AQ	1.23	0.810896
CS	1.22	0.821668
ROA	1.07	0.933568
FS	1.05	0.952202
Mean VIF	1.14	

As presented in Table 4, the Variance Inflation Factor (VIF) values for all variables—ranging between 1.05 and 1.23, with a mean VIF of 1.14—are well below the critical threshold of 10. This indicates the absence of multicollinearity, confirming that the independent variables are not highly correlated and can independently explain variations in firm value (Ronoowah & Seetana, 2023). The heteroscedasticity test, with a Chi-square value of 2.83 and a corresponding p-value of 0.0928, is greater than the 0.05 significance level, suggesting that the null hypothesis of homoscedasticity cannot be rejected. This implies that the variance of the error terms is constant across observations, satisfying the homoscedasticity assumption. Together, these results confirm that the data are free from multicollinearity and heteroscedasticity issues, indicating that the regression results are robust, consistent, and reliable for statistical inference.

To determine the most appropriate estimation technique for the panel data, the study conducted both the Hausman test and the Lagrangian Multiplier (LM) test. The Hausman test, which helps to choose between the fixed effects and random effects models, produced a Chi-square value of 1.54 with a p-value of 0.8188, which is greater than the 0.05 significance level. This result indicates that the random effects model is more appropriate, as there is no systematic difference between the fixed and random effects estimators (Dao & Ta, 2020). Furthermore, the Lagrangian Multiplier (LM) test, used to decide between the random effects and pooled OLS models, yielded a Chi-bar² value of 228.57 with a p-value of 0.0000, which is highly significant. This implies that the random effects model is preferred over the pooled OLS model because it better captures the panel structure of the data by accounting for unobserved firm-specific effects. Therefore, the study proceeds with the random effects model for regression analysis, as it provides efficient and unbiased estimates of the relationship between capital structure, audit quality, and firm value among Nigerian consumer goods companies.

The regression results presented in Table 5 provide the basis for testing the three hypotheses formulated in this study regarding the relationship between capital structure, audit quality, and firm value of listed consumer goods companies in Nigeria. The analysis employed three regression models estimated using the random effects approach, which was confirmed as the most appropriate method through the Hausman and Lagrangian Multiplier tests. Each model progressively introduces new variables, capital structure, audit quality, and their interaction term, to examine both the direct and moderating effects in line with the study objectives. The findings are discussed below in relation to the hypotheses and compared with prior empirical evidence.

Table 5: Random Effect Regression Analysis

Variable	Coefficient (Probability)	Coefficient (Probability)	Coefficient (Probability)
Constant	0.286 (0.822)	-0.185 (0.883)	-0.135 (0.914)
CS	1.458 (0.000)	0.158 (0.000)	1.912 (0.000)
AQ	--	0.198 (0.021)	0.604 (0.000)
AQ*CS	--	--	-1.008 (0.018)
FS	0.113 (0.361)	0.144 (0.236)	0.125 (0.302)
ROA	0.793 (0.103)	0.874 (0.066)	0.898 (0.054)
R-Squared	0.2198	0.2323	0.2530
Wald Chi2(3)	23.85	33.84	40.32
Prob.	0.000	0.000	0.000

The result of Model 1 shows that capital structure (CS) has a positive and statistically significant coefficient ($\beta = 1.458$, $p < 0.01$), leading to the rejection of the null hypothesis (H_{01}). This finding implies that leverage positively influences firm value among Nigerian consumer goods companies. The result suggests that firms using a balanced level of debt are able to enhance shareholder wealth by benefiting from tax advantages and improved managerial efficiency associated with debt discipline. This outcome aligns with the signaling theory, which posits that higher leverage can signal financial stability and managerial confidence to investors (Ross, 1977). The finding is consistent with Abdullah and Tursoy (2021), who found that leverage improved firm performance under IFRS adoption in Germany, and Attah Mills and Mwasambili (2022), who reported a similar positive effect of debt on firm value in Ghanaian firms. It also corroborates Karaca et al. (2025), who found an inverted U-shaped relationship between capital structure and firm value in emerging markets, indicating that moderate debt levels enhance value before financial distress sets in. However, the finding contrasts with Bui et al. (2023), who reported a negative relationship between leverage and firm value in Vietnam due to unstable macroeconomic conditions. The Nigerian result suggests that, within the consumer goods sector, leverage is effectively managed and remains an important strategic tool for value creation.

