

DEBT TO CAPITAL RATIO AND ENVIRONMENTAL SUSTAINABILITY DISCLOSURE IN NIGERIAN FIRMS

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Abstract

This study examined the effect of debt to capital ratio on environmental sustainability disclosure of listed oil and gas firms in Nigeria. Data were generated from annual reports and account and publications of the listed oil and gas firms that operated during 2014-2024. Regression analysis was employed to test the data. This result implies that debt to capital ratio is statistically significant with ERD. The R-squared of 0.509081 (50.91%), means that about 50.91% variations in ERD could be attributed to the explanatory variable (DCR) while 49.09% could be attributable to other factors capable of influencing ERD in Nigeria oil and gas firms. The output for hypothesis holds that ERD has a negative relationship with DCR. Sequel to the negative but significant relationship that exists between debt to capital ratio and environmental remediation disclosure, firms should always use the debt to capital ratio to track a firm's improvement over time as it acquires properties. The debt-to-capital proportion can be used by shareholders to determine if a company seems to have enough income to finance its financial commitments and whether it can expect to be paid rates of return.

Keywords: Debt to capital ratio, Environmental sustainability and Oil and gas firms

Introduction

As the fundamental component of the national economy, the innovation capacity of businesses significantly influences the company itself, the industry and region, and even at the national scale. Currently, the innovation capacity of businesses has significantly increased, yet these businesses still possess considerable potential for development. Moreover, due to the swift advancement of the global economy, issues such as food safety and environmental protection have gained more public attention, leading to an increased emphasis on corporate social responsibility. Companies recognize the importance of social responsibility, and an increasing number have started to embrace it and release social responsibility reports. Meeting social responsibility necessitates that companies innovate. For instance, in addressing stakeholders' demands for eco-friendly products, businesses will implement green innovations to minimize the environmental impact generated by products during their manufacturing. Research, including studies by Fauzi and Locke (2023); Husna and Satria (2019); Dey, Hossain and Rahman (2018), has demonstrated that debt financing can enhance company performance. In contrast, Okudo, Amahalu and Oshiole (2023) discovered that debt adversely affects the financial performance of companies. Since gaining independence, Nigeria has experienced swift socio-economic and physical growth. The nation consequently encounters various obstacles in attaining development that is both economically viable and environmentally sound. The progress made to date cannot be considered sustainable since the different development processes have either misused or overexploited natural resources, which has also had a negative impact on the environment. The natural ecosystem of the nation has been disrupted due to swift population increase exerting significant pressure on the resources (Okafor, 2013).

However, the increase in global environmental awareness and the campaign for sustainable economic development is redirecting the attention of firms towards environmental sensitivity. Sustainable development as is generally known focuses on the creation of wealth and prosperity, whilst considering the true importance of social and environmental aspects, allowing business and public organizations to meet triple bottom line in sustainable management (Okafor, 2018). There is a periodic gap in literature which bridged by extending the fiscal year to 2024 opposite to past studies with a time scope that ended in 2021.

The present study sought to fill, hence ascertains the effect of debt to capital ratio on environmental remediation disclosure of listed oil and gas firms in Nigeria.

Review of Related Literature

Corporations finance their activities with internally generated funds or may require external funding. The external funding may come from debt and equity ((Amin & Cek, 2023). When corporations decide on a capital structure, they can either decrease their debt and equity levels or raise them (Akingunola, Olawale & Olaniyan, 2018). Long-term competitiveness is influenced by a strong capital structure. For any company to compete favourably in this era, it must be well focused on three decisions areas: A dividend policy decision, investment decision, and a financing decision (Maina, Olweny & Wanjau, 2018). There is a strong connection among the three types of decisions. The company's investment decisions are crucial. If they are not taken properly, it will affect every other decision. Management must consider different options before borrowing money or using its own capital (Bai, Ullah, Arif, Erfanian & Urooge, 2023). A financing decision is based on determining the most appropriate financing mix or capital structure. Financing decisions are influenced by decisions regarding fixed assets and current assets. Company sustainability and growth are dependent on dividend policy decisions. A company's ability to pay dividends from earnings

is important to shareholders. The company performance in financial terms will be enhanced if it makes sound decisions in these three areas. This will enable it to meet its objectives of profit maximization and wealth creation for its shareholders as well as meeting the needs of other stakeholders

