INNOVATIONS

Inventory Management and Firms Performance of Listed Manufacturing Firms in Nigeria

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Abstract

This study assessed the mediating role of cost of capital, ignored by most prior studies, on the link between inventory management and firms' performance. The study population are the 40 manufacturing firms listed for the period of 2010 to 2020 on the Nigerian stock exchange market. A total of 33 firms were found useful in this study, after excluding firms with incomplete data, leading to 363 observations. Dataset used were obtained from the Machame Ratio database compiled by Talk Data Associates. A panel ordinary least square regression and structural equation model were used for analyses in the study. The findings showed that inventory management proxied by inventory turnover ratio and inventory conversion period do not influence manufacturing firms' performance in Nigeria. In addition, despite the high and positive impact of cost of capital on firms' performance, does not exhibit a moderating effect between inventory management and firms' performance of manufacturing firms in Nigeria. It was however recommended that government should discourage the importation of substitute locally manufactured goods. Furthermore, managers should source for cheaper cost of capital and guard against diverting loans meant for inventories for other purposes.

Keywords: 1.Cost of capital, 2. Inventory, 3.Performance, 4.Structural equation modeling.

1. Introduction

Inventory is among the most important assets of companies, especially manufacturing firms. Carter (2002) observes that about 60 to 70 percent of the total funds employed by many manufacturing companies are in the form of current assets, out of which inventory has the most significant component comprising raw materials, work-in-progress and finished goods as compared to cash in hand, cash at banks amongst others. Kolias,Dimelis and Filios (2011), in their study, suggest that among current assets, more attention should be given to managing inventories of manufacturing firms because of its effect on production and profitability. They assert that improperly managed inventories tend to negatively affect firm's performance and, in the long-run, result in liquidation of organizations. Therefore, to avert such predicament, adequate efforts must be made by managers of organization to properly manage inventory since it has become 'a necessary evil'.

In management literature, the term inventory management has been used interchangeably with inventory control. It can be defined as the process of monitoring firms' inflow and outflow of inventories and at the same time preventing inventory level from being too high (overstock) and too low (understock) (Rad,2008; Tarurhor &Osazevbaru, 2021). In order to manage inventory effectually, managers give room to trade-off between 'understocking and overstocking'. For instance, it is the responsibility of finance managers to guard against overstock of inventories by minimizing or reducing the level of inventories. However, this may lead to inventory shortages that contradict the marketing manager's efforts to always have sufficient stocks to meet the demands of the final consumers. Arising from the above, inventory management results in contradictory functional objectives of a firm (Kolias, et al, 2011).

Proper inventory management (IM) averts firms' liquidity problems as it aids the quick conversion of inventories to cash and its equivalent. Kim, Mauer and Sherman (1998) argue that firms facing liquidity constraints are likely to have problems of raising external funds, hence the need for managers of firms to understand the underlying concept of cost of capital (COC) of firms. Thus, if finance managers fail to manage their liquid assets and choose to finance the firm through external sources which attract higher interest rates, then the firm's performance will be adversely affected (Alrjoub& Ahmad, 2017). In the same vein, Myers and Majluf (1984) note that the pecking order theory was developed on the premise that firms would prefer internal financing first, followed by debt and equity depending on the total amount of funds needed and other factors. In addition, prior studies have established that most firms prefer financing their businesses with short-term finance to both the medium-term and long-term funds which have lower interest rates and more profitability to firms (Ukeje, Ukpai&Eluemunor, 2007; Tarurhor, 2012). As noted by Kontus (2014), proper inventory management is derived by comparing the cost of keeping organizational inventories and the benefits of storing or holding such inventories. Thus, inventory management can be best described as a trade-off between the costs of keeping inventories as against the benefits of holding the inventories. Furthermore, the alternative use of COC to finance ordering, holding and storage cost of inventories can affect profitability of the firm.

