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The relationship between working capital management and corporate returns of cement industry of emerging market

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Abstract

This study examines the influence of working capital cycles on financial performance of cement industry of Nigeria with a sample of all the listed cement companies in the Nigerian Stock Exchange for the period 2007 to 2018. Correlation and regression analysis were used tools of analysis. Financial performance was proxy by return on assets and return on equity. The study show that a shorter inventory conversion period, account payable period and a longer account collection period enhances the return on asset while a shorter inventory conversion, account collection and account payable periods enhances the return on equity.

KEYWORDS

Cement industry, emerging economy, Nigeria, return on assets, return on equity, working capital cycle

1 | INTRODUCTION

Obviously Nigeria has been passing through auster economic period and the survival of any manufacturing firm in the country warrants continuous efficiency in managing the production operations along with the financing and investing decisions. Due to the declining mood of employable spaces in the labour market in the country, the government is currently encouraging the citizens to venture into entrepreneurship. Entrepreneurship is one of the core courses taught in the tertiary institutions in Nigeria. Currently many people are now seeing it is inevitably exciting to chart one's own vision in creating wealth as a means of livelihood. From this perspective, many desire to be an entrepreneur. The long-run sustainability of entrepreneurship space remains dependable on the ability and success of financial management function. This long-run survival can only be possible through efficient management of working capital (WC).

Evidence in the literature repeatedly points towards poor WC management (WCM) as one of the more common reasons for corporate failure. Personal interactions with some operators of small businesses in Nigeria indicate that many of them are not very good at managing their WC and this a major problem of small business operators. This may be the major cause of their high failure rate compared with that of large business. This is because poor WCM can affect all areas of operations of the firm, creating problems such as delay in production, accumulation of unpaid invoices, suppliers withholding delivery against payment of long outstanding bills, unable to meet interest charges, thereby escalating the level of outstanding debt, postponing major repairs and maintenance among others. These may affect the availability of inputs, thereby lowering capacity utilization, worsening internal cash generation and consequently, worsening WC position. Even good businesses can collapse because of lack of proper management of WC. During the life of a business, the frequent lack of liquidity to meet current obligations on their due dates is not a welcoming situation and may cause business failure. This may also be aggravated by heavy borrowing which bring along a heavy interest burden to a small business. Therefore, effective WCM lies at the heart of a

successful financial health of every enterprise. The major non-cash WC items are the inventories, credit sales (debtors) while the key financier of WC is the spontaneous short-term external financing from credit suppliers. These are seen as the main issues in WCM of any manufacturing outfit. However, the question has been, is there a connection between the management of these key items and the performance of the firms? Discussions on this issue by other scholars have been done in the perspective of different economies with different firms from different sectors.

Cement occupies a critical position in the infrastructural development of any nation. Cement production business has a huge market in Nigeria and it is a critical area any articulate investor can explore. In Nigeria, cement is a very important raw material input in the construction and housing industries and contributes to the development of infrastructural facilities. Essentially, for any building and construction works to take place in Nigeria there must be need for cement. Currently the infrastructural facilities development in most emerging economy is still at embryonic stage a lot more infrastructural development is being expected in order to improve the economy. People are demolishing their mud houses and rebuilding them with cement blocks and castings. As population is also increasing, the need for shelter will be on the increase and housing made of cement is in vogue. From the sample pictures of roles of cement in a developing economy, it is a sector that cannot be neglected, especially in empirical studies on WCM. It deserves separate treatment based on its unique importance in providing the infrastructural facilities for the take-off of other manufacturing outfits. There used to be five listed cement firms in Nigeria but as at date only three cement firms are operating in the cement sector of Nigeria. One of them called NigerCem refused to come up again after series of terminal problems that bedevil it since the 1980s. Benue cement was acquired by Dangote cement while Ashaka Cement and WAPCO were acquired by Lafarge Africa. The failure of the cement plants has been blamed generally on the ineffective utilization of resources. Due to the significant impact of cement, the manufacturers are enjoying sellers' market with little competition. As a result, more people are eyeing the sector as a means to explore their entrepreneurial skill.

Despite the importance of cement industry in wealth creation and generation of employment, no specific empirical studies have been carried out to examine the impact of WCM on the financial performance of the cement firms in many emerging economies. Most of the previous studies focused their analysis majorly on all manufacturing firms (Makori & Jagongo, 2013; Nzioki, Kimeli, Abudho, & Nthiwa, 2013), others focus on developed markets (Deloof, 2003; Peel & Wilson, 1996; Shin & Soenen, 1998). Some other studies generalized the effects of WCM on companies without mentioning specific sectors (Mathuva, 2010; Oloo & Mwangi, 2014). Therefore there is need to establish the importance of WCM in the performance of cement plants with particular interest in cement manufacturing plants in Nigeria. This study that spanned over a period of 12 years from 2007 to 2018 provides useful insights on the impact of WCM in cement industry in an emerging economy. It aims to contribute to the literature by establishing the extent of the impact of each of the WC cycles (WCC) on the financial performance of the cement plants in order to validate the findings of previous studies on WCM. The novelty of this study lies in the geographical location of the study and the methodology adopted. The data on all the three cement firms listed on the Nigerian Stock Exchange (NSE) for the period 2007 to 2018 were used thereby making it the most current study in the cement industry in emerging economies. In order to have a balanced analysis and account for the differences in individual firm characteristics, the study controlled for size, gross WC to total asset ratio (WCR), current financial liabilities ratio (CLR), sales growth rate (SGR), size of the firm (FSZ), gross WC to turnover ratio (WCT) and total financial leverage (TDR) of which other studies employ one or two of these control variables. These are captured in the models of 11 variables each. Financial performance was proxied by both return on assets (ROA) and return on equity (ROE) and not one as observed in most studies. The liquidity surrogate, which is the cash conversion cycle (CCC), was used in disaggregated form.

For the purpose of the study, we hypothesize that the wcc namely the inventory conversion period (ICP) and the accounts collection period (ACP) have inverse and significant relationship with corporate returns while accounts payable period (APP) has inverse and significant relationship with corporate returns of the cement plants. This paper was arranged in five sections. The introduction is in section one, the review of related literature is in section two, the data and methods are displayed in section three, the results and discussion are shown in section four while the paper was concluded in section five.

