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EMISSION DISCLOSURE AND MARKET VALUE ADDED OF OIL AND GAS FIRMS IN NIGERIA

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ABSTRACT: This study assessed the nexus between emission disclosure and the market value added of quoted oil and gas firms in Nigeria for the period of eleven (11) years spanning from 2012 - 2022. Carbon Disclosure, Nitrogen Oxides Disclosure, and Sulphur Oxides Disclosure were used to proxy Environmental Disclosure whereas Market Value Added served as the dependent variable. In line with the objectives of the study, three hypotheses were formulated. An *ex-post facto* research design was employed. Six (6) quoted oil and gas firms constituted the sample size of this study. The secondary data were extracted from the annual reports and accounts of the sampled firms and were analysed via E-Views 9.0 statistical software and Panel Least Square (PLS) regression analysis. Findings from the empirical analysis revealed that there is a significant relationship between Carbon Disclosure, Nitrogen Oxides Disclosure and Sulphur Oxides Disclosure and Market Value Added of quoted oil and gas firms in Nigeria at the 5% level of significance. Inter alia, firms should take the issue of emission disclosure seriously to increase the confidence of the public in their operations which translates to healthy the performance of the industry, and relevant agencies in Nigeria should strengthen their monitoring and oversight functions on the compliance level of firms with environmental frameworks.

Keywords: Environmental Disclosure, Market Value Added, Carbon, Nitrogen Oxides, Sulphur Oxides

INTRODUCTION

The phenomenon of global warming caused by the uncontrolled accumulation of greenhouse gas (GHG) emissions into the atmosphere has a potentially damaging and irreversible impact. An international body for climate change assessment, the Intergovernmental Panel on Climate Change (IPCC, 2014) concluded that human activity is a major cause of increasing global average temperatures and immediate action to reduce global warming to tolerable limits is needed, however, this goal will be achieved only by significantly reducing GHG emissions.

Global warming represents an increase in the average temperature of the Earth's near-surface air and oceans. According to the Intergovernmental Panel on Climate Change (IPCC), which was founded by the United Nations Environment Programme and the World Meteorological Organization for the purpose of providing the most updated and comprehensive scientific, technical and socioeconomic information about climate change, the globally averaged combined land and ocean surface temperature rose approximately 0.85°C over the period of 1880 - 2012. Furthermore, each of the last three decades has been warmer than any preceding decade since 1850 and it is very likely that the period from 1983 - 2012 was the

warmest 30-year period of the last 800 years in the Northern Hemisphere (IPCC, 2014). There are obvious impacts of climate change on natural and human systems worldwide, such as changes in the distribution of precipitation, the intensity and frequency of floods and droughts, the water resources in terms of quantity and quality, food security and sea level, and these impacts are expected to continue and dramatically affect the well-being of billions of people throughout the world (IPCC, 2014). The IPCC report demonstrated that the concentrations of carbon oxides, methane and nitrous oxides in the atmosphere have increased substantially since 1750 (40%, 150% and 20% respectively). Specifically, emissions reached their highest levels from 2000 - 2010. Carbon, which is the most greenhouse gas, increased from 278 parts per million (ppm) is approximately 1750 to 390.5 ppm in 2011. During the same period, methane increased from 722 parts per billion (ppb) to 1803 ppb, and nitrous oxides increased from 271 ppb to 324.2 ppb. The concentrations of these three gases reached the highest levels in at least the last 800,000 years. Furthermore, the average rate of increase of these greenhouse gases observed over the past century is higher than any observed rate of change over the previous 20,000 years (IPCC, 2014).

Emission disclosure, otherwise known as greenhouse gas (GHG) emission disclosure, has become one of the primary threats for the existence of life on earth. The excessive concentration of GHGs in earth's atmosphere has adverse consequences for natural ecosystems and humankind, resulting in global warming or climate change (Liu, Zhou, Zhang, Xu, Chen and Xiong, 2015). Companies have always played a pivotal role in facing the problems of climate change because they are among the largest emitters of GHG. Recently, stakeholders such as shareholders, consumers and regulatory authorities have started exerting pressure on corporations to decrease their GHG emissions. Consequently, corporations are now expected to play a vital role in reducing their GHG emissions and contributing to stabilizing climate change (Luo & Tang, 2014). Currently, businesses such as oil and gas firms face an ever-increasing demand to disseminate information about their climate change - related activities to satisfy the concerns of relevant stakeholders. Emission disclosure is attracting increasing attention from scholars, stakeholders and regulators. This is because, through emission disclosure, stakeholders such as the government and the public can better monitor firms' GHG emissions, which are likely to contribute to improved corporate performance. As a result, corporate GHG emission disclosures have been steadily increasing in both size and complexity over the past decade (Peng et al., 2015).

