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CORPORATE SUSTAINABILITY AND WORKING CAPITAL MANAGEMENT EFFICIENCY IN EMERGING MARKETS: EVIDENCE FROM LISTED FIRMS IN NIGERIA

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ABSTRACT

Corporate sustainability, previously viewed through environmental, social, and governance (ESG) lenses, is now integral to strategic and financial performance. This study investigates the impact of corporate sustainability on the working capital management efficiency (WCME) of listed companies in Nigeria. Drawing on stakeholder theory and resource-based theory, the study conceptualizes corporate sustainability in a composite perspective and assesses its impact on WCME. The empirical analysis utilizes panel data from listed non-financial firms (2014 – 2024). The findings revealed that corporate sustainability performance exerts an adverse and statistically noteworthy effect on both the cash conversion cycle (CCC) and the WCME score. The findings have recommendations for policymakers, corporate managers, and investors, highlighting the need for firms to develop strategies that facilitate efficient working capital management while pursuing sustainability. The policymakers and firm managers must maintain this balance, to ensure sustained operational performance and the overall financial health of the firms.

Keywords: *Corporate Sustainability, ESG Performance, Working Capital Management Efficiency, Slack-Based Measure (SBM)*.

INTRODUCTION

In the past decade, businesses have undergone a significant shift from traditional financial metrics to embracing corporate sustainability, driven by heightened global environmental and social concerns (Barros et al., 2022; Wertz, 2024). Experts and business executives are aware of the necessity of sustainable development due to the negative effects of industrialization (Wertz, 2024). Firms are currently focusing on the long-term (ESG) objectives rather than short-term profits (Gao et al., 2022).

Corporate sustainability is a strategic business model that integrates environmental, social, and governance (ESG) factors into operations, aiming to benefit society (Rajesh & Rajendran, 2020). It reflects a company's commitment to incorporating social and environmental considerations into its practices and relationships (Moin, 2023)

To thrive in today's dynamic environment, businesses must effectively

utilize resources while navigating the complexities of change (Habib, 2022). Embracing corporate sustainability is not just ethical; it is essential for achieving lasting success and relevance.

Working capital is the lifeblood of a company, essential for smooth operations and agility in decision-making (Patil & Vittaldas, 2024). Effective working capital management (WCM) is crucial for corporate success and is often the difference between profitability and distress for many firms (Habib & Mourad, 2022; Habib & Kayani, 2022). While global evidence shows that sustainability enhances financial performance (Eccles et al., 2014), sustainability and WCM are characterized by a complex relationship due to the challenges that emerging markets such as Nigerian firms are facing: unstable policies and increasing expenses.

Past literature gives contradictory findings regarding associations between corporate sustainability and WCM efficiency, with some indicating that WCM efficiency and sustainable practices were associated with lower agency costs and increased investor confidence (Galer, 2023; Biktimirov and Afego, 2022a). The performance of (CSP, assessed using ESG) metrics is associated with improved financial performance, but its influence on the WCM efficiency in Nigeria is under-investigated. Sustainability might increase reputation and access to capital, but it might also create additional expenses that can disrupt the working capital efficiency.

The paper seeks to expound on the connection between CSP, as indicated by ESG scores, and working capital management efficiency of listed firms in Nigeria, where sustainability has the potential to lead to financial prosperity. We affirm the significance of the ESG performance in improving the WCM of the non-financial listed companies in Nigeria. This has long-term consequences for those diverse stakeholders, such as the management and the regulatory bodies.

It is imperative to learn how corporate sustainability and WCM are related to the management of listed companies in Nigeria. We claim that sustainability is a moral and also a strategic necessity in order to enhance short-term liquidity and operational effectiveness. In addition, building a more robust relationship with stakeholders could help to strengthen investor confidence, improve corporate reputation, and create access to preferential financing.