2 | LITERATURE REVIEW

Working capital is a trading capital that changes form and substance during the normal course of business operations. Its efficient management involves planning and controlling current assets and current liabilities in a manner that eliminates the risk of inability to meet due

short-term obligations and also avoid excessive investments in some assets and excessive borrowing. The need to maintain an adequate WC cannot be over-emphasized as it is the life-blood of any business. Inadequate WC provision has been blamed as a major cause of failure of small businesses in many developed and developing countries (Rafuse, 1996). Padachi (2006) stated that the amounts invested in WC are often high in proportion to the total assets employed and so it is vital that these amounts are used in an efficient and effective way. If resources are trapped at various levels of production it will extend the CCC which may affect the profitability unfavourably. Granting more trade credit to customers can adversely affect profitability. If the benefits of holding inventory exceed the costs tied up in it profit will be enhanced. Accounts payable as a short-term source of finance helps to reduce cash operating cycle though it has an implicit cost where discount is offered for early payment. Small firms are vulnerable to changes in the level of WC as they use a relatively high proportion of current assets with less liquidity, volatile cash flows, and a high reliance on short-term debt. They need to address WCM issue more seriously.

Cash collection policy of the listed firms is proxy by account receivable period. It is computed as average accounts receivable divided by sales, all multiplied by 365 days. APP is proxy for how long it takes the firm to repay its short-term creditors. It is computed as average accounts payable divided by cost of sales multiplied by 365 days. CCC is proxy for the length of time it takes a firm to convert resource inputs into cash through sales less the short-term credit facilities provided by trade credit suppliers. It is computed as inventory period plus accounts receivable period less APP (Weinraub & Visscher, 1998; Deloof, 2003; Lazaridis & Tryfonidis, 2006). Current ratio (CR) is used to measure liquidity of the firms. It is calculated as current assets divided by current liabilities. Firms are expected to increase profitability as their CR falls but not below one (1) as this prevents capital from being tied up in the business process. Firm size is represented by natural logarithm of sales and WC ratio is calculated as current assets divided by sales have been used as control variables in the many studies as in Lazaridis and Tryfonidis (2006).

The results of some previous studies are highlighted below. Applying the Pearson correlation and regression data analysis technique Shin and Soenen (1998) with 58,985 firm-years period 1975–1994, Deloof (2003) with 1,009 Belgian firms 1992–1996, Dong and Su (2010) with Vietnamese firms from 2006–2008, Chatterjee (2010) with 30 listed UK firms found an inverse and strong significant relationship between the measures of WCM (inventory and receivable periods) and corporate profitability (gross operating profit) which imply that increasing firms' inventory and receivable days lead to a decreasing profit. Karaduman, Akbas, Ozsozgun, and Durer (2010) with 140 listed firms in Istanbul Turkey from 2005–2008, find a statistically significant negative association between accounts receivable, inventory days and firm profitability (ROA). Lazaridis and Tryfonidis (2006), Gill, Biger, and Mathur (2010), Dong and Su (2010), found a positive and strong significant relationship between payable period and corporate profitability (gross operating profit) which imply that significant financial success can be attained with increased payable days. Karaduman et al. (2010) found a positive and strong significant relationship between payable period and corporate profitability (return on asset). Gill et al. (2010) with 88 US listed firms from 2005–2007, find no statistically significant relationship between average payable days, average inventory days and profitability but negative association between accounts receivable and profitability. This suggests that managers can enhance the profitability of their firms by reducing the account receivable period.

Chatterjee (2010) observes a significantly negative relationship between liquidity, total debt and profitability but a significantly positive association between profitability and firm size. Gill et al. (2010) observe no significant relationship between firm size and profitability. Raheman and Nasr (2007) establish a significantly negative relationship between corporate debt and profitability but a significantly positive association between size of firm (log of sales) and profitability. Moderate use of debt and increase in sales are all very crucial in enhancing profitability. Falope and Ajilore (2009) with 50 listed non-financial Nigerian firms from 1996–2005 observe a significantly negative relationship between WCM variables (average collection period, inventory days, and CCC) and profitability (net operating profit). Lazaridis and Tryfonidis (2006) with 131 Greece listed firms from 2001–2004, find a statistically significant inverse relationship between profitability (gross operating profit) and the CCC, accounts receivables period and inventory period. With 30 Kenyan listed firms Mathuva (2010) using panel data from 1993–2008 finds a significantly negative relationship between ACP and profitability, a significantly positive association between ICP, average payment period and profitability. With 94 listed Pakistani firms from 1999–2004, Raheman and Nasr (2007) find a significantly negative association between WCM variables(average collection and inventory days, CCC, and CR) and profitability (net operating profit). Eljelly (2004) with 929 Saudi firms spread across three industries and applying correlation data analysis and regression data estimation technique, finds a significantly negative relationship between liquidity (CR), CCC and firms'

profitability. He concludes that short CCC and large firm size is associated with enhance profitability.

A significantly negative relationship between ICP and profitability was recognized by Raheman and Nasr (2007), Shin and Soenen (1998), Deloof (2003), Lazaridis and Tryfonidis (2006), Falope and Ajilore (2009), Dong and Su (2010), Chatterjee (2010), Karaduman et al. (2010). Significantly negative relationship between ACP and profitability was recognized by Mathuva (2010), Raheman and Nasr (2007), Shin and Soenen (1998), Deloof (2003), Lazaridis and Tryfonidis (2006), Falope and Ajilore (2009), Dong and Su (2010), Chatterjee (2010), Karaduman et al. (2010). Significantly positive relationship between APP and profitability was recognized by Lazaridis and Tryfonidis (2006), Gill et al. (2010), Dong and Su (2010), Karaduman et al. (2010). Significantly negative relationship between CCC and profitability was recognized by Falope and Ajilore (2009), Raheman and Nasr (2007), Eljelly (2004), Lazaridis and Tryfonidis (2006). Significantly negative relationship between CR and profitability was recognized by Raheman and Nasr (2007), Eljelly (2004). Significantly positive relationship between CCC and profitability was recognized by Mathuva (2010). Significantly positive relationship between firm size and profitability was recognized by Eljelly (2004). However, Gill et al. (2010) find no statistically significant relationship between average payable period, average inventory period and profitability but negative association between accounts receivable and profitability. Akoto, Awunyo-Vitor, Angmor (2013) examined the relationship between working capital management practices and profitability of listed manufacturing firms in Ghana covering the period from 2005-2009 using panel data methodology. The study finds a significant negative relationship between profitability and accounts receivable days; cash conversion cycle, current asset ratio, size, and current asset turnover have significant positive influence on profitability.

