

Environment Operational Performance Effect on Costs of Capital Structure Financing of the Nigerian Listed Manufacturing Companies

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Abstract

Environmental performance of the Nigerian companies has become an issue of interest due to the negative effect of the companies' operations to the natural environment. The performance

affects costs of capital structure financing because of its risk implication. Thus, the study examined the performance effect on costs of capital structure financing. Unlike the resource-depletion view of the performance, it is posited that environment operational performance lowers the companies' costs of capital structure financing. With analysis of 53 listed companies from Nigerian Stock Exchange Market, negative effects are found between the environment operational performance and costs of capital structure financing of the companies. This aligned with instrumental stakeholder's theory of favourable resource allocation arising from improved environmental performance. It contributed to the understanding of capital structure financing advantage that can be achieved with environmental performance, thus supported the win-win view of corporate environmental performance.

Keywords: environment operational performance, environmental risk, instrumental stakeholders, costs of capital structure financing, Nigerian companies

1. Introduction

Nowadays, environmental issues have become a topic of public discourse at both local and international level, with Nigeria having several United Nations (UN) treaties premised on environmental sustainability. These are targeted on companies' environmental activities that affect the physical environment and ecosystem. The purpose is to control man-induced climate change effects on the natural environment.

The rise in the environmental movement and regulatory pressure is not unconnected with the negative aspects of companies' environmental activities which push and pull the companies into environmental performance. For example, Delmas and Toffel (2004) noted that pressure from stakeholders coerced companies to adopt environmental measures that reduce unwarranted negative effects. Similarly, capital market appreciates environmental risk due to costs implication associated with environmental performance (Ambec & Lanoie, 2008; Esty & Winston, 2009; He, Tang, & Wang, 2013). It requires the companies to be environmentally considerate in operational activities, involves efficient and maximum utilisation of resources that limit pollutions and wastes. This, if not properly managed undermines returns and erodes revenues that supposed to go to the owners' coffers. It happens where a company is sanctioned due to poor environmental behaviour and constrained products demand from environment concern customers.

Thus, the interest in the performance behaviour labour the companies to be environmentally considerate in their operations in order to avoid the negative impact (Blanco, Rey-Maqueira, & Lozano, 2009). To satisfy the call, companies engaged in sustainability activities that improve environment operational performance. For example, Cheng, Ioannou, and Serafeim (2014) documented that companies integrate environmental performance effort as a strategic tool serving regulatory compliance and public relation functions. Also, Cetindamar (2007) work on UN Global Compacts showed about 97% of companies covered by the report adopt environmental commitment in their operations for future survival.

However, the financing cost advantage derives from the performance is not much appreciated because it could not be directly augured with short-run profit maximisation objective (Freeman, 2010; King & Lenox, 2002). The view has been that the environmental commitment beyond law requirement is an additional burden on companies' limited resources that can be channelled to more profitable ventures (King & Lenox, 2002; Mahapatra, 1984). However, this stand is not surprising as meta-review of extant literature by Endrikat, Guenther, and Hoppe (2014); Margolis, Elfenbein, and Walsh (2007) observed inconclusive evidence in support of economic value relevance of the environmental performance and its significant effect on financial performance.

Notwithstanding the implication of the performance on short-run profits, this study argued that environmental performance favourably affects costs of capital structure financing. It is on the ground that environmental performance level attained by a company affects its capital structure financing costs due to risk implications of the environmental activities (Connors & Gao, 2010; Sharfman & Fernando, 2008). This effect on financing is observed with increased or reduced costs of capital rising from the market scrutinisation of a company environmental riskiness (Childs, Mauer, & Ott, 2005; Elsas, Flannery, & Garfinkel, 2014; Moyer, McGuigan, & Rao, 2014). Where the risk assessment of a company is high, there are all tendencies to ask for a high cost to cover the risk premium comparable to the level of performance (Connors & Silva-Gao, 2008). Similarly, less risk perceived by the suppliers of fund results in a lower rate for a grant of credit. Thus, this risk implication of the performance arising from regulatory costs, clean-up costs and publicity costs make companies' capital financing riskier, therefore higher cost of capital financing.

It is pertinent to note that the capital structure financing of a company is influenced by the strategic combinations of equity and debt, and this is determined by the overall cost of capital, again the higher the cost, the lower the financing opportunity (Darush & Peter, 2015; Eldomiaty, 2008). A company with excessive cash uses less debt financing and shield itself from bankruptcy cost but earn a lower return on investment (Gill, Biger, & Mathur, 2011).

