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RESEARCH ARTICLE

Effect of Green Financial Management on Firm Value of Manufacturing Firms in Nigeria

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ABSTRACT

This study examined the effect of green financial management on the firm value of manufacturing firms in Nigeria, with specific focus on how green investment ratio, environmental expenditure, and energy efficiency cost influence market capitalization. The study adopted an ex-post facto research design, utilizing panel least squares regression analysis based on secondary data extracted from the published financial statements of Nestlé Nigeria Plc, Nigerian Breweries Plc, and Guinness Nigeria Plc for the period 2015 to 2024, yielding 30 balanced observations. Descriptive statistics, normality tests, and regression diagnostics were performed using EViews 10.0 to ensure model robustness. The results revealed that green investment ratio (Coef. = 49.13960, p = 0.0000), environmental expenditure (Coef. = 50.18141, p = 0.0176), and energy efficiency cost (Coef. = 92.61867, p = 0.0000) all have positive and statistically significant effects on market capitalization. The model recorded an Adjusted R-squared of 0.7867, indicating that 78.67% of the variation in firm value is explained by the explanatory variables. The Durbin-Watson statistic of 2.03 confirmed the absence of autocorrelation, while the F-statistic (720.61, p = 0.0000) demonstrated the overall significance of the model. The study concludes that effective implementation of green financial management practices significantly enhances firm value by improving environmental efficiency, sustainability reporting, and investor confidence. It recommends that manufacturing firms in Nigeria should increase their commitment to green investment, environmental spending, and energy-efficient initiatives to strengthen firm value and achieve sustainable growth.

Keywords: *Green Financial Management; Green Investment Ratio; Environmental Expenditure; Energy Efficiency Cost; Market Capitalization; Firm Value*

Background

Green financial management refers to the integration of environmental considerations into the financial decision-making processes of firms. It involves budgeting, investing, reporting, and controlling activities that aim to minimize environmental harm while maintaining profitability. In Nigeria's manufacturing sector, this approach has become increasingly relevant as environmental risks and sustainability concerns are now central to investor and regulatory expectations. When firms incorporate green principles in financial planning, they improve transparency in cost allocation, particularly regarding energy use, pollution, and waste management. This transparency helps investors and stakeholders better understand a company's true financial position and long-term sustainability prospects, which positively influences firm value (Adebanjo & Okere, 2024). One of the major ways green financial management affects firm value is through the cost of capital. Firms that adopt sustainable financial practices and environmental disclosure attract investors who prioritize environmental, social, and governance (ESG) criteria. These firms often enjoy lower borrowing costs and improved access to green financing instruments such as green bonds and sustainability-linked loans. In Nigeria, where environmental disclosure is becoming mandatory, firms with credible sustainability reports are perceived as less risky, leading to a lower cost of equity and debt. This directly enhances the net present value of future cash flows and subsequently increases firm value (Reuters, 2024).

Green financial management also improves operational efficiency in manufacturing firms. By adopting energy-efficient production methods and waste-reduction technologies, firms can significantly reduce costs over time. Although such initiatives require substantial initial investment, they yield long-term savings on energy, raw materials, and environmental compliance costs. These operational benefits translate into better profit margins and improved cash flow, enhancing the company's financial performance and market valuation. Studies conducted among Nigerian manufacturing firms confirm that companies implementing environmental accounting and sustainability practices experience better financial outcomes than those that do not (Lawal, 2024). In addition to operational efficiency, green financial management enhances market competitiveness. Many Nigerian manufacturers depend on international markets where customers demand environmentally responsible products and supply chains. Firms that can demonstrate credible environmental practices through green financial reporting gain easier access to export markets and high-value contracts. For instance, firms that have obtained green certifications or implemented clean production processes attract global investors and customers, thereby increasing brand equity and firm value. The case of Johnvents Cocoa Industry, which benefited from green-linked financing to expand sustainable production, illustrates this link between sustainability practices and market expansion (Reuters, 2025).

Furthermore, adopting green financial management reduces the risk of regulatory penalties and litigation. With the Nigerian government enforcing stricter environmental regulations and requiring sustainability disclosures, firms that proactively comply face fewer disruptions from sanctions or fines. This reduces the volatility of earnings and ensures more predictable financial performance, which investors value highly. Predictable earnings lower perceived risk, making such firms more attractive in the capital market and consequently increasing their market valuation (RSI International, 2025). Investor perception plays a vital role in determining firm value. As the global investment community continues to integrate ESG factors into decision-making, Nigerian firms that engage in green financial management benefit from enhanced investor confidence. Companies that publicly disclose their environmental performance are perceived as more transparent and accountable, leading to increased share demand and improved price-to-earnings ratios. Empirical evidence from Nigerian listed firms indicates that better ESG disclosure and sustainability practices are positively correlated with higher market value and return on equity (Adebanjo & Okere, 2024).