LITERATURE REVIEW

Conceptual Review

Corporate Sustainability

Corporate sustainability assesses the integration of environmental, social, and governance (ESG) factors into business operations and their societal impacts (Vahid-Golpayegani, 2024). It encompasses voluntary efforts to align social and environmental issues with essential operations and stakeholder engagements. (Moin, 2023). Corporate sustainability, as interpreted by the World Commission on Environment and Development (WCED), aims to balance the interests of current and future stakeholders, significantly influencing a firm's financial performance and long-term sustainability through positive ESG practices (Azeem et al., 2020). Excellent ESG performance builds a better reputation for the company to its stakeholders, such as shareholders, regulators, and people (Yonghui et al., 2023). Companies that operate on high-level ESG have less risk in attracting investors and the best employees and reduce regulatory risks. Environmental sustainability is concerned with nature preservation and climate change (Ahi et al., 2018), whereas social sustainability is about labor relations and relationships with the community (Saeidi et al., 2015; Khan et al., 2023). Sustainability of governance leads to ethical conduct and openness (Ahi et al., 2018). All these together formulate a holistic outlook of sustainable development. The dynamic interaction between firm-specific and total ESG performance reflects how a company manages operational, reputational, and financial risks related to ESG concerns (Bilyay-Erdogan et al., 2023).

The Environmental (E) pillar assesses the impact of business practices on the environment, such as emissions and sustainable resource use, while promoting the production of eco-friendly products (Matos, 2020). It emphasizes minimizing waste and carbon footprints and improving environmental performance while reducing costs per unit of output (Brooks & Oikonomou, 2018). The Social (S) pillar represents a company's commitment to high business, social, and legal standards, prioritizing human rights, stakeholder interests, and employment practices (Lee et al., 2016; Matos, 2020). It encourages public engagement, a healthy environment, and fair treatment, often showcased in sustainability reports. This pillar ultimately promotes development, fairness, and well-being for all (Mangukiya & Sklarew, 2023). The Governance (G) pillar establishes the right incentives among stakeholders, ensuring alignment of interests between shareholders and managers. It includes

mechanisms to balance these interests, aiming to create incentives consistent with the company's objectives while effectively managing conflicts of interest within the firm (Chen et al., 2020; Yusef et al., 2022; Kahveci & Wolfs, 2019)

Working Capital Management Efficiency

Working capital management is a balance of short-term debts and assets of a company to give it permission to operate effectively and stay afloat financially (Wang et al., 2020). Even though its principles remain the same, Cash flow management has changed in response to the transformation of FinTech and data analysis (Hoegerle et al., 2020). The difference between current liabilities and assets is called working capital, and it contains those assets that can be converted into cash easily (Moin, 2023 ; Ding et al., 2013). The WCM is critical to the day-to-day activities and the enhancement of profitability (Atsanan, 2018). It encompasses managing inventory, receivables, and payables to maximize risk and returns. Cash conversion cycle (CCC) is a business indicator that can be utilized to assess the efficiency of working capital (Singh et al., 2018) and is an indicator of the period during which raw material investments are transformed into cash. According to Barros et al. (2022), CCC is a combination of income statement and balance sheet information. As Zhang (2022) found out, financially tight firms are more likely to hold shorter CCC to achieve operational objectives, but a longer CCC is a sign that there is sufficient cash flow to cover expenses.

Corporate Sustainability and WCM Efficiency

WCM balances a company's short-term debts and assets to ensure smooth operations and financial stability (Wang et al., 2020). While its principles remain unchanged, FinTech and data analysis have transformed cash flow management (Högerle et al., 2020). Working capital, the difference between current assets and liabilities, includes assets that can quickly be converted into cash (Moin, 2023, ; Ding et al., 2013). Effective management of working capital is essential for daily operations and improving profitability (Atsanan, 2018). It involves overseeing inventory, receivables, and payables to optimize risk and return. The cash conversion cycle (CCC) is a key metric for evaluating working capital effectiveness (Singh et al., 2018), measuring the time required to convert raw material investments into cash. As noted by Barros et al. (2022), CCC integrates information from both the income statement and balance sheet. Zhang (2022) observed that

financially constrained firms tend to have a shorter CCC to meet operational goals, whereas a longer CCC indicates adequate cash flow for expenses

Theoretical Framework

The relationship between corporate sustainability and WCM can be explained by the Stakeholder theory and Resource-based theory. Stakeholder Theory, formulated by R. Edward Freeman in 1984, was a response to Milton Friedman's concept, which many felt unfairly prioritized shareholders over other stakeholders and limited the functions of firms in society (Freeman et al., 2010). Freeman (1994) argues that, although shareholders or owners are important to a business, the well-being of a greater number of individuals, or stakeholders, is equally important as they are connected to and have a stake in the business. Freeman adds that managers have to consider the interests of all stakeholder groups when making decisions (Laplume et al., 2008). According to stakeholder theory, decisions that take into account the interests of all stakeholders can not only improve short-run financial performance but also ensure long-run business success. Long-term success must be alongside sustainable practices. Adopting stakeholder theory is a comprehensive strategy that fosters stakeholders' trust and aligns a firm's long-term objectives (Góes et al., 2023).

