CONTROLLING INVENTORY LEVELS OF LISTED INDUSTRIAL GOODS FIRMS IN NIGERIA: EFFECT ON FIRM PROFIT

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ABSTRACT:

The nub of this study is to examine the effect of inventory control on the profitability of listed industrial goods firms in Nigeria. The specific objectives of the study were to examine the extent to which inventory conversion period, inventory to sales ratio and inventory turnover ratio affect return on assets. Ex-post facto design was deployed for the study. A sample size of seven (7) listed industrial goods firms was purposively selected from the population of thirteen (13) listed industrial goods manufacturing firms in Nigeria. Cross-section Fixed Effect Model was utilised in estimating the test results at 5% level of significance. The findings include: inventory conversion period does not have a significant effect on return on assets (β_1 = 0.000108, t-Statistic = 1.140571, Prob>|t| = 0.2586); inventory to sales ratio significantly and negatively affects return on assets (β_2 = -2.955392, t-Statistic = -5.534244, Prob>|t| = 0.0000); inventory turnover ratio significantly and negatively affects return on assets (β_3 = -0.057291, t-Statistic = -8.533998, Prob>|t| = 0.0000) of listed industrial goods manufacturing firms in Nigeria. In conclusion, the earnings after tax of the firm is improved through the instrumentality of effective inventory control techniques. It was recommended that potential investors in listed industrial goods firms should watch out for firms with a lower inventory as a percentage of sales since lower inventory to sales ratio is an indication that the firm is making more sale per item in the firm's inventory.

1. INTRODUCTION

Inventories are stocks of a product which a company manufactures for sale, and components that are of various forms in which inventory exists in a manufacturing firm known to be raw materials, work in progress, and finished goods (Orumie & Nzerem, 2023). Inventory is one of the resources which

are essential to a firm, thus need to be managed and controlled by the firm (Panigrahi, Jena, Sahoo & Nayak, 2023). Managing inventory levels entails the activity of organizing the availability of stock item to customers. It coordinates the purchasing, manufacturing, and distribution functions to meet the marketing needs. The need for inventory control or management cannot be overemphasized as it is a means for improving the performance of manufacturing industries. An efficient control of inventory is required because a substantial share of a firm's funds is invested in them (Federgruen, Liu & Lu, 2023). Listed industrial goods firms in Nigeria and all other manufacturing sectors, must ensure that inventory is maintained at desired levels. Excess and shortage of inventory bring down the level of profitability of the firms (Anichebe & Agu, 2013). Whether it is a manufacturing organization or a merchandized organization, the goal should always be the same, that is, to ensure the inventory is ready and at the same time it is at desired level. Inventory represents an important decision variable at all stages of product manufacturing, distribution and sales, in addition to being a major portion of current assets.

Manufacturing companies rely on inventories of raw materials to maintain independence from suppliers, and effective control of inventory is crucial for business success, as noted by Sitienei and Memba (2015). Poor inventory control can pose a serious threat to profitability, given the substantial amounts of money committed to raw materials, work in progress, finished goods, and other supplies (Fajri & Nurasik, 2023). Companies must effectively manage these inventories to avoid negative impacts on profits. Maintaining an optimal level of inventory is crucial, as shortages can result in lost sales and production disruption, while excess inventory leads to unnecessary carrying costs and risks of obsolescence or spoilage. The aim of inventory control is to maintain an optimal inventory level at the lowest possible cost. The primary objective of inventory control is to minimize the costs of holding, replacing, and shortages of inventory, while increasing the efficiency of production and distribution, ultimately leading to improved profitability for the company (Victoire, 2015). This involves finding the right balance between holding too little or too much inventory at any given time. Despite the potential cost savings and reduced capital tie-up that can come from effective inventory control, many managers overlook this aspect. As a result, some companies fail to adequately manage their inventory levels, leading to under-stocking and disruptions in operations and production. Rather than focusing solely on maximizing returns, it is crucial for organizations to also examine their investment in inventory as efficient and effective inventory control plays a significant role in the success and survival of manufacturing firms. Poor inventory management can result in stockouts, reduced productivity and profitability, and increased holding and storage costs in the case of excess inventory (Panigrahi, Jena, Sahoo & Nayak, 2023). Thus, the present study aims

to investigate the impact of inventory control on the profitability of listed industrial goods firms in Nigeria. The current study aims to fill a gap in the existing literature by including a variable (inventory to sales ratio) that has been previously overlooked by other studies.

