

## Inventory Management and Profitability: Evidence from Listed Industrial Goods Companies in Nigeria (2020 - 2024)

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### Abstract

This study investigates the influence of inventory management on the profitability of listed Nigerian industrial goods companies from 2020-2024. The study was anchored on the Theory of Constraints as its framework. The ex post facto panel design was employed, relying on secondary data extracted from the audited reports and accounts of companies listed on the Nigerian Exchange Group (NXG). Of the thirteen (13) companies in the population, only seven (7) met the criteria of being listed before 2020 and with complete reports for the study period. Profitability was proxy by Return on Assets (ROA), while inventory management was measured using Inventory Conversion Period (ICP), Inventory Turnover Ratio (ITR), and Inventory to Sales Ratio (ISR), with firm size as a control variable. The study employed panel data regression, descriptive statistics, and the Hausman test to analyze the data. Results revealed that ICP had a positive but insignificant effect on profitability; ISR had a significant negative effect, indicating excessive inventory relative to sales reduces efficiency; and ITR had a negative but insignificant effect, suggesting high turnover alone does not guarantee better performance. As a result, inventory management significantly influenced profitability, highlighting the need for operational alignment. The study recommends adopting optimization models such as Economic Order Quantity (EOQ) and Just-In-Time (JIT), monitoring inventory-to-sales ratios, and enhancing manager training for improved asset utilization.

**Keywords:** Inventory Management, Profitability, Nigeria Exchange Group, Sales Ratio, Turnover Ratio.

### Introduction

Inventories are stocks of a product a company manufactures for sale, and components that are of various forms that exist in a manufacturing firm as raw materials and work in progress (Orumie & Nzerem, 2023). Inventory is one of the resources, which are essential to a firm, thus needs to be efficiently managed and controlled (Panigrahi et al., 2013). Managing inventory levels entails the activity of organizing the availability of stock items to customers and for production. It coordinates the purchasing, manufacturing, and distribution functions to meet the marketing needs. The need for inventory 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 et al., 2019). 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 affect the level of profitability of the firms (Anichebe & Agu, 2013). Manufacturing companies rely on inventories of raw materials to maintain independence from suppliers; thus, effective control of inventory is crucial for business success (Moedu et al., 2023). 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 could lead to unnecessary carrying costs and risks of obsolescence or spoilage. By closely monitoring and managing inventory through key indicators such as the inventory turnover ratio and inventory conversion period, firms can enhance their operational efficiency and profitability.

The aim of inventory management is to maintain an optimal inventory level at the lowest possible cost. The primary objective of inventory management 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. Therefore, the application of specific inventory-related ratios such as inventory to sales ratio becomes essential in determining the adequacy of inventory relative to sales performance and helps inform strategic decisions in inventory management.

### **Statement of Research Problem**

Despite the potential cost savings and reduced capital tie-up that can come with effective inventory management, many managers overlook its potential benefits. 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 stock-out, reduced productivity and profitability, and increased holding and storage costs in the case of excess inventory (Panigrahi et al., 2013).

While a range of inventory management techniques exists, key performance indicators such as inventory conversion period, inventory to sales ratio, and inventory turnover ratio provide critical insights into how well a firm manages its inventory. A prolonged inventory conversion period may signal operational inefficiencies, whereas a high inventory to sales ratio could indicate excessive stock holding, adversely affecting liquidity. Similarly, a low

inventory turnover ratio may suggest sluggish sales or overstocking, both of which can erode profitability.

Several prior studies have explored the effect of inventory management on profitability but with distinct focal points and methodologies. For instance, Akinola et al. (2024) focused on listed consumer goods firms in Nigeria, highlighting a non-significant influence of inventory management variables on corporate profitability within their specific sample. Moedu et al. (2023) examined listed industrial goods firms, noting significant negative effects of inventory to sales ratio and inventory turnover ratio on return on assets. Similarly, studies by other researchers such as Olaide and Omodero (2023), Jonah and Chika (2023), and Adegbite and Ajagbe (2023) have contributed insights into the relationship between inventory management practices and financial performance metrics within different sectors of Nigerian industries. However, these studies have predominantly focused on manufacturing firms, with varying methodologies including panel regression, fixed effect models, and ex-post facto designs. The gap identified for this study lies in the need for comprehensive research specifically targeting industrial goods firms in Nigeria over the specified time frame. The study will use industrial goods firms in Nigeria and incorporate variables such as inventory conversion period, inventory to sales ratio, inventory turnover ratio, and return on assets, drawing on prior methodologies while extending the analysis to fill the identified gap in literature.