The resource-based theory emerged in 1984 and was developed by Birger Wernerfelt; it focuses on strategic management. At the core of this theory is the analysis of a firm's resources to achieve a sustained competitive advantage over other firms in the industry. The theory emphasizes the firm's ability to leverage distinctive internal resources and competencies that are difficult to replicate, thus providing a competitive edge. Sustainable companies cultivate unique resources, such as cutting-edge, eco-friendly technologies and efficient supply chains (Ng et al., 2022).

Empirical Review

Karki et al. (2024) examined the connection between general (ESG) performance and WCM (WCM) productivity based on the 520 Indian listed companies during 2017-2021. Their results showed that companies that had good ESG results were able to manage short-term liquidity better, and all the ESG elements had a positive impact on WCM efficiency. This shows the necessity of incorporating sustainability in financial planning.

Habib et al. (2024) examined the impact of sustainable investment practices on the WCM strategies of Malaysian SMEs

using firm-level ESG data from 2014 to 2022. Their study revealed that while sustainable practices could initially cause liquidity constraints, green finance (GF) moderates this effect, leading to better WCM and operational sustainability for SMEs. Mathath, et al., (2024) analyzed the influence of ESG performance on trade credit and WCM in 586 Indian NSE-listed firms from 2015 to 2022. They found a positive correlation between ESG disclosure and trade credit, while a negative relationship existed between ESG disclosure and cash conversion cycle, suggesting enhanced WCM efficiency through better ESG transparency. Moin (2023,) studied corporate sustainability and WCM in Sweden, using data from 418 firm-year observations of 38 Nasdaq Stockholm-listed firms from 2010 to 2020. The study revealed no significant relationship between ESG scores and cash conversion cycle, but a notable adverse link between working capital requirements and environmental and social scores, indicating that stronger sustainability profiles enhance WCM efficiency mainly through reduced WCR. Barros et al. (2022) explored the connection between CS and WCM in the U.S., analyzing data from 1,394 publicly listed firms from 2002 to 2022. The results showed that firms with higher ESG scores had shorter CCC and lower working capital requirements, primarily due to environmental and social factors, suggesting that more sustainable companies generally need less working capital than their peers.

H_{o1}: There is no significant relationship between corporate sustainability performance and working capital management efficiency.

RESEARCH METHOD

This study used an ex-post facto design, analyzing seventy non-financial firms listed on the Nigerian Exchange Group from a total of 107, over a decade from 2014 to 2024, using a purposive sampling technique. The sample was selected through purposive sampling and involved secondary data. The quantitative approach included descriptive statistics followed by panel regression techniques to explore variable relationships.

The study focuses on WCM as the dependent variable, measured through two indicators: cash conversion cycle (CCC) and WCM score (WCMES) in selected Nigerian firms. CCC, recognized for its comprehensive nature in empirical research, indicates a firm's liquidity by measuring the time taken to convert cash outflows into inflows (Moin, 2023; Trans et al., 2017). A shorter CCC suggests a more aggressive WCM strategy (Trans et al.,

2017). Consistent with prior studies and following the methodology of Enqvist et al. (2014), Barros et al. (2022), and Moin (2023,), the firm's cash conversion cycle (CCC) will be computed in terms of days using the following formula:

CCC = No. Of Days Accounts Receivable + No. Days of Inventory – No. Of Days Accounts Payable

Where each component of CCC is calculated as follows:

Number of Days Account Receivable = (Accounts Receivables ÷ Sales) x 365

Number of Days Account Inventory = (Inventory ÷ Cost of Goods Sold) x 365

Number of Days Account Payable = (Accounts Payable ÷ Cost of Goods Sold) x 365

The second indicator of dependent variable is the WCM efficiency score (WCMES), which is computed using the non-parametric SBM-DEA model. In the domain of working capital management, prior research asserts that DEA is superior to central-tendency measures (such as mean-based ratios) because it identifies benchmark firms that demonstrate optimal transformation of short-term assets and liabilities into financial returns. By focusing on best-performing decision-making units (DMUs), DEA highlights practical improvement targets for less efficient firms an analytical capability that ratio methods cannot provide (Mourad et al., 2022). The method is therefore well aligned with the study's objective of evaluating firm-level efficiency in a way that supports continuous improvement rather than simple comparative assessment.