The relevance of inventory has attracted the attention of researchers in both the academia and industries to research on the usefulness of IM on firms' performance. Moreover, it has become a core area in operation management taught in higher institutions. Past empirical studies conducted on inventory management and firms performance had mixed findings, reporting positive relationship (Huson& Nanda, 1995; Fullerton &McWatters, 2001, Prempeh, 2016, Obeidat,2021), negative relationship (Madishetti&Kibona, 2013; Sitienei&Memba, 2015; Bawa et al, 2018), no relationship (Tunc& Gupta, 1993; Balakrishnan, Linsmeier and Venkatachalam.,1996; Vastag&Whybark, 2005; Chen, Frank, & Wu, 2005) and moderating or mediating relationship (Sim&Killough, 1998; Shah & Shin, 2007; Hofer, Eroglu& Hofer, 2012; Elsayed&Waliba, 2016). Clearly, most of the above studies were carried out in developed countries where the financial system is stable, unlike developing countries that are associated with high financing cost (Alrjoub& Ahmad, 2017; Baños-caballero, García-teruel, &Martínez-solano, 2014).

Consequently upon the above, this study contributes to theoretical knowledge, empirical evidence and methodological approach of prior studies on impact of inventory management and firm's performance. However, the emphasis of this study is on the moderating role of COC on inventory management-firm performance relationship focusing on quoted manufacturing firms in Nigeria.

2.0 Literature Review and Hypotheses Development

2.1 Inventory Management and Firms' Performance

This study modified the approach of Elsayed and Wahba (2016) in grouping the literature review into five sub-headings- positive relationship, negative relationship, no relationship, reverse and inverse relationship, and mediators or moderators relationship of IM on firms' performance.

2.1.1 Positive relationship

Empirical studies have shown that inventory reduction has positive effects on firms' performance (Huson& Nanda, 1995; FsalooFullerton&McWatters, 2001). Huson and Nanda (1995) noted that firms which adopt Just-in Time (JIT) system had improvement in their earnings per share due to improvement in inventory turnover. In the same vein, Lieberman, Helper and Demeester (1999) emphasized that a ten percent (10%) reduction in inventory will give rise to one percent (1%) gain in labour production. Pong and Mitchell (2012) also found a positive relationship between profitability and inventory days-reduction which is statistically significant in their study of UK firms. Furthermore, Dellof (2003) in his study of Belguim firms, found out that lower inventories have positive effects on firms' profitability. Prempeh (2016), studied manufacturing firms in Ghana noted that a positive and statically significant relationship exist between IM and profitability. Similarly, according to Adegbie, Nwaobai, Ogundajo and Olunuga (2020) and Etale and Sawyer (2020), noted that inventory management is positively and statistically significant to firms' performance. Eneje, Nweze and Udeh (2012) in their study of brewery firms in Nigeria from 1989 to 2008, revealed that raw materials proxy for inventory management had a strong and positive statistically significant influence on profitability. They concluded that proper IM is a major driver of profitability in the breweries industries in Nigeria.

2.1.2 No Relationship

Balakrishnan et al. (1996) fathomed out that performance of inventory management was not caused by the presence of return on assets (ROA) in their study of financial benefits effect of JIT adoption in USA firms. Similarly, Vastag and Whybark (2005), established that index of reported corporate performance have no relationship with inventory management proxy by inventory turnover. In addition, Bawa, Asamoah and Kissi (2018) found that inventory management had insignificant relationship with firms' performance. They concluded that inventory conversion period, proxy for inventory management had no effect on firms' performance.

2.1.3 Negative Relationship

Fosu (2016), inventory management has a negative relationship with profitability in the study of manufacturing industries in Ghana. Moreso, Bawa et al. (2018) works supported the study of Fosu (2016) by reporting a negative and non-significant relationship between profitability and inventory conversion period. Besides, Madishetti and Kibona (2013), a significant negative linear relationship exist between profitability and inventory conversion period in twenty six Tanzanian small and medium- scale enterprises (SMEs) for a period of six years (2006 to 2011). Sitienei and Memba, (2015) in their study in Kenya, found a negative correlation between gross profit margin and inventory conversion period. Similarly, Boute et al (2007), found that inventory ratio is negatively related to return on asset (ROA). Their study concluded that companies with very low inventory ratio have more chances of being better financial performers than companies with high inventory ratio.

However, some prior empirical studies proxied IM with inventory turnover ratio, found negative correlation with profitability when measured by return on sales on retail companies in Greece (Kolias et al, 2011) and on retail in the United State of America (USA)(Gaur, Fisher & Raman, 2005; Roumiantsev&Netessine, 2007).

2.1.4 Reverse and Inverse Relationship

Panigrahi (2013) carried out a study on top five Indian cement companies for a period of ten years (2001 to 2010). Results showed an inverse linear relationship exist between inventory conversion period and profitability. However, Shah and Shin (2007) established a reverse correlation between proxy of inventory management (inventory turnover) and profitability in the USA. Their study concludes that higher inventory productivity leads to higher return on sales and vice-versa.

