Value Relevance of Environmental Sustainability Information Disclosure

ABSTRACT

The broad objective of this study is to empirically investigate the value relevance of environmental sustainability information disclosure of listed oil and gas firms in Nigeria using a fifteen (15) year time frame data (2006 to 2020). To achieve this objective, we employed one notable valuation model; Ohlson 1995 Valuation Model with carbon emission information disclosure as the non-financial information which was included in the model. To this end, we hypothesized that carbon emission information disclosure has no significant relevant value among listed oil and gas companies in Nigeria during the period under investigation. Further, we employed ex-post facto and descriptive research design on a panel data set sourced from annual financial reports of eight (8) listed oil and gas firms in Nigeria. Robust least square regression analysis technique was employed to test the formulated hypotheses and the resulting estimates was discussed after validating the coefficients which were obtained from the analysis. Results obtained from the descriptive statistics reflects a poor carbon emission reporting situation in Nigeria. The result reveals that on average about 2% of the sampled firms disclosed information relating to carbon emission during the period under consideration. Specifically, the regression result indicates that stock market investors reactions towards carbon emission disclosure of oil and gas firms in Nigeria is negative which further strengthen the notion that investors perceive the control of carbon emission as severe cost rather than profit. However, this study recommends that to relieve such negative consequences in the capital market, managers of oil and gas firms in Nigeria must take appropriate action to communicate their commitments and efforts genuinely and adequately around carbon reduction to investors. This study contributes to the emerging field of environmental sustainability accounting especially from an underdeveloped market such as Nigeria by presenting empirical evidence relating to the relevant value of carbon emission reporting with practical financial implications that will be most useful to investors.

KEYWORDS*: Carbon Emission, Carbon Emission Disclosure, Firm Value, Olhson Valuation Model.*

1.0 Introduction

"Climate change is becoming a more regular environmental issue especially in the management, sciences leading to the fact that carbon information reporting have become increasingly popular among large companies worldwide. The risks of climate change have caused many scholars to pay attention to Greenhouse gas (GHG) emissions and the concern about GHG emissions is inseparable from the investigation of corporate voluntary carbon disclosure information" (Böhling, Murguía, Godfrid, 2019). "However, it has been well recognized that in addition to the achievement of maximizing shareholder wealth, managers should also fulfill social responsibilities especially environmental responsibility" (Sun, Wang & Li, 2022). In the views of Cormier et al., (1993), "market players define environmental performance as the information about environmental liabilities that firms should provide". "Environmental accounting reporting, according to Onyebuenyi (2021), is the communication of environmental performance information by an organization to its stakeholders, including environmental impacts, performance in managing those impacts, and contribution to ecological and sustainable development". "It identifies and describes the exact environmental costs, such as liability fees or waste disposal fees (Murthy, 2014), and it includes the processing of both financial and non-financial data about environmental and ecological impacts" (Oyedokun, Egberioyinemi & Tonademukaila, 2019).

"Voluntary disclosure (which is an applicable practice under the International Financial Reporting Standard, IFRS) is a process whereby managers transmit information to the market to reduce information asymmetry that occurs between management and investors" (Healy & Palepu, 2001) "Information asymmetry means that management is expected to have more privileged information than existing or potential investors. Therefore, disclosing such information helps mitigate the adverse selection of poor risk investments and related moral hazards (Beaver, 1998) and efficiently allocates resources" (Kim et al., 2017). "In like opinion of Plumlee et al., (2015), voluntary disclosure leads to decreased uncertainty, less risky and more credible firms, it enhances financial performance, and ultimately improve firm value. Voluntary carbon information disclosure mandated by the ISO14064-1 as a component of firms' environmental performance goes beyond compliance with the regulations in the interest of climate-change practices of corporations" (Du, 2015a).

Notably, public attention has increased concerning carbon emissions (García-Sánchez, Hussain, Khan, Martínez-Ferrero, 2021) and have put managers under pressure to disclose such information as an attempt to examine the important factors that contributes to firm value. "Carbon emission reporting has also gained growing attention from various stakeholders, including corporate managers, consumers, investors, regulators, standard setters, nongovernmental organizations, and academics. The United Nations Framework Convention on Climate Change and the Carbon Disclosure Project (CDP) have called for transparent carbon reporting, noting that it can be used to monitor and reward various actors, provide climate mitigation actions, and enhance firm performance. These days, investors tend to evaluate the performance of company's pollution control program and the risks associated with potential

sanctions or fines for violation of environmental protection laws" (Giannarakis, Zafeiriou, Sariannidis, 2017).