1.1 Objectives of the Study

The main objective of the study is to determine the effect of inventory control on the profitability of listed industrial goods firms in Nigeria. The specific objectives of the study are as follows:

1. To evaluate the effect of inventory conversion period on return on assets (ROA) of listed industrial goods firms in Nigeria.
2. To determine the extent to which inventory to sales ratio affects return on assets (ROA) of listed industrial goods firms in Nigeria.
3. To ascertain the extent inventory turnover ratio affects return on assets (ROA) of listed industrial goods firms in Nigeria

1.2 Hypotheses

H_{01}: There is no significant effect of inventory conversion period on return on asset of listed industrial goods firms in Nigeria.

H_{02}: There is no significant effect of inventory to sales ratio on return on asset of listed industrial goods firms in Nigeria.

H_{03}: There is no significant effect of inventory turnover ratio on return on asset of listed industrial goods firms in Nigeria**.**

2. LITERATURE REVIEW

2.1 Conceptual review

2.1.1 Inventory Control

Inventory control is a policy aimed at acquiring the correct amount of materials at the right time and location (Orumie & Nzerem, 2023). It involves managing a firm's investment in inventory, monitoring inventory levels, forecasting demand, and determining when and how much to order, as described by Fajri and Nurasik (2023). Inventory control refers to the method of ensuring that inventory flow adheres to the plan within an organization. Miller (2010) stated that inventory control involves coordinating purchasing, manufacturing, and distribution functions to meet marketing requirements and organize item availability to customers. Ezeani (2008) described inventory control as a store manager's techniques for ensuring that materials are available in the appropriate quantity, quality, and price without the risk of stockouts or overstocking.

In order for inventory control to be effective, an organization must develop objectives and prepare budgets to achieve them, as stated by Orumie and Nzerem (2023). Planning inventory is crucial for any organization, as it allows them to determine the optimum level of investment in inventories. This requires balancing the need for sufficient stocks to meet production and sales requirements against the risk of holding unnecessary surplus inventory that could become obsolete. On one hand, insufficient inventories can lead to lost sales, while on the other hand, having more inventory than necessary can be costly (Roth, Bhaya & Kaszkurewicz, 2023). Different departments within the same organization may have varying perspectives on inventory management. For example, the sales department may prefer having large inventory reserves to meet any demand, while the production department may require substantial inventory of materials to ensure that the production process is not disrupted.

2.1.2. Inventory Turnover Ratio

The inventory turnover ratio of a company refers to the speed at which goods are being received and shipped out from its storage facilities (Mbula, Memba & Njeru, 2016). This ratio is used to measure how fast the inventory of merchandise is being replenished through sales (Nasution, Sembiring, Batubara & Putri, 2022) and serves as an indicator of how quickly a company is generating revenue from its product sales (Herison, Sahabuddin, Azis & Azis, 2022).

Inventory turnover ratio is a measure of how many times the average stock of a company is sold over a given period of time (Alnaim & Kouaib, 2023). To calculate the inventory turnover ratio, a company needs to keep a close track of the flow of inventory into and out of its business. The inventory turnover ratio is calculated by dividing the cost of goods sold by the inventory (Nworie, Moedu & Onyali, 2022).

2.1.3 Inventory Conversion Period

The time required to obtain materials, manufacture a product, and sell it is known as the conversion period. This period represents the time during which a company must invest cash in order to transform materials into sales (Anusi & Nduka, 2022). The average number of days that inventories are held by a company before they are sold is known as the days in inventory. A shorter conversion period is preferred, which means a lower number of days in inventory. To calculate the average inventory, the sum of the beginning and ending balances of the inventory for a year is divided by two (Anusi & Nduka, 2022). The average inventory is then divided by the cost of goods sold to determine what portion of the cost of goods sold comes from inventory. To calculate the cash

conversion cycle in days, this amount is then multiplied by the average number of days in a year, 365 (Lantz, 2008).

