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Firm's Characteristics, Capital Structure and Financial Performance of Energy Utility Companies in Nigeria.

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Abstract: This study examined the moderating effect of firm size and age on the relationship between debt capital and financial performance of Listed Energy utility Firms in Nigeria for the period of five years (2019-2023). Short term Debt, Long Term debt and Total debt proxied debt capital while Return on Assets proxied financial performance. Firm size and age served as moderating variable. The study adopted ex-post facto research design and inferential statistics. Robust Fixed effect Models and Drisc/Kraay Standard Error were used in analyzing the data. Primary findings revealed that short-term debt, long-term debt and total debt have negative significant effect on return on assets. However, the secondary findings have revealed that moderated firm size and age on the total -term-debt has positive insignificant effect on return on assets while moderated-long-term-debt and moderated-total-debt have positive significant effect on return on assets. The moderation R-Squared was 0.901 while the primary R-Squared was 0.554. That means, firm size and age has moderated debt by 0.860. In view of the findings, this study concludes that firm size and age has great moderating effect on debt capital. Therefore, this study recommends that investors should consider firm size and age as an effective variable in making investment and financial decision. Secondly, management of companies should consider firm size and age in determining the debt to be collected.

Key Word(S): Firm age, Firm size, Long-Term-Debt, Return-on-Assets, Short-Term-Debt

I. Introduction

Financing is an important aspect of a business. Capital structure denotes the method through which a company funds its assets by utilizing a blend of equity, debt, and hybrid financial instruments. (Kanoma, Miko, Ayuba, Mohammed & Tagwai, 2024), whether a firm is young or established, it requires funds to operate (Massidda & Piras, 2024), this fund is referred to as Capital. A company's sources of cash for operations and capital investments include long-term debt financing, preferred stock, and common stock, often known as equity financing (Jansen, Michiels, Voordeckers & Steijvers, 2023). A financing manager is responsible for determining the optimal financing mix and debt-equity combination for his company (Sylvester & James 2022). Financial management heavily relies on making sound financial decisions, particularly when determining how a company structures its capital, as these choices significantly affect the company's operations, development, and results. Companies must carefully choose their combination of financing sources, as this decision is vital for both survival and expansion. Capital structure refers to the strategic combination of funding sources a company utilizes to finance its operations and investments, including long-term debt, short-term debt, equity, and other financial instruments (Ayton, Krasnikova, & Malki, 2022).Financial performance is a strategic priority for businesses, driven by a combination of internal and external factors (Hasanuddin, 2021).

In today's business world, a firm's size is vital for success due to economies of scale. Corporate firms aim to gain a competitive advantage by increasing their size, lowering manufacturing costs and increasing market share (Ballerini, Herhausen& Ferraris, 2023), bigger companies may produce things at far lower costs than smaller enterprises. According to Jihadi, Vilantika, Hashemi, Arifin, Bachtiar, & Sholichah, (2021), a firm's size correlates with its market capitalization, book value, and profitability investors are generally more interested in large-scale firms this is because huge businesses tend to be more stable. Firm age, defined as the duration a company has operated since its establishment or stock market listing (typically in years), serves as a key indicator of stability and credibility in capital structure frameworks.). Moderators are particularly relevant in studies with weak or contradictory findings, as they help contextualize why outcomes diverge across firms or sectors (Lo , 2020; Turner, Ting, Wong, Lim, & Tan, 2021). Integrating such variables into capital structure analysis could resolve discrepancies and enhance predictive accuracy in financial performance models

The interplay between firm age, size, capital structure, and financial performance in emerging economies has garnered significant global academic interest. This relationship is particularly relevant in Nigeria's energy utility sector, where limited specialized research exists despite the sector's critical role in driving the national economy. Investigating how capital structure decisions shaped by firm maturity and scale impact financial outcomes in this context remains vital. The discourse on capital structure, rooted in Modigliani and Miller's (1958) seminal work, underscores the enduring relevance of balancing debt and equity to optimize firm value. Such analysis is crucial for addressing sector-specific challenges and enhancing the financial sustainability of energy utilities in developing markets. Modigliani and Miller's (1958) irrelevance theory posits that a firm's value is unaffected by its capital structure, though this hinges on idealized assumptions no taxes, bankruptcy costs, or transaction fees. However, empirical studies (Myers & Majluf, 1984) demonstrate that capital structure significantly influences value in real-world settings.As a result, this study investigated the role of firm size and age as a moderator in the relationship between capital structure and financial performance

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue VI, June 2025

among Energy utility companies in Nigeria.,Ahmad, Wu & Khattak, (2023) noted the firm's size and age are an important mediator in the link between independent variables and company financial performance.

Research Objectives

This study aimed to investigate the impact of firm age and size on the relationship between capital structure and the financial performance of publicly listed energy utility companies in Nigeria.

Assess the significant influence of short-term debt on the return on assets of listed energy utility firms in Nigeria.

Measure the significant effect of long-term debt on the return on assets of listed energy utility firms in Nigeria.

Analyze the impact of total debt on the return on assets of listed energy utility firms in Nigeria.

Investigate the extent to which firm age significantly affect the relationship between total debt and return on assets in listedenergy utility firms in Nigeria.

Determine the effect of firm size on the relationship between total debt and return on assets in listed energy utility firms in Nigeria.

Overview of the Power Holding Company of Nigeria (PHCN)

The Electric Power Sector Reform (EPSR) was passed in Nigeria in 2005, which kicked off the privatization process in the country's energy industry. The EPSR was introduced as a legal and regulatory framework for private sector participation in the event of the sector's monopoly being unbundled. Following the 2005 EPSR Act, the Power Holding Company of Nigeria (PHCN) acquired the assets and liabilities of the former Nigerian Electricity Power Authority (NEPA). The PHCN was divided into eighteen entities, including six generation companies (GENCOs), one transmission company (TRANSCO), and eleven distribution businesses (DISCOs). Privatization reform was fully implemented in both the power generation and distribution value chains in 2013, in order to meet the growing demand for a stable and reliable electricity supply while improving efficiency.