Debt to Capital Ratio

The debt-to-capital ratio (D/C ratio) measures the financial leverage of a company by comparing its total liabilities to total capital. The debt-to-capital ratio formula measures the proportion of debt that a business uses to fund its ongoing operations as compared with capital (Hargrave, 2021). The debt-to-capital ratio is a measurement of a company's financial leverage. The debt-to-capital ratio is calculated by taking the company's interest-bearing debt, both short- and long-term liabilities and dividing it by the total capital. Total capital is all interest-bearing debt plus shareholders' equity, which may include items such as common stock, preferred stock, and minority interest (Tamplin, 2023). The debt-to-capital ratio is a measurement of a business's total debt against total capital. This can be used to determine how much leverage a business has. It is simply the total amount of a company's debt divided by its total capital (Brock, 2022). Debt pertains to all of a business's short-term and long-term debts. Capital pertains to all of the business's capital which includes common stock, preferred stock, and retained earnings (kindness, 2021).

The debt-to-capital ratio, also referred to as D/C ratio, measures how much debt a company uses to fund its operational and functional costs compared to using its capital. Capital comprises the assets and cash a business has. The purpose of the D/C ratio is to measure the amount of risk a company takes regarding debt and overall financial operation (Kvilhaug, 2022). Calculating a company's D/C ratio helps business owners and finance teams better understand their company's capital structure and financial competence. The formula provides a percentage that communicates the level of risk a company takes in its financial operations. A higher percentage translates to a higher level of leverage and risk. This means that the company has more debt than capital, or profit. It's risky for a company to have more debt than capital because this means it has less funding of its own to support the company during a slow period (Clarke, 2022). The debt-to-capital ratio can indicate whether or not a company will be able to pay back the interest on those loans, and if it will have enough money left over for other investments such as research and development or acquisitions. It may also indicate that a company has too much debt and should consider selling off assets in order to reduce its liabilities and level out this ratio (Perez, 2022).

$$\text{Debt-To-Capital Ratio} = \frac{\text{Debt}}{\text{Debt} + \text{Shareholders' Equity}}$$

Empirical Studies

Uwuigbe and Jimoh (2012) investigated corporate environmental reporting in Nigeria. A sample of 5 companies in industrial product manufacturing was utilized for the year 2011. Content analysis and Analysis of Variance (ANOVA) were employed to examine the data. The research indicated a strong connection between disclosure practices and manufacturing companies in Nigeria. Ebiringa, Yadirichukwu, Chigbu, and Ogochukwu (2013) investigated how firm size and profitability influence the level of corporate social disclosures made by Oil and Gas companies in Nigeria. A sample of twenty publicly traded companies was chosen through the simple random sampling method. Data obtained from the content analysis of the audited financial reports of the chosen companies for the 2011 fiscal year was utilized in the research. The standard least squares regression method was utilized for data analysis. The

research indicated that there is a negligible negative relationship between environmental disclosure and company size. Profitability had a strong positive correlation with the environmental disclosure of the companies. Braam, Weerd, Hauck, and Huijbregts (2016) examined the factors influencing corporate environmental reporting based on a sample of Dutch firms in the Netherlands during the years 2009-2011. The data collected was analyzed using multiple regression techniques. The research indicated a meaningful connection between external assurance, greenhouse gas emissions, water, and corporate environmental reporting (CER). Ohidoa, Omokhudu, and Oserogho (2016) examined the factors influencing environmental disclosure in Nigeria from 2012 to 2015. The precise goals were to analyze the impact of industry type, leverage, and firm size on environmental disclosure. Data from the past were gathered from the financial statements and accounts of companies in the manufacturing and finance sectors that are listed on the Nigeria Stock Exchange. The statistical method used in the study was binary logistic panel data regression. The research indicated that the type of industry and the size of the firm had a beneficial impact. Ofoegbu and Megbuluba (2016) examined the influence of firm characteristics on the quality of corporate environmental accounting information disclosure (CEAID) in the Nigerian quoted manufacturing firms. A sample of 10 quoted firms for the period 2008-2014 was used to measure the quality of CEAID based on financial disclosure. Multiple regression analysis, fixed effect model, random effect model was used to analyze the data collected. The results of the study revealed that firm financial performance had a significant impact on the quality of CEAID, but firm size had no impact on the quality of corporate environmental accounting information disclosure (CEAID).