### Research Questions

The following research questions guides this study:

- i. To what extent does inventory conversion period affect the profitability of industrial goods firms in Nigeria?
- ii. Does inventory to sales ratio influence the profitability of industrial goods firms in Nigeria?
- iii. What is the effect of inventory turnover ratio on the profitability of industrial goods firms in Nigeria?

### Statement of Hypotheses

The following null hypotheses were formulated for the study

**H<sub>1</sub>:** Inventory conversion period has no significant effect on the profitability of industrial goods firms in Nigeria.

**H<sub>2</sub>:** Inventory to sales ratio has no significant influence on the profitability of industrial goods firms in Nigeria.

**H<sub>3</sub>:** Inventory turnover ratio has no significant effect on the profitability of industrial goods firms in Nigeria.

**Literature Review****Conceptual Framework****Concept of Inventory**

Inventory represents the stock of good maintained by a firm to meet its current and future needs (Jonah et al., 2023). Inventory refers the stock of a product(s) that a firm manufacture, warehouses, sells and the components of such products (Kairu, 2017). It consists of finished goods for a merchandizing company and in a manufacturing company it comes in various forms as raw materials, work-in-progress and finished goods (ICAN, 2009). Inventory represents a vital capital component of a business, and a business' success and failure depend on the inventory management performance since inventory management eradicates liquidity problems, upsurges the company's profitability and invariably determines the financial positions of organizations Gebisa & Ram (2021). It represents one of the key elements and the largest value in current assets of the financial position of a company. However, any defect in evaluating and determining its stock cost, invariably negatively affects production, thereby downplaying the company's profitability (Yankah et al., 2022; Joseph et al., 2023).

**Concept of Inventory Management**

Inventory management is principally concerned with placement and the size of stocked goods and raw materials to enhance production and distribution. It involves the control and planning, regulation and monitoring of inventory levels using controls and techniques (Akinleye & Adesina, 2024). Furthermore, inventory management involves the setting of optimal re-order levels, calculation of economic order quantities, and monitoring inventory levels through manual or computerized methods. It is an important activity that the management of a firm should not ignore (Joseph et al., 2023).

Inventory management is a policy aimed at acquiring the correct number 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 & Nurasik, 2023). Inventory control refers to the method of ensuring that inventory flow adheres to the plan within an organization. Usaini and Abdulrahman (2021) described inventory control as a store officer's techniques for ensuring that materials are accessible in the right quantity, quality and price without the risk of stock-outs or overstocking.

Orumie and Nzerem (2023) assert that in order for inventory management to be effective, an organization must develop objectives and prepare budgets to achieve them. 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 et al., 2023).

The effective management of inventories, which represent a significant cost item, will contribute significantly to the profitability and success of the business concern. In contrast, ineffective material management may result in lower profits and the eventual demise of the once-promising business. In Nigeria's economic cycle, the problem of insufficient stocks, which slows production and ultimately results in lost sales, profits, and maybe lost goodwill, has recently taken on an unprecedented scope and size. Mishandling and inadequate storage facilities, which can result in inventory item damage and a loss to the business, are other issues that plague the industrial sector frequently (Ajayi et al., 2021; Joseph et al., 2023).

### **Inventory Management Metrics**

#### ***Inventory Conversion Period***

The measure of time it takes to acquire materials, manufacture a product, and dispose of it, is known as the conversion period. This period represents the duration a firm must invest cash in order to convert materials to sales (Anusi & Nduka, 2022). The average number of days the materials are kept by a firm before they are sold is called the days in inventory. A shorter conversion period is preferred, which means a lower number of days in inventory. The formula is defined as:

Inventory conversion period = Average Inventory / Cost of Goods Sold

#### ***Inventory Turnover Ratio***

The inventory turnover ratio of a firm refers to the speed with which merchandises are being received and dispatched from its storage facilities (Mbula et al., 2016). Or it measures of how many times the average stock of a company is sold over a given period of time (Alnaim & Kouaib, 2023). This ratio is used to evaluate how quick the inventory of merchandise is being restocked through sales (Nasution & Sembiring, 2022). It indicates how fast a firm is generating income from sales. It is calculated as:

Inventory Turnover Ratio = Cost of Goods Sold / Average Inventory

#### ***Inventory to Sales Ratio***

The inventory to sales ratio is a measure that depicts the relationship between the value of a firm's inventory and total sales (Muris et al., 2023). Its aim is to track the amount of capital invested in inventory compared to the company's sales volume at a given period. A lower inventory to sales ratio implies that a firm is more effective in allocating capital to its inventory (Ranjeeni et al., 2023). The formula is given as:

Inventory to sale ratio = Average Inventory / Net sales

### **Components of Inventory**

Raw materials/components, work in progress (WIP), finished goods, and Maintenance, Repair and Operations (MRO) are the four primary forms of inventory. A few individuals, on the other hand, only recognize three types of inventories, ignoring MRO (Joseph et al., 2023; Akinleye & Adesina, 2024). These are explained below:

#### ***Raw Materials***

Raw materials refer to various input materials or resources that is used for production and are converted into finished or semi-finished goods. They can be manufacture by the company or acquired from a supplier (Joseph, et al., 2023).