In recent years, there has been intense societal and scientific debate about emission disclosure, which often centres on corporations (Howard-Grenville, Buckle, Hoskins & George, 2014). Consequently, businesses have been increasingly asked to provide more information on their climate change strategies and plans for managing and reducing GHG emissions. Businesses have started viewing climate change as an opportunity rather than a burden. Financial markets have started to reward companies that are moving ahead on climate change, while those lagging behind are assigned more risk (Kolk, Levy & Pinkse, 2018). As a result, an increasing number of firms have allocated resources to the communication of information on their climate change activities to interested parties.

The literature has identified many benefits that businesses can achieve from recording and subsequently disclosing their GHG related activities. GHG emission disclosure can lead to improved carbon management, which can reduce energy consumption and energy costs. Improved GHG management can also help companies address natural disaster (droughts, floods) and regulatory risks related to climate change. GHG emission disclosure reports also

help investors estimate a company's regulatory and natural risks related to climate change and, at the same time improve stock performance and capital costs (Matisoff, 2013).

Shareholders expect management to generate value over and above the costs of resources consumed, including the cost of using capital. A company that is destroying value will always struggle to attract further capital to finance expansion since it will be hamstrung by a share price that stands at a discount to the underlying value of its assets and by higher interest rates on debt or bank loans demanded by creditors. Speculators and investors are likewise progressively taking a gander at the nature of numbers instead of the amount. To meet such desires, highly administered organizations embrace practices that improve the estimation of budget reports and incentives for stakeholders. Market value added (MVA) as such builds the value of disclosures. The conventional performance measure of a business, which includes the net profit margin (NPM), return on investment (ROI), return on equity (ROE), return on capital employed (ROCE), return on total assets (ROTA), earnings per share (EPS) and price earnings ratio (P/E Ratio) have been criticized for their inability to incorporate the full cost of capital. Along these lines, accounting earnings are not a steady indicator of firm's value and cannot be utilized for estimating corporate performance. It is against this backdrop that this study tends to examine the relationship between emission disclosures and the market value added of quoted oil and gas firms in Nigeria.

Statement of the Problem

Companies such as oil and gas firms have been facing increasing pressure to assess, reduce and report their GHG emissions to stakeholders such as consumers, governments, suppliers, investors, financial institutions, media, nongovernmental organizations and the general public, as corporate activities have a significant effect on the global GHG emissions, directly or indirectly (Halkos & Skouloudis, 2016). To respond to these pressures, a growing number of companies around the world have started to establish strategies and take actions to mitigate their emission footprint and disclose information about GHG emissions by using various channels of communication. In line with these developments, a growing number of voluntary or mandatory reporting schemes under which companies report GHG emissions have been introduced by a number of governments including Nigeria. In addition to government reporting schemes, a variety of nongovernmental initiatives have emerged for the purpose of encouraging or pressurizing companies to disclose information about their effects on the ecological environment and environmental performance, including GHG emissions. Examples of these initiatives include the Carbon Disclosure Project (CDP), the Institutional Investor Group on Climate Change (IIGCC), the Investor Network on Climate Risk (INCR), the Global Reporting Initiative (GRI), the International Integrated Reporting Committee (IIRC) and initiatives of the World Economic Forum (WEF). The CDP, which is a not-for-profit and investor-backed organization represents the most established and prominent institution with respect to GHG emission disclosure. Despite these developments, GHG emission disclosure is still not mandatory in most countries worldwide, including Nigeria, and firms such as oil and gas firms have developed different strategic approaches with regard to the voluntary disclosure of GHG emissions.

Numerous studies have attempted to establish the importance of emission disclosure for enhancing firm performance, but there has been no consensus on the influence of emission disclosure on firm performance. Findings from the extant literature have been mixed and

inconclusive, ranging from significant positive relationships to negative relationships and nonsignificant relationships, thereby creating a gap in knowledge that this study tends to fill.

Objectives of the Study

The general objective of this study is to examine the relationship between emission disclosure and the market value added of quoted oil and gas firms in Nigeria. However, the study specifically examines the following:

i. Ascertain the relationship between carbon disclosure and market value added of quoted oil and gas firms in Nigeria.
ii. Determine the relationship between nitrogen oxide (NOx) disclosure and market value added of quoted oil and gas firms in Nigeria.
iii. Evaluate the relationship between sulphur oxide (SOx) disclosure and market value added of quoted oil and gas firms in Nigeria.