The implications of these findings from the literature are that increasing firms' inventory and receivable periods lead to a decreasing profit (Shin & Soenen, 1998; Deloof, 2003; Dong & Su, 2010; Chatterjee, 2010; Karaduman et al., 2010) while increasing payable period lead to an increasing profit Lazaridis & Tryfonidis, 2006; Gill et al., 2010; Dong & Su, 2010; Karaduman et al., 2010). The lower the liquidity, the higher the firm size, the higher is the profitability (Chatterjee, 2010). The profitability of firm increases when they hold highly liquid assets which can easily and quickly be sold off and the revenue re-invested in other relatively higher short-term assets. Use of high level of debt is unhealthy for the financial success of the firm whereas increases in sales encourage firm profitability.

From the related literature reviewed, there is no study that specifically addressed the cement industry especially in Nigeria on the issue of impact of WCM components on corporate profitability. Some of the appropriate control variables that might impact on the dependent variables were not used in their models. The present study is an attempt to fill the gap using listed cement firms in Nigeria as manufacturing firms.

3 | METHODOLOGY

This is a correlational study as it is set to establish the relationship between two or more variables. It is also experimental as it is set to support, refute or validate a hypothesis. It is also set to establish the cause and effect relationship that existed between the input (cause) and the output (effect) variables by demonstrating what the outcome (dependent variable) would be when the input (independent) variable is manipulated. The study is a panel or longitudinal as it followed the sample over time and made repeated observations to show the patterns of change and establish the direction and magnitude of causal relationships. Therefore, for the purpose of data analysis we engaged descriptive statistics, correlation coefficients and multiple regressions. Descriptive statistics are used to determine the central tendency and normality for each variable and correlation coefficients are used to determine the strength of association between two variables.

Panel data that entail pooling several data points on each variable was used. The data on all the three cement firms listed on the NSE for the period 2007 to 2018 were collected from the approved audited annual financial reports of the firms, so the validity of the data is assured. As already discussed in the literature CCC for a firm was calculated as days of accounts receivable + days of inventory – days of accounts payable (Deloof, 2003; Lazaridis & Tryfonidis, 2006). Studies on WCM are replete with use of control variables along with the main variables of WC in order to have a balanced analysis of the effect of relevant variables that can impact on the performance of firms. Some cases on point include Smith and Begemann (1997), Deloof (2003), Eljelly (2004), Garcia-Teruel and Martinez-Solano (2007), Lazaridis and Tryfonidis (2006) among others. On the same basis of analysis this study has taken into consideration some control variables likely to relate to firm performance. These include liquidity (LIQ), gross WC to total asset ratio (WCR), CLR, SGR, size of the firm (FSZ), gross WCT and its total financial leverage (TDR). The period 2007–2018 was considered for the study because it was the period with the complete latest relevant data.

The models of this study consist of 11 variables each. Financial performance proxied by ROA and ROE served

as the response variables while liquidity surrogates are the CCC in disaggregated form which serves as the study's main input variables and current ratio (CRR). Because of the individual firm differences or characteristics, the study controlled for size, gross WC to total asset ratio (WCR), CLR, SGR, size of the firm (FSZ), gross WCT and total financial leverage (TDR). The study used the ordinary Least Squares (OLS) regression estimator. The OLS model is stated as:

$$Yit = \alpha i + \beta_1 Xit + uit \quad (1)$$

Where αi (i = 1...*n*) is the unknown intercept for each entity (*n* entity-specific intercepts), Yit is the dependent variable (DV) where i = entity and t = time, Xit represents one independent variable (IV), β_1 is the coefficient of that independent variable (IV), uit is the error term.

From the above econometric model, the following functions were deduced:

$$\text{Yit} = \text{f}(\text{financial performance})$$

But financial performance = f(ROA) and f(ROE).
Therefore,

$$\text{Yit} = \text{f}(\text{ROA}) \quad (2)$$

Also, Xit = f(WCC, Z).
Where Z represents control variables.
But WCC = f(ICP, ACP, APP, CRR) and.
Z = f(WCR, CLR, SGR, FSZ, WCT, TDR).
Therefore,

$$\text{Xit} = (\text{f}, \text{ICP}, \text{ACP}, \text{APP}, \text{CRR}, \text{WCR}, \text{CLR}, \text{SGR}, \text{FSZ}, \text{WCT}, \text{TDR}) \quad (3)$$

Therefore, to investigate the relationship between the WCC and firms' profitability we substitute Equation (2) and Equation (3) into Equation (1) and the final working model became;

$$\text{ROAit} = \beta o + \beta_1 \text{ICPit} + \beta_2 \text{ACPit} + \beta_3 \text{APPit} + \beta_4 \text{CRRit} + \beta_5 \text{WCRit} + \beta_6 \text{CLRit} + \beta_7 \text{SGRit} + \beta_8 \text{FSZit} + \beta_9 \text{WCTit} + \beta_{10} \text{TDRit} + \text{uit} \quad (1)$$

$$\text{ROEit} = \beta o + \beta_1 \text{ICPit} + \beta_2 \text{ACPit} + \beta_3 \text{APPit} + \beta_4 \text{CRRit} + \beta_5 \text{WCRit} + \beta_6 \text{CLRit} + \beta_7 \text{SGRit} + \beta_8 \text{FSZit} + \beta_9 \text{WCTit} + \beta_{10} \text{TDRit} + \text{uit} \quad (2)$$

where β_0 (i = 1...*n*) is the unknown intercept for each entity (*n* entity-specific intercepts) or the unobserved time-invariant individual effect, β_1, β_2, β_3 represent the parameter of the explanatory variable CCC components (ICP, ACP, APP). β_4 represents the partial slope coefficient of the predictor variable CRRit, β_5 represents the parameter of the independent variable WCRit, β_6 serves as the partial slope coefficient of the exogenous variable CLRit, β_7 is the parameter of the input variable SGRit, β_8 represents the partial slope coefficient of the influencing variable FSZit while β_9 and β_{10} represent the partial slope coefficients of WCTit and FDRit respectively. ROAit = return on assets of firm (i) in time (t). CRRit = current ratio of firm (i) in time (t) and so on with other variables shown in Table 1 below.

i = 1, 2.

t = 2007–2018 (12 years).