The paper followed instrumental stakeholders' theory which explains the adoption of stakeholders' engagement in operational activities by a company that allow the achievement of certain advantage (Al-Tuwaijri, Christensen, & Hughes Ii, 2004; Ambec & Lanoie, 2008; Bonnafous-Boucher & Porcher, 2010; Cheng et al., 2014). This particularly relevant in understanding financial stakeholders' behaviour with regard to environmental risk assessment effect on costs. As financial stakeholders consider the risk in the determination cost of capital financing (Connors & Gao, 2010; Sharfman & Fernando, 2008). It contributed to the understanding of capital structure financing advantage that can be achieved with environmental performance, thus supported the win-win view of corporate environmental performance.

This work examined the effect of environmental operational performance (EOP) on costs of capital financing of Nigerian listed companies. It viewed the performance from floor-level operational performance as suggested by Montabon, Sroufe, and Narasimhan (2007); Rao, Singh, la O'Castillo, Intal, and Sajid (2009); Trumpp, Endrikat, Zopf, and Guenther (2015);

Xie and Hayase (2007). That environmental performance is multi-dimensional construct best captured at the operational level of activities with the amount of resources consumed and output-level of pollutions, emissions and wastes. Thus, it adds to environmental performance construct measures in accounting by examining the measure from the operational level. This will help improve research knowledge on the performance risk effect on companies' costs of capital structure financing.

The next section presents a conceptual review about the environmental performance and different operationalisation used in the prior studies. Also, provides literature on capital structure financing and environmental risk effect on the cost of capital.

1.1 Environment Operational Performance

Frequent judgements are being made about companies' environmental performance, though no particular stand was reached about its standardisation (Henri & Journeault, 2010). Research literature offered different conceptions of the performance. for example, Luo, Wang, Raithel, and Zheng (2015) referred the performance as a company's efforts toward maximum resources utilisations, emissions reduction, and environment-friendly product innovation. Walls, Phan, and Berrone (2011) viewed it as a product of environmental management strategy to reduction negative impact of companies' activities on the physical environment. Brammer and Pavelin (2006, 2008) used reports of UK environmental agency perception of the performance as the amount of court fine charged on the company as a result of environmental transgressions. Sutantoputra, Lindorff, and Johnson (2012) conception is on waste management, the amount of emissions and adoption of environmental management system reported in Corporate Monitor. Similarly, Aerts and Cormier (2009) view was a level of exposure a company received from media as result of pollution activities.

It can be seen that previous research has provided an extensive view of the performance but failed to achieve a common conception. This work conceived environmental performance from the operational level, as the level of efficient resources consumptions in form materials, energy, and water; and the resultant levels of emissions, pollutions, and waste water discharge into the environment. This conception is aligned with Montabon et al. (2007); Rao et al. (2009); Xie and Hayase (2007) who suggested for floor-level operations in the measure of companies' environmental performance.

1.2 Cost of Capital Structure Financing

Modern day businesses are normally financed through equity, debts, or mixtures of the financing options. The choice depends on the capital market risk perceptions and the company's access to alternative financing source. Thus, a company's capital structure composed of equity, debt and reserves deployed to finance operations (Premkanth, Aziz, & Le, 2015). Equity cost is a value or returns to owners as a price for a risk-taking investment in a company capital financing while the cost of debt is a fixed charge on long-term financing of a company's capital projects. The overall weighted average of the financing costs gives a company's cost of capital used by capital markets in valuations and financing decisions.

In effect, strategic management of the capital structure financing influenced company's valuations which ultimately affects financing costs (Margaritis & Psillaki, 2010; Mauer & Sarkar, 2005). This includes environmental risk management, as perceived risk from poor environmental commitments results in sanctions, fines, and restrictions that affect returns, valuations, and cost of capital (Sharfman & Fernando, 2008). Improved environmental performance through the applications of operational measures maximised resource utilisations, efficiencies, and lower emissions, pollutions and wastes mitigate risk. Thus, where the market perception of a company's riskiness is lower, lower cost of capital is charged.