Research Questions

In line with the objectives of this study, the following research questions guided the discussion in this work:

i. To what extent does carbon disclosure relate to the market value added of quoted oil and gas firms in Nigeria?
ii. What is the degree of relationship between nitrogen oxide disclosure and the market value added of quoted oil and gas firms in Nigeria?
iii. To what degree does sulphur oxide disclosure relate to the market value added of quoted oil and gas firms in Nigeria?

Research Hypotheses

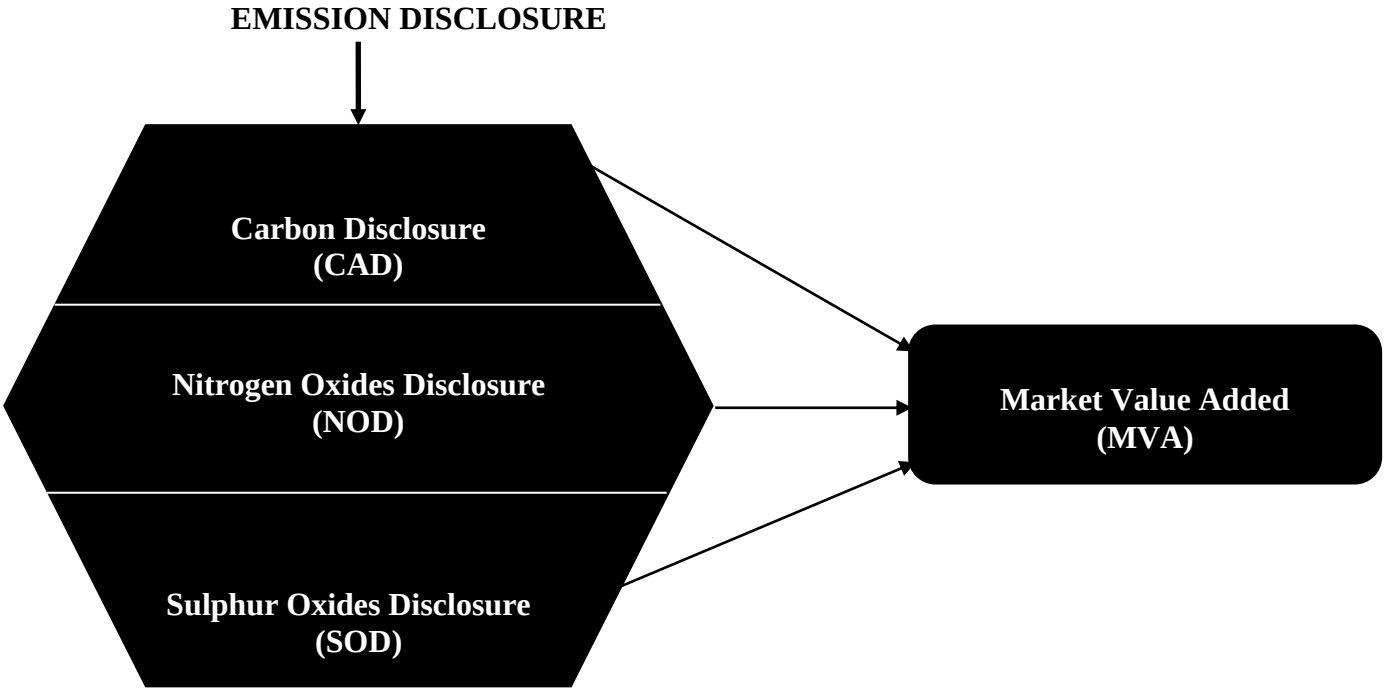
On the basis of the research objectives, the following null hypotheses guided this study:

Ho_1: There is no significant relationship between carbon disclosure and the market value added of quoted oil and gas firms in Nigeria.

Ho_2: Nitrogen oxide disclosure has no significant effect on the market value added of quoted oil and gas firms in Nigeria.

Ho_3: There is no significant relationship between sulphur oxide disclosure and the market value added of quoted oil and gas firms in Nigeria.

LITERATURE REVIEW



Source, Researcher 2024

Concept of Emission Disclosure

Disclosure is a word that is newly prevalent in the climate change discourse. This means that companies measure and report information about their environmental performance and impacts so that investors can better understand its relevance to the future of the business (Okudo & Amahalu, 2019). Disclosure is the act of releasing all relevant company information that may influence an investment decision. Disclosure items, as outlined by the Securities and Exchange Commission (SEC), include those related to a company's financial condition, operating results and management compensation. Disclosure refers to the act of releasing all relevant information on a company that may influence an investment decision, making public both positive and negative news, data, and other details about its operations, or that impact its operations in a timely fashion *(*Oleh, Chen, Proskurina, Mao, Gryn & Pushkar, 2021*).*