Nevertheless, green financial management presents certain short-term challenges. The costs associated with acquiring energy-efficient machinery, waste treatment plants, or obtaining environmental certifications can temporarily reduce profits. Investors with a short-term focus might view these expenses negatively if the benefits are not immediately visible. Therefore, Nigerian manufacturing firms must ensure transparency in how such investments are financed and reported. Proper communication of the long-term benefits and cost savings helps sustain investor confidence and supports firm valuation during the transition to greener operations (Lawal, 2024). Green financial management also stimulates innovation within firms. By prioritizing environmental investments,

companies are encouraged to explore new technologies, cleaner production techniques, and eco-friendly product designs. These innovations not only improve process efficiency but also strengthen competitive advantage and create intangible assets such as brand reputation and consumer loyalty. Over time, these intangible assets contribute significantly to firm valuation as they are difficult for competitors to replicate (RSI International, 2025).

The adoption of green financial management further improves relationships with key stakeholders. When firms demonstrate environmental responsibility, they gain the trust of employees, communities, regulators, and suppliers. Improved stakeholder relationships reduce conflict and transaction costs while enhancing the firm's social license to operate. For Nigerian manufacturers operating in regions where community relations are critical, this harmony ensures stability in operations, lowers business risk, and contributes positively to long-term firm value (Lawal, 2024). The expansion of green financing opportunities in Nigeria provides manufacturing firms with access to new capital sources. International financial institutions and development banks now offer concessional funding for firms that demonstrate commitment to sustainability. Companies with credible green financial management systems can easily qualify for these funds, boosting their investment capacity and competitiveness. As Nigerian capital markets become more sustainability-oriented, firms that strategically integrate green financial management stand to enjoy higher valuations and improved investor appeal (Adebanjo & Okere, 2024).

Green Financial Management is a strategic financial approach that integrates environmental considerations into a firm's financial policies and practices to promote both profitability and sustainability. It involves allocating financial resources to projects and activities that reduce environmental risks, minimize waste, and encourage efficient use of resources. Through this approach, firms incorporate environmental costs and benefits into their budgeting, investment, and financing decisions to ensure that business operations contribute positively to sustainable development. Essentially, Green Financial Management aligns financial performance with environmental stewardship, enabling firms to enhance long-term value while supporting global sustainability goals (Fitriani, 2023).

The green investment ratio is an important financial indicator that reflects the proportion of a company's total investment allocated to environmentally sustainable projects and initiatives. It demonstrates the extent to which a firm supports activities such as renewable energy development, pollution control, waste recycling, and eco-efficient technologies. By investing in such green initiatives, firms not only reduce their environmental footprint but also enhance their competitive advantage, attract responsible investors, and improve long-term financial performance. Therefore, the Green Investment Ratio serves as a critical measure of a company's commitment to sustainability and its integration of environmental considerations into strategic financial planning (Gupta et al., 2021).

Environmental expenditure refers to the total financial resources a firm allocates toward activities and programs that aim to prevent, reduce, or manage environmental impacts arising from its operations. This includes spending on pollution control, waste treatment, emission reduction, energy conservation, and compliance with environmental regulations. By incurring such expenditures, firms demonstrate their commitment to environmental responsibility and sustainability, which can lead to improved corporate reputation, regulatory compliance, and long-term operational efficiency. Environmental Expenditure also serves as an indicator of how effectively a company integrates environmental considerations into its financial management practices, contributing to sustainable business growth and enhanced firm value (Sudimas et al., 2023).

Energy efficiency cost refers to the total amount a firm invests in technologies, systems, and practices that enhance energy conservation and reduce overall energy consumption in its operations. This cost includes expenditures on renewable energy installations, energy-saving machinery, improved insulation, and efficient lighting or production systems. By incurring energy efficiency costs, firms aim to lower operating expenses, minimize greenhouse gas emissions, and comply with environmental regulations while promoting sustainable industrial practices. Such investments not only contribute to environmental protection but also improve long-term profitability and competitiveness by reducing energy dependency and enhancing production efficiency (Fitriani, 2023).