μit = Stochastic error term.

The summarized format for the calculation of each of the variables is shown in Table 1.

The researchers expected a negative effect of ICP, ACP and CR ($\beta_1 < 0$, $\beta_2 < 0$, $\beta_4 < 0$) and positive effect of APP ($\beta_3 > 0$) on firms' financial performance because, the higher the ICP, ACP and CR, the less capable the firms were in meeting their short-term financial obligations, as they had a higher proportion of asset value in the store and idle asset is barren of income generation towards making profit. A positive effect of size ($\beta_8 > 0$) on firms' financial performance was expected because the big firms can achieve economies of scale by increasing output at minimal cost per unit. Sales growth could serve as a sign for future continuous existence and of good investment opportunities hence projected to have a positive ($\beta_7 > 0$) effect (Claessens, Djankov, Fan & Lang, 2002; Maury, 2006; and King & Santor, 2008). WCR effect is expected to be positive ($\beta_5 > 0$) as more income earning assets are held likewise the WCT ($\beta_9 > 0$). A higher ratio of financial liabilities ratio (FLR) current financial liabilities to total asset provides creditors with a high level of risk and negatively affects profitability as a result of increasing cost of capital and possible case of bankruptcy. Therefore FLR is projected to have a negative ($\beta_6 < 0$) influence likewise $\beta_{10} < 0$. It was assumed that the ICP, ACP, APP, CR, WCR, FLR, growth, size, WCT and FDR would have a combined influence on the firms' financial performance which implies the partial slope coefficients would be statistically significantly different from zero or would be simultaneously not equal to zero. Thus, ($\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8, \beta_9, \beta_{10} \neq 0$).

The study adopted the descriptive and inferential techniques of data analysis. The descriptive technique

TABLE 1 Variables definitions and measurement of working capital items

	Variables	Definitions	Measurement	Abbreviation
1	ROA	Return on asset	EBIT/Total asset	EBIT/TA
2	ROE	Return on equity	Profit after tax/shareholders' funds	PAT/SHF
3	ICP	Inventory conversion period	[average inventory/cost of goods sold]*365	AI*365/COGS
4	ACP	Accounts collection period	[average trade debtors/sales]*365	AD*365/sales
5	APP	Accounts payable period	[average trade payable/ purchases]*365	AP*365/COGS
6	CRR	Liquidity = current ratio	Current asset/current liabilities	CA/CL
7	WCR	Working capital ratio	Current asset/Total asset	CA/TA
8	CLR	Current liabilities ratio	Current liabilities/Total assets	CL/TA
9	SGR	Sales growth rate	(succeeding sales - preceding sales)/ preceding sales	$(S_t–S_{t-1})*100/S_{t-1}$
10	FSZ	Firm size	Natural logarithm of total asset	LnTA
11	WCT	Working capital turnover ratio	Current assets/ sales	CA/S
12	TDR	Total debt ratio	Total financial debt/Total assets	TD/TA

Source: Researchers' compilation.

was employed to analyse both the explained and the explanatory variables while Pearson correlational technique was used to explore the relationship that existed between WCC and the firms' financial performance. The multiple regression analysis was adopted to examine the effect of liquidity on the firms' financial performance. Before the descriptive and inferential analysis of data, the Durbin–Wu–Hausman test, and the tests for multicollinearity, data normality, heteroscedasticity and autocorrelation were conducted in order to come out with the variables that were deemed fit to be used in the study and also to determine the appropriate regression estimator for the study. All the data analysis was conducted through Eview version 9 software packages with a 5% level of significance ($p \leq 0.05$).

However, it is expected that.

ICP should relate negatively with profitability in manufacturing firms as in Dong and Su (2010) and Gill et al. (2010).

ACP should relate negatively with profitability in manufacturing firms as in Dong and Su (2010) and Gill et al. (2010).

APP should relate positively with firm profitability as in Dong and Su (2010) and Karaduman et al. (2010). This is because increase in APP affords the firm more time to reinvest the creditors' money and earn some interest on it or could use it to acquire other short-term assets, turn them over, before repaying their creditors. Dong and Su (2010) and Karaduman et al. (2010) among others confirm positive relationship between APP and profitability.

CCC should have negative relationship with profitability as the shorter the cycle, the less time capital is tied up in the business process and the better for the firm and vice versa as in Falope and Ajilore (2009). Profitability is expected to increase as CR falls but not below one (1) as this prevents capital from being tied up in the business process. Eljelly (2004) observes that a significantly negative relationship exists between profitability and CR of the firms. Firm size should have positive association with profitability. The definition of all the variables in the model follows standard finance literature.

4 | RESULTS AND DISCUSSION

From Table 2, ROA and ROE which serve as the indices of firm performance had mean values of 15.39471 and 22.52096% respectively. These positive values are indications that the assets of the firms were been used efficiently to generate profits from the year 2007 to 2018. Data values of ROA could rise to a maximum of 32.05810 and could fall to a minimum of −2.1848 leading to a range of 34.2429 with *SD* of 8.380285. The *SD* value indicates that the data values of ROA were moderately dispersed from the average. The skewness value of −0.128914 shows that ROA distribution was lowly negatively skewed to the left. This is an indication that, a greater portion of the data distribution fell on the right side. In other words, the left tail of the ROA distribution is longer than that of the right tail. The kurtosis coefficient of 2.20285 (less than 3.0) shows that ROA distribution was to some extent normally distributed.