Among DEA models, the Slack-Based Measure (SBM) is particularly effective due to its incorporation of input and output slacks in the efficiency score. This allows for a detailed assessment of inefficiencies in WCM, which often stem from excessive receivable days, unnecessary inventory, and suboptimal trade credit use. The SBM model's dual focus on minimizing delays and maximizing financial performance aligns with the concept of balancing liquidity management and profitability in working capital management. This is chosen for continuous improvement because it focuses on the best practices of the companies being studied, as opposed to conventional methods that rely on central-tendency metrics (Habib, 2022; Mourad et al., 2022; Shahwan & Habib, 2021).

The specification of inputs and outputs in DEA-based efficiency models is crucial for ensuring the robustness and interpretability of efficiency scores,

particularly in working capital management (WCM). This study defines inputs and outputs based on theoretical expectations and empirical evidence, emphasizing the Receivables Period, Inventory Period, and Payables Period as key input variables. These represent manageable factors that influence cash flow and minimize liquidity constraints. Return on Assets (ROA) serves as the output variable, reflecting the financial performance linked to efficient short-term asset utilization.

Every DEA model requires specific inputs and outputs to evaluate efficiency. In this study, three inputs, denoted as X_1, X_2, and X_3, and one output, denoted as Y_1, will be used to estimate WCM efficiency. These inputs and output are adopted from the methodologies of Seth et al. (2024) and Karki et al. (2024).

Inputs:

X1 – Receivables period = (Account receivable / Sales) x 365

X2 – Payable Period = (Account payables / Purchases) x 365

X3 – Inventory period = (Inventory / Cost of Sales) x 365

Output:

Y1 – Return on Assets = (Earnings before interest and taxes / Total Assets

In this study, independent variables include the ESGC score, derived from the reliable Refinitiv Eikon database, which has been cited in over 1,200 academic articles over the last 15 years. ESG scores, ranging from 0 to 100, are used rather than letter grades, and reflect performance from category A (leaders) to D (laggards). The ESG Score is calculated through a bottom-up approach with over 500 data points across 186 metrics grouped into ten categories under the Environmental, Social, and Governance pillars. Each pillar consists of specific categories of metrics focusing on Resource use, Emissions, Innovation for Environmental; Workforce, Human rights, Community, and Product responsibility for Social; and Management, Shareholders, and Corporate social responsibility strategy for Governance.

Model Specification

$$\mathrm{CCC} = f\,(\mathrm{ESGP}, \mathrm{FS}, \mathrm{LEV}, \mathrm{CR}) \ldots\ldots\ldots 1.1$$

$$\mathrm{WCMES} = f\,(\mathrm{ESGP}, \mathrm{FS}, \mathrm{LEV}, \mathrm{CR} \ldots\ldots\ldots 1.2$$

$$CCC_{it} = \alpha_0 + \alpha CCC_{it-1} + \alpha_1 ESGP_{it} + \alpha_2 FS_{it} + \alpha_3 LEV_{it} + \alpha_4 CR_{it} + \omega_i + \varepsilon_{it} \quad (1.3)$$

$$WCMES_{it} = \alpha_0 + \alpha WCME_{it-1} + \alpha_1 ESGP_{it} + \alpha_2 FS_{it} + \alpha_3 LEV_{it} + \alpha_4 CR_{it} + \omega_i + \varepsilon_{it} \quad (1.4)$$

Where:

CCC_{it-1}= lag of the dependent variable

$WCME_{it-1}$= lag of the dependent variable
CCC = Cash Conversion Cycle
WCMES = WCM Score
ESGP = Environmental, Social, and Governance Performance
FS = Size
LEV = Leverage
CR = Current Ratio