Energy utility businesses in Nigeria are divided into three categories based on their mandate. The regulations include electricity generation, distribution (low voltage), and transmission (high voltage). These electric utility providers align with the Vision 2030, a strong energy system supports economic growth and aligns with Vision 2030 to support economic growth and align with Vision 2030, it's crucial to prioritise efficiency in this sector and pass on any gains to consumers. The energy sector in Nigeria is experiencing growth due to market reforms and vertical unbundling, leading to the emergence of 11 electricity distribution companies, 25 electricity generation companies, and two publicly listed distribution firms. Listed energy utility companies have the opportunity to raise equity through new share issuances or rights offerings, while non-listed firms can seek funding from venture capitalists and private equity investors. Additionally, debt financing can be accessed through commercial lenders, Development Finance Institutions (DFIs), and government loans at concessional rates.

II. Literature Review

Conceptual Review

Capital structure has been described in diverse ways by researchers, academics, and stakeholders. At its core, it represents the composition of a company's financial obligations, reflecting the particular combination of debt and equity utilized to fund its operations, generate profits, or deliver services. Companies often raise funds through debt financing in financial markets. Because interest payments on debt are tax-deductible, unlike dividends paid to shareholders, which are taxable, debt financing is frequently more appealing than equity financing. Additionally, debt financing typically provides quicker access to capital and often at lower interest rates compared to equity financing, which is generally more costly.A company's capital structure represents the mix of its common stock, preferred stock, long-term debt, and short-term debt, showcasing how the business utilizes different financial resources to sustain operations and drive growth. Some definitions describe capital structure as the financial foundation of a company, consisting of both debt and equity. Alternatively, it is often viewed as the equilibrium between long-term debt and equity, highlighting the proportion of borrowed funds versus shareholder investments in financing the organization's activities.

A company's capital structure consists of both internal and external sources of financing used to fund its assets, as emphasized by (Dat, 2022). It reflects the organization of a firm's financial resources, striking a balance between shareholder equity and borrowed funds to achieve an optimal financial position. Companies rely on capital to cover operational expenses and make strategic investments, with its determination requiring careful analysis and forward-looking planning. This process incorporates key financial metrics such as the cost of capital, weighted average cost of capital (WACC), debt-to-equity ratio, and cost of equity to ensure informed decision-making.According to Josia, Uguru, & Nkwaga, (2024), capital structure refers to the combination of debt and equity financing that supports a company's operations. Khan, Zafar & Ayaz, (2022) defines it as the foundation of a firm's financial structure, characterizing it as the ratio of debt to equity capital that a business maintains to fund its activities and growth. This structure integrates long-term financing mechanisms, equity shares, and retained earnings. Khan, Zafar and Ayaz, (2022) emphasizes that optimizing capital structure entails balancing debt and equity to maximize stakeholder value while mitigating financial risks.

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue VI, June 2025

Capital serves as the backbone of an organization's financial stability, enabling sustainable operations by providing a safeguard for daily activities and unforeseen losses during challenges. It ensures the firm meets stakeholder obligations and maintains fiscal health while generating value through productive industrial processes. Resources vital to production termed *factors of production* are traditionally categorized into labor, physical assets (machinery), financial capital, and information. This underscores capital's indispensable role in business functionality. Obafemi, Araoye, Ajayi and Babatunde (2024) asserts that capital structure is central to corporate financing, with managers tasked with orchestrating an optimal balance of debt and equity. This strategic allocation is pivotal to operational efficiency. Mansour, Al-Naimi, and Daoud (2023) and Gutterman (2022), expand this definition, characterizing capital structure as the composition of debt, equity, and hybrid instruments like leases, convertible bonds, and warrants. Idachaba and Shallangwa (2022), further describes it as the financial framework underpinning a company's assets and operations. Decisions on capital composition evolve continuously, often aligned with project-specific funding needs.

Ogunmakin, Adebayo and Omodara (2022), note that capital structure became a foundational concept in finance after Franco Modigliani and Merton Miller's 1958 proposition, which argued that a firm's financing mix does not affect its value under perfect market conditions. Despite its alignment with corporate values, identifying an optimal capital structure remains a critical managerial challenge. Capital structure denotes the composition of debt and equity financing a company employs to sustain operations, encompassing the arrangement of liabilities, equity, and debt to shape financial health, performance, and market valuation (Nguyen, Lien Le & Anh Vu, 2021). Building on prior definitions, this study adopts Wilson, Idachaba & Shallangwa, 2022) interpretation, framing capital structure as the debt-to-equity ratio utilized to finance business activities. Here, capital structure is operationalized as the proportion of short- and long-term debts (e.g., loans, bonds) and equity instruments (e.g., common shares, preference shares, debentures, convertible securities) that firms leverage to fund operations.

Capital structure is typically measured through total debt (both long- and short-term) and equity, as these metrics are widely adopted in empirical studies (Aggreh, Nworie & Abiahu, .2022). Debt as defined by Aggreh et al., (2022), involves third-party borrowing without diluting ownership. Such arrangements are formalized through agreements such as mortgages, bonds, or leases, binding the borrower (debtor) to repay the lender (creditor) under specified terms (Madumere & Ukaegbu, 2023). Total debt thus reflects the cumulative external financing an organization secures to sustain its activities. Meero, (2022), highlights that increased debt levels enable firms to access capital for expansion or operational needs. While this provides liquidity for investments, it also imposes repayment obligations, including interest, within a fixed period.