2.1.4 Inventory to Sales Ratio

The inventory to sales ratio is a metric that shows the connection between the value of a company's inventory and its total sales (Muris, Raff, Schmitt & Stähler, 2023). Its purpose is to track the amount of capital assigned to inventory compared to the company's sales volume during a particular period. A lower inventory to sales ratio indicates that the company is more effective in allocating capital to its inventory (Ranjeeni, Truong & Kober, 2023). To calculate the inventory to sales ratio, add the opening and closing inventory together to get the average inventory value, then divide it by two. Finally, divide the resulting amount by net sales.

2.1.5 Profitability

The ultimate objective of any business venture is profitability, as without it, the business cannot sustain in the long term (Nworie & Nwoye, 2023). Therefore, it is crucial to assess the current and past profitability and predict future profitability. Profitability is measured by comparing income and expenses. Income is the revenue generated from business activities, but funds acquired through borrowing do not qualify as income. Such transactions only create cash flow for the business or asset purchases (Hofstrand, 2009). The best indicator of a company's health is its profitability because without profits, the company cannot expand. Increasing profits demonstrate that the firm can offer dividends, and its share price will likely increase. Creditors prefer lending to profitable firms at lower rates than unprofitable ones. Hence, profitable companies can use leverage to increase shareholders' equity further. The most common measures of profitability are Return on Assets (ROA) and Return on Equity (ROE) (Albertazzi & Gambacorta, 2009).

2.1.5.1 Return on Asset

Return on asset (ROA) is a financial metric that expresses the proportion of profit generated by a company relative to its overall resources. Typically, it is calculated by dividing the net income, which is the profit after tax, as shown on the income statement, by the total assets (Enekwe, Agu & Eziedo, 2014), which includes cash and cash equivalents, receivables, inventories, land, capital, equipment, and the value of intellectual property such as patents, as reflected on the statement of financial position. ROA is a useful metric for investors and analysts as it provides insight into a company's efficiency in utilizing its assets to generate profits. A higher ROA indicates that a

company is generating more profit for every asset, which suggests that it is more efficient in managing its resources (Mohamad, Suraidi, Rahman & Suhaimi, 2016).

2.2 Theoretical Review

2.2.1 Lean Theory

In 1991, James P. Womack, Daniel T. Jones, and Daniel Roos introduced Lean theory. This theory operates on the premise that the delivery of a product or service must provide value to customers. It is employed to scrutinize processes in order to minimize wasteful activities that do not add value for the customer. Lean theory is specifically concerned with optimizing costs in inventory systems (Feinberg & Keane, 2006). This approach expedites decision-making regarding manufacturing, warehousing, and other supply chain considerations (Schwarz, Ulhassan, Thor & Westerlund, 2014). The theory builds upon the economic order quantity (EOQ) model, which aims to optimize the quantity of any individual item ordered.

This theory is relevant to the study since it postulates that the implementation of lean practice in a firm enables the adoption of diverse operating systems for monitoring inventory levels that enhance firm effectiveness (Schwarz, Ulhassan, Thor & Westerlund, 2014). At a macro level, the strength of the Lean theory lies in both the timing and magnitude of its adoption. The theory asserts that inventory management limits a firm's ability to respond to fluctuations in demand (Feinberg & Keane, 2006). According to Lean theory, inventory control is a critical element of any supply chain, whether it involves products or services. The effectiveness of inventory control is essential to achieving increased profitability, responsiveness, flexibility, cost efficiency, and asset management.