$\alpha_0 = intercept$
$\alpha_{1-\alpha_4 = Estimated\ Parameters}$
$\varepsilon_{it} = Stochastic\ Error\ Term$
ω_i = Fixed-effect error term
ε = independent term and $\varepsilon \sim N(0, \sigma^2\varepsilon)$
Note the subscription index "it"
i = i_{th} cross-sectional unit, i = 1, ….., N
t = t_{th} time period, i = 1, …., T

RESULTS AND DISCUSSIONS

Descriptive Analysis

Table 1 Summary of Descriptive Statistics

	CCC	WCMES	ESGP	FS	LEV	CR
Mean	-34805.32	51.1949	0.4949	10.2364	0.7044	1.4597
Median	-17.274	5.1603	0.4923	10.1305	0.6055	1.0993
Maximum	64163.28	7047.335	0.9138	12.992	15.161	36.4101
Minimum	-139976	0.0000	0.0590	7.7667	0.0322	0.0061
Standard Deviation	598751.1	389.5474	0.1708	0.9561	0.7467	2.3925
Skewness	-20.5024	14.4243	0.0473	0.1649	11.616	9.1435
Kurtosis	442.6374	236.6683	2.5016	2.5841	199.197	107.590
Jarque-Bera	6255046.	1778480.	8.2557	9.0401	1252310.	361692.7
Probability	0.0000	0.0000	0.0161	0.0108	0.0000	0.0000
Sum	-268000	39420.09	381.094	7882.059	542.406	1124.005
Sum Sq. D.	2.76E+14	1.17E+08	22.4276	703.0850	428.867	4401.915
Observations	770	770	770	770	770	770

Table 1 denotes the results of estimated descriptive statistics for each variable. The mean CCC was -34805.32, signifying the average cash conversion circle. The adverse mean indicates that, on average, Nigerian listed firms receive cash inflows from customers before settling obligations with suppliers, implying reliance on trade credit and efficiency in receivables collection. The substantial standard deviation of 598751.1 indicates considerable variability and highlights the wide disparities in working capital practices across firms. These observations align with the expectation that corporate sustainability (ESG performance) could serve as a driver of more consistent efficiency in working capital management. Firms with stronger ESG commitments may foster better relationships with stakeholders, suppliers, and customers, which in turn facilitates improved credit terms, trust, and supply chain efficiency (Eccles et al., 2014).

The mean of WCMES was 51.1949, indicating that the working capital efficiency of sampled firms was above 50 percent, which is still encouraging but shows inefficiencies, with most firms clustered at low scores, while only a few achieve high efficiency. This result is consistent with prior studies highlighting inefficiencies and sectoral differences in working capital practices within emerging economies. The data is characterized by a noteworthy standard deviation of 389.5474, suggesting substantial variability. The Jarque-Bera test rejects the normality assumption (p-value = 0.00), further confirming the non-normal distribution.

The result further indicates that the average aggregate ESGP was 0.4949, which means that sampled firms performed their ESG at about 50 percent, respectively, and this suggests Nigerian firms are at moderate sustainability adoption levels. The substantial standard deviation of 0.1708 indicates considerably low variability across the firms.

Correlation Analysis

The correlation matrix is used to investigate the relationship between each explanatory variable and the criterion variable, as well as to check for multicollinearity. Before moving on to regression estimations, this approach looks at the pairwise linear correlations and evaluates the possible danger of multicollinearity.

Table 2 Correlation Matrix

Correlation Probability	CCC	WCMES	ESGP	FS	LEV	CR
CCC	1.0000					
WCMES	0.0074	1.0000				
ESGP	-0.0112	-0.0576	1.0000			
FS	0.0352	0.0332	0.0585	1.0000		
LEV	-0.1731	-0.0179	0.0574	-0.1116	1.0000	
CR	0.0337	0.0084	0.0361	-0.1062	-0.146	1.0000

The findings from the correlation matrix in Table 2 show that WCMES has a favorable and weak association with CCC, given a coefficient (0.0074. This implies that there is a link between CCC and WCMES. The Table also revealed that ESGP has a weak adverse relationship with CCC and WCMES, given coefficients of (-0.0112 and -0.0576). On the part of the control variable, FS had a weak and favorable association with CCC and WCMES, given coefficients (0.0352 and 0.0332). Leverage had a strong adverse and noteworthy association with CCC and WCMES, given coefficients of (-0.1731) and -0.0179). In addition, the current ratio had a weak favorable association with CCC and WCMES, given a coefficient of (0.0337 and 0.0084). Other regressors have a relatively weak relationship since their correlation coefficients are not up to 0.5.