Data values of ROE could rise to a maximum of 59.37030 and could fall to a minimum of −22.04100 leading to a range of 81.41130 with *SD* of 16.14318. The *SD*

TABLE 2 Descriptive statistics

	ROA	ROE	ICP	ACP	APP	CRR	WCR	CLR	SGR	FSZ	WCT	TDR
Mean	15.39471	22.52096	117.6186	6.592072	73.64307	0.989406	0.276706	0.318464	39.72697	9.058428	0.431308	0.477339
Median	17.28610	22.88730	88.90330	3.633250	70.72155	0.858650	0.217100	0.291550	18.25615	8.854650	0.436900	0.468750
Maximum	32.05810	59.37030	217.4910	26.24300	283.0625	2.118300	0.543400	0.724400	478.5595	11.54130	0.674300	0.751200
Minimum	−2.184800	−22.04100	35.71410	0.000000	14.89920	0.073300	0.049300	0.033200	−17.78220	7.565400	0.132200	0.041000
Std. Dev.	8.380285	16.14318	60.35133	7.159798	48.73454	0.516227	0.159534	0.157599	87.22048	0.990571	0.118683	0.148932
Skewness	−0.128914	−0.255700	0.407141	1.223935	2.193065	0.364047	0.441407	0.859549	3.900458	0.351172	−0.205831	−0.385224
Kurtosis	2.202850	3.507308	1.633265	3.393296	10.48377	2.345295	1.757669	3.351981	19.29501	2.347897	2.796735	3.790141
Jarque-Bera	1.052885	0.778338	3.796530	9.220131	112.8674	1.438139	3.484121	4.618782	489.5725	1.377786	0.316174	1.826870
Probability	0.590703	0.677620	0.149828	0.009951	0.000000	0.487205	0.175159	0.099322	0.000000	0.502132	0.853776	0.401144
Sum	554.2097	810.7546	4,234.271	237.3146	2,651.151	35.61860	9.961400	11.46470	1,430.171	326.1034	15.52710	17.18420
Sum Sq. Dev.	2,458.021	9,121.081	127,479.9	1794.195	83,126.96	9.327146	0.890786	0.869314	266,259.4	34.34310	0.492994	0.776328
Observations	36	36	36	36	36	36	36	36	36	36	36	36

Source: Eview version 9 output, 2020.

value indicates that the data values of ROE were widely dispersed from the average. The skewness value of −0.2557 shows that ROE distribution was lowly negatively skewed to the left. This is an indication that, a greater portion of the data distribution fell on the right side. That is, the left tail of the ROE distribution is longer than that of the right tail. The kurtosis coefficient of 3.507308 more than 3.0 shows that the ROE values were moderately dispersed. The current ratio (CRR), a measure of the firms' ability to meet their short-term financial obligations has a mean value of 0.989406 indicates a shaky financial well-being which shows that the current asset would not be enough if the current liabilities were to be met. The CRR data was widely dispersed around the mean CRR with an *SD* of 48.73454 and lowly positively skewed to the right, that is, greater portion of CRR distribution fell on the left side. The kurtosis of 10.48377 shows wide dispersion from a normal distribution. The average size of the firms was 9.058428 with an *SD* of 0.990571 showing not too much dispersion from the mean, normally distributed. The SGR was not normally distributed.

It takes the cement plants an average period of 118 days to convert the inventory into finished product with maximum value 271 and minimum of 36 days. The firms' average period of credit granted to the customers is 7 days with maximum value 26 and minimum of zero days. The firms take an average period of 74 days to pay the creditors with maximum value 283 and minimum of 15 days. The positions of other variables on these scales are shown in Table 2.

The Pearson Product–Moment Correlation Coefficient was adopted to explore the relationship between the variables at 5% level of significance. From Table 3 the coefficients of correlation of 0.044, 0.180, 0.244 and 0.219 show there was a negative relationship between ICP, APP, CLR, FSZ, WCT, TDR and ROA which indicates that a decrease in these variables led to an increase in ROA and vice versa. The negative relation means that any negative change in the independent variables causes a positive change in the concerned dependent variables (ROA or ROE) and vice versa. ICP, APP, CLR, firm size, WCT ratio and total debt ratio show negative relation with ROA. There was a positive relationship between ACP, CRR, WCR, SGR and ROA which indicates that an increase in these variables led to an increase in ROA and vice versa. That is, there was positive relation between ROA and ACP, liquidity, WC ratio and SGR respectively. The positive relation means that any positive change in the independent variables causes a positive change in the concerned dependent variables (ROA or ROE) and vice versa. All except liquidity, WC ratio and SGR show negative relation with ROE. There was a negative relationship

TABLE 3 Correlation matrix

	ROA	ROE	ICP	ACP	APP	CRR	WCR	CLR	SGR	FSZ	WCT	TDR
ROA	1.000000	0.909109	−0.019874	0.043723	−0.156583	0.179693	0.244311	−0.142282	0.218889	−0.051428	−0.189103	−0.238193
ROE	0.909109	1.000000	−0.191556	−0.061631	−0.116917	0.021057	0.061708	−0.102756	0.339210	−0.165440	−0.220930	−0.214100
ICP	−0.019874	−0.191556	1.000000	0.171494	0.044712	0.769148	0.782329	−0.079104	−0.381926	0.795986	0.546166	−0.244144
ACP	0.043723	−0.061631	0.171494	1.000000	0.315010	−0.159182	0.352870	0.474817	0.012722	0.215812	0.123220	0.495025
APP	−0.156583	−0.116917	0.044712	0.315010	1.000000	−0.242842	0.025469	0.465892	−0.242089	−0.004896	0.126262	0.357676
CRR	0.179693	0.021057	0.769148	−0.159182	−0.242842	1.000000	0.700570	−0.485292	−0.064849	0.680274	0.515352	−0.459381
WCR	0.244311	0.061708	0.782329	0.352870	0.025469	0.700570	1.000000	0.136070	−0.148152	0.600911	0.572723	0.041033
CLR	−0.142282	−0.102756	−0.079104	0.474817	0.465892	−0.485292	0.136070	1.000000	0.004046	−0.237670	0.088405	0.744421
SGR	0.218889	0.339210	−0.381926	0.012722	−0.242089	−0.064849	−0.148152	0.004046	1.000000	−0.172288	−0.063075	0.101325
FSZ	−0.051428	−0.165440	0.795986	0.215812	−0.004896	0.680274	0.600911	−0.237670	−0.172288	1.000000	0.543906	−0.359103
WCT	−0.189103	−0.220930	0.546166	0.123220	0.126262	0.515352	0.572723	0.088405	−0.063075	0.543906	1.000000	−0.076187
TDR	−0.238193	−0.214100	−0.244144	0.495025	0.357676	−0.459381	0.041033	0.744421	0.101325	−0.359103	−0.076187	1.000000

Source: Eview version 9 output, 2020.

between ICP, ACP, APP, CLR, FSZ, TDR and ROE which indicates that a decrease in these variables led to an increase in ROE and vice versa. There was a positive relationship between CRR, WCR, SGR and ROE which indicates that an increase in these variables led to an increase in ROE and vice versa.