2.1.5 Mediators / Moderators Relationship

The effects of mediating or moderating roles on inventory management and firms' performance relationship have been established in prior empirical studies (Elsayed&Wahba, 2016; Hofer, Eroglu& Hofer, 2012; Basu& Wang, 2011; Eroglu& Hofer, 2011; Capkun, Hameri, & Weiss, 2009; Shah & Shin, 2007; Kinney &Wempe, 2002; Sim&Killough, 1998). Elsayed and Wahba (2016), organizational life cycle stage exhibits a moderating variable on the effect of IM on firms' performance. The result established that at the initial growth stage or the maturity stage of the organizational life cycle, a negative relationship exist between IM and firms' performance. Furthermore, Capkun et al. (2009) established that the positive effect of inventory reduction on organizational performance is associated by the moderating variables of inventory types. Similarly, Sim and Killough (1998) found that the introduction of moderating variables of total quality management (TQM) and performance goals has caused positive effect on proxies of manufacturing practices and management accounting system.

Arising from the results of prior studies, the following hypotheses are formulated:

H_{1a} Inventory turnover ratio has positive and significant effect on the performance of manufacturing firms in Nigeria.

H_{2a} Inventory conversion period has positive and significant effect on the performance of manufacturing firms in Nigeria.

2.1.6 Cost of Capital

Inventories required by manufacturing firms need to be properly financed to improve performance. It is, therefore, the responsibilities of finance mangers to advise management on the cost-benefit attributable to sources of finance available to investment options in order to avoid using short-term loans to finance long-term investment (Alrjoub& Ahmed, 2017). Ibrahim and Ibrahim (2015) emphasized that the traditional approach of COC supports the proposition that high cost of capital can affect the values of firms, hence efforts should be made to seek cheaper sources of finance that will reduce the cost of COC. The traditional approach suggests that a negative and significant relationship exist between firm value and COC.

Furthermore, the pecking order theory assumes that firms prefer the internal finances to external equity financing because the former is cheaper and does not disclose further information

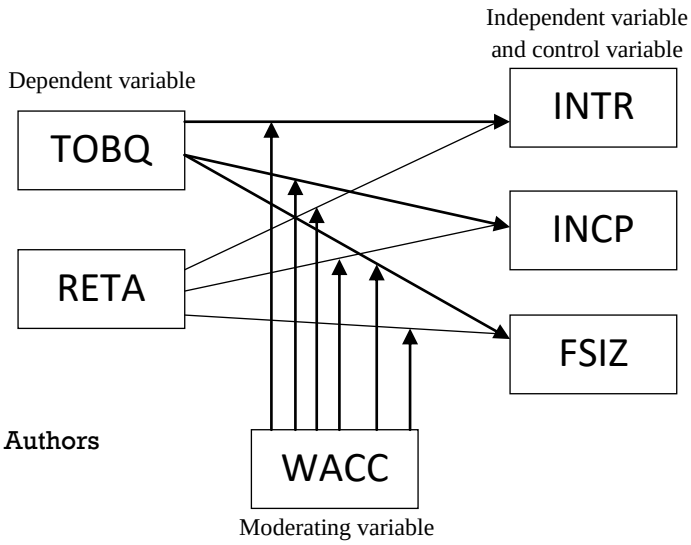
about the firm. However, Islam and Hu (2012) and Scott and Cole (2000) contended that there are situations where firms will not apply the same pattern of financing for similar projects; thus, this presumption supports the assumptions of the contingency theory. In addition, the sources of finance required, is significantly influenced by the environment in which the firm operates (Flymn, Huo& Zhao, 2010). In this regard, firms must consider their environment to choose the appropriate sources of finance to improve firms' performance in the manufacturing sector. Based on the above discussion, COC has a significant role on the relationship between IM and firm's performance. Hence, the COC is used in this study to serve as a moderating role on the effects of IM on firms' performance. Given the above, we thus hypothesized that:

H_{1b} COC moderates between inventory turnover ratio and firms' performance.

H_{2b} COC moderates between inventory conversion period and firms' performance.

Furthermore, the conceptual framework of this study captures the relationship between the dependent, independent and moderating variables as shown in figure 1.