Hence, the problem of multicollinearity did not occur. These results imply that the hypothesized relationships among corporate sustainability, inflation, and WCM are unlikely to be explained by simple

Variance Inflation Factor (VIF)

The VIF was used to harshly determine multicollinearity among the explanatory variables in the study. According to Wooldridge (2016), a VIF value greater than 10 can be taken as good evidence of strong multicollinearity between the independent variable and the rest. Additionally, luckily, we did not find any explanatory variable with a VIF of more than 10.0 as shown in Table 3 This observation highlights the strength of our model and boosts the accuracy of our findings.

Table 3 Variance Inflation Factor (VIF)

	CCC			WCMES		
Variable	Coefficient Variance	Uncentered VIF	Centered VIF	Coefficient Variance	Uncentered VIF	Centered VIF
C	5.86E10	129.0603	NA	25440.67	129.0603	NA
ESGP	1.57E10	9.5091	1.0105	6839.152	9.5091	1.0105
FS	5.14E08	119.688	1.0339	223.2140	119.688	1.0339
LEV	8.51E08	1.975	1.0446	369.7269	1.9753	1.0446
CR	826370.0	1.4289	1.0409	35.89429	1.4289	1.0409

Panel Generalized Method of Moments

Table 4 Estimated Panel Generalized Method Of Moments

		CCC	WCMES
CCC (-1)	Coeff.	-0.2642	
	t-stat	-5.1706	
	Prob.	0.0000	
WCMES (-1)	Coeff.		-0.0720
	t-stat		-3.1317)
	Prob.		0.0064
ESGP	Coeff.	-0.4769	-0.4564
	t-stat	-3.5718	-3.0606
	Prob.	0.0040	0.0098
FS	Coeff.	0.2946	0.2180
	t-stat	2.1295	3.7666
	Prob.	0.0360	0.0008
LEV	Coeff.	0.4105	0.2344
	t-stat	6.5428	3.7405
	Prob.	0.0000	0.0006
CR	Coeff.	0.6181	8.1022
	t-stat	3.1208	9.0987
	Prob.	0.0067	0.0000
SARGAN TEST J-STAT		41.6181	46.3443
PROB(J-STAT.)		0.2047	0.2270
AR (2)-P-VAL		0.2573	0.7221
WALD TEST		2119886.2(0.0000)	74316.43(0.0000)
INSTRUMENT RANK		70	70

T-stat. values ( ), P<0.10*, P<0.05**, P<0.01***

Table 4 presents the results of the panel Generalized Method of Moments (GMM) estimation, which investigates the relationship between corporate sustainability performance (aggregate ESG score) and WCM of listed firms in Nigeria. The results from Table 4 show that the aggregate ESGP had an adverse and noteworthy influence on WCM - CCC (t-val -3.5718, P<0.05). This finding indicates that higher ESG performance is linked to a longer cash conversion cycle. Firms investing more in environmental, social, and governance practices often face delays in converting inventories and receivables into cash inflows, suggesting inefficiencies in managing these assets. Companies should reassess their processes to balance sustainability efforts with operational performance. This suggests that ESG activities may increase operational costs, constrain liquidity, and prolong the cycle of cash recovery in the short run. In emerging markets like Nigeria, where access to affordable capital is limited, such additional expenditures could undermine immediate operational efficiency.