Nurideen (2017) investigated the effect of short term financial leverage on shareholders' wealth maximization of Ghanaian banks from 2004-2014 and estimated the relationship using panel ordinary least square estimation technique after the relevant econometric considerations were tested. The study revealed that both minimum mean proxy and maximum mean proxy of short term financial leverage positively affect shareholders' wealth, however, the minimum mean proxy was insignificant. It was concluded that the higher the level of short term financial leverage, the more the wealth of shareholders of Ghanaian banks are maximized. It was recommended that Ghanaian banks should increase their coverage to deepen their customer bases to boost short term debt for the purpose of maximizing shareholders' wealth.

Onyali and Okafor (2018) examined the effect of firm characteristics on corporate environmental performance of quoted industrial goods firms in Nigeria. Specifically, the study examined the effect of firm size, profitability and firm age on waste management cost of the industrial goods firms. The study adopted the ex-post facto research design. Population and sample size of the study is made up of eleven industrial goods firms quoted on the Nigerian stock exchange as at the year, 2017. The study utilized secondary data sourced from annual reports and accounts of the sampled firms for the study period, 2008-2017. Data analysis was done using Pearson correlation coefficient and Multivariate regressions analysis. Findings of the study revealed that firm attributes (firm size, profitability and firm age) have a significant and positive effect on environmental performance (measured by waste management cost) at 5% significant level.

Giannarakis (2021) investigated the effect of CSR disclosure on financial leverage of USA firms from 2015-2019. A sample of 100 companies listed in the US was studied for the year. The study employed a Multiple Linear Regression via statistical package of E-views to test

the effect of independent variable on the dependent variable. The result of the study indicated that CSR disclosure has a negative effect on debt-to-equity ratio.

Chang, Hsiou-Wei, Wen-Hsien, Wei-Liang Wang and Cheng-Tsu Huang (2021) studied the relationship between Taiwanese firms' corporate social responsibility (CSR) performance and financial outcome from 2011-2017. Multiple regression analysis was conducted to depict the relationships. The results showed that a firm's CSR performance is negatively correlated with employee turnover and turnover variability.

Santos-Jaen and Serrano-Madrid (2021) examined the relationship between corporate social responsibility and firms' financial performance in Spain from 2016-2020. Multiple regression analysis was conducted to depict the relationships. The research found that competitive advantage significantly mediated the indirect impact of perceived CSR and disclosure on firms' financial performance.

Muhammad and Muhammad (2022) examined the effect of board characteristics on corporate social responsibility disclosure of listed food and beverage firms in Nigeria over the period 2005-2020. The study made use of secondary data generated from Annual Reports and Accounts of the sampled firms and the Nigerian Stock Exchange Fact book. The data were analyzed by means of descriptive statistics, correlation and regression analysis using STATA (version 12) package. The study revealed that managerial ownership has a significant negative effect on corporate social responsibility disclosure.

Dincer, Keskin and Dincer (2023) shed light on the relationship between sustainability reporting and firm performance in Turkey. The impact of sustainability reporting is investigated using pooled ordinary least square (OLS) method for panel data regression through two models based on Tobin's Q and ROA. A total of 920 observations for 46 companies with 3 different impact levels based on their environmental effect and 5-year quarterly panel data between 2016–2020. The research used data from Borsa Istanbul (Istanbul Stock Exchange) and also independent variables such as leverage, risk, size, current ratio, growth, sustainability reporting, and the environmental impact level of companies. The results showed that sustainability reporting has a significant positive impact on financial performance according to the ROA model, and a significant negative correlation between risk and financial performance according to both ROA and Tobin's Q models.