FIG 1: Conceptual framework



Source: Authors

3.0 Methods

The population of the study were all manufacturing firms listed on the Nigerian stock exchange market for the period of 2010 to 2020. Longitudinal research design and the stratified random selection technique were adopted in this study. Thirty three firms were chosen from the total of forty firms, excluding firms with incomplete data leading to 363 observations. The manufacturing companies were chosen because of their contributions to Gross Domestic Product (GDP) and rapid changes in the manufacturing environment (Alrjoub et al, 2017). The study's dataset were obtained from MachameRatio database as compiled by TalkData Associates.

3.1 Variable Measurement

Firms' performance being the dependent variable was proxy by Tobin Q and Return on Assets, while independent variables were measured by inventory turnover ratio and inventory conversion period. In addition, firms' size was introduced as a control variable and COC as moderating variable. Table 1 depicts the measurement variables used in this study.

Table 1: Variables Connotation and Measurement

Variable	Connotation	Measurement
TobinQ	TOBQ	Market Capitalization + Total Liabilities -Cash flow divided by Total asset
Return on Assets	RETA	Profit after tax divided by Total asset
Inventory Turnover Ratio	INTR	Cost of goods sold divided by Average inventory
Inventory Conversion Period	INCP	Inventory divided by cost of goods sold multiply by 1/365
Cost of Capital	WACC	After tax weighted cost of debt plus Weighted cost of equity
Firm Size	FSIZ	Natural logarithm of sales

Source: Authors

The study's model specification for the hypotheses are estimated below.

$$TOBQ = B_0 + B_1.INTR_{it} + B_2.INCP_{it} + B_3.FSIZ_{it} + \varepsilon_{it} \quad \text{.....1}$$

$$RETA = B_0 + B_1.INTR_{it} + B_2.INCP_{it} + B_3.FSIZ_{it} + \varepsilon_{it} \text{ .....2}$$

$$TOBQ = B_0 + B_1.INTR_{it} + B_2.INCP_{it} + B_3.FSIZ_{it} + B_4.WACC.INAR_{it} + B_5 WACC.INCP_{it} + B_6 WACC.FSIZ_{it} + \varepsilon_{it} \text{..... 3}$$

$$RETA = B_0 + B_1.INTR_{it} + B_2.INCP_{it} + B_3.FSIZ_{it} + B_4.WACC.INAR_{it} + B_5 WACC.INCP_{it} + B_6 WACC.FSIZ_{it} + \varepsilon_{it} \text{..... 4}$$

Equations 1 and 2 captures the direct relationship between inventory management and firms' performance to test for Hypotheses 1_a and 2_a, while equations 3 and 4 indicate the presence of the interactive term (moderating variable) on the relationship between inventory management and firms' performance in order to test for hypotheses 1_b and 2_b, using Panel OLS and SEM. SEM analysis was added in this study to establish the effect of the moderating variable of COC on IM and firms performance(Tarurhor, 2021; Tarurhor &Emudainohwo, 2020; Civelek, 2018).

4.0 Results and Discussions

4.1 Summary Statistics

Table 2 shows the summary of descriptive statistics of variables used in this study.

Table 2: Summary of Descriptive Statistics

Variables	Obs	Mean	Std. Dev.	Min	Max
Tobq	363	1.891699	1.660287	.1241	11.2986
Reta	363	5.144207	12.53872	-70.3448	53.9594
Intr	363	4.449379	2.74738	.3421	24.0183
incp	363	119.7036	103.9438	.1334	1066.984
Fsiz	363	7.145368	.8422653	5.0927	8.7617
wacc	363	.0571749	.2599395	-1.2987	.6531

Source: Authors' Computation

Firms' performance proxy by TobinQ (TOBQ) and return on assets (RETA) showed a mean of 189% and 514% respectively. This reveals that the manufacturing firms in Nigeria had a very high performance value for the periods under study. In the same vein, inventory turnover ratio and inventory conversion period reported high mean values of 445% and 1197% respectively. Cost of raising funds was on average of 6 percent. This value supports government efforts to encourage local manufacturing firms by reducing interest rates.

4.2 Correlation Matrix

The correlation matrix in table 3 was carried out to establish whether there exist linear relationship and multicollinearity between the pairs of independent variables. The results showed a coefficient values ranging from -0.59 to 0.4485. Thus, since the reported correlation coefficient values are relatively low and less than the 0.70 threshold, suggesting the absence of multicollinearity problem (Manson, Lin & Marshall,1999), proceeding to confirmation test of variance inflation factor may not be necessary(Dimitrious& Hall, 2015).