#### ***Work in Progress (WIP)***

This represents raw material that are still in the production process that are yet to be converted into finished products but remain partly completed at the end of the financial year of the company (Olaide & Omodero, 2023). WIP are valued and recorded in the books of account.

#### ***Finished Goods***

as the name implies, finished goods are raw materials that have been fully/completely converted to their final form/product and are ready to be sold or consumed. This is the last stage of the production process.

#### ***Maintenance, Repairs and Operations (MRO)***

The MRO components of inventory consist of tools/items that ensures that the production processes run effectively and efficiently. They include hand tools (e.g., saw, hammers, drills etc.), consumables (lubricants, personal protective equipment, etc.), spare parts, diagnostic and testing equipment etc.

### **Concept of Profitability**

The main objective of any business is to make profit because without it the business cannot sustain itself in the long term (Nworie & Nwoye, 2023). Consequently, it becomes paramount to evaluate the current and past profits and forecast the future profit. Profitability is evaluated by comparing income and expenses. Income is the revenue derived from the operation of business activities, however moneys acquired through borrowing does not represent income; but only generates a flow of cash for assets acquired and the business (Hofstrand, 2019). Increased profits indicate that the firm can offer better dividends, and its share price will likely increase. Creditors prefer lending to firms at have a good track record of increased profitability. Profitable companies can still leverage on debts to enhance shareholders' equity even more. The commonest measures for

profitability are Return on Assets (ROA) and Return on Equity (ROE) (Albertazzi & Gambacorta, 2019). For this study return on asset (ROA) will be employed.

### **Return on Asset**

Return on asset (ROA) is used to express the proportion of profit generated by a firm in relation to its total assets. It is calculated as Net Income divided by average total assets (Enekwe et al., 2019), 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 in evaluating a firm's efficiency, investment potentials and creditworthiness. A higher ROA indicates that a company is making enough profit for amount employed on asset, which suggests that it is more efficient in managing its resources (Mohamad et al., 2019).

### **Relationship Between Inventory Management and Profitability**

The relationship between inventory management and profitability is a critical aspect that needs to be carefully examined. Inventory management plays a vital role in optimizing the profitability of manufacturing sectors. A well-managed inventory system helps to minimize stock-outs and overstocking situations, which can lead to lost sales and increased carrying costs (Oloruntoba et al., 2019). Consequently, efficient inventory management helps businesses to meet customers' demands promptly, thereby enhancing customer satisfaction and loyalty (La Londe & Masters, 1994). Thus, it can be concluded that a strong correlation exists between effective inventory management and profitability in the manufacturing sector. And with proper inventory management techniques, the Nigerian industrial goods firms can maximize profitability by streamlining operations, reducing costs, and meeting customer demand efficiently.

### **Theoretical Framework**

The study is guided by the theory of Constraints and is discussed below.

#### **Theory of Constraints (TOC)**

Theory of Constraints was propounded in the mid-1980s by Eli Goldratt. The theory of constraints was established to explain the whole approach that Goldratt described to be the overall theory for the operation of an organization (Olaide & Omodero, 2023). The theory advocates strongly the exclusions of any capacity costs from products. Three factors, which are throughput, operating expense and inventory, play important roles. TOC is a methodology for identifying the most important limiting factor, that is, constraints; that stands in the way of maximizing production and then systematically improving that constraint until it is no longer the limiting factor.

The theory of constraints is a management philosophy that seeks to increase manufacturing throughput efficiency or system performance measured by sales through the identification of those processes that are constraining the manufacturing system

(Goldratt, 1990). Theory of constraints emphasizes focus on effectively managing the capacity and capability of these constraints if they are to improve the operational performance of their organization. Firms applying appropriate inventory control systems can achieve this.

In relation to inventory management, the TOC challenges traditional approaches that often rely on large buffer stocks to ensure smooth operations. Instead, it advocates for a more dynamic and responsive system. According to the TOC, excessive inventory is seen as a symptom of underlying inefficiencies and constraints within the production process. By focusing on these constraints, firms can streamline operations, reduce excess inventory, and improve cash flow.

This theory posits that the performance of any system is determined by its most critical limiting constraint. In the context of inventory management, the Theory of Constraints suggests that inefficiencies or bottlenecks in inventory processes can hinder overall profitability. By focusing on identifying and addressing these constraints, firms can improve their inventory management practices and, consequently, enhance their profitability. Akinola et al. (2024) assert that a firm that maximizes the efficiency of every machine will outperform the one that does not.