The findings show that the higher the ACP, liquidity, WC ratio and SGR the higher will be the rate of ROA and vice versa. The higher the ICP, APP, CLR, firm size, WCT ratio and total debt ratio the lower will be the rate of ROA and vice versa. With respect to ROE, the higher the liquidity, WC ratio and SGR the higher will be the rate of ROE and vice versa while the higher the values of all other independent variables the lower will be the rate of ROE.

Therefore, ACP, liquidity, WC ratio and SGR have positive impact on ROA while ICP, APP, CLR, firm size, WCT ratio and total debt ratio have negative impact on ROA. Working capital ratio (WCR), current FLR and total debt ratio (FDR) have positive impact on ROE while ICP, ACP, APP, liquidity (CRR), SGR, firm size (FSZ) and WCT have negative impact on ROE.

Therefore, with the control variables ACP is positively related to ROA while ICP and APP are negatively related to ROA. The implications are that the longer the ACP the higher the profitability as proxy by ROA and vice versa and the shorter the ICP and the APP the higher the profitability as proxy by ROA and vice versa. Hence, the Nigerian cement plants can increase their profitability or wealth of the stakeholders by extending reasonably their ACP and reducing their ICP and APP. Though receivable collection period affects the firm's WCC in a positive manner because longer collection period increases the length of WCC but if this is balanced by extended APP the WCC can still be at manageable level that can still power the profitability to high level. This may be the reason why the cement plants supply cement to the dealers on trust without prolonged payment period while the payments to suppliers of the raw inputs into cement production are staggered. Could this be the reason why many of the cement plants are falling by the wayside and looking for rescue through acquisitions?

Furthermore, with the control variables ICP, ACP and APP have negative impact on ROE. This means that the financial managers can increase shareholder wealth (ROE) by reducing the WCC through reduction in the ICP, ACP and APP.

From Table 4, ROA of the sampled firms registered an average value of 59.16% during the study period when all other variables were held constant while that of ROE was 99.70. ICP had non-significant negative impact while ACP, APP and CRR had insignificant positive impact on the firms' ROA. The WCR had significant positive impact

TABLE 4 OLS Regression results (dependent variables = ROA&ROE)

(a) ROA	Variable	Coefficient	*SE*	t-statistic	*p*	ROE	Variable	Coefficient	*SE*	t-statistic	*p*
	C	59.16283	19.17298	3.085740	.0049		C	99.70313	39.56180	2.520187	.0185
	ICP	−0.078444	0.056053	−1.399455	.1740		ICP	−0.128644	0.115661	−1.112245	.2766
	ACP	0.249903	0.255873	0.976669	.3381		ACP	0.006733	0.527972	0.012753	.9899
	APP	0.021764	0.027771	0.783698	.4406		APP	0.063980	0.057302	1.116543	.2748
	CRR	2.743566	8.355074	0.328371	.7454		CRR	−5.911695	17.23998	−0.342906	.7345
	WCR	51.31546	18.69045	2.745544	.0110		WCR	99.69606	38.56615	2.585067	.0160
	CLR	6.524641	17.91732	0.364153	.7188		CLR	4.487797	36.97085	0.121387	.9044
	SGR	0.017281	0.017724	0.975004	.3389		SGR	0.063739	0.036573	1.742804	.0937
	FSZ	−2.595252	2.256315	−1.150217	.2609		FSZ	−3.847058	4.655714	−0.826309	.4164
	WCT	−32.39478	12.94202	−2.503070	.0192		WCT	−48.64373	26.70475	−1.821538	.0805
	TDR	−41.87563	12.95592	−3.232161	.0034		TDR	−76.83715	26.73344	−2.874196	.0082

(b) Model summary

Model	R^2	R adjusted	Std. error of the estimate	F-stat	*p* (F-statistic)	Mean dependent var	*SD* dependent var	Durbin-Watson
ROA	0.571484	0.400077	6.490922	3.334086	.007036	15.39471	8.380285	1.350277
ROE	0.508324	0.311653	13.39346	2.584645	.026344	22.52096	16.14318	1.219093

Source: Eview version 9 output, 2020.

on ROA. WCT and TDR had significant negative impact while CLR and SGR had insignificant positive and FSZ had significant negative effect on ROA. For instance, a unit increase in ICP, WCT, TDR, and FSZ led to a 0.116544, 3.627595, 20.23190, and 30.17486 decreases respectively in ROA on the average, when all other factors were held fixed. However, the impact was not statistically significant at the 95% confidence interval except the firm size. Further, CLR of the firms positively affect ROA but the effect was statistically non-insignificant at $\alpha = 5\%$. Other variables can be depicted from Table 4a. The F-statistic value was computed to assess the collective effect of the explanatory variables on ROA and ROE. From Table 4b, the F-statistic value of 3.334086 was significant at the 95% confidence interval for the ROA model. This implies, collectively, the input variables significantly accounted for 57.15% of the variations in ROA. That is, all the independent variables had a combined significant effect on ROA at the 5% level of significance.

ROA = 59.16283–0.078444ICP +0.249903ACP + 0.021764APP+ 2.743566CRR +51.31546WCR +6.524641CLR +0.017281SGR −2.595252FSZ −32.39478WCT −41.87563TDR was finally deduced as the estimated model for the study. This implies, the partial slope coefficients ($\beta1 = -0.078444$), ($\beta2 = +0.249903$), ($\beta3 = +0.021764$), ($\beta4 = +2.743566$), ($\beta5 = +51.31546$), ($\beta6 = +6.524641$), ($\beta7 = +0.017281$), ($\beta8 = -2.59525$), ($\beta9 = -32.39478$), and ($\beta10 = -41.87563$), for ICP, ACP, APP, CRR, WCR, CLR, SGR, FSZ, WCT and TDR were respectively simultaneously not equal to zero. Thus, *($\beta1, \beta2, \beta3, \beta4, \beta5, \beta6 \neq 0$)* and was in line with the priori expectation of the study.