Yang and Han (2023) tested the relationship between environmental sustainability commitment and access to finance and whether the relationship was mediated by financial performance. The study further examined the moderating role of corporate governance on the relationship between environmental sustainability commitment and access to finance. Owner/managers of 600 SMEs from three provinces in South Africa were randomly selected using a probability sampling method. Primary data were collected using self-administered questionnaires. The moderated mediation model was tested using PLS-SEM. The findings showed that environmental sustainability commitment significantly predicts access to finance both directly and indirectly through financial performance. Moreover, the results showed that corporate governance positively moderates the link between environmental sustainability commitment and access to finance.

Methodology

Research Design

Ex-post facto research design was employed in this study. This study was treated as *ex-post facto* research since it relied on historical data.

Population and Sample Size

The population of the study consisted of all the nine (9) Oil and Gas firms listed on the Nigerian Exchange (NGX) Group as at 31st December, 2024.

Since the entire population size was used as sample hence, no need for sample size.

The data to be used in this study were collected mainly from secondary source. These data were obtained for eleven (11) years annual reports and account from 2014-2024 of the sample Oil and Gas firms.

Method of Data Analysis

The thrust of this study was to ascertain the effect of debt financing on environmental sustainability disclosure of listed oil and gas firms in Nigeria over a period of eleven (11) years from 2014 to 2024. *Ex-post facto* research design was adopted for the study. Descriptive statistics was utilized to describe the mean, median, standard deviation, kurtosis, skewness, maximum and minimum values of the study variables via E-Views 10 statistical software. Inferential statistics of this study was carried out using:

- i. **Pearson Correlation Analysis:** This is a good measure of relationship between two variables which tells us about the strength of relationship and also the direction of relationship.
- ii. **Panel Least Square (PLS) regression analysis:** was used to predict the value of the dependent variable based on the value of the independent variable.

Model Specification

This study adapted and modified the model of Uyagu, Okpanachi, Nyor and Muhammad (2017):

$$ED = \beta_0 + \beta_1 DER_{it} + \beta_2 PROF_{it} + \mu_{it} \quad - \quad - \quad - \quad eq (i)$$

Where:

ED = Emission Disclosure

DER = Debt to Equity Ratio

PROF = Profitability

Consequent upon the adapted model, the following regression equation was constructed:

$$ERD_{it} = \beta_0 + \beta_1 DCR_{it} + \mu_{it} \quad - \quad - \quad eq (i)$$

Where:

β_0 = Constant term (intercept)

β_{it} = Coefficients of Debt Financing estimated for firm i in period t

μ_{it} = Error term/unexplained variable(s) of firm i in period t

ERD_{it} = Environmental Remediation Disclosure of firm i in period t

DCR_{it} = Debt to Capital Ratio of firm i in period t

Decision Rule

Accept the null hypothesis (H_0) if the p-value of the test is greater than 0.05, otherwise reject and accept the alternate hypothesis (H_1).

Data Analysis

	ERD	DCR
Mean	0.674545	7.109091
Median	0.730000	6.350000
Maximum	0.910000	15.15000
Minimum	0.370000	3.270000
Std. Dev.	0.185761	3.723690
Skewness	-0.492973	0.956441
Kurtosis	2.077613	2.913386
Jarque-Bera	0.835490	1.680534
Probability	0.658530	0.431595
Sum	7.420000	78.20000
Sum Sq. Dev.	0.345073	138.6587
Observations	99	99

Source: E-Views 10.0 Output, 2025

Table 1 shows the descriptive statistics of study variables. The observation of 99 in table 4.1 is as a result of the panel data set with the combination of time series data and cross sectional data (11years x 9 firms) . The involvement of sampled firms in the disclosure of environmental remediation activities is averagely 67.45% , a maximum of 91% percent and a minimum of 37% environmental remediation disclosure level with a standard deviation of 18.5. The observed average for debt to capital ratio in the sampled companies 7.1091 units, with a maximum number of 15.15 units, a minimum of 3.27 units and a standard deviation of 3.7237.