GRI 305 addresses emissions into air as the discharge of substances from a source into the atmosphere. The emissions, as stated are carbon (C), ozone (O3) -depleted substances (ODS), nitrogen oxides (NOx) and sulphur oxides (SOx), among other significant air emissions. The targets of emission reduction are at the centre of any credible green business policy. A growing number of companies assess and address the potential threats and opportunities of climate change for their businesses, measure the greenhouse gas (GHG) emissions generated by activities, and assess their exposure to physical climate change impacts as well as changing market conditions and consumer preferences as a consequence of climate change. Moreover, there is increasing demand from governments, investors and other stakeholders for information on corporate climate change. The Organization for Economic Cooperation and Development (OECD) guidelines for multinational enterprises, updated in May 2011, reflect

the increasing stakeholder demand for more corporate transparency by encouraging companies to disclose environmental information with high-quality standards, particularly in the case of greenhouse gas emissions, as the scope of their monitoring is expanding to cover direct and indirect, current and future, corporate and product emissions.

Emission is the production and discharge of something, especially gas or radiation. Emission is anything that is released into the open space, but more often, it refers to gases being released into the air, such as greenhouse gasses or emissions from power plants and factories. Emissions are essentially chemicals in exhaust gases that are harmful to air quality, mainly carbon (C), methane (CH4), nitrogen oxides (NOx), sulphur oxides (SOx), and ozone (O3), which depletes substances. Emission is an amount of something, especially a gas that harms the environment that is sent out into the air. Emissions fees are a surcharge on the pollution created while producing goods and services. For example, a carbon tax is a tax on the carbon content of fossil fuels that aims to discourage their use and thereby reduce carbon emissions. A carbon price is a cost applied to carbon pollution to encourage polluters to reduce the amount of greenhouse gas (GHG) they emit into the atmosphere.

Carbon Disclosure

The study of carbon disclosure has gained increasing importance in recent years because through carbon disclosure, businesses can communicate their climate change activities to their stakeholders (Hahn, Reimsbach, & Schiemann , 2015). These disclosures can help stakeholders such as shareholders, creditors, regulatory agencies, institutional investors and the public to make better investment decisions for a particular company. Carbon disclosure includes natural emissions and industry emissions. Natural carbon emission is a natural cycle that can be neutralized by plants and seas. The natural carbon emission benefits from keeping the Earth's temperature warm at 6°C. Industry carbon emissions come from human activities without considering the environment condition, further; this makes carbon dioxide denser and unable to be absorbed by nature. This has become worse since the industry revolution, where machines have contributed to higher carbon emissions. This condition has caused global warming problems. Carbon disclosure is needed to manage the carbon emissions from the industry. Carbon emission disclosure can be provided in the annual report or sustainability report. Carbon disclosures can be either mandatory or voluntary. Carbon disclosure as mandatory comes from the regulation that obligates firms to disclose information about carbon emissions periodically. Carbon disclosure as voluntary disclosure is usually performed in the Carbon Disclosure Project (Halil & Seda, 2019). Carbon disclosure helps investor evaluate the reduction in carbon emissions and climate change. Carbon emissions from time to time continue to increase both at the global, regional, national, state and local levels of an area.

Disclosure of Nitrogen Oxides

Nitrous oxide emissions from human activities have increased to 30% over the past four decades, and scientists have projected the highest emission levels in climate models (Rob-Jackson 2016). The nitrogen oxide (NO_x) family, namely nitric oxide or nitrogen monoxide (NO), nitrogen dioxide (NO_2), nitrous oxide (N_2O), and their derivatives, has a wide range of health and environmental impacts. Nitrogen oxides are released into the air from the exhaust of motor vehicles, the burning of coal, oil, or natural gas; and processes such as arc welding, electroplating, engraving, and dynamite blasting. They are also produced commercially by

reacting nitric acid with metals or cellulose. Studies have shown that NO_2 and related derivatives (NOx) will increase the risk of lung cancer. The International Agency for Research on Cancer recently classified outdoor air pollution and particulate matter as carcinogenic (Khalek, Bougher, & Merritt, 2019). In the United States, the Environmental Protection Agency (EPA) has set primary standards in compliance with the Clean Air Act of NO_2 to not exceed 53 ppb annually, similar to other parts of the developed and developing nations of the world (Wang, Zhang, Cao, You & Lai, 2016). Therefore, fast, sensitive and reliable analysis of NOx is essential for public health, as well as for personal protection. The aforementioned adverse environmental and human health effects of nitrogen oxides necessitate that NOx emissions into the atmosphere be reduced.