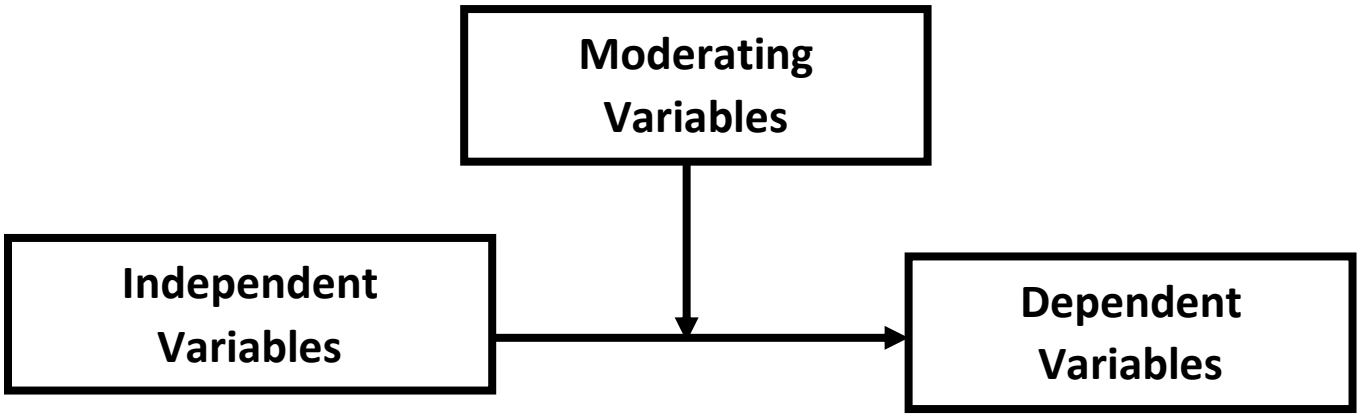


Figure 2.1. Conceptual Framework of the Study

Theoretical Framework

This study was draw upon the Pecking Order Theory and Classical Theory as its theoretical underpinnings. Introduced by Myers and Majluf in 1984, the Pecking Order Theory posits that firms prioritize internal financing before seeking external funds. Essentially, companies exhaust their internal resources before turning to outside sources. If external financing is required, debt is preferred over equity, making equity the last resort. Existing literature supports this theory, suggesting a negative relationship between a company's capital structure and its performance. Notably, the Pecking Order Theory does not incorporate the concept of an optimal leverage ratio.

The Pecking Order Theory

According to Myers and Majluf (1984), there is no single optimal capital structure for a company, and firms don't have a target debt-to-equity ratio. Instead, they prioritize funding sources based on a pecking order. This theory distinguishes between internal financing (primarily retained earnings) and external financing (debt or equity). Companies prefer to use internal funds first. If those are insufficient, they turn to debt financing before finally resorting to issuing new equity. This pecking order arises from information asymmetry, where managers typically have more information about the company's prospects than investors or creditors.

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue VI, June 2025

Managers possess more comprehensive knowledge of a firm's intrinsic value and risks than outside investors. However, they face challenges in credibly conveying the quality of existing assets and future investment opportunities to potential investors. This information asymmetry—the inability to distinguish between promising and unpromising ventures—leads investors to assume that firms issue new shares only when their perceived value exceeds the current market price. Consequently, a company's announcement of a new share issuance often signals negative prospects to the market, resulting in a decline in stock price.

Classical Theory

Durand (1952) introduced the classical theory of capital structure, asserting that debt financing is cheaper than equity. He argued that increasing debt lowers a firm's average cost of capital, thereby enhancing its overall value. Additionally, as debt replaces equity, the return on equity rises due to equity's higher cost.

However, Durand acknowledged that excessive debt increases bankruptcy risk, raising the cost of debt. Attaining an optimal capital structure hinges on striking a balance between debt and equity financing to enhance firm value and reduce the weighted average cost of capital. Organizations should therefore target a financing blend that harmonizes cost-effectiveness with value creation, ensuring that their debt-equity composition aligns with both strategic objectives and market conditions. This equilibrium enables firms to leverage the tax advantages and discipline of debt while mitigating risks such as financial distress, thereby fostering sustainable growth and competitive advantage.

Knowledge gap

The link between capital structure and financial performance has been widely studied across various industries and geographical locations, resulting in a range of diverse and sometimes contradictory conclusions. These inconsistencies have prompted further investigations to clarify the nature, direction, and scope of this relationship using broader datasets and sector specific analyses. In Nigeria, studies have contributed to this discourse. However, these studies are often limited by methodological shortcomings and narrow variable coverage. For instance, Adeniyi, Marsidi and Babatunji (2020) focused exclusively on short-term debt, neglecting other financing sources such as equity and long-term debt. This narrow scope restricts the applicability of their findings to loan financing rather than providing a comprehensive understanding of the debt-equity mix. Such limitations underscore the need for more holistic approaches that incorporate a wider range of financing options and employ robust methodologies to better capture the complexities of capital structure and its impact on financial performance.

Existing studies on capital structure and financial performance in Nigeria exhibit significant methodological and conceptual limitations. For instance, Babalola (2012) and Adamkaite, Streimikiene, and Rudzioniene (2023) focused solely on total debt relative to total assets, overlooking equity financing—a critical component of capital structure. Similarly, Manasseh, Nwakoby, Okanya, Ifediora, and Nzidee (2023) relied on the Chi-square technique, which is inadequate for capturing time variations and firm-specific characteristics. Parametric methods, which account for temporal dynamics and individual firm attributes, are better suited for such analyses. Previous studies exploring the link between capital structure and financial performance have produced inconsistent findings, with variations in scope and methodology. For instance, Yinusa and Babalola (2012) concentrated exclusively on the total debt-to-assets ratio, whereas Sebastian and Rapuluchukwu (2012) analyzed different forms of debt, including short-term, long-term, and total debt, but failed to account for equity financing. Additionally, Idode et al (2014) did not address the importance of short-term and long-term debt, both of which are vital funding sources for Nigerian firms. These gaps highlight the necessity for more thorough research that incorporates a complete range of financing options both debt and equity and utilizes robust methodologies to offer a deeper and more comprehensive understanding of the intricate relationship between capital structure and firm performance.