"This is in line with the position of Freedman and Jaggi (1982) who suggest that the disclosure of pollution information (Carbon Emission) is perceived important for investors' investment decisions". In relation to the nexus between environmental information disclosure and company value, scholars document varieties of opinions. Hassel et al. (2005) argue that "environmental investments increase costs, resulting in lower returns and market values and conclude that environmental performance is negatively related to firm's market value. Whereas other scholars argue that environmental efforts are a way to enhance competitive advantage and improve investor financial performance". Matsumura et al. (2014) demonstrate that "the median market value of firms that voluntarily disclose carbon emissions information is $2.3 billion higher than the firms that do not disclose such information". Plumlee et al. (2015) provides "evidence which suggest that the quality of voluntary environmental disclosure has impact on enterprise value". According to the extant literature, the value-added asset theory asserts that firm value would increase due to environmental disclosure, while it would decrease under the altruistic liability theory.

"The oil and gas industry remains Nigeria's economic backbone, accounting for more than 80% of the country's foreign exchange earnings" (Uwakonye et al., 2006). "Despite the fact that the majority of crude oil in Nigeria comes from numerous small producing fields in the swamps of the Niger Delta, multinationals have demonstrated a lackluster attitude, ranging from promoting environmental degradation to a lack of transparency and insensitivity to stakeholder concerns, resulting in ongoing community unrest and public criticism" (Umoren et al., 2018).

"Although, limited studies have explored the value relevance of voluntary carbon disclosure (Jiang, Luo, Xu & Shao, 2021) most prior studies which focus on the value relevance of carbon emissions information such as those of Chapple et al., 2013; Choi and Luo, 2021; Clarkson et al., 2015; Griffin et al., 2017; Luo & Tang, 2014; Matsumura et al., 2014, find that carbon emissions are value relevant and that higher carbon emissions are associated with lower firm value. Other studies pay special attention to carbon risk and opportunity information (Elijido-Ten & Clarkson, 2019; Jung et al., 2018; Schiemann & Sakhel, 2019) by sampling developed countries which clearly suggest that empirical evidence on the value relevance of carbon issues is largely skewed to developed societies while only a handful have been conducted in less developed countries". "However, developing country like Nigeria play a greater part in the rapid increase in emissions because of their large economies of scales and remarkable growth and hence their use of greenhouse gas (GHG)" (Elijido-Ten & Clarkson, 2019). Although in Nigeria, some companies within the oil and gas sector voluntarily disclose carbon emission information, but the question is: Is carbon information disclosure of oil and gas listed firms in Nigeria value relevant? Additionally, because the provision to disclose environmental sustainability information is not compulsory, it is possible for firms to overlook the importance of objectivity and the qualitative level of environmental accounting information disclosure. Against this backdrop, this study tends

to answer the above question by investigating the value relevance of environmental sustainability information disclosure of listed oil and gas firms in Nigeria with special emphasis on carbon emission disclosure which have been given less attention.

In this study, two contrasting theories are presented—the Signaling and the Altruistic liability theories to predict the relevant value of environmental sustainability information disclosure. "On the one hand, voluntary carbon disclosure offers a means for managers to convey relevant and reliable information about a firm's underlying carbon performance to stakeholders, including shareholders. The availability of carbon information can reduce information asymmetry and thus is value relevant. The signaling theory argues that managers have an incentive to voluntarily disclose more information about their superior carbon performance" (Al-Tuwaijri et al., 2004; Clarkson et al., 2008; Luo & Tang, 2014; Verrecchia, 1983). "On the other hand, voluntary carbon disclosure carried out to achieve higher environmental standards in low-standard countries are not serving their shareholders. Such behavior hurts market value and may reflect managerial idiosyncrasies" (García-Sánchez, Hussain, Khan, & Martínez-Ferrero 2021).