2. Literature Review and Hypotheses Development

Previous studies have attempted to provide a link between environmental performance and costs of capital financing. Though, the greater part of the efforts was made to examine the effect on financial performance, no conclusion is reached (Endrikat et al., 2014). The arguments rest on the positive effect of the environmental performance on financial performance, yet limited effort was made to examine the link from costs perspectives.

Donaldson and Preston (1995); Jones (1995) have shown support for instrumental stakeholders' theory in the examination of links between environment stakeholders satisfaction to companies' performance. It provides that companies that adopt stakeholders' engagement in its operational activities tend to achieve a certain economic advantage. The theory asserts that stakeholders' engagement is rewarded by a certain positive gesture from the company's stakeholders (Busch & Hoffmann, 2011; Hart & Dowell, 2011; Surroca, Tribó, & Waddock, 2010). For instance, financial stakeholders consider the risk in deciding to extend financing to a company and in determination cost of capital financing.

Environmental performance can be seen as an opportunity rather than cost because of its implication on financing by either increasing or reducing costs of capital (Childs et al., 2005; Elsas et al., 2014; Moyer et al., 2014). Improved performance provides a company with increased efficiency, costs saving, products' markets and favourable parley with regulators (Hart & Dowell, 2011). On the other hand, poor performance suggests tendencies suffer regulatory cost and additional clean-up cost making investment in the company riskier, therefore higher cost of capital.

The relationships between environmental performance and capital structure financing can be explained by stakeholders' theory, in particular, instrumental stakeholders. These are the category of parties that have a financial stake in the company and can influence companies' financing ability. A company that has the ability to make its interest congruent with its financial stakeholders has the advantage of capital structure financing at a lower cost of capital.

Empirical work of Sharfman and Fernando (2008) on US companies using a dataset from S&P report a negative effect of environmental risk management on costs of finance. They provide that improved environmental performance of a company is related to markets risk perception on investments. Therefore, the cost of capital financing will be high as a result of

environmental risk perception. This scenario arises due to a likelihood of risk premium assigned to poor environmental performance because of uncertainty regarding regulatory intervention. Thus, suggest a higher cost of capital.

Goss and Roberts (2011) conducted a study of CSR and bank lending cost on 3996 loan sets extended to 1265 US companies for a period 1991-2006. It used London interbank offer rate to measure lending cost, and KLD ranking index to measures the company' Corporate Social Responsibility (CSR) performance. The objective was to examine the relationship between CSR and bank lending, and report a negative relationship. The findings aligned CSR performance with financial distress, assert that low rated company are charged high rates because of the market risk perception. They are asked to pay a high cost of loans comparable with the high performing companies.

Similarly, Lee and Faff (2009) report that company with improved CSR performance rating is associated with lower idiosyncrasy risk and high return. That is a negative relationship was established, and add that where the market perceived a company is environmentally friendly, it accept lower risk premium on equity, and allow access to more of debt financing in the capital structure. This is possible because the debtors will ask for a lower rate on loan due to the absence of scrutiny threat pertinent with poor environment performers.

Cheng et al. (2014) work report a negative relationship with costs of capital structure financing and the SRI rating. It showed that companies with high CSR performance enjoy a lower cost of capital due to stakeholders' engagement that reduces risk perception. They made a cross-country study with a total sample of 10078 companies drawn from different countries of Europe, USA, Asia and Latin America for a period covering 2002-2009. The capital constraint was measured using Kaplan and Zingales (1997) index developed from leverage ratios, and used of SRI rating as a measure of the CSR.

However, one issue with the Cheng et al. (2014) findings is the measure of CSR using SRI rating. A company can manipulate the index data to get high ranking in order to get access to the SRI fund. Similarly, the study was limited to the US, and the size of the fund is quite small in comparison with total assets. Notwithstanding that, impliedly the finding showed that company's costs of capital structure financing are negatively related to the CSR performance.

In the same context, Sharfman and Fernando (2008) examined the associations between environmental risk management and financing advantage of 267 US companies drawn from Standard and Poor (S&P) top 500. A negative relationship was reported, indicating financial markets reward companies with better environmental standings. This gestured that investing in the company is less risky, and low cost of debt and equity premium. Therefore, such scenario provides for the low cost of capital which ultimately increases overall returns.

H1: There is negative effect of environment operational performance on cost of capital structure financing.

As previously explained, the capital structure financing is made up of equity and debts financing variables, each with its peculiarities. Thus, to appreciate the performance effect on

capital structure financing costs further analysis is made on debt and equity. This enabled the understanding the overall cost of capital, cost debt and cost of equity effects.