In response to the limitations identified in prior research and the need for more comprehensive analysis, this study investigated how firm age and size shape the relationship between capital structure and financial performance in both listed and unlisted energy utility companies in Nigeria. The research focuses on the impact of key debt ratios total debt to total assets, total debt to total equity, short-term debt to total assets, and long-term debt to total assets on the financial performance of these firms. Spanning the period from 2019 to 2023, the study hypothesizes that these four financial metrics do not significantly influence the financial performance of Nigeria's energy utility sector. By addressing these gaps, the research aims to provide a more nuanced understanding of the interplay between capital structure and firm performance in this critical industry. The energy utility sector was selected due to the prevalent use of leverage by Nigerian energy suppliers to fund their operations, whether through loans, equity, or a combination of both. It is essential for investors and shareholders to comprehend how capital structure impacts business performance

III. Methodology

This study used a panel of 2 listed power generation companies and 10 electricity distribution companies in Nigeria to ascertain the relationship between the firm's age and size, the firm's capital structure and financial performance. The two power generation companies are Transcorp Power Limited and Geregu power PLC while the 10 electricity distribution companies are **Ikeja Electricity Distribution Company** (**IKEDC**) , **Eko Electricity Distribution Plc** (EKEDC), **Jos Electricity Distribution** Plc (JEDPLC), Abuja Electricity Distribution Company PLC , Benin Electricity PLC (BEDC), **Enugu Electricity Distribution Plc** (**EEDC**),Kano Disribution Plc (KEDCO), Yola Electricity Distribution Company (YEDC), **Port Harcourt Electricity**

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue VI, June 2025

Distribution Plc (PHEDC), Ibadan **Electricity Distribution Company** (IBEDC). The privatisation of the electricity sector was in 2013, the effective date for take-over by all successor companies was 1st November 2014; hence, 2013 and 2014 are the years of public and private ownership of some distribution companies. The data for the empirical analysis spans from 2019 to 2023 collected across 2 Power generation companies and 10 electricity distribution companies in ten different states in Nigeria and the stock market, also the annual data available in the reports of the Nigerian Electricity Regulatory Commission Quarterly Report and individual Annual Financial report.

Both independent and dependent factors make up the study's variables. According to Yesuf, Getahun & Debas, . (2023) , and others, the dependent variable is financial performance as measured by return on assets (ROA), while the independent variables are capital structure as measured by the short-, long-, and total debt ratios (STD, LTD, and TD). Return on assets (ROA) is used in this study as a primary measure of financial performance. ROA assesses how effectively a business uses its resources to produce profits. In contrast to other metrics, ROA takes into account a firm's debt and generates earnings by comparing its profits to the total assets used by the company over a given time period. Since ROA shows how well a company makes money off of its underlying assets, it is a trustworthy indicator of profitability, claims Kamaruddin, Ishak, Hamzah, Abdul Halim & Nurullah Rasade, (2021).

Ex-post facto research design was used in this study. Based on diagnostic tests that verified the data's internal consistency and traditional assumptions, the regression analysis was conducted using Drisc/Kraay Standard Error regression and Robust Fixed Effect Models. Twelve (12) Energy Utility companies between 2013 and 2023 made up the study's population. The study's data will come from the financial statements and annual reports of the Twelve (12) Energy Utility companies. The study looked at the connection between debt and financial performance. It next looked at how business size and age affected the association between moderated debt and financial performance.

Model Details

To assess the nature and strength of the relationship between firm characteristics and financial performance, two models be develop each to test one hypothesis of the study. The regression model employed by Ahmed, Ahmad, Sayed, Ayon, Mia, Koli & Shahid, (2023) was applied in this work, albeit with modifications.

$ROAit = \alpha + \beta 1STDTAit + \beta 2LTDTAit + \beta 3TDTAit + \beta 4FSZit + \beta 5FGEit + \varepsilon it$ ----------(i) $ROAit = \alpha + \beta 1STDTAit + \beta 2LTDTAit + \beta 3TDTAit + \beta 4TDTAit * FSZit + \beta 5TDTAit * FGEit + \varepsilon it$ -……..(ii)

Where:

ROAit = Return on Assets i in year t

STDTAit = Short Term debt to Total Assets i in year t

LTDTAit = Long Term Debt to Total Assets i in year t

TDTAit = Total Debt to Total Assets i in year t

FSZ = Firm Size i in year t

FGE=Firm Age i in year t

TDTAit*FSZit = Moderated Total debt to Total Assets by firm size i in year t

TDTAit*FGEit= Moderated Total debt to Total Assets by firm age i in year t

α = Constant (fixed effect parameter)

β1-5 = Coefficients of the study variables

i = Cross sections (Number of firms),

t = Time series (Number of years)

Ɛit = Error term (Effect of other variables that are excluded from the regression)

The apriori expectation is that β1, β2, β3, β4, β5, < 0.

Table 1: Variable, Symbol, Measurement and Source

Variable	**Symbol**	**Measurement**	**Source**
Independent Variable			

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue VI, June 2025

Short Term Debt	STD	Short term debt to total assets.	Farah, I., Amin, C., & Pramudianto, P. (2021), Pradana, E., & Imelda, E. (2023),
Long Term Debt	LTD	Long term debt to total assets	Farah, I., Amin, C., & Pramudianto, P. (2021), Pradana, E., & Imelda, E. (2023),
Total Debt	TD	Total debt to total assets	Kurniawan, A. (2021), Gunawan, R., Widiyanti, M., Malinda, S., & Adam, M. (2022),
Dependent Variable			
Return on Assets	ROA	Profit after interest and tax/Total Assets	Paramita, A. S., Ardiansah, M. N., Delyuzar, R. A., & Dzulfikar, A. (2022), Widati, S., Asiah, N., Kamela, H., & Hidayat, T. A. (2024).
Moderating Variable			
Firm Size	FSZ	Natural Logarithm of Total Assets	Zhang, D. (2024), Erawati, T., Lestari, P. Y., & Listyawati, R. (2025)
Firm Age	FGE	No of years from incorporation	Ahmed, A. M., Sharif, N. A., Ali, M. N., & Hágen, I. (2023),Matemilola, B. T., Kijkasiwat, P., & Liew, C. Y. (2024)

IV. Results and Discussions

Table 2: Descriptive Statistics

Variable	Obs	Mean	Std. Dev	Minimum	Maximum	Skewness	Kurtosis
ROA	65	-1,998,015	69,100,000	-364,000,000	178,000,000	-1.64	13.72
STD	65	144,000,000	115,000,000	38,868.75	546,000,000	1.21	4.85
LTD	65	37,500,000	60,600,000	299,214	316,000,000	3.86	17.50
TD	65	170,000,000	116,000,000	10,600,000	582,000,000	1.16	4.96
FSZ	65	18.63	0.77	17.06	20.22	-0.14	2.56
FGE	65	13.02	4.00	6	18	-0.43	1.72

Source: STATA 18 Output (2023)

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue VI, June 2025

Table 2 presents the descriptive statistics for the variables Return on Assets (ROA), Short-Term Debt (STD), Long-Term Debt (LTD), Total Debt (TD), Firm Size (FSZ), and Firm Age (FGD).