Table 3: Correlation Matrix.

Variables	Tobq	Reta	intr	incp	fsiz	wacc
Tobq	1.0000					
Reta	0.4485	1.0000				
Intr	0.1590	0.0128	1.0000			
incp	-0.1797	-0.1720	-0.5921	1.0000		
Fsiz	0.0621	0.2934	0.1278	-0.1822	1.0000	
wacc	-0.0894	0.4252	-0.1586	0.1569	-0.0385	1.0000

Source: Authors' Computation

4.3 Regression Analysis

The study carried out Panel ordinary least square (OLS) and the structural equation model (SEM). The panel OLS model focuses on the fixed effect, random effect and hausman specification

test. Thus, the fixed effect captured individuality across each of the manufacturing firms while the hausman specification test results aided this study to choose between the fixed and random effect as shown in table 4a and 4b.

Table 4a: Hausman Specification test (Tobq)

Variables	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	Fixed	Random	Difference	S.E
intr	.0228528	.0288723	-.0060195	.0042371
Fsiz	-1.066481	-.4898168	-.5766643	.19177
incp	-.0007399	-.0008516	.0001117	.0001045
wacc	-.4298152	-.3843831	-.0454321	.0605724

chi2(4) = 10.32 and Prob>chi2 = 0.0354 Source: Authors' Computation

The test statistics of the model chi(4)=10.32 was greater than the table value chi(4)=9.49 and statistically significant at 5% since Prob>chi2=0.0354. Arising from the result, the fixed effect was reported in this study.

Table 4b: Hausman Specification test (Reta)

Variables	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	Fixed	Random	Difference	S.E
Intr	-.3917072	-.3554615	-.0362457	.0428938
Fsiz	-3.814833	1.783471	-5.598304	1.684316
incp	-.0123322	-.0150667	.0027345	.0010692
wacc	17.48969	18.64486	-1.155176	.6164732

chi2(4) = 24.14 and Prob>chi2 = 0.0001 Source: Authors' Computation

In the same vein, the test statistics reports chi(4)=24.14 which was also greater than chi(4)=7.78 table value at 1% level of significance. From the above, the random effect was not favoured, hence emphasis on analysis will be based on fixed effect approach.

Table 5 reports the fixed effects and SEM results which corresponds with the SEM diagram results as shown in Fig 2. Firms' performance measured by both TOBQ and RETA showed a negative relationship with inventory conversion period. This finding does not support hypothesis 2 and it is also at variance with prior studies of Pong and Mitchell (2012) and Panigrahi (2013). However, it is consistent with the works of Bawa et al. (2018), Sitienei and Memba (2015) and Fosu (2016).

Table 5: Fixed effects and SEM results

To bqreta

Variable	Fixed effect	SEM	Fixed effect	SEM
Intr	0.0228528	0.0449154	-0.3917072	-0.4524408
Incp	-0.0007399	-0.001942	-0.0123322	-0.030425*
wacc	-0.4298152	-0.3667789	17.48969	22.17528*
Fsz	-1.066481	0.0555918	-3.814833	4.136286*