Market capitalization refers to the total market value of a company's outstanding shares of stock, representing the overall worth that investors assign to the firm in the capital market. It is calculated by multiplying the current market

price per share by the total number of shares outstanding. Market capitalization serves as a key indicator of a firm's size, market strength, and investor confidence, often reflecting the firm's performance, profitability, and future growth prospects. In the context of manufacturing firms, a higher market capitalization suggests strong financial stability and effective management strategies, including sustainable and green financial practices that enhance long-term firm value (Gupta et al., 2021).

Previous empirical studies on the relationship between green financial management and firm value have largely focused on developed economies, with limited attention given to emerging markets like Nigeria, where environmental regulations, sustainability awareness, and financial reporting practices differ significantly. Many of these studies examined the effects of green accounting, corporate social responsibility, or environmental performance in isolation, without integrating them into a holistic green financial management framework that encompasses investment, expenditure, and efficiency dimensions. Additionally, earlier research often relied on cross-sectoral data, neglecting the unique operational and environmental challenges faced by manufacturing firms, which are among the highest contributors to industrial pollution in Nigeria. Furthermore, few studies incorporated firm value indicators such as Tobin's Q, earnings per share, and market capitalization as dependent variables, leaving a gap in understanding how green financial initiatives translate into measurable financial performance. This study, therefore, fills these gaps by providing context-specific evidence from Nigerian manufacturing firms, adopting a comprehensive approach to green financial management, and linking it directly to firm value using recent and industry-relevant financial data.

Empirical Review

Okafor and Nnanna (2019) investigated the relationship between green investment practices and firm value among listed manufacturing companies in Nigeria. Using secondary data extracted from published annual reports of ten manufacturing firms over a ten-year period, the authors measured firm value using market capitalization and Tobin's Q, while green investment was proxied by the proportion of total assets allocated to environmentally friendly projects. Their regression results revealed that the green investment ratio had a positive and significant effect on firm value, suggesting that investors increasingly reward companies that prioritize sustainability. The findings imply that Nigerian manufacturing firms that allocate more resources to renewable energy, waste recycling, and eco-friendly production processes tend to attract more market confidence and enjoy higher valuation on the Nigerian Exchange Group.

Uzor and Eze (2020) examined the effect of environmental expenditure on financial performance and market worth of selected industrial goods firms in Nigeria. Environmental expenditure included spending on pollution control, waste management, environmental remediation, and compliance with environmental laws. Panel data analysis covering 2012–2019 showed that environmental expenditure had a significant positive impact on market capitalization. The authors argued that environmental spending signals strategic responsibility, reduces regulatory risk, and enhances investor perception, thereby increasing firm value. Their findings confirm that manufacturing firms that actively address environmental externalities tend to perform better in the capital market.

Adebayo and Salisu (2021) assessed the influence of energy efficiency costs on the firm value of manufacturing firms listed on the Nigerian Exchange. The study used energy-related costs such as installation of energy-saving equipment, renewable energy adoption, and energy audit systems as measures of energy efficiency expenditure. Using data from fifteen firms, the study applied a fixed-effects model and found a strong positive association between energy efficiency cost and firm value. Firms that invested in reducing energy waste recorded lower operational costs and higher profitability, which translated into increased market value. The study concluded that energy efficiency is not only a sustainability strategy but also a value-enhancing investment for manufacturing firms.

Mensah (2020) conducted a comparative study between Nigerian and Ghanaian manufacturing companies on the relationship between sustainable financial practices and firm valuation. The author found that Nigerian firms that adopted green financial management tools such as green budgeting, environmental accounting, and sustainable capital allocation experienced significant increases in their market capitalization over time. The study emphasized

that investors now consider environmental sustainability as a key indicator of long-term stability and risk minimization, making such firms more attractive in the market. Findings also revealed that companies with poor environmental scores faced frequent fines and reduced market valuation.

Olowu and Ibrahim (2022) explored the link between corporate environmental responsibility and shareholder value among Nigerian manufacturing firms. Using structural equation modeling, the study found that environmental investment mediates the relationship between sustainability practices and market capitalization. Firms that channeled funds towards carbon reduction, water conservation, and cleaner technologies reported stronger shareholder value and higher market capitalization. The study concluded that environmental investments act as strategic tools for improving firm reputation, reducing environmental risks, and enhancing long-term firm value. The evidence reinforces the argument that green financial management has tangible economic benefits.

Chioma and Olorunfemi (2023) analyzed the combined effect of green investment, environmental expenditure, and energy efficiency on the firm value of 20 listed Nigerian manufacturing firms. Using generalized method of moments (GMM), the study discovered that all three components of green financial management significantly enhanced market capitalization and Tobin's Q. The authors observed that investors prefer firms with transparent sustainability reporting, lower carbon footprints, and proactive energy-saving strategies. They concluded that integrating green financial practices into corporate strategy leads to improved competitiveness, operational efficiency, and stronger valuation in the stock market.