The ROA variable shows a negative mean of -1,998,015, indicating that, on average, companies are not profitable. The distribution is negatively skewed (-1.64), suggesting that most companies have low or negative returns, with a few outliers showing very high values. The kurtosis (13.72) indicates the presence of extreme outliers.

For STD, the mean is 144,000,000, with a positive skew (1.21), suggesting that while most companies have low short-term debt, a few have very high levels. The kurtosis (4.85) suggests a distribution with outliers.

LTD and TD also show high variability in debt levels, with positive skewness indicating that a few companies have much higher levels of long-term and total debt. The kurtosis values of 17.5 for LTD and 4.96 for TD indicate heavy tails in their distributions, suggesting extreme values.

The FSZ (firm size) has a mean of 18.63 and is relatively consistent, with a near-normal distribution (skewness of -0.14 and kurtosis of 2.56), indicating fewer extreme outlier

Lastly, FGD (firm age) has a mean of 13.02 years, with a slight left skew (-0.43), indicating that most companies are older.

Table 3: Correlation Coefficients Matrix (Multicolinearity)

Variable	**ROA**	**STD**	**LTD**	**TD**	**FSZ**	**FGE**
ROA	1.0000					
STD	-0.1864	1.0000				
LTD	0.0249	-0.2090	1.0000			
TD	-0.1888	0.9773	-0.0781	1.0000		
FSZ	0.0800	0.6863	0.0133	0.7115	1.0000	
FGE	-0.0131	0.3529	-0.1158	0.3355	0.4105	1.0000

Source: STATA 18 Output (2023)

The correlation matrix, as presented in Table 3, provides a detailed view of the relationships between the variables Return on Assets (ROA), Short-Term Debt (STD), Long-Term Debt (LTD), Total Debt (TD), Firm Size (FSZ), and Firm Age (FGD). These relationships help to understand the degree to which the variables are linearly related to one another. The relationship between ROA and Short-Term Debt (STD) is negative, with a correlation of -0.1864, indicating a weak inverse relationship. This suggests that, as short-term debt increases, companies tend to experience a slight decline in their profitability, though the relationship is not strong. The correlation between ROA and Long-Term Debt (LTD) is 0.0249, which is close to zero, implying that there is virtually no linear relationship between these two variables. Similarly, the correlation between ROA and Total Debt (TD) is also weakly negative, at -0.1888, further suggesting that, on average, the level of total debt does not have a strong impact on the profitability of the companies in the sample. In terms of debt relationships, the correlation between Short-Term Debt (STD) and Long-Term Debt (LTD) is -0.2090, indicating a weak negative relationship between the two types of debt. This suggests that companies with higher levels of short-term debt tend to have slightly lower long-term debt. However, the weak magnitude of this correlation implies that the two types of debt are not strongly related. On the other hand, the correlation between Short-Term Debt (STD) and Total Debt (TD) is 0.9773, a very high positive correlation. This indicates that short-term debt is a significant component of total debt for these companies, as companies with high levels of short-term debt also tend to have higher levels of total debt. The correlation between Short-Term Debt (STD) and Firm Size (FSZ) is 0.6863, suggesting a moderate positive relationship. Larger firms are more likely to have higher short-term debt, which may be due to their ability to access larger amounts of credit or their greater operational needs requiring short-term financing. The correlation between Short-Term Debt (STD) and Firm Age (FGD) is 0.3529, indicating that older companies tend to have higher levels of short-term debt. This could reflect the longer financial history and established creditworthiness of older firms, allowing them to maintain higher levels of short-term debt. Looking at Long-Term Debt (LTD), the correlation with Total Debt (TD) is very weak, at -0.0781, suggesting that the amount of long-term debt is not a strong predictor of total debt. The correlation between Long-Term Debt (LTD) and Firm Size (FSZ) is 0.0133, which is nearly zero, indicating that firm size has a negligible effect on the amount of long-term debt companies hold. The correlation between Long-Term Debt (LTD) and Firm Age (FGD) is -0.1158, suggesting a weak negative relationship, where older companies might slightly rely less on long-term debt. For Total Debt (TD), the correlation with Firm Size (FSZ) is 0.7115, indicating a moderate to strong positive relationship. Larger companies tend to have higher total debt, likely due to their ability to access larger amounts of capital. The correlation between Total Debt (TD) and Firm Age (FGD) is 0.3355, suggesting a moderate positive relationship, where older companies tend to have higher total debt. This could be because older firms have established credit histories and may have accumulated more debt

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue VI, June 2025

over time. Finally, the correlation between Firm Size (FSZ) and Firm Age (FGD) is 0.4105, indicating a moderate positive relationship. This suggests that older companies tend to be larger, as firms typically grow in both size and complexity over time.

Table 4: Variance Inflation Factor Test (Multicolinearity)

Variable	VIF	1/VIF (Tolerance)
STD	37.01	0.027020
LTD	1.67	0.597440
TD	36.56	0.027354
FSZ	2.21	0.452791
FGD	1.24	0.808350
Mean VIF	15.74	

Source: STATA 18 Output (2023)

The Variance Inflation Factor (VIF) test has provided insights into the potential multicollinearity among the independent variables. Table 4 shows the VIF and 1/VIF (Tolerance) values for each variable. The VIF values for Short-Term Debt (STD) and Total Debt (TD) are notably high at 37.01 and 36.56, respectively. These values are well above the commonly accepted threshold of 10, suggesting that both STD and TD are highly collinear with other independent variables in the model. The 1/VIF values for these variables are 0.027020 and 0.027354, which are extremely low, further confirming the strong multicollinearity between these variables. Such high VIF values indicate that these two variables may be redundant or too similar to each other in explaining the variation in the dependent variable, ROA. On the other hand, Firm Size (FSZ), Long-Term Debt (LTD), and Firm Age (FGD) show VIF values of 2.21, 1.67, and 1.24, respectively, with corresponding 1/VIF values of 0.452791, 0.597440, and 0.808350. These values are much lower than the VIF threshold of 10, indicating that these variables do not suffer from significant multicollinearity. The mean VIF for all independent variables is 15.74, which is quite high. This suggests that, overall, multicollinearity might be a concern for the model, especially due to the high VIF values of STD and TD.