Disclosure of Sulphur Oxides

Sulphur oxides are emitted from locomotives, ships, wood pulping, paper manufacturing, petroleum and metal refining, metal smelting and fossil fuel combustion. Sulphur oxides (SOx) are two distinct compounds, namely, sulphur dioxide (SO_2) and sulphur trioxide (SO_3). Sulphur dioxide is a colourless, toxic gas with a pungent odor formed when sulphur is oxidized (Srivastava, 2000). Catalytic conversion of SO_2 to SO_3 is possible in the presence of particulates in the atmosphere, or of boiler deposits, dust, and other gaseous impurities in the flue gas, but generally, this conversion remains marginal. Particulates tend to catalyse the atmospheric conversion of SO_2 to SO_3 which combines with water vapour to form sulphuric acid mist (aerosols). The negative impacts of SOx gases on humans include irritation of the skin, tissues and mucus membranes of the eyes, nose, and throat and adverse respiratory effects. Sulphur dioxide is an important component that causes acid rain, which leads to acidification of water reservoirs and damage to trees and soil. SO_2 pollution is more harmful when the concentrations of particulate and other pollutants are high. The World Health Organization (WHO) recommends a concentration of no greater than 0.5 parts per million (ppm) over 24 hours for maximum exposure (Stern, 2011). Reducing the sulphur content in fuels, which has a direct effect on the emission of sulphur to the air for the benefit of natural ecosystems, has become inevitable.

Market Value Added

The market value added (MVA) is a performance measurement tool that computes for the increase in the value of a company's stock price. The MVA is derived by comparing the total market value of the firm and the book value of the invested capital (Jasperson, 2021). Market value added (MVA) is a calculation that shows the difference between the market value of a company and the capital contributed by all investors, both bondholders and shareholders. In other words, it is the market value of debt and equity minus all capital claims held against the company. It is calculated as:

MVA = market value of stocks - book value of stockholders' equity

The market value (MV) of stocks is computed by multiplying the number of outstanding shares by the market price per share (Jasperson, 2021).

A company's MVA is an indication of its capacity to increase shareholder value over time. A high MVA is evidence of effective management and strong operational capabilities. A low MVA can mean that the value of management's actions and investments is less than the value

of the capital contributed by shareholders. A negative MVA means that the management's actions and investments have diminished and reversed the value of capital contributed by shareholders.

Emission Disclosure and Market Value Added

Climate change is becoming one of the most important issues of the twenty-first century, and it is widely recognized as the most significant environmental issue facing the global economy. The majority of scientists agree that greenhouse gas emission disclosure is the most prominent factor responsible for climate change (Singh, Chen, Del-Giudice, & El-Kassar, 2019). The evidence suggests that the failure of the businesses to manage these impacts can expose them to considerable risk (Le, Nguyen amd Phan, 2019). Currently, many businesses are aware that the need to address the issue of climate change to survive. Concerns about emissions have prompted participants in capital markets, both shareholders and creditors to incorporate emission-related considerations in their risk analysis to assess investment options and lending decision. Therefore, there is a growing demand for businesses to publicly report information about their emission-related business practices (Jain, Panda & Choudhary, 2020), and it is expected that firms will report this issue in a comprehensive, transparent, and accountable manner.

Theoretical Framework

Triple bottom line (TBL) theory

The Triple Bottom Line Theory (profit, people and planet) arouses out of frustration with traditional financially focused measures of business performance, which has given preference to profit as a key metric. Elkington in 1994 propounded the Triple bottom line theory. He argues that for a more balanced approach in measuring performance over time, profit, people and planet should aim to measure financial, social and environmental performance over a period of time. He further argues that companies should prepare three different bottom lines:

- Traditional measure of corporate profit or loss account
- The bottom line of a company's people accounts - a measure of, in some shape or form, how socially responsible a firm has been throughout its operations.
- The bottom line of the company's "planet account" - a measure of how economically responsible it has been. This is also in line with Green Paper (2001), where it sees the triple bottom line as the idea that the overall performance of a company should be measured on the basis of its combined contribution to economic prosperity, environmental quality and social capital.

The Triple Bottom Line relates to the present research in the sense that the listed oil and gas firms in Nigeria should look not only at the economic value that they generate but also that the TBL ensures that firms should incorporate environmental and social activities in their assessment of their performance in Nigeria.

METHODOLOGY

Research Design

The research design that was employed in this study is an *ex-post facto* research design. This approach is appropriate because ex-post facto research aims at measuring and establishing the relationship between one variable and another or the effect of one variable on another, in which the variables involved are not manipulated by the researcher (Kothari & Garg, 2014).