Gao and Connors (2011) in a combined study of environmental performance, disclosure and leverage report a positive relationship between the environmental performance and debt financing. A total of 424 observations were made on 47 US electric utility companies for a period 2001-2007. Though the study was limited to a use of TRI emissions as a single measure of performance, its validity is questioned. (Trumpp et al., 2015; Walls et al., 2011; Wong, Law, & Huang, 2008) This is because it does not represent comprehensive environment operational activities of the company, and it can be the source of flaws in the findings (Endrikat et al., 2014; Schultze & Trommer, 2012; Trumpp et al., 2015). Similarly, Schneider (2011) used TRI data in the study of environmental performance effect on bonds price. A regression analysis is conducted on data drawn from US paper and pulps and chemical industries. A sample of 48 and 52 companies was selected, and data observations periods of 1994-2004 and 1999-2004, respectively. The work findings showed that investors consider environmental risk in pricing bond investors considers environmental risk, which suggests a likelihood effect of the risk assessment on cost. Thus, it is evident that a negative relationship exists between bond price, indicating investors' recognition of environmental risk assessment. However, these works were less vigorous due to its limited coverage, by concentrating in just two industries, and the use of TRI which is said to be just a measure of emission level and not environmental performance. Accordingly, the following hypothesis is developed:

H1a: There is a negative effect of environment operational performance on the cost of debt financing.

This is based on the on assumption that capital debt financing is influenced by investors risk assessment of the company. Environmental risks are now part of investment portfolio consider in debt financing. Those companies that are having environmental concerns by investors tend to have a higher cost of debt.

Earlier perspective about the financing of a company's capital projects is first considered from internal sources. That is finances from owner's equity and reserves, which is easily accessible by the company. With the development of modern business management, the owners are now external to a company, thus consider environmental risk implication in the equity financing. For example, Cheng et al. (2014) report the performance effect on access to capital financing through costs, poor environmental performance is associated with a high-risk premium, thus high equity costs.

The importance of environmental performance is appreciated by scholars in the determination of cost of equity financing, though the findings are inconclusive (Endrikat et al., 2014). For example, El Ghouli, Guedhami, Kwok, and Mishra (2011), in a study of the effect of social responsibility on the cost of capital of 2809 US companies used data from KLD ratings, and equity risk premium as a proxy for the average of cost of equity. A positive relationship between the social responsibility performance and equity financing option, in particular, showed that improved environmental initiatives reduce the cost of equity financing. They

noted that the riskiness of a company activity is an important factor that market considers in determining the rate of return on investment, a lower rate implies easy access to the equity financing.

Connors and Silva-Gao (2008) studied the impact of environmental risk on the cost of equity capital following the win-win view and using TRI as a measure of performance report a negative effect of the performance on company equity value. The risk premium was used as a proxy for the cost of equity. A total of 86 companies were used over a period 2001-2007, report a negative relationship between the performance and risk premium. Though the study was limited to two industries, and the use of emission level alone cannot be an adequate representation of a company environmental activity. Similarly, Kim, An, and Kim (2015) work on environmental risk related to carbon emissions effect on equity cost reports that as environmental risk increases cost of equity increases. The authors found a negative effect of the performance on the cost of equity. This is confirmed in a study by El Ghouli et al. (2011) where the result revealed the negative effect of CSR of US companies.

Reviews of previous studies have shown a link between equity financing and environmental performance. It indicated a negative effect of environmental risk arising from poor performance on equity cost of financing. Thus, the following hypothesis will be addressed:

H1b: There is negative effect of environment operational performance on cost equity capital financing

The measurement issue in environmental performance was earlier noted in Walls et al. (2011); Xie and Hayase (2007) conceptualization of the performance. A meta-analysis by Endrikat et al. (2014) on environmental performance and financial performance proved the inconsistencies in the results were caused by measurement misspecification of environmental performance. For example, Sharfman and Fernando (2008, p. 589) provide that “the TRI and KLD data are limited in their ability to reflect environmental risk management accurately”. The measure of environmental performance should be looking at as multi-dimensional construct (input-output and process-outcome). It was suggested that studies that try to establish a link between environmental performance and financial performance should consider its multi-dimensional nature (Schultze & Trommer, 2012; Trumpp et al., 2015). Similarly, the review has shown the diversity of measure which can affect the validity of the findings. Thus, following input-output operationalization of the performance, and instrumental stakeholder’ theory that concerned with financial stakeholders environmental risk effect on capital structure financing. The present study aims to contribute towards the understanding of the strategic importance of the performance on costs of capital structure financing. This is done alternatively, through floor-level operation environmental performance measures.