2.3 Empirical Review

Alnaim and Kouaib (2023) explored the impact of inventory turnover on the profitability level of Saudi manufacturers. The data comprised 78 manufacturers listed on the Saudi Stock Exchange and was used to test the research hypothesis. The related data over the 2017–2021 period were collected from annual reports and the Datastream database. After running a multiple regression analysis with a fixed effects model, findings showed that the higher the inventory turnover ratio, the higher the cost which could be suppressed, and the greater the profitability of a company.

Fatie and Usman (2022) examined the effect of inventory management on financial performance of listed consumer goods companies in Nigeria with a sample of twenty-one (21) listed consumer goods companies for a period 2016-2020. The proxy for the independent variable (inventory

management) were inventory turnover, raw material, work-in-progress and finished goods. While return on asset (ROA) was used to proxy profitability (dependent variable). The result show that raw material has no significant effect on financial performance of listed consumer goods companies in Nigeria; WIP has a negative significant effect on financial performance of listed consumer goods companies in Nigeria, while finished goods has no significant effect on financial performance of listed consumer good companies in Nigeria

Nworie and Ofoje (2022) examined the effect of inventory conversion period on the return on assets of listed food and beverages firms in Nigeria. Ex-post facto research design was used. The study selected a sample size of six (6) food and beverages firms using purposive sampling tool. Secondary data were sourced from the annual reports of the sampled firms over a period of ten (10) years which spanned from 2012 to 2021.The estimation of result was carried out with the use of random effects model of panel least square regression at 5% level of significance. The findings showed that Inventory conversion period has a significant negative effect on the return on asset of listed food and beverages firms in Nigeria.

Nworie, Moedu and Onyali (2022) determined the extent to which inventory turnover ratio affects the Earnings Per Share of listed consumer goods firms on the Nigerian Exchange Group, using causal-comparative research design. Purposive sampling technique was deployed to determine the twelve (12) consumer goods firms that made up the sample participants of the study, out of a population of twenty-one. Secondary data were obtained from the annual reports and accounts of the selected companies over a period of ten years which spanned from 2011 to 2020. The hypotheses formulated were tested using Ordinary Least Square technique at 5% level of significance. The findings revealed that inventory turnover ratio has a positive but non-significant effect on earnings per share of consumer goods firms in Nigeria.

Ejike (2019) examined impact of inventory control on operating profits of manufacturing firms in Nigeria. A survey of twenty (20) listed manufacturing firms in Nigeria. Secondary data from the annual reports and accounts from the Nigeria stock exchange from 2003 -2016 was used. Using the linear regression analysis, the researcher measured the impactact of inventory control on operating profit of manufacturing firms in Nigeria of which inventory control (independent variable) was proxied by inventory turnover ratio and operating profits (dependent variable). It was found that inventory turnover ratio had significant positive impact on the operating profit.

Kolawole, Akomolafe and Olusipe (2019) evaluated the relationship between inventory and profitability of manufacturing firms in Nigeria using International Brewery Plc as a case study. The study adopted gross profit as a proxy for profitability (the dependent variable) while component of inventory management such as raw materials inventory, work in progress, finished goods inventories among others were used as the explanatory variables representing inventory management. Secondary data for the study was collected from the annual reports of the company for the period 2002-2011. They employed simple linear regression technique as the statistical tool for data analysis. The result showed that inventory management had strong influence on profitability of International Breweries Plc. in Nigeria.

Amahalu, Ezechukwu, Egolum and Obi (2018) examined the relationship between inventory management and financial performance of brewery firms in Nigeria for the period 2010-2016. The study adopted ROA, revenue growth and ROE to proxy financial performance (the dependent variable) while inventory conversion period was used as the independent variable. Secondary data was collected from annual reports of seven sampled breweries firms and NSE fact book. OLS regression was employed based on STRATA version 13 software for data analysis. The result indicated a significant positive relationship between inventory conversion period, ROA and growth in revenue.

Asamoah, Bawa, and Kissi (2018) examined the impact of inventory management on the performance of firms listed on the Ghana stock exchange for the period of 2007-2014. They adopted inventory conversion period and return on asset among others as proxy for inventory management (independent variable) and performance (dependent variable) respectively. Secondary data for the study variables was collected from annual reports of sampled fourteen (14) listed manufacturing companies in Ghana. The study employed Pearson's correlation and multiple regression techniques. The result indicated that inventory management had no effect on firm performance.