The ICP had non-significant negative impact while ACP and APP had non-significant positive effect on ROE. All the other independent variables registered insignificant effect on ROE except WCR. The CRR, FSZ, WCT, TDR had a negative effect on ROE as a unit decrease in each of them led to a 5.911695, 3.847058, 48.64373, 76.83715 increases respectively in ROE on the average, when all other factors were held fixed. Further, WCR and CLR positively affected ROE but the effect was statistically insignificant from WCR. From Table 4b, the F-statistic value of 2.584645 was significant at the 95% confidence interval for the ROE model. This implies, collectively, the input variables insignificantly accounted for 50.83% of the variations in ROE. That is, all the independent variables had a combined insignificant effect on ROA at the 5% level of significance.

ROE = 99.70313 − 0.128644ICP + 0.006733ACP + 0.063980APP − 5.911695CRR + 99.69606WCR − 4.487797CLR + 0.063739SGR-3.847058FSZ − 48.64373WCT − 76.83715TDR was deduced as the estimated model for the study. This implies, the partial slope coefficients ($\beta1 = -0.128644$), ($\beta2 = +0.006733$), ($\beta3 = +0.063980$), ($\beta4 = -5.911695$), ($\beta5 = +99.69606$), ($\beta6 = 4.487797$), ($\beta7 = +0.063739$), ($\beta8 = -3.847058$), ($\beta9 = -48.64373$), and ($\beta10 = -76.83715$) for ICP, ACP, APP, CRR, WCR, CLR, SGR, FSZ, WCT and TDR were respectively simultaneously not equal to zero. Thus, *($\beta1, \beta2, \beta3, \beta4, \beta5, \beta6 \neq 0$)* and was in line with the priori expectation of the study.

Based on extant literature that supports the area of study there exists a negative relationship between ICP and ROA which lends support to that of Jose, Lancaster, and Stevens (1996), Deloof (2003), Garcia-Teruel and Martinez-Solano (2007), Raheman and Nasr (2007), Demirgunes and Samiloglu (2008). A positive relationship exists between ACP, APP and ROA which lends support to that of Deloof (2003), Raheman and Nasr (2007). There was a positive relationship between CRR and ROA which finds no support in the literature reviewed in this study. It also reveals that FSZ, WCT and TDR relate inversely with ROA which indicates that a decrease in these variables led to an increase in ROA and vice versa. Furthermore, WCR, CLR, SGR relate positively with ROA which indicates that an increase in these variables led to an increase in ROA and vice versa. There was a positive relationship between ACP, APP which indicates that an increase in these variables led to an increase in ROE and vice versa. This support the findings of Jose et al. (1996), Deloof (2003), Vishnani and Shah (2007), Garcia-Teruel and Martinez-Solano (2007), Raheman and Nasr (2007), Demirgunes and Samiloglu (2008), Mathuva (2010), Gill (2011) for ACP and the works of Deloof (2003), Raheman and Nasr (2007) for APP. There was a negative relationship between ICP and ROE. There was also a positive relationship between WCR, CLR, SGR and ROE which indicates that an increase in these variables led to an increase in ROE and vice versa. There is insignificant positive relationship between ACP, APP and the financial performance proxy by ROE of the listed companies though WCR, WCT and TDR registered significant relationship. The study therefore accepts the null hypothesis that ICP, ACP and APP had no significant effect on the firms' financial performance as measured by ROA. From the ROE perspective, no significant effect was recorded between ICP, ACP, APP, CRR and the financial performance proxy by ROE of the listed companies. The study therefore accepts the null hypothesis and concludes that WCC had no significant impact on the firms' financial performance as measured by ROE. Therefore, ICP related negatively and insignificantly with profitability in terms of ROA and ROE as in Dong and Su (2010) and Gill et al. (2010). The ACP and APP related positively with profitability in terms of ROA and ROE as in Dong and Su (2010) and Karaduman et al. (2010). The

increase in APP affords the firm more time to reinvest the creditors' money and earn some interest on it or could use it to acquire other short-term assets, turn them over, before repaying their creditors.

5 | CONCLUSION

Finally the results of the study show that an increase in liquidity, WC to total asset ratio and SGR enhance the profitability of the cement firms though not so appreciably except in WC to total asset ratio. As short-term financial liabilities, firm size, current asset to total revenue and total debt ratio depreciate the return on asset and return on equity appreciate but significantly only on current asset to total revenue, total debt ratio on ROA, total debt ratio on ROE. ICP had insignificant negative effect on ROA. Therefore, cement firms hold their inventory at shorter period by speeding up the production process and this impacted favourably on their profitability to debt and equity holders (ROA). Receivable period had positive effect on ROA. This means that the cement firm's profitability to debt and equity holders (ROA) was enhanced by increasing the length of time granted to their credit customers to pay up their debt. Account payable deferal had insignificant negative impact on ROA. That is, by speeding up payments to suppliers of the raw material inputs, there were steady supplies of raw materials, the production process moved on smoothly to churn out finished products for sale at improved profitability to debt and equity holders. For the equity holders their wealth was maximized by holding the inventory, receivables and payables periods at reasonably reduced level.

5.1 | Policy implications of the study

Cement price has been skyrocketing from N450 per 50 kg bag in 2007 to its current price of N2500 per 50 kg bag, a 455.56% increase. Ascertaining the level of effect of WCM on return can motivate the cement producers to pay critical attention to WCM in a manner that will reduce operating costs, cement market price and still maintain appreciable returns to the stakeholders. With this, the cement sellers will maintain their margin of profit and users of cement will find it affordable at cheaper cost. Moreover, one of the oldest cement firms in Nigeria, NigerCem that went into oblivion in the early 1980s as a result of WC mismanagement has been purchased by a new investor. For more than 5 years now after the purchase the investor has been retooling the cement plant to get it back to production. If the research and development department of the new set-up can go through this publication, they would be better groomed in arranging their WCM practices. Furthermore, there have been alignments and realignments among cement firms in Nigeria in order to stabilize cement production and reduce the gap in cement supply. These had led to some mergers and acquisitions in the industry. The resultant companies can draw knowledge from the results of this study with respect to managing their WC.