Table 2 Pearson Correlation Matrix

	ERD	DCR
ERD	1.0000	
DCR	-0.7133	1.0000

Source: E-Views 10.0 Correlation Output, 2025

From the findings on the correlation analysis between ERD and the other study variables in table 2, the study found that there a negative correlation coefficient between DCR (-0.7133) and ERD.

Test of Hypothesis

H₀₁: Debt to capital ratio has no significant effect on environmental remediation disclosure of listed oil and gas firms in Nigeria.

H₁: Debt to capital ratio has significant effect on environmental remediation disclosure of listed oil and gas firms in Nigeria.

Table 3: Panel Least Square (PLS) Regression Analysis testing the effect of Debt to Capital Ratio on Environmental Remediation Disclosure

Dependent Variable: ERD
Method: Panel Least Squares
Date:12/19/25 Time: 15:47
Sample: 2014 2024
Periods included: 11
Cross-sections included: 9
Total panel (balanced) observations: 99

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.927495	0.028193	32.89785	0.0000
DCR	-0.035584	0.003548	-10.02939	0.0000
R-squared	0.509081	Mean dependent var		0.674545
Adjusted R-squared	0.504020	S.D. dependent var		0.178018
S.E. of regression	0.125371	Akaike info criterion		-1.295091
Sum squared resid	1.524624	Schwarz criterion		-1.242664
Log likelihood	66.10701	Hannan-Quinn criter.		-1.273879
F-statistic	100.5888	Durbin-Watson stat		2.063192
Prob(F-statistic)	0.000000			

Source: E-Views 10.0 Regression Output, 2025

In table 3, the slope coefficient shows that the probability value is $P(x_1=0.0000<0.05)$. This result implies that debt to capital ratio is statistically significant with ERD. The R-squared which is known as the coefficient of determination is 0.509081 (50.91%), this means that about 50.91% variations in ERD could be attributed to the explanatory variable (DCR) while 49.09% could be attributable to other factors capable of influencing ERD in Nigeria oil and gas firms. Table 5 also shows that ERD has a negative relationship with the explanatory variable (DCR). This relationship is represented by the equation:

$$ERD = 0.927495 - 0.035584DCR$$

The implication of this result is that a unit/one naira change in the explanatory variables (DCR) will lead to a corresponding reduction in ERD. The overall significance of the model (Prob > F = 0.000000) is statistically significant at 5% level of significance.

The P-value of the model (Prob > F = 0.000000) is less than 0.05. In view of the rule of thumb, H_1 is accepted and H_0 rejected.

Conclusion

This study examined the effect of debt financing on environmental sustainability disclosure of listed oil and gas firms in Nigeria. This study obtained panel data from annual reports and account and publications of the listed oil and gas firms that operated during 2014-2024. The slope coefficient for hypothesis shows that the probability value is $P(x_1=0.0000<0.05)$. This result implies that debt to capital ratio is statistically significant with ERD. The R-squared of 0.509081 (50.91%), means that about 50.91% variations in ERD could be attributed to the explanatory variable (DCR) while 49.09% could be attributable to other factors capable of influencing ERD in Nigeria oil and gas firms. The output for hypothesis holds that ERD has a negative relationship with DCR. The findings of this study is consistent with the works of

Dincer, Keskin and Dincer (2023); Okafor (2020); Atang and Eyisi (2020); but contradicted the findings of Yang and Han (2023); Nkwoji (2021).

Sequel to the negative but significant relationship that exists between debt to capital ratio and environmental remediation disclosure, firms should always use the debt to capital ratio to track a firm's improvement over time as it acquires properties. The debt-to-capital proportion can be used by shareholders to determine if a company seems to have enough income to finance its financial commitments and whether it can expect to be paid rates of return.

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