The rest of the paper is structured as follows. Section 2 introduces literature review and hypothesis testing while section 3 describes the research design. Section 4 presents and discusses the empirical results while section 5 concludes the paper.

2.0 Literature Review

2.1 Conceptual Literature

2.1.1 Environmental Sustainability Information Disclosure

"The global best practice for sustainability reporting, according to Herbert et al. (2020), has several reporting guidelines for reporting sustainability, which includes reporting the firm's environmental, economic, and social performance. Evaluating a company's environmental report reflects the company's disclosure of the environmental impact of its manufacturing activities. Further, the economic report echoes the firm's disclosure of the economic impact of its sustainable activities, whereas the social report includes the firm's report on the various social responsibility activities carried out throughout the year" (Herbert et al.,2020). "The GRI standards lay the groundwork preliminary for global sustainability reporting standards. The standards are modular and interconnected, representing global best practices for reporting on a wide range of economic, environmental, and social (EES) impacts" (Global Reporting Initiative, 2002). "The concept of sustainability reporting is critical to both the traditional concern of profit maximization strategies in business organizations and the global evaluation of firms' financial performance and its impact on the economy and environment" (Hart, 1997). "The evolution of strategic thinking on sustainability reporting, on the other hand, emphasizes the importance of incorporating activities that seek to integrate social and environmental issues into business decision making" (Sihotang & Effendi, 2010). This is done to assist businesses in properly integrating their environment and stakeholders, as well as to hold those businesses socially accountable to the communities in which they operate.

Nigeria should not be an exception when it comes to implementing sustainability reporting in the business community with regard to the oil and gas sector, due to both the potential risks that their activities pose to the host community and their roles in the nation's economic development (Umoren et al., 2018).

2.1.2 Environmental Sustainability Information Disclosure and Firm Value

"Theoretical research suggests that mandated reporting elicits changes in firm behavior because improved transparency facilitates monitoring of the reporting firm's behavior and feeds back to the real actions of the firm" (Kanodia & Sapra, 2016). As contracting stakeholders of the firm (e.g., investors, government agencies, NGOs, customers, employees, etc.) gain access to improved information, this enhances their ability to exert pressure on the disclosing firm to change its behavior. Firms in turn face increased accountability over the mandated information, as stakeholders exerting pressure expect to see performance improvements over time (Clarkson, Grewal & Richardson, 2022). "According to asymmetric information theory, voluntary carbon information disclosure reduces information asymmetry to outsiders in the capital market, including the investors" (Healy & Palepu, 2001).

"The cost-concerned school discusses that the investments in environment and high carbon emissions increased costs, resulting in decreased earnings and lower market values" (Sun, Wang & Li, 2022). "Consequently, the environmental performance is negative relation with firm market value" (Freedman and Jaggi, 1982; Chapple et al., 2013). "First, carbon emissions have the characteristic of externality and how firms internalize the carbon emissions cost is currently uncertainty in the future. Conversely, the market is probably to reflect such uncertainty, of which liabilities from future carbon emissions is important. Second, if the capital markets confirm VCDI as insufficiently reliable (Barth et al., 2001), then they may overlook this information when assessing firm value" (Sımnett, et al., 2009). "Market participants are willing to put in more costs if they fail to obtain sufficient voluntary carbon information disclosure which eventually, passes the cost on to firms" (Johnston, 2005). "Similarly, non-disclosure is considered as the adverse signal (Milgrom, 1981) and penalty to the firms, reflected in firm value".

"However, investigating the relationship between environmental sustainability information disclosure and firm value has been highly developed and researched in the modern literature. The link may be positive, neutral or negative (Khaghaany, Kbelah & Almagtome, 2019) and be divided into three groups: (a) studies that find positive relationship, suggesting that environmental sustainability improves firms' value, (b) studies that find negative relationship, adopting the idea that firm must use its resources only to maximize its profits and otherwise it will have adverse results (Aerts, Cormier & Magnan, 2008), and (c) studies that find neutral relationship, implying that environmental sustainability play insignificant role on firm value" (Freedman & Patten, 2004; Holm & Rikhardson 2008). Therefore, drawing upon the revelations from prior related studies, this study hypothesize that carbon emission information disclosure has no significant relevant value among listed oil and gas companies in Nigeria and formulate the hypothesis thus:

Ho: Carbon emission disclosure has no significant relevant value among listed oil and gas firms in Nigeria

2.2 Theoretical Framework

Signaling Theory

"The signaling theory argues that managers have an incentive to voluntarily disclose more information about their superior carbon performance" (Al-Tuwaijri et al., 2004; Clarkson et al., 2008; Luo and Tang, 2014); Verrecchia, 1983). "Such voluntary disclosure conveys news of good carbon governance to investors, signaling firms' environmental responsibility and their willingness and capability to manage carbon risks and maximize carbon opportunities. A lack of carbon disclosure is a negative indicator of firms' increased exposure to carbon risk and future regulatory costs. Voluntary carbon disclosure also enables firms to communicate effectively with various stakeholders (including shareholders) about their carbon management strategies and accountability" (Choi et al., 2021). "Disclosure enables stakeholders to increase their understanding of carbon issues, thus reducing information asymmetry and capital costs" (Clarkson et al., 2013; Li et al., 2017; Plumlee et al., 2015). Schiemann and Sakhel (2019) find that "the reporting of physical risks related to climate change is associated with low information asymmetry". Bui et al. (2020) provide "empirical evidence that improved carbon disclosure reduces the cost of equity capital".

Altruistic Liability Theory

"The altruistic liability theory suggests that firms that emit pollution are obligated to resolve such pollution but investment to address these obligations increases costs. For instance, the investment to achieve environmental performance is viewed as an expense under this theory. Disclosing carbon information increases the firm's risk and leads to a decline in corporate value if and only if information on carbon emission is regarded as a risk factor" (Li, 2016). "Thus, the firm value will decrease as they disclose their environmental efforts. Furthermore, conventional economic logic suggests that operating in countries where environmental regulation is lax or non-existent is less expensive than operating in countries where strict environmental regulations result in fines, liabilities, and administrative or legal action against polluters" (Stewart, 1993). According to Jaffe et al. (1995), "most developing countries' environmental spending is only a fraction (1%) of GDP, which strongly supports the notion that using local standards saves funds when operating in countries with less stringent or poorly enforced environmental regulations. Further, businesses may be able to re-capitalize old equipment that is no longer acceptable in more regulated markets by defaulting to local standards in countries with lax regulation or enforcement. Overall, the assumption is that adhering to more stringent environmental standards where they are not required or enforced is wasteful. As a result, firms that are altruistic in their efforts to raise environmental standards while investing in low-income countries are not serving their shareholders. The behavior reduces market value and may reflect managerial quirks".

2.3 Empirical Review

An emerging economy study was conducted in Nigeria by Emeka-Nwokeji and Osisioma (2019). "Content analysis of annual reports provided by non-financial firms was employed to specifically examine whether environmental, social and governance disclosures are determinants of firm value. (Tobin's Q). Results of the study revealed that both environmental and governance disclosures were able to explain variation in firm value, but the relationship between social disclosure and firm value is negatively insignificant".

Okpala and Iredele (2018) examine "the effect of corporate social and environmental disclosure on the market value of eighty-four listed firms. Tobin's Q measure of firm value was adopted while content analysis technique was employed to extract information relating to social and environmental disclosures of non-financial firms in Nigeria. Findings from the study showed that corporate social and environmental disclosures have negative significant effect on market value which implies that disclosure will lead to a decrease in firm market value. This result is a deviation from most studies in Nigeria and adduced to negligible number of ethical investors in Nigeria who regard environmental and social activities important".

Khaghaany, Kbelah and Almagtome (2019) also used "two measures of share price and traded shares to represent firm value in their study of value relevance of sustainability reporting in the tourism sector of Iraq. The independent variables were the three components of sustainability: economic, environmental, and social, and a metric was created to classify each of these components based on the GRI guidelines. The overall result of the study showed that sustainability reporting accounted for 54% of the changes in share price and did not however produce a significant effect on traded shares of the Iraqi tourism firms for the period studied".