Otuya and Eginiwi (2017) examined the effect of inventory management on profitability of SMEs in Delta state involving a sample of thirty (30) firms. The study adopted inventory turnover, inventory conversion period and inventory leanness to represent inventory management, while gross profit margin was used as proxy for profitability (the dependent variable). They employ multiple regression analysis to evaluate data. The result revealed mix findings: inventory turnover had significant positive relationship with gross profit margin, inventory conversion period had significant negative relationship with profitability and inventory leanness had positive but insignificant link with profitability.

Kung'u (2016) examined the effect of inventory control practices on profitability of industrial and allied firms in Kenya for the period of 2009-2014. The study sample involved 71 companies. The researcher used both primary and secondary data for the study. Primary data was collected through the use of questionnaire while secondary data was collected from the annual reports of sampled companies. The study employed descriptive statistics, Pearson's correlation, ANOVA and linear regression analysis based on window SPSS software as the technique for data analysis. The result provided evidence that inventory control had positive significant relationship with profitability.

Mohamad, Suraidi, Rahman and Suhaimi (2016) examined the relationship between inventory management and the performance of a textile chain store in Malaysia for the period 2008-2012 using both primary and secondary data. The study adopted return on asset as proxy for company's performance and the dependent variable. While inventory days representing inventory management is the dependent variable. Secondary data was collected from financial statements of the sampled company. The study employed descriptive statistics and sample regression technique based on E-views 7.0 software as the tools for data analysis. The result revealed that there was a significant relationship between inventory management and return on asset.

Etale and Bingilar (2016) examined the effect of inventory cost management on profitability of listed brewery firms in Nigeria. Secondary data from the annual reports and accounts of selected brewery firms from the Nigeria stock exchange from 2005-2014s of selected brewery firms from the Nigeria stock exchange from 2005-2014 was used in the study. Using the multiple regression technique, the study found that efficient inventory cost management has a positive effect on profitability of brewery firms in Nigeria.

Agu, Obi-Anike and Eke (2016) examined the relationship between inventory control and profitability of manufacturing companies in Nigeria. The study made use of both primary data and secondary data. Secondary data was obtained from annual reports of three (3) sampled companies. They employed descriptive statistics, Pearson's correlation, and regression techniques for the analysis of data. The result provided evidence that inventory control significantly affected the productivity of manufacturing firms.

Ahmed, Modibbo, Modu and Mohammad (2015) examined the relationship between inventory management and financial performance of conglomerate companies quoted on the Nigeria stock

exchange for the period 2010-2014. The study regressed annual absolute values of inventory (raw materials, work-in-progress, and finished goods) against return on asset (proxy from financial performance). Secondary data for the study were collected from the annual reports of sampled companies. They employed descriptive statistics, Pearson's correlation and linear regression techniques for data analysis. Their finding indicated that inventory management was significantly related to financial performance.

Mbula, Wachira, and Lyria (2015) examined the effect of inventory management on profitability of tea companies in Kenya for the period 2009-2013 with primary data collected through the use of questionnaire. The secondary data was collected from the financial statements of the sampled companies. They adopted return on asset as proxy for profitability (the dependent variable) and inventory conversion period as the independent variable. The study employed descriptive statistics and simple regression technique as the statistical tools for data analysis. Their findings reveal that inventory management had a significantly negative effect on profitability.

Thogan and Jane (2014) investigated the association between inventory management policies and the financial performance of a firm. They used conventional firm specific variables (inventory levels, margins and lead times) as explanatory variables. They found no evidence that smaller relative levels are associated with financial performance as measured by return on asset.