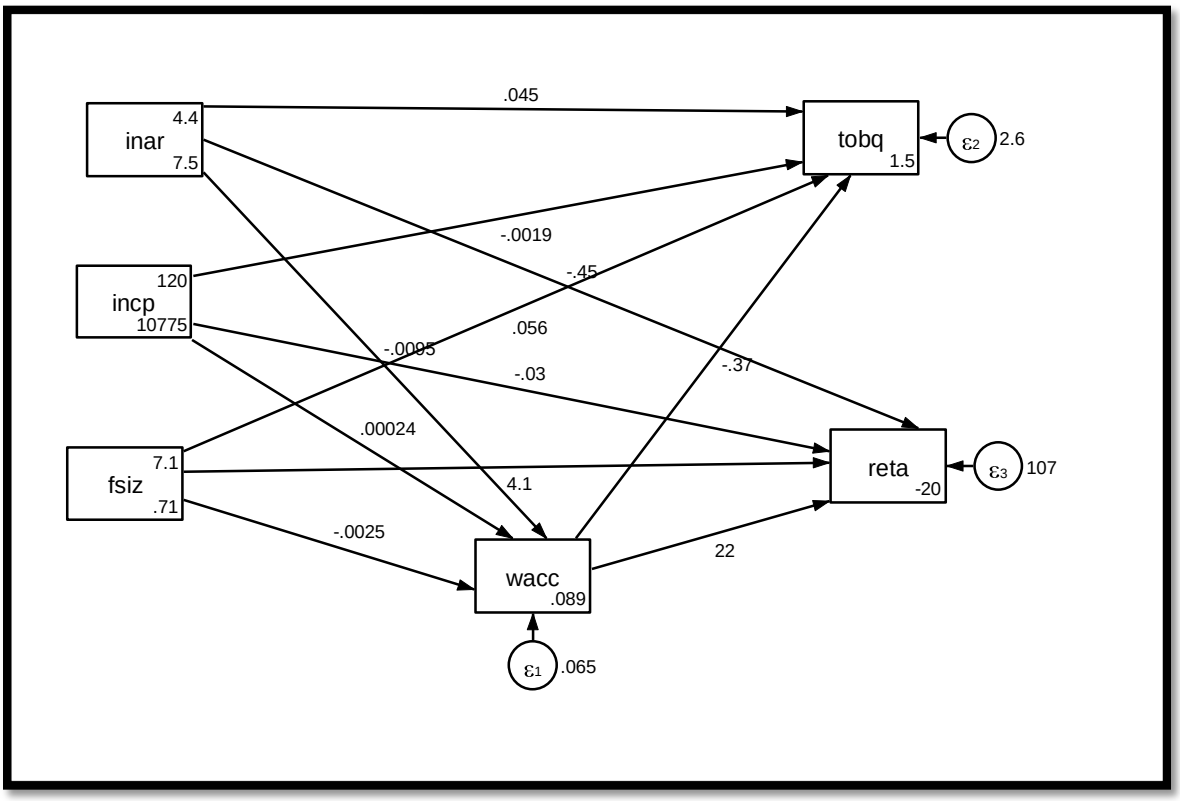
*P<0.01 Source: Authors' Computation

Furthermore, inventory turnover ratio has positive and non-significant relationship with tobq. This result supports hypothesis 1 and Obeidat, 2021). Though it is at variance with the findings of Kolias, et al. (2011), Gaur et al. (2005) and Roumianster and Netessine (2007). However, when proxied by RETA, the relationship with inventory turnover ratio became negative.

The COC which moderates between IM and firms' performance reports positive and statistical significant relationship when firms' performance was being measured by RETA. In addition, it reports a negative effect on TOBQ. This is evident that the COC plays non-significant role on the relationship between IM and firms' performance. This is at variance with the study of Alrjoub and Ahmad (2017).

In table 6, COC showed a negative and non-significant relationship with inventory turnover ratio (-0.0095485). However, its relationship with inventory conversion period was positive at 0.0002391. These findings suggest that COC has no moderating effect on the relationship between IM and firm's performance because it had no statistically significant relationship with the proxies of IM (Baron & Kenny, 1986). This finding is inconsistent with the study of Alrjoub and Ahmad (2017) which reported a moderating effect of COC on IM and firms' performance in Jordan firms with 279 observations using the generalized method of moments (GMM) estimation. However, this result supports the works of Kumar and Upadhaya (2017) and Civelek (2018) that when the sample size or numbers of observation is less than 500, the moderating effect cannot also be captured by structural equation model.

Fig 2: SEM Diagram



Source: Authors' Computation

Table 6: Moderating effect regression result

Wacc	Coefficient
Intr	-0.0095485
incp	0.0002391
Fsz	-0.0025169

Source: Authors' Computation

5. Conclusion

From the foregoing, the study examined critically the effect of COC as it moderates on the relationship between proxies of IM and the performance of manufacturing firms quoted in the Nigerian stock market. A total of 33 firms were used for the period of eleven years (2010 to 2020), giving a total of 363 observations. The results showed that inventory turnover ratio has positive relationship with tobinq and negative relationship with return on assets.

In the same vein, inventory conversion period has a negative relationship with firms' performance measured by both TOBQ and return on assets, although such relationship was

significant at 1% level of significance when proxied with RETA. Furthermore, COC relationship with IM measurements are non-significant.

This study implies that managers should seek to access funds with lower COC to finance IM. In addition, they should avoid using short-term loans to finance long-term investment and vice-versa. Government should as well discourage the importation of similar locally manufactured products, to give way to quick conversion of locally manufactured goods to cash.

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