In study carried out by Echobu, Ekundayo and Abu, (2022), "they researched on whether reporting the social and environmental impact of the activities of a corporation is relevant information for decision by users of the information". Using the Ohlson (1995) model which was modified, "the study used share price as a measure of the value of the oil and gas firms studied, and a strict bias for only GRI social and environmental disclosures, as explanatory variables. Applying regression analysis, the study find that social information disclosure is relevant for making decisions that can lead to positive and significant change in share price. Environmental disclosures on the other hand were found not to have any value relevance. The study advocated for full compliance to the GRI social disclosures for optimum firm value, which should also lead to increased societal and communal acceptance through the corporate social responsibility efforts".

Herbert, Nwaorgu, Onyilo and Iormbagah, (2020), evaluated "the sustainability reporting and performance of listed upstream petroleum companies in Nigeria, using a content analysis approach. The paper objectively evaluated the textual content of the sustainability reports of the

firms in line with the GRI standards and find evidence of inadequate reporting of sustainable economic performance by the major oil and gas firms. The results also show that the oil and gas companies are less perturbed by environmental conservatism due to weak environmental law enforcement".

3.0 METHODOLOGY

In a bid to investigate whether sustainability reporting is relevant for measuring corporate value among listed oil and gas firms in Nigeria, this study adopted the Ohlson 1995 valuation model which states that for a listed firm, market value is determined by its annual earnings, book value of equity and any other information that increases the value of the firm (Echobu, Ekundayo & Abu, 2022). Since other information different from financial information can also positively affect value, the Ohlson model is modified to include non-financial information, represented as environmental components of sustainability report. The carbon emission which is a non-financial information to be tested is taken while asset growth is included as a control variable. The non-financial information of the firms was collated from the sampled firms' annual reports using content analysis technique and guided by the GRI (G4) standard guidelines which have been widely employed in environmental sustainability studies. The GRI (G4) standard guidelines have been considered to enhance the reliability of narrative reporting including environmental sustainability information disclosures. For the purpose of data collation, this study employs purposive sampling technique which require certain criteria to be met by the sampled companies. The key criteria are accessibility of annual financial reports that reveals all relevant information needed for the analyses over the entire selected period of study. Further, selected firms must have joined the Nigerian Exchange Group before year 2011 hence, a balanced panel data structure suitable for data analysis is readily achieved. Therefore, for the purpose of analysis only eight (8) oil and gas firms that have all relevant information made the final sample size. The period of interest (2006-2020) covers the era where the International Financial Reporting Standard (IFRS) was adopted in Nigeria. In this study, ex post facto and descriptive research design on a panel data set was adopted. Robust least square regression analysis technique was employed to test the formulated hypotheses.

3.1 Model Specification

Ohlson (1995) Valuation Model

In accordance with Ohlson (1995) this study model begins by explaining price P_{it} of stock i at time t as a function of book value per share $BVPS_{it}$, abnormal earnings per share $AEPS_{it}$ and other information v_{it}:

However, in empirical studies, due to data restrictions and the lack of a proper model for calculating normal earnings, earnings per share (EPS_{it}) is commonly used as a proxy for $AEPS_{it}$ (Goncharov et al., 2006; Gu, 2007).

$$P_{it} = BVPS_{it} + \alpha_1 AEPS_{it} + \alpha_2 v_{it} \qquad (1)$$

Therefore, introducing the non-financial information (Carbon Emission) enable us to re-write the model as:

$$SP_{it} = \alpha_1 BVPS_{it} + \alpha_2 EPS_{it} + \alpha_3 CAREM_{it} + \alpha_4 ASSGRT_{it} + \mu_{it} \quad (2)$$

Where:

SP = Stock Price
BVPS = Book Value per share
EPS = Earnings Per Share
CAREM =Carbon Emission
ASSGRT = Asset Growth
i = cross sections (sample companies)
t = time effect (2006 to 2020)
μ_{it} = Stochastic error Term

Chart 1 Operationalization of Variables

Variable	Measurement	Source
Share Price	December closing share price	Kocamis & Gungor (2014).
Earnings per Share	Earnings Per Share in per share basis is computed as net profit after tax divided by outstanding shares.	Umoren, Akpan & Okafor (2018)
Book Value per Share	Book to Market value in numbers is computed as total equity divided by market capitalization.	Mahmes (2016)
Carbon Emission	Content Analysis based on Global Reporting Initiative (GRI) Checklist	Baldarelli, Baldo, & Neshava-Kiosevva (2017)
Asset Growth	Total asset growth in percentage is computed as current year total asset minus previous year total asset divided by previous total asset	Eljayash, Kavanagh & Kong (2013)