Table 5: Shapiro-Wilk W. Test (Normality Test)

Variable	Obs.	W	V	Z	Prob>z
ROA	65	0.81070	10.974	5.187	<0.001
STD	65	0.90658	5.416	3.658	<0.001
LTD	65	0.46254	31.156	7.447	<0.001
TD	65	0.91768	4.772	3.384	<0.001
FSZ	65	0.97972	1.176	0.350	0.36301
FGD	65	0.92908	4.111	3.061	0.001

Source: STATA 18 Output (2023)

The Shapiro-Wilk test for normality was conducted to assess whether the variables in the dataset follow a normal distribution. The results of the test for each variable are as follows: For ROA, the Shapiro-Wilk W statistic is 0.81070, and the associated p-value is 0.00000. Given that the p-value is less than 0.05, we reject the null hypothesis, indicating that ROA is not normally distributed. This suggests that the distribution of ROA deviates significantly from a normal distribution, and its skewed nature might need further consideration in subsequent analyses. The variable STD shows a W statistic of 0.90658, with a p-value of 0.00013. Again, the p-value is less than 0.05, leading us to reject the null hypothesis and conclude that STD is not normally distributed. The distribution of short-term debt exhibits a departure from normality, which could influence the validity of some statistical models if not addressed. For LTD, the W statistic is 0.46254, and the p-value is 0.00000, indicating a significant deviation from normality. Since the p-value is much smaller than 0.05, we reject the null hypothesis, confirming that LTD is not normally distributed. The long-term debt distribution shows substantial skewness, which may need attention in further analysis, especially when employing methods that assume normality. In the case of TD, the W statistic is 0.91768, and the p-value is 0.00036. With a p-value less than 0.05, we reject the null hypothesis, meaning that TD is not normally distributed. Like the other debt variables, the total debt distribution shows significant non-normality, which may necessitate transformation before proceeding with certain statistical

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue VI, June 2025

techniques. Conversely, FSZ (Firm Size) has a W statistic of 0.97972 and a p-value of 0.36301, which is greater than 0.05. This result suggests that we fail to reject the null hypothesis, meaning that FSZ follows a normal distribution. This indicates that firm size is normally distributed across the sample, and no transformation is necessary for this variable in the context of normality. Finally, for FGD (Firm Age), the W statistic is 0.92908, with a p-value of 0.00110. Since the p-value is less than 0.05, we reject the null hypothesis, indicating that FGD is not normally distributed. The age distribution of firms also deviates from normality, which might affect any analysis that assumes a normal distribution for this variable.

Table 6: Diagnostic Tests

Diagnostic Items	**Probability**	**Appropriate Regression Tool**
Hausman Test	0.0626	Random Effects (RE)
Breusch-Pagan/Cook-Weisberg Test (Hettest)	1.0000	Pooled Ordinary Least Squares (since **Random Effects** is not necessary)
Wooldridge Test (Autocorrelation) in panel data	0.1353	Fixed Effects Model with AR (1) Disturbances
Link Test	0.190	Fixed Effects Model (no misspecification)
Ramsey RESET Test	0.4335	Pooled OLS Regression

Source: STATA 18 Output (2023)

The Hausman Test produced a p-value of 0.0626, suggesting that there is no strong evidence to reject the Random Effects (RE) model. Although this p-value is slightly above the 0.05 significance threshold, it does not provide conclusive evidence in favor of the Fixed Effects (FE) model, and therefore, the Random Effects model remains appropriate. The Breusch-Pagan/Cook-Weisberg Test for heteroskedasticity returned a p-value of 1.0000, indicating that there is no significant difference between the Random Effects model and a Pooled Ordinary Least Squares (OLS) model. This result implies that the panel-specific effects do not add significant explanatory power to the model, and a Pooled OLS model could be just as effective in this case.

For the Wooldridge Test for autocorrelation in panel data, the p-value of 0.1353 suggests that there is no significant autocorrelation in the residuals of the Fixed Effects model with AR(1) disturbances. This indicates that the assumption of no autocorrelation holds, and there is no need for further adjustment in terms of serial correlation. The Link Test result, with a p-value of 0.190, shows that there is no indication of model misspecification. The Fixed Effects model appears to be correctly specified, with no omitted variables or incorrect functional form. Additionally, the Ramsey RESET Test, with a p-value of 0.4335, further supports the absence of misspecification, indicating that the Pooled OLS regression does not suffer from omitted variables and is correctly specified.

Table 7: Robust Fixed effect Regression Results for STD, LTD, TD and FSZ

ROA .	**Coefficient**	**Robust Std. Err**	**T**	**P>t**
STD	-.0192887	.3236533	-0.06	0.953
LTD	-0.0799193	0.0874963	-0.91	0.379
TD	-0.300129	0.2822511	-1.06	0.309
FSZ	47700000.0	21400000.0	2.22	0.046
FGD	-14600000.0	6846866.0	-2.14	0.054
Constant	-643000000.0	375000000.0	-1.72	0.112

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue VI, June 2025

Source: STATA 18 Output (2023)

The results from the Robust Fixed Effect Regression show the estimated relationships between ROA (Return on Assets) and the independent variables: STD (Short-Term Debt), LTD (Long-Term Debt), TD (Total Debt), FSZ (Firm Size), and FGD (Firm Age). For Short-Term Debt (STD), the coefficient is -0.0193, but the p-value of 0.953 suggests that this variable has no significant impact on ROA. The very high p-value indicates that the relationship between short-term debt and profitability is likely due to random variation, and we cannot conclude that there is any effect of STD on ROA. For Long-Term Debt (LTD), the coefficient is -0.0799, with a p-value of 0.379, also indicating that long-term debt does not significantly affect ROA. Again, the high p-value suggests that LTD is not a meaningful predictor of ROA in this model. Similarly, Total Debt (TD) has a coefficient of -0.3001, but with a p-value of 0.309, it shows that total debt is not a statistically significant factor in determining ROA. The negative sign suggests a potential inverse relationship, but its lack of statistical significance means we cannot rely on this result. The relationship between Firm Size (FSZ) and ROA shows a positive and statistically significant coefficient of 47,700,000, with a p-value of 0.046. This suggests that as firm size increases, ROA tends to increase as well, with larger firms showing higher profitability. The p-value of 0.046 indicates this result is statistically significant, although it is marginally significant at the 5% level. For Firm Age (FGD), the coefficient is -14,600,000, with a p-value of 0.054. While this result is marginally significant at the 10% level, it suggests that older firms tend to have lower profitability. The negative coefficient indicates that as firms age, their ROA tends to decrease, although the result is not strongly significant at the usual 5% threshold. Finally, the constant is -643,000,000, with a p-value of 0.112, which indicates that the baseline level of ROA when all independent variables are zero is not statistically significant.