3. Methodology and Models

The data for the research is gathered from companies that are listed in Nigerian Stock Exchange Market (NSE). A total of 77 manufacturing companies is listed in the market serving as the study population. No trading record of 16 companies in the market database at 31st December 2015, thus considered inactive and excluded in the research. Therefore, a

sample of 61 companies is selected for the year 2014 and 2015. This is allowed for lag 2014 effect of the environment operational performance on 2015 costs of capital financing.

The data on environment operational performance was gathered from the questionnaire with EMS-ISO standard index extended in Rao et al. (2009); Xie and Hayase (2007) with 0.858 overall Cronch-Alpha level of reliability. Similarly, normality test on the EOP data returned skewness of -0.134 and standard error of 0.327, and have a kurtosis of -0.771 and standard error of 0.644. This falls within the accepted level of -2 to 2 suggested (McDonald & Ho, 2002). While capital structure financing variables are calculated from data available from companies' financial statements and NSE data.

The study considered overall weighted cost, cost debt and cost of equity capital structure financing. The variables are endogenous individually observed with the companies' environment operational performance, and some attributes are incorporated into the model as control variables. Thus, in line with Cheng et al. (2014); Gao and Connors (2011); He et al. (2013); Sharfman and Fernando (2008) models the following equations are developed:

H₁: A negative effect of environment operational performance on the overall weighted cost of capital financing.

$$WACC = \beta_0 + \beta_1 EOP + \beta_2 ED + \beta_3 ROA + \beta_4 TAN + \beta_5 SIZE + \beta_5 GROWTH + \beta_6 RISK + \beta_7 NDTS - - - + \quad (eq1)$$

H_{1a}: A negative effect of environment operational performance on the cost of debt capital financing.

$$COD = \beta_0 + \beta_1 EOP + \beta_2 ED + \beta_3 ROA + \beta_4 TAN + \beta_5 SIZE + \beta_5 GROWTH + \beta_6 RISK + \beta_7 NDTS - - - - \mp \quad (eq1a)$$

H_{1b}: A negative effect of environmental operational performance on the cost of equity capital financing.

$$COE = \beta_0 + \beta_1 EOP + \beta_2 ED + \beta_3 ROA + \beta_4 TAN + \beta_5 SIZE + \beta_5 GROW + \beta_6 RISK + \beta_7 NDTS - - - - \mp \quad (eq1b)$$

Where:

WACC = Weighted Average Cost of Capital for company for the year

COD = Cost of Debt for company for the year

COE = Cost of Equity for company for the year

EOP = Environment Operational Performance of company for the year

ED = Overall Environmental Disclosures of company in annual report for the year

Capital Structure Predetermined Variables:

SIZE = Natural Log. of Total Assets of company for the year

Profitability (ROA) = EBIT/Total Assets of company for the year

Tangibility (TAN) = Fixed Assets/Total Assets of company for the year

Growth Opportunity (GROWTH) = changes in Gross assets of company for the year

Risk Tendency (RISK) = Total Sales/Total Assets of company for the year
 Non-Debt Tax Shield (NDTS) = Total Depreciation/Total Fixed Assets of company for the year

4. Results and Discussion

The data was put into STATA software for the analysis after transformation into logs, and the results presented below.

4.1 Descriptive Statistics

A descriptive analysis was made on the sample data, where the summary results were presented in Table 1. Cost of capital financing is computed using the overall weighted cost of capital with (WACC) with a mean score of 3.031 was observed. It shows the standard deviation of 0.238, indicating lower variability around mean cost of financing. Similarly, the cost of equity (COE) and cost of debt (COD) have a mean score of 2.639 and 3.088 respectively. The much concentrations of the data around the Mean describe a typical nature of the financing characteristics of the Nigerian stocks exchange.