Author's Compilation, 2023

4.1 RESULTS AND DISCUSSION

To examine the value relevance of environmental sustainability information disclosure of listed oil and gas firms in Nigeria for the period between 2006 and 2020, first descriptive statistics was used to evaluate the characteristics of the data in terms of its mean, minimum, maximum and standard deviation. Further, to test for normality of data, Shapiro Wiki procedure was employed before the regression analysis was conducted. Next, Spearman Rank Correlation analysis technique was employed to check for possible undesirable correlation among the variables of interest. In checking for consistency and efficiency of the estimates, post-regression analysis test to include test for multicollinearity and the test for heteroscedasticity was carried out. Breusch-

Pagan test for heteroscedasticity reveals the presence of heteroscedasticity in the estimated model hence the researcher proceeded to employ the Robust Standard Least Square Regression Analysis technique which was relied upon for hypothesis testing.

Table 1 Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
SP	98	23.11316	159.2194	-88.6	1301.03
EPS	110	6.015909	21.99839	-52.98	143.96
BVPS	110	52.41973	144.444	-5.67	1090.92
CAREM	103	.0194175	.1386618	0	1
ASSGRT	97	20.7168	57.39923	-100	330.25

SOURCE: Author's Computation 2022

Table 1 describes the data in terms of its mean, standard deviation, minimum and maximum statistics. It is observed that between 2006 and 2020 in terms of firm value as measured by stock price, the maximum value (1,301.01), earning per share (143.96) and book value per share (1,090.92) for the sampled oil and gas firms in Nigeria. Their minimum values are (-88.6), (-52.98) and (-5.67) respectively for the same period under consideration. Also, the descriptive statistics result reveals a wide disparity in the mean of stock price, earning per share and book value per share as reflected in their corresponding standard deviation. Further, the data for environmental (carbon emission) disclosures shows a mean value of 0.194175 suggesting that only about 2% of the sampled firms provided information on carbon emission in their annual reports following the GRI (G4) guidelines during the period under review. This implies that oil and gas firms in Nigeria barely report the impacts of their activities on the environment.

Table 2 Shapiro-Wilk W Test for Normal Data

Variable	Obs	W	V	z	Prob>z
SP	98	0.42309	46.836	8.524	0.00000
EPS	110	0.44303	49.806	8.715	0.00000
BVPS	110	0.32137	60.686	9.155	0.00000
CAREM	103	0.52032	40.594	8.229	0.00000
ASSGRT	97	0.77886	17.801	6.377	0.00000

SOURCE: Author's Computation (2022)

From table 2, it is observed that the dependent variables of stock price (Prob > z = 0.00000), earnings per share (Prob > z = 0.00000), and book value per share (Prob > z = 0.00000) are not normally distributed since the probability of their z-statistics is statistically significant at 1%

significant level. The same can be said for the independent variables of the study as well as the control variable. This interpretation is justified following the study of Bera and Jarque (1982).

Table 3 Spearman Rank Correlation Analysis

	SP	EPS	BVPS	CAREM	ASSGRT
SP	1.0000				
EPS	0.1780	1.0000			
BVPS	0.0561	0.5582	1.0000		
CAREM	-0.0026	-0.1658	-0.1790	1.0000	
ASSGRT	0.1666	0.2264	-0.0199	0.1158	1.0000

SOURCE: Author's Computation (2022)

Table 3 shows both the magnitude and the direction of association between stock price, earning per share, book value per share and environmental disclosures. Specifically, the analysis from the Spearman's rank correlation showed that stock price (-0.0026), earning per share (-0.1658) and book value per share (-0.1790) have negative association with the independent variable. Meanwhile, asset growth (0.1158) is seen to correlate positively with the independent variable. However, it is observed that all the associations are seen to be weak (less than 0.8), hence there is no room to suspect the presence of collinearity.