Similarly, the results reveal that ESGP has an adverse and statistically

noteworthy effect on WCMES (t-val -3.0606, P<0.05). This implies that improved ESG practices reduce the efficiency score of WCM. In other words, despite the long-term reputational and strategic benefits of ESG, the immediate effect is to weaken firms' ability to utilize working capital resources optimally. In addition, the adverse impact on WCMES suggests that firms prioritizing sustainability may struggle with efficient management of working capital. This inefficiency can lead to cash flow challenges, making it more difficult for firms to meet short-term obligations, invest in growth opportunities, or handle unexpected expenses. The adverse effect on WCMES suggests that sustainability investments, while valuable, may divert resources away from core operational activities that directly improve efficiency**.** On the part of the control variable, the results revealed that the firm size had a favorable and noteworthy influence on WCM-CCC (t-val= 2.1295, P<0.05) and WCMES (t-val= 3.7666, P<0.05). This implies that larger firms enjoy economies of scale, stronger bargaining power, and greater access to financial markets, which enable them to manage working capital more efficiently. The finding is consistent with prior evidence that larger firms often maintain lower cash conversion cycles due to better supplier and customer negotiation advantages (Baños-Caballero et al., 2014). The leverage had a favorable and noteworthy influence on WCM-CCC (t-val 6.5428, P<0.05) and WCMES (t-val 3.7405, P<0.05). This indicates that more highly leveraged firms, possibly under the pressure of debt obligations, adopt stricter working capital policies to maintain liquidity. While excessive debt could introduce financial rigidity, the result suggests that, in the Nigerian context, moderate leverage encourages firms to optimize resource allocation and improve efficiency, consistent with the discipline hypothesis of debt.

Furthermore, the current ratio had a favorable and noteworthy influence on WCM-CCC (t-val= 3.1208, P<0.05) and WCMES (t-val= 9.0987, P<0.05). This underlines the fact that more liquid firms can easily satisfy the immediate requirements and cope with the with the working capital cycles. This finding reflects the importance of liquidity buffers in ensuring operational stability and efficiency (Aktas et al., 2015). This can facilitate better decision-making regarding resource allocation and help avoid cash flow constraints that could hinder day-to-day operations. The post estimation tests based on second order auto regression AR (2) and Prob (J-statistic) test show (0.2573)

and (0.7221). Since these are above the 5% significance level, the null hypothesis of instrument validity cannot be rejected. This confirms that the instruments used in the GMM estimation are appropriate and not correlated with the error term, that is, all the instruments are valid, and the model has a good fit for prediction. The Arellano-Bond AR (2) test returns non-noteworthy p-values (0.2573 for CCC and 0.7221 for WCMES), indicating the absence of second-order autocorrelation. This validates the consistency of the GMM estimators. However, the W*ald test* (x^2=p-val<0.05) disclosed that corporate sustainability performance had a noteworthy effect on WCM of listed firms in Nigeria.

Discussion of Findings

The finding showed that aggregate ESGP had an adverse and noteworthy influence on CCC. This implies that an increased level of participation in ESG activities is related to an increased cash conversion cycle, which implies inefficiency in the use of liquidity in the short term. This negative effect of ESGP on the CCC means that companies that have a greater ESG involvement will require more time to turn investments into inventory and receivables to cash. This is a long cash conversion cycle that indicates liquidity inefficiency due to the use of working capital in sustainability-related activities including (García-Sanchez et al., 2020).

This finding can be explained within the stakeholder theory, which argues that firms allocate resources toward fulfilling stakeholder expectations (Freeman, 1984). While such commitments enhance long-term legitimacy, they may divert funds away from operational needs, increasing working capital burdens (Barros et al., 2022). The investors and stakeholders might perceive firms with a noteworthy adverse ESGP effect on CCC as potentially riskier, particularly concerning liquidity (Saha & Khan, 2024). This perception could affect investment decisions, as investors may prefer firms with efficient cash flow management, possibly leading to lower valuations for those with prolonged CCCs due to sustainability efforts (Zimon & Tarighi, 2021).

The results further showed that ESG performance significantly reduces the WCMES; this suggests that sustainability investments undermine the optimal use of working capital resources. The fall of the WCMES signals that ESG-motivated companies can work below optimum levels of efficiency in their short-term asset and liability management because their working capital resources are strained between competing operational and sustainability demands. In the resource-based perspective, ESG capabilities may be strategic resources that deliver long-term competitive advantages.

However, RBV also emphasizes

that resources must be rare, valuable, and well-integrated to yield benefits (Barney, 1991). In Nigeria, many ESG practices are compliance-driven rather than strategically integrated, which explains their adverse effect on efficiency. Firms with lower WCME scores may find it harder to attract investment, and Investors typically favor companies that demonstrate efficient management of working capital, as it reflects overall financial health. Implementing sustainable practices often requires upfront investments or changes to existing processes. If these changes adversely affect working capital efficiency, firms might face higher operational costs, which can strain financial resources and reduce the funds available for daily operations. The Nigerian listed firms have made substantial investments in energy-efficient technologies, waste management systems, and community development projects. Although these initiatives align with sustainability goals, they tie up noteworthy working capital resources that could otherwise enhance operational liquidity. Similarly, some firms have adopted socially responsible practices involving staff welfare programs and host-community investments. These activities, while enhancing corporate reputation, increase short-term expenses, extend payment periods to suppliers, and delay cash recovery from customers, thus lengthening the CCC and reducing working capital efficiency**.**