Environment operational performance (EOP) have mean scores of 3.836, and standard deviations of 0.672. Control variables formed part of the explanatory variables in this study, representing different features of companies. These variables show wider variability around the mean by the standard deviations, as in the table below:

Table 1. Descriptive statistics

VARIABLES	MEAN	SD	MIN	MAX
Cost of Debt (COD)	3.088	0.565	1.099	3.738
Cost of Equity (COE)	2.639	0.539	1.609	3.829
Weighted Cost of Capital (WACC)	3.031	0.238	2.197	3.434
Environment Operational Performance (EOP)	3.836	0.672	3.431	4.454
Return on Assets (ROA)	2.374	0.971	0.693	4.934
Tangibility (TAN)	3.906	0.504	2.639	4.585
SIZE	16.02	1.322	13.06	18.14
GROWTH	2.063	0.912	1	4.625
RISK	4.251	1.070	1	6.186
Non-Debt Tax Shield (NDTS)	3.428	0.741	1.609	4.585

4.2 Correlation Results

Spearman correlation analysis results were presented in Table 2 showing the matrix among all the variable of interest for equation **H1, H1a H1b**. The relationships between WACC, COD, COE and EOP is negatively related with 0.553, 0.659, 0.544 coefficients, respectively. This points to inverse behaviour in relationships among the variable. That is, when EOP is low, WACC, COD and COE are high, thus, poor environment operational performance goes with the high cost of equity, debt, and overall cost of capital financing.

The results show that when Nigerian companies' environment operational performance is lower, the cost of capital is high. This is the same with the cost of debt financing option, lower performance increases debt cost due to risk perception of the Nigerian capital market about the companies' stocks. Similarly, equity cost shows a negative relationship, indicating market risk valuation is reflected on owners' capital cost estimation.

Table 2. Correlation results on environment operational performance and capital structure financing

	WACC	COD	COE	EOP	ROA	TAN	SIZE	GROWTH	RISK	NDTS
WACC	1									
COD	0.754	1								
COE	0.161	-0.326	1							
EOP	-0.553	-0.66	-0.544	1						
ROA	0.196	0.03	0.508	0.046	1					
TAN	0.201	0.22	0.265	0.321	0.021	1				
SIZE	0.303	0.17	0.189	-0.157	0.215	0.311	1			
GROWTH	0.895	0.72	-0.193	-0.561	0.128	0.134	0.345	1		
RISK	-0.135	0.15	0.280	0.25	0.249	0.126	-0.21	-0.117	1	
NDTS	-0.118	0.07	-0.147	-0.056	-0.098	0.176	0.025	-0.054	0.04	1

Correlation ranges as in Zikmund (2003) (Note 1)

4.3 Regressions Results

In testing the effect of EOP on costs of structure capital structure financing, i.e. WACC, COD and COE a multivariate regression were carried out. Table 3 shows the results of the analysis presented in three models, which is the EOP effect on WACC, COD, and COE.

Model(1) shows a regression result of the multivariate analysis on WACC, EOP, and control variables. An R-square of 0.854 was achieved, indicating sufficient indices for the test. The data explained the effect by 85.4%. A significant negative effect of EOP on WACC with 0.0913 coefficient is revealed at 5% significant level, and standard error of 0.00729. The result revealed inverse behaviour between the environmental operational performance and

weighted cost of capital. Thus, where all things being equal, 1% negative change in EOP results in 0.0913 change in the overall cost of capital structure financing (WACC). Results of control variables here are inconsistent, ROA, TAN, and Growth are positive with 0.0247, 0.0164, and 0.139 coefficients at a significant p-value of 0.05, and 0.01 for TAN and Growth, respectively. While NDTs has a significant negative effect of 0.139 coefficient at 0.05 p-value, Size and Risk are negative but non-significant. Thus, support H1 negative effect of EOP on WACC

Model (2) is regarding the relationship between EOP and COD, with a predicted negative effect. The results of the Model as shown in Table 3 achieved an R-square of 0.695, demonstrated 69.5% ability of the data to explain the results. It further indicates a negative and significant effect of EOP on COD with 0.340 coefficient and standard error of 0.181 at 10% p-value level. That is at 0.1 p-values, a 1% change in EOP results in 0.340 negative change of COD, and vice versa. The model control variables are inconsistent with only TAN and Growth at a significant level of 0.1, and 0.01 with -0.248, and 2.171 coefficient, respectively. Size, Risk, and NDTs are all show negative and non-significant relationships with 3.848, 0.0472, and 0.0427 coefficients, respectively. While ROA has a positive and non-significant relationship with 0.130 coefficient. The findings on the model support H1a with the negative effect of EOP on COD as predicted.