Table 4 Regression Analysis

Variables	Earnings Per Share	Book Value Per Share	Carbon Emission	Asset Growth	Constant
Financial Distress Model					
Coefficient t_ Statistics Probability_t	1.665 (2.63) {0.010} **	-0.258 (-1.44) {0.153}	-72.414 (-2.32) {0.022} **	0.247 (2.56) {0.012} **	-10.658 (-1.64) {0.105}
No. of Obs. Prob. F statistics R^2 VIF	110 0.0067 0.14 < 5				

Source: Authors' Computation (2022)

4.2 Discussion of Regression Result

Table 4 shows the result obtained from the regression analysis. The model's goodness of fit as captured by the Fisher statistics and the corresponding probability value (0.0067) shows a 5% statistically significant level suggesting that the entire model is fit and can be employed for

interpretation and policy recommendation. The R^2 value of (0.1431) for the model indicates that about 14.31% of the variation in the dependent variable is being explained by the independent and the control variables in the model. Specifically, the researcher provided interpretation for the estimates obtained from the robust standard error analysis. Based on the outcome presented in the table, it is evident that carbon emission is value relevant in Nigeria. Evidently, carbon emission economic magnitude as obtained from the result signifies that one standard deviation change in carbon information reporting by the average company in the sample results in about 72.41% decrease in the share price of the firm. This outcome is in clear response to the view that if large emitters use voluntary carbon disclosure purely as a legitimizing tool to manipulate stakeholders' impressions rather than as a credible signal of their actual performance, they should be easily detected by the public or media.

Particularly, this study outcome aligns with extant related studies of Choi and Luo, 2021; Choi, et al., 2021; Clarkson et al., 2015; Matsumura et al., 2014, which show that corporate carbon emissions is important to investors' behavior and firm value. From this result, there is clear evidence that firms with higher carbon emissions are often perceived as poor carbon performers and are considered major users of energy and creators of industrial waste, (which is a case of oil and gas firms in Nigeria) resulting in major environmental consequences and community concerns. Accordingly, these firms are susceptible to various climate policies and regulations, attract a wide range of press coverage and public attention, and invite close monitoring from a variety of stakeholders. This negative outcome aligns with the views of (Cooper, Raman, Yin, 2018) who posit that carbon emissions in China are covered by the emissions pricing scheme; hence investors would expect a reduction in companies' future cash flows due to settling future liabilities associated with such emissions Further, the outcome sternly supports the altruistic liability theory which posit that disclosing carbon emission information increases the firm's risk and leads to a decline in corporate value if and only if all such information is regarded as a risk factor (Batson, 1987, 2011; Johnson et al., 1989; Eckel and Grossman, 1996). However, the result contradicts those of Jung et al. (2018) who suggest that investors interpret increased carbon emission disclosure as a positive sign of firms' management of exposure to future regulatory costs noting that the benefits of increased voluntary disclosure are expected to be greater for large carbon emitters.

5.0 Conclusion and Recommendation

This study evaluates the value relevance of environmental sustainability information disclosure of oil and gas firms in Nigeria with special reference to carbon emission information disclosure. Whether or not information on carbon emission disclosure is able to tweak decisions that will affect stock prices of oil and gas firms was tested using regression analysis. This study concludes that disclosing environmental sustainability information via carbon emission of oil and gas firms in Nigeria has value which is significantly relevant to corporate investors. Specifically, the study reports that investors in Nigeria show negative concerns to carbon emission information disclosure during the period under review. This finding is consistent with the **altruistic liability**

theory which posit that carbon information disclosure increases the firm's risk and leads to a decline in corporate value if information on carbon emission is regarded as a risk factor. Thus, the firm value will decrease as they disclose their environmental efforts. However, this study recommends that to relieve such negative consequences in the capital market, managers of oil and gas firms in Nigeria must take appropriate actions to communicate their commitments and efforts genuinely and adequately around *carbon reduction* to investors. A lack of credible disclosure will give the impression that the company is attempting to hide bad news or will be perceived as evidence of irresponsible corporate behavior, thereby heightening the legitimacy crisis.

5.1 Future Thrust

This study can be extended in several ways. Further research is needed on the value relevance of the interaction effect of environmental and social performance on the market value of equity and the investigation of such relations in large-, mid- and small-cap listed companies in Nigeria. Understanding how environmental and social norms may differ across industries and how they affect environmental/social performance relations and stock prices would be a valuable area for future research. The results of this study are limited to the data set that was provided by the machame ratios.

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