The findings revealed that corporate sustainability performance exerts an adverse and statistically noteworthy effect on both (CCC and the WCM score (WCMES). These dual effects provide empirical evidence that, in the Nigerian context, the pursuit of sustainability objectives may temporarily undermine firms' working capital optimization and liquidity cycles. While sustainability initiatives build long-term legitimacy, risk mitigation, and reputation, they often generate short-run trade-offs with cash flow management and efficiency. However, the favorable contributions of firm size, leverage, and liquidity suggest that financially stronger firms are better positioned to absorb the costs of ESG compliance and sustain efficiency.

Empirical evidence provides mixed support. On one hand, this finding is supported by Habib et al. (2024), who revealed that a firm's sustainable investment practices significantly and negatively affect its working capital. The study indicated that firms actively engaging in sustainable investment practices are more efficient in managing working capital for their business operations' long-term sustainability (Habib et al., 2024). Also, findings discovered from the work of Mathath and Kumar (2024) revealed that a negative link

exists between ESG disclosure and the cash conversion cycle, which underscores the role of ESG disclosure in increasing suppliers' willingness to extend trade credit and facilitating efficient working capital management practices. On the other hand, studies such as Barros et al. (2022) and Karki et al. (2025) showed that firms with high ESG performance better manage short-term liquidity.

The results of this study are limited to the data collected from the reports of listed companies, which limits the generalizability of the findings to the entire Nigerian corporate landscape. This focus means that the conclusions drawn may not accurately reflect the dynamics present in other sectors or among non-listed firms and financial sectors. Additionally, the study did not consider other important factors, such as economic performance and other macroeconomic indicators, such as interest rate, which can significantly influence a company's WCME.

CONCLUSION

These findings emphasizes that ESG (Environmental, Social, and Governance) engagement in Nigerian firms, while associated with short-term liquidity challenges, is a strategic investment yielding long-term benefits. It recognizes that immediate operational inefficiencies do not undermine the economic value of ESG; instead, they reflect the adaptation process in transitioning to sustainable business models. Over time, improvements in regulatory frameworks and sustainable financing may alleviate liquidity issues, leading to greater efficiency, enhanced investor confidence, and sustainable profitability. This study concludes that ESG integration within Nigerian firms is a double-edged financial strategy imposing short-term liquidity costs but fostering long-term competitive resilience, reputational capital, and strategic stability.

Based on the empirical findings and contextual realities, the following recommendations are made: firstly, Regulatory authorities, the SEC, and NGX should expand green finance and ESG-linked credit facilities to reduce the liquidity burden of sustainability investments. In addition, firms should embed ESG considerations into their financial and operational planning frameworks. Sustainability projects should be phased and aligned with the firm's cash flow capabilities to prevent overextension of liquidity. Integrating sustainability expenditures within working capital budgeting will help firms strike a balance between ESG goals and liquidity preservation. Tools such as supply chain financing, vendor partnerships, and green procurement credits can help shorten the cash conversion cycle even when ESG expenditures are rising.

Lastly, while the push for sustainability disclosure is laudable, regulators should adopt a phased implementation approach that recognizes sectoral and firm-size differences. Small and medium-sized listed firms, in particular, may require grace periods, tax reliefs, or compliance support to transition smoothly into ESG reporting regimes without compromising liquidity. This context-sensitive approach will prevent sustainability compliance from evolving into a financial burden that stifles operational efficiency (SEC, 2024).

Suggestions for Further Study

Future studies should extend this analysis by examining the lagged and long-term effects of ESG performance on working capital efficiency to determine when the liquidity trade-off transitions into financial gains. Researchers could indeed expand on this study by exploring different sectors, such as the financial sector and non-listed firms. By conducting an inter-sectoral analysis, they could provide a broader understanding of WCME in Nigeria. Investigating these sectors would allow for a comparative assessment of how corporate attributes affect market value in varying contexts, revealing industry-specific trends and challenges

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