Table 8: Drisc/Kraay Regression Results for STD, LTD, TD, FSZ, FGE, STD*FSZ *FGE and LTD*FSZ*FGE

ROA	Coefficient	Drisc/Kraay Std. Err.	t	P>t
STD	22.6268	43.89677	0.52	0.616
LTD	16.11047	23.88557	0.67	0.513
TD	-25.79529	43.37771	-0.59	0.563
FSZ	25600000.0	48500000.0	0.53	0.607
FGE	-19900000.0	15800000.0	-1.26	0.233
STD*FSZ	-1.179207	2.356133	-0.5	0.626
LTD*FSZ	-0.8681899	1.27854	-0.68	0.51
TD*FSZ	1.293518	2.324093	0.56	0.588
STD*FGE	-0.0212709	0.1667862	-0.13	0.901
LTD*FGE	-0.0121348	0.0199213	-0.61	0.554
TD*FGE	0.0629426	0.1893108	0.33	0.745
Constant	-136000000.0	754000000.0	-0.18	0.86

Source: STATA 18 Output (2023)

The regression results for Driscoll and Kraay standard errors shed light on the relationships between ROA (Return on Assets) and the independent variables, including Short-Term Debt (STD), Long-Term Debt (LTD), Total Debt (TD), Firm Size (FSZ), Firm

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue VI, June 2025

Age (FGD), and their interaction terms. For Short-Term Debt (STD), the coefficient is 22.63, suggesting a positive relationship with ROA, but the p-value of 0.616 indicates that this relationship is not statistically significant. Thus, short-term debt does not have a notable impact on profitability in this context. Similarly, Long-Term Debt (LTD) has a coefficient of 16.11, which is positive, but with a p-value of 0.513, it indicates that long-term debt also does not significantly influence ROA. This suggests that both short-term and long-term debts do not exhibit a clear relationship with ROA in this model. The coefficient for Total Debt (TD) is -25.80, showing a negative relationship with ROA, but the p-value of 0.563 indicates that this relationship is not significant. Total debt doesn't appear to have a substantial effect on ROA, based on the available data. Firm Size (FSZ), with a coefficient of 25,600,000, shows a positive relationship with ROA, but with a p-value of 0.607, it is not statistically significant. While larger firms might be expected to be more profitable, this model does not find strong evidence to support this relationship. The coefficient for Firm Age (FGD) is -19,900,000, which suggests a negative relationship with ROA, but with a p-value of 0.233, it also does not show statistical significance. Older firms, in this case, do not necessarily perform better in terms of profitability, based on the model's results. The interaction terms between STD and FSZ, LTD and FSZ, and TD and FSZ show no significant impact on ROA. For instance, the STD*FSZ interaction has a coefficient of -1.18, and the p-value of 0.626 suggests it is not significant. Similarly, the interaction between LTD and FSZ, and TD and FSZ, shows coefficients of -0.87 and 1.29, respectively, but with p-values of 0.510 and 0.588, indicating no meaningful effect on ROA. The interaction terms involving Firm Age (FGD), including STD*FGD, LTD*FGD, and TD*FGD, also have p-values that range from 0.554 to 0.901, meaning these interactions do not significantly influence ROA either. Finally, the constant term is -136,000,000, and with a p-value of 0.860, it is not statistically significant. This suggests that when all variables are at zero, the baseline ROA is not statistically different from zero.

V. Discussion

Understanding how a firm's financial structure influences its profitability remains a central question in corporate finance. This study dives into this complex relationship by examining how short-term debt (STD), long-term debt (LTD), total debt (TD), firm size (FSZ), and firm age (FGD) shape profitability, measured by Return on Assets (ROA). The results reveal a nuanced picture that both confirms and challenges existing theories, highlighting the intricate dance between leverage and firm performance. Interestingly, short-term debt shows a negative but statistically insignificant relationship with profitability. This suggests that while borrowing in the short term might increase financial risk, it does not necessarily translate into lower returns for these firms. This finding resonates with recent studies in emerging markets (Phan, 2017), where firms often strategically manage short-term debt to balance liquidity needs without severely impacting profitability. The strikingly high correlation between short-term and total debt (0.98) in this sample hints that total debt's influence on profitability is largely driven by short-term obligations, underscoring the importance of looking beyond aggregate debt figures to understand firm dynamics (Abor, 2005).

In a similar vein, the effect of long-term debt on profitability is also negative but statistically insignificant. This finding supports Rajan and Zingales's (1995) view that the impact of long-term debt varies considerably depending on macroeconomic and firm-specific factors. For some firms, long-term debt may serve as a strategic financing tool that supports growth without immediate adverse effects on profitability, a dynamic observed in transitional economies such as Vietnam (Tran et al., 2023). When considering total debt, the weak negative association with profitability echoes the capital structure irrelevance theory proposed by Modigliani and Miller (1958), which suggests that debt levels alone may not determine firm value under certain conditions. Nevertheless, the negative sign also highlights the potential financial distress costs associated with debt, which can erode profits if not managed prudently, as documented in Nigerian and Indonesian contexts (Owolabi & Adegbite, 2023; Syafruddin, Weinanto, & Haryani, 2023). Beyond debt, firm size emerges as a significant positive driver of profitability. Larger firms tend to enjoy advantages such as economies of scale, better access to capital markets, and diversified operations, which collectively enhance performance (Penrose, 1959; Cheng, 2008; Jaisinghani & Kanjilal, 2017). These benefits enable bigger firms to better withstand market fluctuations and capitalize on growth opportunities. Conversely, firm age exhibits a weak negative relationship with profitability, a finding that challenges the conventional wisdom that older firms inherently perform better due to accumulated experience and market presence (Coad, 2009). This suggests that as firms mature, they might face diminishing returns or operational rigidities that limit further profitability gains.