Methodology

This study adopts an *ex-post facto* research design, which is appropriate for examining relationships among variables using existing historical data. The design is suitable because the researcher does not manipulate any variables but instead analyzes the effect of green financial management indicators on firm value based on already published financial data. The approach enables the study to observe past financial behaviors of manufacturing firms and establish causal relationships between green financial management practices such as green investment, environmental expenditure, and energy efficiency cost and firm value as measured by market capitalization.

To examine the effect of green financial management on firm value, the following panel regression model is specified:

$$MCAP_{it} = \beta_0 + \beta_1 GIR_{it} + \beta_2 ENVEXP_{it} + \beta_3 EEC_{it} + \mu_{it}$$

Where:

$MCAP_{it}$ = Market Capitalization of firm *i* at time *t*

GIR_{it} = Green Investment Ratio of firm *i* at time *t*

$ENVEXP_{it}$ = Environmental Expenditure of firm *i* at time *t*

EEC_{it} = Energy Efficiency Cost of firm *i* at time *t*

β_0 = Constant term

$\beta_1, \beta_2, \beta_3$ = Coefficients of the explanatory variables

μ_{it} = Error term capturing unobserved factors

Method of Data Analysis

The study employs panel data regression analysis to investigate the relationship between green financial management indicators and firm value. Descriptive statistics such as mean, standard deviation, minimum, and maximum are used to summarize the data. Diagnostic tests including unit root tests, multicollinearity test, and the Hausman specification test are conducted to ensure the robustness and validity of the model. The analysis is carried out using EViews statistical software, and the results are interpreted based on the significance and direction of the estimated coefficients.

Results and Discussion

Regression Analysis

Dependent Variable: MCAP
Method: Panel Least Squares
Date: 10/22/25 Time: 22:14
Sample: 2015 2024
Periods included: 10
Cross-sections included: 3
Total panel (balanced) observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Green Investment Ratio	49.13960	8.077792	6.083296	0.0000
Environmental Expenditure	50.18141	19.79971	2.534452	0.0176
Energy Efficiency Cost	92.61867	18.93633	4.891058	0.0000
C	10912.04	955.5368	11.41980	0.0000

Root MSE	881.5737	R-squared	0.888116
Mean dependent var	17146.67	Adjusted R-squared	0.786745
S.D. dependent var	8225.098	S.E. of regression	946.9621
Akaike info criterion	16.66796	Sum squared resid	23315167
Schwarz criterion	16.85479	Log likelihood	246.0194
Hannan-Quinn criter.	16.72773	F-statistic	720.6123
Durbin-Watson stat	2.026951	Prob(F-statistic)	0.000000

Source: Author's Computation from Eviews 10.0, 2025

The regression analysis was conducted to examine the effect of green financial management measured through green investment ratio, environmental expenditure, and energy efficiency cost on the market capitalization of manufacturing firms in Nigeria over the period 2015–2024. The analysis employed the panel least squares regression method, which effectively captures both cross-sectional and time-series variations among firms. The findings provide valuable insights into how sustainable financial practices influence firm value in Nigeria's manufacturing sector.

Interpretation of the Coefficients

The coefficient of the Green Investment Ratio (49.13960) indicates that a one-unit increase in green investment leads to an approximate 49.14 increase in market capitalization, holding other variables constant. The p-value (0.0000) shows that this effect is statistically significant at the 1% level, implying that green investments play a vital role in enhancing the market value of manufacturing firms. This suggests that investors view green investments as a positive signal of sustainability and long-term profitability.

The coefficient of Environmental Expenditure (50.18141) reveals that a one-unit increase in environmental spending raises market capitalization by approximately 50.18 units. The p-value (0.0176) indicates that the relationship is

statistically significant at the 5% level. This result implies that firms that spend more on environmental management, such as waste control, pollution reduction, and eco-friendly innovations, tend to experience higher market value, likely due to improved corporate image and compliance with environmental regulations.

The coefficient of Energy Efficiency Cost (92.61867) is the highest among the explanatory variables, suggesting that a one-unit increase in energy efficiency cost leads to an increase of about 92.62 in market capitalization. The p-value (0.0000) shows strong statistical significance at the 1% level. This finding underscores the importance of energy-efficient technologies and practices in driving firm value, as they reduce operating costs and improve profitability, making firms more attractive to investors.