Model (3) shows the results of the analysis on EOP and COE. An R-square of 0.573 was achieved, indicating the strength of the data to in predicting the results, thus explained the effect by 57.3%. It also shows a significant negative coefficient of 0.121 and standard error of 0.0347 at 0.01 p-value. That is a 1% negative change in EOP results in 0.121 increase in COE at 1% significant level. All the control variables are non-significant except for ROA which has a positive and significant relationship with 0.210 coefficient at 1% p-value level. TAN, SIZE, and RISK have positive coefficients of 0.00964, 1.510, 0.0291, and Growth, NDTs are negative with 0.020, 0.0780 coefficients, respectively. This support H1b with the negative effect of EOP on COE.

Table 3. Relationship between environment operational performance and cost of capital structure financing (WACC)

VARIABLES	Model (1)	Model (2)	Model (3)
	WACC	COD	COE
EOP	-0.0193** (0.00729)	-0.340* (0.181)	-0.121*** (0.0347)
ROA	0.0247** (0.0112)	0.130 (0.277)	0.210*** (0.0532)
TAN	0.0164*** (0.00510)	-0.248* (0.126)	0.00964 (0.0243)
SIZE	-0.299 (0.193)	-3.848 (4.785)	1.510 (0.919)

GROWTH	0.139*** (0.0148)	2.171*** (0.368)	-0.0202 (0.0706)
RISK	-0.0129 (0.00924)	-0.0462 (0.229)	0.0291 (0.0440)
NDTS	-0.0392** (0.0192)	-0.0427 (0.476)	-0.0780 (0.0915)
Constant	3.766*** (0.545)	8.753 (13.50)	-2.321 (2.592)
Observations	53	53	53
R-squared	0.854	0.695	0.573

The significant levels of coefficients are indicated with *** for 1% p-value, ** for 5% p-value, * for 10% p-value, and Standard errors in parentheses

4.4 Sensitivity Test

The robustness of the result is tested using the cost of production (PC) as an alternative measure of environment operational performance. This approach is adapted from Clarkson, Li, Richardson, and Vasvari (2011) work, where the use of this measure proven robust in all the tests results. Untabulated results of the analysis show EOP effects on WACC, COD, and COE are consistent with -0.025, -0.435, and -0.153 coefficients, and standard errors of 0.008, 0.202, and 0.038 at 0.003, 0.036, and 0.001 p-values, respectively.

With the use of PC, the significant level in Model (1) improved to 1% but did not change the direction of the effect. The PC effect on COD level of significant also negative and increased to 5%, and model (3) remained at negative 1% significant level.

4.5 Discussion

The findings of the model (1) about the negative effect of EOP on WACC asserts the strategic importance of the performance on overall capital structure cost management. It presupposed the instrumental stakeholders' theory of environmental stakeholders' engagement pays through the allocation of financial resources at a lower cost. This underpinning is aligned with Freeman and Moutchnik (2013); Freeman (2010) that the capital markets recognise companies' commitment to environmental issues. It pays the environment-friendly companies with easy access to capital financing at lower rates.

Similarly, previous work by Cheng et al. (2014); Connors and Gao (2010); Goss and Roberts (2011); He et al. (2013); Horváthová (2012); Walls, Berrone, and Phan (2012) have all demonstrated that improved environmental performance lower idiosyncrasy risk of capital financing. Lower risk perceptions make financial stakeholders accept minimum feasible premium on capital financing.

With findings of the model (1), it can be inferred that overall cost of capital structure financing of the Nigerian companies falls with improvement in environment operational performance. This is due to the environmental risk assessment effect on the stakeholders financing decisions.

Similarly, the overall cost is negatively affected by NDTs, and Growth level. Growth potential companies tend to have favourable capital market valuation and expected return, thus low cost of capital structure financing. Likewise, companies with NDTs in its financial structure are favoured by the market because of low agency cost, unlike more leveraged companies. These findings on the growth opportunity and non-debt tax shield are supported by the works of Degryse, de Goeij, and Kappert (2012); Huang and Song (2006); Odit and Gobardhun (2011). They provided that a company with high growth potentials attracts capital financing due to investors' increased value expectation.