Sekeroglu and Altan (2014) examined the relationship between inventory management and profitability of Borsa Instanbul (BIST) listed firms in Turkey for the period 2003-2012. The study sample included forty-one (41) firms comprising sixteen (16) firms in weaving, fourteen (14) in edibles and eleven (11) in the wholesale and retail industries. Secondary data for the ten year period covered in the study were obtained from annual financial statements of the sampled firms. They employed simple regression and correlation techniques. The results indicated that there is a positive relationship between inventory management and profitability in the edibles industries, but no relationship was established between inventory management and profitability in the weaving and wholesale and retail industries.

Panigrahi (2013) examined the relationship between inventory conversion period and profitability of five (5) cement companies listed on the Bombay stock exchange in India for the period of 2001-2010. The model of the study adopted gross operating profit (proxy for profitability) as the response variable while inventory conversion period (proxy for inventory management) among three other

control variables were used as the explanatory variable. Secondary data for the study was collected from annual reports of the selected companies. The researcher employed correlation and multiple regression techniques as method of data analysis. The result indicated the existence of a significant negative relationship between inventory conversion period and profitability of listed cement companies in India.

3. MATERIAL AND METHOD

The research design adopted in this study was the ex-post facto method because it involves event which have taken place or already existed and cannot be manipulated. The population of the study constitutes all the listed industrial goods firms in the Nigerian Stock Exchange (NSE). In the Nigerian Stock Exchange, the listed industrial goods firms totaled thirteen as at 31st December, 2021. However, for the purpose of this study, only seven (7) out of the 13 firms were selected on the basis of availability of complete data for the period of ten (10) years from 2012 to 2021, both years inclusive. The econometric technique employed was panel data regression approach. Descriptive analysis was used in the study to describe relevant aspect of inventory control and provide detail information about each relevant variable. Hausman test was used to determine whether Random Effect or Fixed Effect was more appropriate for the analysis.

3.1 Model Specification

In carrying out this research, we developed a compact form model as follows;

$ROA_{it} = f(ICP_{it}, ITR_{it}, ISR_{it})\dots\dots(i)$

$ROA_{it} = \beta_0 + \beta_1 ICP_{it} + \beta_2 ITR_{it} + \beta_3 ISR_{it} + \mu_t\dots\dots(ii)$

Where:

ROA = Return on Asset was measured by net profit after tax divided by total assets.

ICP = Inventory Conversion Period was measured by inventory divided by cost of sales then multiplied by 365 days.

ITR = Inventory Turnover Ratio was measured by cost of sales divided by inventory value.

ISR = Inventory to Sales Ratio was measured by inventory values divided by net sales.

β_0 = Intercept for y variable of firm

β_1-β_3 = coefficient for the independent variables y of firms, denoting the nature of the relationship with dependent variable Z.

μ_t = Error term

4. RESULT AND DISCUSSIONS

4.1 Data Analysis

4.1.1 Descriptive Statistical Analysis of the Data

Data obtained on ROA, ICP, ISR and ITR were descriptively summarized using Mean, maximum Values, Minimum Values and Standard deviation. Table 1 gives the output of the descriptive statistical analysis of the data.

Table 1 Descriptive Statistics of the Data

	ROA	ICP	ITR	ISR
Mean	0.070971	119.3173	4.236961	0.144659
Median	0.086338	86.96922	3.533174	0.137729
Maximum	1.088969	2174.936	32.25856	0.354785
Minimum	-1.799173	0.000000	0.000000	0.000000
Std. Dev.	0.292436	262.1919	4.498784	0.087363
Skewness	-3.270261	7.138009	4.183561	0.067669
Kurtosis	27.33021	55.80449	25.06386	2.344301
Jarque-Bera	1851.318	8727.013	1624.066	1.307420
Probability	0.000000	0.000000	0.000000	0.520113
Sum	4.967959	8352.208	296.5873	10.12612
Sum Sq. Dev.	5.900799	4743378.	1396.495	0.526626
Observations	70	70	70	70

Source: Researcher's Computation (2023) Using E-View Version 10

The mean value of ROA is 7.1% which implies that the industrial goods firms on average earn N0.07 from every N1 assets used in the business activities. The standard deviation of ROA from this mean figure is 0.292436, showing there is a very wide dispersion in the data among the firms sampled. The highest ROA was 1.089 while the lowest ROA was -1.799. Inventory Conversion Period averaged 119 days approximately with a standard deviation of 262 days. The highest ICP was 2175 and the lowest ICP was 0. The mean value of Inventory to sales ratio was 14.47% with a standard deviation of 0.087363. The range values of ISR are 0.354785 to 0.000. Finally, Inventory Turnover Ratio has a mean value of 4.236961, a standard deviation of 4.498784, a maximum value of 32.25856 and a minimum value of 0.000.