Study population

The population of this study consisted of all the eleven (11) oil and gas companies listed on the Nigerian Exchange (NGX) Group as of 31st December, 2022. They include: 11 Plc (formerly Mobil Oil Plc); Capital Oil Plc; Conoil Plc; Eterna Plc; Ardova Plc (formerly Forte Oil Plc); Japaul Oil & Maritime Services; MRS Oil Nigeria Plc; Oando Plc; Rak Unity Petroleum Company Plc; Seplat Petroleum Development Company Plc; and Total Nigeria Plc.

Sample size and sampling technique

The sample size of this study comprises of six (6) listed oil and gas firms in the Nigeria Exchange (NGX) Group from 2012 - 2022. The purposive sampling technique was adopted to select oil and gas companies that consistently filed their annual reports with the Nigerian Exchange (NGX) Group for the study period (2012 - 2022). The time frame considered for this study is eleven (11) years (2012 - 2022). This is because 2012 marks the introduction of International Financial Reporting Standards (IFRS) in Nigeria and the need for a comparison of firms in the global market. By doing so, the harmonization and uniformity of standards in annual reports and accounts are guaranteed. The sampled firms are: Conoil Plc; Eterna Oil Plc, MRS Oil Nigeria Plc; Oando Plc; Rak Unity Petroleum Plc; and Total Nigeria Plc.

Sources of Data Collection

This study utilized secondary data extracted from the annual reports and statements of account of the sampled listed oil and gas companies.

Model Specification

To determine the relationship between environmental disclosure and the market value added of oil and gas firms listed on the Nigerian Exchange (NGX) Group. This study adapts the model of Okafor, Egbunike and Amahalu (2021):

$$ROA = \beta o + \beta_1 EMID + \beta_2 EWD + \beta_3 ENVR + \varepsilon \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

where:

ROA = Return on Assets

ENVR = Environmental remediation

ε = error term

To test for hypotheses 1, 2, and 3, this study estimated the following regression equations on the basis of the formulated hypotheses:

$MVA_{it} = \beta o + \beta_1 CAD_{it} + \mu_{it}$ - - 1

$MVA_{it} = \beta o + \beta_1 NOD_{it} + \mu_{it}$ - - 2

$MVA_{it} = \beta o + \beta_1 SOD_{it} + \mu_{it}$ - - 3

Considering the utilization of the adapted model, the following model was thus formulated:

$MVA_{it} = \beta o + \beta_1 CAD_{it} + \beta_2 NOD_{it} + \beta_3 SOD_{it} + \mu_{it}$

where:

βo is the intercept of the regression.

β_1, β_2,and β_3 are the coefficients of the regression.

MVA_{it} = Market Value Added of firm í in period t

CAD_{it} = Carbon disclosure of firm í in period t

NOD_{it} = Nitrogen oxides disclosure of firm í in period t

SOD_{it} = Sulphur oxides disclosure of firm í in period t

í = individual firms (1, 2…..3)

t = time periods (2012, 2013 ... 2022)

μ_{it} = Error term

Method of Data Analysis

With the aid of E-Views 9.0 statistical software, the inferential statistics of this study were carried out via panel least squares (PLS) regression analysis and content analysis.

The environmental disclosure index (EDI) was used to measure emission reporting activities, and this index was developed on the basis of the Global Reporting Initiatives (GRI) G4 framework.

The weighting scale used by Wiseman scored the three emission disclosure reporting indicators used for the study as follows:

A score of 0 for an item not referred to in a report; a score of 1 when the report only briefly mentioned something pertinent to the item or provided only qualitative statements; a score of 2 when the report provided specific and detailed information with some numerical support; and rarely a score of 3 when a report provided extensive numerical support with data on goals achieved or fully accomplished.

Decision rule

Reject Ho and accept the H_A, if the p_value of the test is less than 0.05

Data Analysis and Discussion of Findings

Descriptive Statistics

	LMVA	LCAD	LNOD	LSOD
Mean	8.409748	0.159637	0.223492	0.159637
Median	8.554790	0.301030	0.301030	0.301030
Maximum	10.06209	0.301030	0.301030	0.301030
Minimum	6.305864	0.000000	0.000000	0.000000
Std. Dev.	0.992591	0.151390	0.132649	0.151390
Skewness	-0.085648	-0.121435	-1.108734	-0.121435
Kurtosis	1.912201	1.014747	2.229292	1.014747
Jarque-Bera	3.334785	11.00060	15.15568	11.00060
Probability	0.188739	0.004086	0.000512	0.004086
Sum	555.0434	10.53605	14.75047	10.53605
Sum Sq. Dev.	64.04038	1.489722	1.143722	1.489722
Observations	66	66	66	66

Source: *E-view 9 Statistical Package*

Since the mean and median results of the selected variables in the table are close to each other, the variables are adequate for the study. The statistics for skewness, kurtosis, and standard deviation show that there are no appreciable differences across the variables.