As mentioned earlier, the capital structure financing costs included debt financing cost. Thus, Model (2) showed a negative effect of the EOP on COD. That is, as EOP improved COD decreased due to falls in market environmental risk perception. Where the market is comfortable with the level of companies' environmental performance, it will be willing to extend loan-term credit at a lower rate. This is because of the high level of expectation in interests and principals payment when due.

This negative effect of the EOP on COD have received empirical support from the works of Cheng et al. (2014); Clarkson et al. (2011); Gao and Connors (2011); Goss and Roberts (2011); He et al. (2013); Horváthová (2012); Sinclair-Desgagné and Gozlan (2003), who individually provided evidences of the negative effect of environmental performance on cost of debt capital. However, Sharfman and Fernando (2008) found a contradictory result, documented a positive effect of environmental risk management on cost of debt financing. However, he attributed the result to a likely estimation error in the measure of the cost of debt and the inclusion of leverage in the model.

The control variables in the model are all non-significant except TAN and Growth, where TAN of companies fixed assets have a negative effect on the COD. That is, as the stock of tangible assets in companies' capital structure decreases the cost of debt capital financing increases. This indicates conservative nature of the market that requires more security on loan debt capital. This can be a result of high uncertainty prevalent in the NSE due to unpredictable fiscal and monetary policy implications. The positive effect of Growth on COD can be viewed from features of the growth potentials companies. These companies are normally new, have a lower capital base, and may be not rated. For the market to extend debt loan beyond average, the high premium rate may be asked to cover panicking and the uncertainty.

Likewise, the negative effect of EOP on Equity cost as seen in the model (3) is not surprising as equity-holders are more concern with long-term value and survival. Thus, Environmental risk assessment in equity financing played a significant role in the financing of the Nigerian companies. The improved environmental performance results in risk reduction which favourably affects the cost of equity financing. The equity-holders are more willing to hold

shares in the companies' with improved environmental performance. This is supported with instrumental stakeholders' theory view of capital market favourable resource allocation to environment-friendly companies. Empirical findings of Cheng et al. (2014); Connors and Silva-Gao (2008); El Ghouli et al. (2011); Jacobs, Singhal, and Subramanian (2010); Sharfman and Fernando (2008) have shown the negative effect of the performance on equity cost.

Apart from ROA, all other control variables in the model are non-significant. The COE increases with increase in ROA, and vice versa. This will can relate with risk assessment of the equity, as managers pursue risky ventures to maximise earning, and equity holders consider bankruptcy issues in the stock valuation. Hewa Wellalage, Locke, and Matlay (2015); Nunkoo and Boateng (2010) documented a positive relationship between the profitability and equity.

5. Conclusion

The paper examined the environment operational performance effect on costs of capital structure financing of the Nigerian listed manufacturing. This is due to the call for a floor-level measure of the performance that captures resource consumptions and pollutions outputs arising from operations. It also evaluated the importance of environmental risk perception effect on financing costs, breaking the costs into debts cost, equity cost, and overall capital cost. This allowed the understanding of the cost most affected by the level of the companies' environment operational performance.

Unlike the resources depletion view of environmental commitment, the findings support the strategic importance of environment performance in risk management and its effect on costs. Those companies that are environment considerate with lower risk implication enjoy favourable market costs of capital structure financing. Thus, it is favourable for the companies to be environmentally performed as all the capital costs have shown a negative relationship with the environment operational performance.

It also explored the use of the alternative approach to the measure of environmental performance that is from operational level of activities. The floor-level measure efficiency in the use of environmental resources and pollutions into the physical environment. This reflects a true companies' environmental performance effect on the cost of capital.

Nevertheless, this study has some limitations, particularly in the use of cross-sectional data which may not necessarily stable over the study periods. Future research can be made with longitudinal data in form of time series to accommodate data stability. Though, business decisions data are required to be timely relevant due market fluctuations. Similarly, the use of survey questionnaire to measure environment operational performance is a source of concern, through it being used consistently used in environmental management research, see, (Trumpp et al., 2015).

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Note

Note 1. Zikmund (2003) provides for numerical ranges of the correlation strength between -0.10 to +1.00. Further broken into three: Small correlation -0.10 to -0.29 and +0.10 to +0.29; Medium correlation -0.30 to -0.49 and +0.30 to +0.49; Large correlation -0.50 to -1.00 and +0.5 to +1.00.

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