The test result of the Jarque-Bera statistic returned probability values of 0.000000, 0.000000, 0.000000 and 0.520113 for ROA, ICP, ITR and ISR, respectively. Therefore, only ISR is normally distributed. Although, the presence of outliers in ROA, ICP and ITR leads to abnormality of the residuals, OLS was still used because the assumption of normality is not compulsory for OLS regression.

4.2.1 Hausman Specification Test

The aim of this test was to choose between Fixed Effect Model and Random Effect Model.

Table 2 Correlated Random Effects - Hausman Test

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	32.766576	3	0.0000

Source: Researcher's Computation (2023) Using E-View Version 10

The Hausman specification test result showed that the Fixed Effect Model is more appropriate than Random Effect Model since the Prob(Chi-Sq) = 0.000 is less than 0.05. Therefore, the estimation of the regression results was carried out using Fixed Effect regression technique.

4.3 Test of Hypotheses

Fixed Effect Model was deployed to estimate the test results using the under-listed model.

$$ROA_{it} = \beta_0 + \beta_1 ICP_{it} + \beta_2 ISR_{it} + \beta_3 ITR_{it} + \mu_{it} \dots\dots\dots\dots\dots \text{ eqn 1}$$

The results of the Fixed Effect estimation test is presented below.

Table 3 Fixed Effect Estimation Test Result

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ICP	0.000108	9.48E-05	1.140571	0.2586
ITR	-0.057291	0.006713	-8.533998	0.0000
ISR	-2.955392	0.534019	-5.534244	0.0000
C	0.728329	0.093952	7.752163	0.0000
	Effects Specification			
Cross-section fixed (dummy variables)				

R-squared	0.607770	Mean dependent var	0.070971
Adjusted R-squared	0.548936	S.D. dependent var	0.292436
S.E. of regression	0.196404	Akaike info criterion	-0.285724
Sum squared resid	2.314468	Schwarz criterion	0.035490
Log likelihood	20.00034	Hannan-Quinn criter.	-0.158134
F-statistic	10.33018	Durbin-Watson stat	2.172051
Prob(F-statistic)	0.000000		

Source: Researcher's Computation (2023) Using E-View Version 10

R-squared shows the amount of changes in the response or dependent variable that are as a result of the variations in the predictor or independent variables. From results in Table 4.7 above, R-squared was 0.607770, a revelation that 60.78% variations in Return on Asset of listed industrial goods firms stems from the systematic variations in inventory conversion period, inventory to sales ratio and inventory turnover ratio. Alternative variables outside the model account for 39.22% variations in the ROA. The Adjusted R^2 value of 0.548936 corrected the addition of irrelevant predictor variables in the model and therefore implies that ICP, ISR and ITR precisely explain 54.89% of the variance in the ROA of the listed industrial goods firms in Nigeria.

The overall significance of the model was shown through the *F*-statistic and its Probability. The Prob(F-statistic) = 0.00000 that goes along with the *F*-statistic = 10.33018 is less than 0.05. Therefore, the model fits better than a zero-predictor model. This implies that the joint effect of ICP, ISR and ITR significantly influences the Return on Asset of listed industrial goods firms in Nigeria.

4.3.1 Hypothesis I

H_0: There is no significant effect of inventory conversion period on the Return on Asset of listed industrial goods manufacturing firms in Nigeria.