Panel Data Analysis

$$LMVA = \beta_0 + \beta_1 LogLCAD + \beta_2 LogLNOD + \beta_3 LogLSOD + E$$

Fixed effects

Dependent Variable: LMVA
Method: Pooled Least Squares
Date: 07/30/24 Time: 11:45
Sample: 1 66
Included observations: 66

Cross-sections included: 4
Total pool (balanced) observations: 264

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	8.368663	0.131717	63.53531	0.0000
LCAD	2.869504	0.369529	7.765296	0.0000
LNOD	-1.059852	0.421102	-2.516852	0.0125
LSOD	-1.128346	0.366753	-3.076580	0.0023
Fixed Effects (Cross)				
LMVA—C	1.63E-15			
LNOD—C	1.63E-15			
LSOD—C	1.63E-15			
LCAD—C	1.63E-15			

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.707354	Mean dependent var	8.409748
Adjusted R-squared	0.688848	S.D. dependent var	0.986913
S.E. of regression	0.888853	Akaike info criterion	2.628388
Sum squared resid	203.0455	Schwarz criterion	2.723205
Log likelihood	-339.9473	Hannan-Quinn criter.	2.666489
F-statistic	11.20505	Durbin-Watson stat	0.910618
Prob(F-statistic)	0.000000		

Source: E-view 9.0 Output

The fixed effect output shows that the selected independent variables have a significant effect on the dependent variable. This implies that the selected independent variables can increase the market value added of the oil and gas firms in Nigeria. Additionally, the results of nitrogen oxide disclosure and sulphur oxide disclosure show that there is no relationship between these factors and the market value added of oil and gas companies in Nigeria.

Random effects

Dependent Variable: LMVA
Method: Pooled EGLS (Cross-section random effects)
Date: 07/30/24 Time: 11:45
Sample: 1 66
Included observations: 66
Cross-sections included: 4
Total pool (balanced) observations: 264
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	8.368663	0.131717	63.53531	0.0000
LCAD	2.869504	0.369529	7.765296	0.0000
LNOD	-1.059852	0.421102	-2.516852	0.0124
LSOD	-1.128346	0.366753	-3.076580	0.0023
Random Effects (Cross)				
LMVA—C	0.000000			
LNOD—C	0.000000			
LSOD—C	0.000000			
LCAD—C	0.000000			

Effects Specification	S.D.	Rho
Cross-section random	0.000000	0.0000
Idiosyncratic random	0.888853	1.0000

Weighted Statistics			
R-squared	0.707354	Mean dependent var	8.409748
Adjusted R-squared	0.698208	S.D. dependent var	0.986913
S.E. of regression	0.883711	Sum squared resid	203.0455
F-statistic	22.67170	Durbin-Watson stat	1.910618
Prob(F-statistic)	0.000000		

Unweighted Statistics			
R-squared	0.207354	Mean dependent var	8.409748
Sum squared resid	203.0455	Durbin-Watson stat	0.910618

Source: E-view 9.0 Output

The random effects results show that the selected independent variables have a significant effect on the dependent variable. This implies that the selected independent variables can increase the market value added of the oil and gas firms in Nigeria. Although the outputs of the fixed and random effects shows similar results, for reliable decision- making, the result was subjected to a correlated random effect – Hausman test. The results of the test are presented in table 2.

Table 2: Correlated Random Effects - Hausman Test

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.05945	3	0.3015

Source: *E-View 9.0 result, 2024.*

The results of the Hausman test in Table 4 revealed that the chi-square statistics is 0.059 and that p_value is 0.3015, which is greater than the significant value of 0.05. Therefore, the null hypothesis of Hausman test, which states that Random effect model is more appropriate, shows that Fixed effect is rejected and that the alternative hypothesis, which holds otherwise, is accepted. This implies that the analytical results of the random effect will be adopted in decisions about the model of the study.

Test of Hypotheses

The results of the Panel Least Square (Random Effect) estimations were utilized to form opinions on the three hypotheses previously formulated in this study. The key parameters from the results as they pertains to the three hypotheses are presented in Table 3.