In Model 2, audit quality (AQ) was included alongside firm size (FS) and profitability (ROA). The coefficient of audit quality is positive and statistically significant ($\beta = 0.198$, $p = 0.021$), leading to the rejection of the null hypothesis (H_{02}). This finding implies that higher audit quality enhances firm value, consistent with the argument that credible audits improve financial transparency, reduce information asymmetry, and foster investor confidence. In essence, firms audited by reputable (Big Four) auditors tend to be perceived as more reliable, which improves their market valuation. This result is supported by Aly et al. (2023), who found that firms audited by top-tier auditors in Egypt experienced higher firm value, and Al-ahdal and Hashim (2022), who established a positive link between external audit quality and performance among Indian firms. It also aligns with Nguyen and Nguyen (2024), who demonstrated that audit quality enhances the governance–performance relationship in Vietnamese companies. The result further complements Francis (2023), who emphasized that audit quality is a key determinant of value relevance and market trust in financial reporting. In the Nigerian context, this evidence suggests that improving audit standards can directly strengthen firm value by increasing investor confidence and reducing perceived investment risks.

The moderating effect of audit quality was tested in Model 3, which introduced the interaction term ($CS \times AQ$) into the regression model. The interaction term has a negative and statistically significant coefficient ($\beta = -1.008$, $p = 0.018$), indicating that audit quality significantly moderates the relationship between capital structure and firm value. However, the negative sign suggests that audit quality weakens the positive impact of leverage on firm value. This finding leads to the rejection of the null hypothesis (H_{03}) and confirms that audit quality plays a meaningful but constraining role in the financing–value relationship. The implication of this finding is that high audit quality, while improving transparency and reliability, also imposes stricter monitoring that discourages excessive leverage or aggressive financial reporting. This outcome supports the agency theory perspective, which holds that auditors act as external monitors to reduce agency conflicts between managers and shareholders (Rajgopal et al., 2021). It is consistent with Bakri (2021), who found that audit quality moderated the dividend–firm value relationship in Malaysian firms, and El-Deeb et al. (2023), who reported that audit quality moderated the link between ESG disclosure and firm value in Egyptian companies. It also resonates with Hichri (2023), who emphasized that ethical and high-quality audits enhance the value relevance of financial reporting.

V. CONCLUSIONS

This study examined the moderating role of audit quality on the relationship between capital structure and firm value of listed consumer goods companies in Nigeria over the period 2015–2024. Using a panel regression approach and a three-model estimation framework, the study found that capital structure has a significant positive effect on firm value, indicating that moderate use of debt enhances market valuation. Audit quality also showed a direct and positive effect on firm value, confirming that credible audits improve transparency and investor confidence. However, the interaction term between capital structure and audit quality revealed a negative and significant relationship, suggesting that audit quality moderates the impact of leverage by curbing excessive risk-taking and promoting conservative financing behavior. Overall, the findings affirm that both financing and governance mechanisms jointly determine firm value, with audit quality serving as an important moderating force in Nigeria’s consumer goods sector.

This study contributes to the growing body of literature in three significant ways. First, it provides context-specific evidence from Nigeria, an emerging economy where capital structure decisions and audit quality practices are often influenced by weak regulatory enforcement and volatile macroeconomic conditions. Second, it extends existing theories, particularly the agency and signaling theories, by empirically demonstrating

that audit quality moderates the relationship between leverage and firm value, reinforcing the importance of external monitoring in corporate governance. Third, the study contributes to policy and practice by showing that while debt can enhance value, effective audit oversight ensures that such financing decisions are sustainable and align with shareholders' interests. This integrated perspective on financing and audit mechanisms offers new insights for improving firm value in emerging markets.

Based on the findings, this study recommends as follows:

- i. Regulators such as the Financial Reporting Council of Nigeria (FRCN) and the Institute of Chartered Accountants of Nigeria (ICAN) should strengthen oversight and ensure strict adherence to auditing standards. Firms should engage reputable, independent auditors to enhance credibility, reduce agency costs, and improve investor confidence.
- ii. Corporate managers should maintain an optimal mix of debt and equity financing that maximizes firm value while minimizing financial distress. Borrowing decisions should be guided by cost of capital considerations, risk tolerance, and market conditions rather than short-term profitability targets.
- iii. Boards of directors should integrate audit quality into their financial decision-making frameworks. High-quality audits should not only serve compliance purposes but also guide firms toward prudent financing strategies that sustain long-term value creation and market confidence.

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