The study further explored whether firm size or age moderates the relationship between debt and profitability. However, no significant interaction effects were found, indicating that the influence of debt on profitability does not differ substantially across firms of varying size or age. This contrasts with earlier findings by DeAngelo and Masulis (1980), who argued that larger firms might leverage debt more effectively due to superior access to capital markets. The lack of such moderating effects here could be attributed to the specific characteristics of the sample or industry factors. Robust diagnostic tests confirmed the validity of the regression models, with no major issues of heteroskedasticity or autocorrelation. However, the non-normal distribution of key variables such as ROA and debt ratios suggests the presence of outliers or skewness, which may have reduced the statistical power of the analysis, a common challenge in financial research (Seckanovic, 2021). In summary, while firm size clearly plays a crucial role in enhancing profitability, the levels and composition of debt appear to have a more subtle, context-dependent relationship with firm performance. These findings underscore the importance of considering firm-specific strategies and external economic conditions when evaluating capital structure decisions. Future research could deepen this understanding by incorporating variables such as operational efficiency, management quality, and market dynamics.

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue VI, June 2025

VI. Conclusion

This study aimed to explore the relationship between the financial structure and profitability of energy utility firms in Nigeria, focusing on the impact of short-term debt, long-term debt, total debt, firm size, and firm age on the return on assets (ROA). Using data collected from 12 energy utility firms over the period 2019 to 2023, the study employed various statistical techniques, including correlation analysis, fixed-effects regression models, and diagnostic tests. The findings reveal that firm size (FSZ) is a significant determinant of profitability, with larger firms generally demonstrating higher returns on assets. However, the levels of debt, including short-term debt, long-term debt, and total debt, do not exhibit significant effects on profitability in the sample. This suggests that the debt structure, whether consisting of short-term or long-term debt, does not have a considerable impact on the profitability of firms within the sample during the period under review. While previous studies have suggested varying degrees of influence of capital structure on profitability, the results from this study align more closely with the notion that, in certain industries or contexts, factors other than debt, such as firm size, might play a more critical role in determining financial performance. The lack of significant findings related to debt could imply that the firms in this sample might be optimizing their capital structure or are in industries where debt levels are not as influential on profitability. Additionally, the results for firm age (FGD) were inconclusive, with firm age showing only a marginal negative relationship with profitability, which could be indicative of the firm maturation process, where older firms may face diminishing returns as they reach a mature stage of growth.

Overall, this study contributes to the broader understanding of how financial structure impacts firm performance, particularly in the context of Nigerian energy utility firms. However, the absence of significant relationships between debt and profitability suggests that other factors, such as managerial decisions, market conditions, or operational efficiency, may be more influential in determining profitability than the capital structure decisions alone.

VII. Recommendation

Based on the findings of this study, the following recommendations are made for companies in Nigeria:

Diversify Financing Sources

Since the study found no significant impact of debt on profitability, companies should consider diversifying their sources of financing. This could include seeking equity financing or exploring government-backed loans, particularly for companies with lower profitability. Relying less on debt and focusing on retained earnings or alternative sources of capital could mitigate the risks associated with high financial leverage.

Focus on Operational Efficiency for Larger Companies

The positive relationship between company size (FSZ) and profitability suggests that larger companies tend to be more profitable. To enhance profitability, smaller companies should focus on improving operational efficiency and scaling up their operations. Strategies may include optimizing existing infrastructure, improving service delivery, or expanding market reach.

Debt Restructuring and Financial Prudence

Although the study found that debt levels did not have a significant effect on profitability, the high multicollinearity between short-term and total debt indicates that debt structure could be optimized. Companies should carefully assess their capital structure and explore opportunities for restructuring short-term debt into long-term debt. This would provide financial flexibility and reduce the financial risks associated with short-term borrowing.

Improve Transparency and Reporting Practices

The study's results regarding company age suggest that older companies may face diminishing returns, which could be linked to management practices or outdated operational models. For better financial management, companies should focus on improving financial transparency and reporting. Ensuring that stakeholders have accurate and up-to-date information on financial health can enhance decision-making and attract investors, even in a competitive market.

Invest in Technological Innovation and Infrastructure: Given the evolving business landscape, companies should invest in modern technologies and infrastructure upgrades. These investments can increase operational efficiency, reduce losses, and improve service delivery. Innovation in smart technologies and real-time monitoring systems can help companies reduce costs and improve profitability.

Policy Advocacy and Regulatory Support

Policymakers should create a conducive environment for companies by offering incentives for modernization, such as tax breaks or grants for innovative projects. Additionally, providing a clear regulatory framework for pricing and subsidies could help stabilize the market and ensure long-term growth. Collaboration between the government and private companies is essential to strengthen infrastructure and promote sustainable development.

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue VI, June 2025

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Abbreviations:

DFIs	Development Finance Institutions
WACC	Weighted average cost of capital
EPSR	Electric Power Sector Reform
PHCN	Power Holding Company of Nigeria
NEPA	Nigerian Electricity Power Authority
GENCOs	Generation companies
TRANSCO	Transmission company
DISCOs	Distribution businesses
IMF	International Monetary Fund
EBIT	Earnings before interest and taxes
IAS	International Accounting Standard
ROA	Return on assets
ROE	Return on equity
ROI	Return on investment
EPS	Earnings per share
LTD	Long-term debt
STTA	Sales-to-total assets ratio
CR	Current ratio
RecTA	Receivables-to-total assets ratio
LTDTE	Long-term debt-to-equity ratios
STDTE	Short-term debt-to-equity ratios

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue VI, June 2025

STD	Short term debt
LTD	Long-term debt
TD	Total debt
POT	Pecking Order Theory
NSE	Nigeria Stock Exchange
FSZ	Firm size
FGD	Firm age