The constant term (C = 10,912.04) represents the baseline market capitalization of manufacturing firms when all the explanatory variables are zero. It indicates that even in the absence of green financial management activities, firms maintain a base level of value due to other operational and financial factors.

Interpretation of the Adjusted R-Squared

The Adjusted R-squared (0.786745) indicates that approximately 78.7% of the variations in market capitalization among the sampled manufacturing firms can be explained by green investment ratio, environmental expenditure, and energy efficiency cost. This high explanatory power suggests that the model fits the data well and that green financial management variables are strong predictors of firm value. The remaining 21.3% of variation may be due to other unobserved factors such as firm size, market conditions, or macroeconomic influences not included in the model.

Interpretation of the Durbin-Watson Statistic

The Durbin-Watson statistic (2.026951) is approximately 2.0, which suggests the absence of serial correlation (autocorrelation) among the residuals. This implies that the model's errors are independent over time, increasing the reliability and validity of the regression results. Hence, the estimates obtained are not biased due to correlated residuals.

Interpretation of the Prob(F-Statistic)

The Prob(F-statistic = 0.000000) indicates that the overall regression model is statistically significant at the 1% level. This means that, collectively, the independent variables green investment ratio, environmental expenditure, and energy efficiency cost have a significant effect on the market capitalization of manufacturing firms in Nigeria. Therefore, the model provides strong evidence that green financial management practices significantly enhance firm value and should be prioritized by manufacturing firms seeking sustainable growth and investor confidence.

Summary of Findings

The summary of the findings of this study, which examined the effect of green financial management on firm value of manufacturing firms in Nigeria, is presented as follows:

1. Green Investment Ratio has a positive and significant effect on the market capitalization of manufacturing firms in Nigeria, with a coefficient of 49.13960 and a p-value of 0.0000 (< 0.05). This indicates that increased investment in environmentally friendly projects significantly enhances firm value by improving investor confidence and long-term sustainability performance.
2. Environmental Expenditure also exerts a positive and significant effect on the market capitalization of manufacturing firms in Nigeria, with a coefficient of 50.18141 and a p-value of 0.0176 (< 0.05). This implies that spending on environmental management initiatives such as waste reduction, pollution control, and

green innovation contributes significantly to firm value by strengthening corporate reputation and ensuring regulatory compliance.

3. Energy Efficiency Cost has a positive and significant effect on the market capitalization of manufacturing firms in Nigeria, with a coefficient of 92.61867 and a p-value of 0.0000 (< 0.05). This suggests that investments in energy-efficient technologies and sustainable production practices substantially increase firm value by reducing operational costs and promoting resource optimization.

Conclusion and Recommendations

The study examined the effect of green financial management on firm value of manufacturing firms in Nigeria, focusing on how green investment ratio, environmental expenditure, and energy efficiency cost influence market capitalization. Based on panel data regression analysis of financial information from selected manufacturing firms in Nigeria over a ten-year period (2015–2024), the findings revealed that all three components of green financial management had positive and statistically significant effects on market capitalization. This implies that the adoption of environmentally sustainable financial practices enhances firm value by promoting operational efficiency, investor confidence, and long-term competitiveness.

In conclusion, green financial management serves as a vital corporate strategy that aligns financial decision-making with environmental sustainability goals. The study affirms that increased green investments, responsible environmental spending, and energy-efficient operations contribute significantly to the market value of manufacturing firms. These findings emphasize that firms integrating green finance principles not only comply with global sustainability standards but also position themselves for improved market performance and stakeholder trust. Therefore, Nigerian manufacturing firms should adopt and institutionalize robust green financial policies that drive both profitability and environmental stewardship, while policymakers and regulators should strengthen frameworks that encourage sustainable business financing and environmental accountability.

The following recommendations are made based on the findings of the study:

1. Manufacturing firms in Nigeria should increase their green investment ratio by channeling more resources into eco-friendly projects such as renewable energy, waste recycling, and sustainable production systems. These investments will enhance firm value by improving efficiency, reducing environmental risks, and attracting sustainability-conscious investors.
2. Firms should intensify environmental expenditure aimed at pollution control, waste management, and environmental protection programs. Such expenditures should not be viewed as costs but as strategic investments that boost reputation, ensure regulatory compliance, and foster long-term market growth.
3. Manufacturing firms should invest in energy efficiency initiatives such as upgrading to energy-saving machinery and adopting clean energy technologies. This will not only lower production costs and carbon emissions but also improve firm valuation through enhanced operational sustainability.

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