ICP has a coefficient value of 0.000108, implying that there is a positive correlation between ICP and ROA in the industrial goods firms. Furthermore, this is a testament that a marginal increase in ICP leads to an increase in ROA by 0.000108, and vice versa.

4.3.1.1 Decision: This positive effect is adjudged non-significant because the Prob>|t| = 0.2586 is greater than 0.05 and the absolute value of t-Statistic (1.140571) is less than 2. In conclusion, this results show that there is a non-significant positive effect of inventory conversion period on the Return on Asset of listed industrial goods manufacturing firms in Nigeria (β_1 = 0.000108, t-Statistic

= 1.140571, Prob>|t| = 0.2586). This does not agree with common logic that if a firm takes more time before obtaining materials for production, the earnings of the firm gets reduced up to the extent of such delay. This finding negated the results of Panigrahi (2013) and Mwangi (2016) but agreed with those of Sitienei and Kioko (2015) that realized positive effect.

4.3.2 Hypothesis II

H_0: There is no significant effect of inventory to sales ratio on the Return on Asset of listed industrial goods manufacturing firms in Nigeria.

ISR has a coefficient value of -2.955392, implying that there is a negative correlation between ISR and ROA in the industrial goods firms. Furthermore, this is a testament that a marginal increase in ISR leads to a decrease in ROA by 2.955392, and vice versa.

4.3.2.1 Decision: This negative effect is adjudged significant because the Prob>|t| = 0.0000 is less than 0.05 and the absolute value of t-Statistic (5.534244) exceeds 2. In conclusion, this results show that there is a significant negative effect of inventory to sales ratio on the Return on Asset of listed industrial goods manufacturing firms in Nigeria (β_2 = -2.955392, t-Statistic = -5.534244, Prob>|t| = 0.0000). This implies that a lower inventory as a percentage of sales results in higher earnings for the firm. Of course, decrease in inventory to sales ratio is an indication that the firm is making more sale per item in the firm's inventory. Fatie and Usman (2022) realised similar finding.

4.3.3 Hypothesis III

H_0: There is no significant effect of inventory turnover ratio on the Return on Asset of listed industrial goods manufacturing firms in Nigeria.

ITR has a coefficient value of -0.057291, implying that there is a negative correlation between ITR and ROA in the industrial goods firms. Furthermore, this is a testament that a marginal increase in ITR leads to a decrease in ROA by 0.057291, and vice versa.

4.3.3.1 Decision: This negative effect is adjudged significant because the Prob>|t| = 0.0000 is less than 0.05 and the absolute value of t-Statistic (8.533998) exceeds 2. In conclusion, this result shows that there is a significant negative effect of inventory turnover ratio on the Return on Asset of listed industrial goods manufacturing firms in Nigeria (β_3 = -0.057291, t-Statistic = -8.533998, Prob>|t| = 0.0000). Mwangi (2016) found similar result but the study contradicted the findings of Folinas and Shen (2014).

CONCLUSION AND RECOMMENDATIONS

The main purpose of inventory control is to keep the inventories at an optimum level, without either stock-outs or excess. In an industrial goods manufacturing firm setting, inventory control is carried out to monitor how goods move from manufacturing point to warehousing and finally to points of sale. Inventory control influences firm profitability since it is a way of ensuring proper management of stock investment which helps firm keep an accurate demand forecasting to avoid unplanned stock procurement. This assists the industrial goods firms to make plans for future demand by meeting the growing demands of customers. Ultimately, the earnings after tax of the firm is improved through the instrumentality of effective inventory control techniques. It was based on the above conclusion that the study recommends the following:

1. Potential investors in listed industrial goods firms should watch out for firms with a lower inventory as a percentage of sales since lower inventory to sales ratio is an indication that the firm is making more sale per item in the firm's inventory.

2. Managers of listed industrial goods firms should utilize technological procurement techniques to decide on the level of stock to be maintained for the day-to-day operations of the entity.

3. Financial managers of listed industrial goods firms should endeavor to maintain an optimal inventory level that lowers cost of inventory holding but also enables the firm meet the demands of customers more efficiently by avoiding stock-outs.

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