ENDNOTE

Source: Computed from the annual financial statements of the subject-firms.

DATA AVAILABILITY STATEMENT

Data availability statement The data that support the findings of this study are available from the corresponding author upon reasonable request.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

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APPENDIX A
(DATA IN BRIEF): Working capital data of cement companies

1 CCNN	ICP	ACP	APP	CCC	WCC	CA/CL	CA/TA	CL/TA	SG	LTA	CA/S	TD/TA	ROA	ROE
2007	192	26	121	218	97	0.84	0.51	0.61	26.18	9.9594	0.5798	0.6544	6.15	4.40
2008	211	21	132	233	100	1.14	0.47	0.41	22.82	9.9443	0.4188	0.5479	25.21	38.49
2009	168	19	123	187	64	1.11	0.49	0.44	20.15	9.9914	0.4033	0.5698	27.16	42.97
2010	182	19	120	200	81	1.21	0.49	0.41	(5.79)	10.0302	0.4727	0.5478	19.25	26.18
2011	217	14	96	231	135	1.79	0.54	0.30	24.45	10.0993	0.4843	0.4428	27.76	32.90
2012	186	8	76	194	118	1.49	0.54	0.37	8.70	10.1536	0.5116	0.4636	12.67	15.66
2013	202	1	80	203	123	1.88	0.53	0.28	4.37	10.1778	0.5041	0.3982	14.06	15.71
2014	203	1	67	204	137	2.12	0.47	0.22	(4.23)	10.1981	0.4898	0.4014	17.42	20.31
2015	213	-	52	213	161	1.67	0.41	0.25	(13.77)	10.2342	0.5388	0.4084	11.02	11.84
2016	193	-	34	193	159	1.73	0.47	0.27	8.05	10.3017	0.6743	0.4262	9.02	10.91
2017	179	-	38	179	141	1.72	0.50	0.29	39.05	10.3918	0.6291	0.4153	17.15	22.37
2018	200	-	57	200	143	1.50	0.05	0.03	61.94	11.5413	0.5448	0.0410	2.26	1.72
2.Dang	**ICP**	**ACP**	**APP**	**CCC**	**WCC**	**CA/CL**	**CA/TA**	**CL/TA**	**SG**	**LTA**	**CA/S**	**TD/TA**	**ROA**	**ROE**
2007	52	6	283	58	(225)	0.12	0.09	0.72	(9.22)	7.5654	0.6035	0.7387	5.23	13.03
2008	36	2	74	37	(36)	0.07	0.05	0.67	200.61	7.6447	0.1322	0.6884	13.49	30.14
2009	44	4	43	49	6	0.40	0.20	0.51	112.79	7.7065	0.2974	0.5241	32.06	59.37
2010	36	11	15	47	32	1.30	0.29	0.22	478.56	8.6043	0.5756	0.4739	25.72	49.80
2011	56	10	16	66	50	0.66	0.14	0.21	16.36	8.7209	0.3105	0.4352	22.85	42.24
2012	78	3	33	81	48	0.85	0.17	0.20	21.18	8.7952	0.3709	0.3395	23.73	35.43
2013	78	5	51	82	31	0.91	0.17	0.18	30.08	8.9141	0.3653	0.3034	24.51	36.79
2014	85	4	75	89	14	0.57	0.12	0.21	-	8.9838	0.3173	0.3372	19.82	29.10
2015	81	3	70	84	14	0.83	0.15	0.18	32.22	9.0457	0.3379	0.4197	18.71	28.12
2016	77	7	72	84	12	0.59	0.20	0.34	25.22	9.1841	0.4929	0.4781	11.94	23.41
2017	92	8	84	100	16	0.79	0.25	0.31	30.97	9.2216	0.5093	0.5310	18.26	26.14
2018	96	7	78	103	24	0.87	0.25	0.29	11.87	9.2290	0.4758	0.4177	19.99	39.56
3.Lafarge	**ICP**	**ACP**	**APP**	**CCC**	**WCC**	**CA/CL**	**CA/TA**	**CL/TA**	**SG**	**LTA**	**CA/S**	**TD/TA**	**ROA**	**ROE**
2007	106	-	21	106	85	1.09	0.34	0.31	(2.16)	7.7041	0.4443	0.3516	22.88	34.08
2008	128	1	25	129	104	1.03	0.30	0.29	11.92	7.7908	0.4295	0.3450	20.67	27.81

3.Lafarge	ICP	ACP	APP	CCC	WCC	CA/CL	CA/TA	CL/TA	SG	LTA	CA/S	TD/TA	ROA	ROE
2009	129	1	27	130	103	1.63	0.20	0.12	5.35	7.9403	0.3821	0.4985	10.27	11.57
2010	127	3	27	131	104	0.30	0.15	0.49	(3.84)	8.0736	0.4030	0.5924	7.14	10.11
2011	86	4	92	89	(3)	0.77	0.16	0.21	41.90	8.1835	0.4010	0.6325	7.72	15.18
2012	77	2	122	79	(43)	0.77	0.16	0.21	39.99	8.1809	0.2789	0.5498	17.56	21.40
2013	76	1	99	77	(21)	0.93	0.23	0.25	11.58	8.2038	0.3775	0.4205	19.57	30.25
2014	79	2	103	81	(22)	0.69	0.07	0.11	8.93	8.5361	0.2390	0.1949	10.23	10.25
2015	48	-	48	48	1	0.83	0.16	0.20	152.47	8.6561	0.2764	0.6112	8.94	15.33
2016	79	6	80	85	5	0.56	0.20	0.35	(17.78)	8.7011	0.4476	0.5046	(2.18)	6.79
2017	76	17	67	92	26	0.44	0.26	0.59	36.16	8.7617	0.5051	0.7283	1.36	(22.04)
2018	81	20	53	101	48	0.44	0.17	0.39	3.10	8.7330	0.3027	0.7512	4.59	(6.54)

Source: Computed from the annual financial statements of the subject-firms.