Table 3: Results of the key parameters for hypotheses test (random effect)

Independent/Control Variables	**Model**	
	Coefficients	p_value
C	8.36663	0.0000
LogCAD	2.869504	0.0000
LogNOD	-1.059852	0.0124
LogSOD	-1.128346	0.0023

Source: *Result from random effects*

Hypothesis 1 (HO_1): LCAD has no significant relationship with market value added

The results of the test for this hypothesis are presented in Table 3. The results reveal that a significant and positive relationship exists between LCAD and MVA with a coefficient value of 2.869504 and a p_value of 0.0000. The result indicates that LCAD has a significant relationship with the MVA of sampled quoted oil and gas firms in Nigeria at the 5% level of significance. With this result, therefore, the null hypothesis, which states that LCAD has no significant relationship with market value added is rejected, whereas the alternative hypothesis that a significant relationship exists is accepted.

Hypothesis 2 (HO_2): NOD has no significant effect on market value added

The results of the test for this hypothesis are presented in Table 3. The results show that a significant and negative relationship exists between LNOD and MVA with a coefficient value of -1.059852 and a p_value of 0.0124. This result indicates that LNOD has a significant effect on the MVA of sampled quoted oil and gas firms in Nigeria at the 5% level of significance. With this result therefore, the null hypothesis which states that LNOD has no significant effect on market value added is rejected whereas the alternative hypothesis that a significant effect exists is accepted.

Hypothesis 3 (HO_3): SOD has no significant relationship with market value added

The results of the test for this hypothesis are presented on Table 3. The results reveal that a significant and negative relationship exists between LSOD and MVA with a coefficient value of -1.128346 and a p_value of 0.0023. This result indicates that LSOD has a significant

relationship with the MVA of quoted oil and gas firms in Nigeria at the 5% level of significance. With this result, therefore, the null hypothesis which states that LSOD has no significant relationship with market value added is rejected, whereas the alternative hypothesis that a significant relationship exists is accepted.

DISCUSSION OF FINDINGS

The findings of emission disclosure on market value added of quoted oil and gas firms in Nigeria reveals as follows; the outcome of the regression result on hypothesis one (Ho_1) on carbon disclosure (CAD) showed a coefficient value of 2.8695 and probability value of 0.0000 which is less than 0.05 level of significance. The results revealed that positive and significant relationship with market value added (MVA) exists. The findings of this study corroborate the results of Mohammad and Aisa (2020), and Kurnia, Nur, and Putra (2020), but negate the works of Halil and Seda (2019), and Kurnia, Darlis, and Putra (2020). This means that emission disclosure affect market value added of quoted oil and gas firms in Nigeria. The result also in consistent with Tripple bottom line theory where carbon disclosure of companies is significant, as it encourages firms to consider the environmental impact of their operations and strive to reduce their carbon footprint.

The outcome of the regression results on hypothesis two (Ho_2) on nitrogen oxide disclosure (NOD) and market value added (MVA) showed a coefficient value of -1.0598 and probability value of 0.0124 which is less than 0.05 level of significance. The results indicate that negative and significant relationship exists between nitrogen oxide disclosure and market value added of quoted oil and gas firms in Nigeria. The findings of this study are in consonance with Okeke, Ifurueze and Nwadiaro, (2021), and Jung and Heejin (2022) but debunked the findings of Julansa, Zuraida and Diantimala (2020) whose results contradicts with the present study of nitrogen oxide disclosure and market value added. This means that nitrogen oxide disclosure affect market value added of quoted oil and gas firms in Nigeria.

The outcome of the regression results on hypothesis three (Ho_3) on sulphur oxide disclosure (SOD) and market value added (MVA) showed a coefficient value of -1.1283 and probability value of 0.0023 which is less than 0.05 level of significance. The results indicate that negative and significant relationship exists between sulphur oxide disclosure and market value added of quoted oil and gas firms in Nigeria. The findings of this study are in conformity with the works of Orellano, Reynoso and Quaranta (2021), but contradict the works of Faisal, Erika, Tarmizi and Haryanto (2018) who founds negative and insignificant relationship with the study variables. This means that sulphur oxide disclosure affect market value added of quoted oil and gas firms in Nigeria.

Conclusion

On the basis of these findings, the study concludes that emission disclosure practiced by selected quoted oil and gas firms in Nigeria today has a significant effect on market value added during the period under review. The results show that, to an extent, the emission information of oil and gas firms is disclosed; this finding highlights the tendency of emission disclosure to increase the market value added of oil and gas firms in Nigeria. However, most firms in Nigeria have not been environmentally responsive.

Recommendations

The study hereby recommends the following:

1. Firms should take the issue of emission disclosures seriously to increase the confidence of the public in their operations, which will translate into healthy performance in the industry.

2. The legislative arm of the government should strictly ensure that companies disclose their emission activities and that serious penalty should be met for companies that infringe on environmental sustainability regulations.

3. Relevant agencies in Nigeria should strengthen their monitoring and oversight functions with respect to the compliance level of firms with environmental frameworks.

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