The Theory of Constraints emphasizes the importance of throughput and the identification and elimination of constraints that impede efficient operations. In this context, TOC supports a positive relationship between effective inventory management and profitability. It underscores the need to optimize inventory flows by addressing bottlenecks, which is reflected in a shorter inventory conversion period (ICP) and a higher inventory turnover ratio (ITR). Firms that turn over their inventory more quickly and avoid overstocking are likely managing their constraints effectively, thus enhancing throughput and ultimately improving ROA. Furthermore, by minimizing excessive inventory (reflected in a lower inventory to sales ratio), firms reduce tied-up capital and operational inefficiencies, which TOC posits are critical to improving profitability.

## **Empirical Review**

### ***Inventory Conversion Period and Profitability***

Amahalu et al. (2023) 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 et al. (2023) 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.

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.

Usaini and Abdulrahman (2021) study explored the efficient control and management of inventory in manufacturing industries with emphasis on Hamdala Sweet Factory Ltd. The objective of the study was to evaluate and recognize the areas of lapses in the firm and proffer strategies to improve the firm's inventory management services. The primary source for data collection was used to gather data from respondents through interview and the administration of questionnaires from a sample of 50 respondents. The study used the chi-square method to analyze the data. The study discovered lapses in following inventory policies leading to longer conversion period. The study recommended that adhering to inventory policies and shortening the ICP will help improve liquidity and profitability.

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.

### ***Inventory to Sales Ratio and Profitability***

Moedu et al. (2023) examined the effect of inventory control on the profitability of listed industrial goods firms in Nigeria. 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 utilized 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; inventory to sales ratio significantly and negatively affects return on asset; inventory turnover ratio significantly and negatively affects return on assets 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.

Kolawole et al. (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 study revealed that high levels of raw materials, work-in-progress, and finished goods relative to sales negatively affected profitability, implying inefficiencies in inventory-to-sales conversion.

Usaini and Abdulrahman (2021) study as above recommended the usage to the economic order quantity (EOQ) to efficiently manage inventory. This ensures resources are not wasted and allowing for more productive use of the firm's materials and resources.

#### ***Inventory Turnover Ratio and Profitability***

Akinola et al. (2024) determined the influence of inventory management on the corporate profitability of listed consumer goods firms in Nigeria. The sample population consisted of 20 consumer goods firms listed in the Nigeria Exchange Group. Information for the study was obtained from secondary sources, specifically, the audited financial statement of the firms between 2016 and 2022. The study employed panel regression analysis as the technique of estimation. Financial success was represented by return on assets, which is the dependent variable, while inventory-to-asset ratio, inventory-to-turnover ratio and inventory-to-sales were the proxies for inventory management; firm size and firm growth were the control variables. The findings using the random-effect regression model revealed that all the independent variables have a non-significant influence on corporate profitability in consumer goods firms in Nigeria. The study concludes that inventory management influences corporate profitability positively in consumer goods firms in Nigeria.

Nworie et al. (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.

Usaini and Abdulrahman (2021) study above suggest adopting a structured inventory strategy (to track increase movement) that will increase turnover which might reduce cost per unit and directly enhance profitability.

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 impact of inventory control on operating profit of manufacturing firms in Nigeria of which inventory control (independent variable) was proxy by inventory turnover ratio and operating profits (dependent variable). It was found that inventory turnover ratio had significant positive impact on the operating profit.

### Research Methodology

The study adopted the ex post facto research to measure inventory management and the profitability variables of the listed industrial goods companies in Nigeria.

Data was collected using the secondary source of data collection through the annual audited reports and accounts of the listed industrial goods companies for five (5) years from 2020 – 2024, all the years included.

The total listed industrial goods companies as at 31<sup>st</sup> December 2024 were thirteen (13) as displayed in appendix 1, represented the population of the study. However, the sample size was ascertained using the filtration criteria that:

1. The company must be listed before 2020. All the companies were listed.
2. The company must have published its annual audited reports and accounts for all the years of study. Only seven (7) met this requirement.

As a result, only seven (7) companies satisfied the selection criterion and the include: Berger Paints PLC, Beta Glass PLC, BUA Cement PLC, CAP PLC, Cutix PLC, Dangote Cement PLC and Lafarge Africa PLC. Although the sample includes only seven (7) of the thirteen potential companies, the selected sample represents a significant majority (over 50%) of the total market recapitalization in 2025, ensuring that the study captured the dominant industry drivers and sufficiently mitigating concerns regarding the limited sample size. The analysis was carried out with the aid of econometric view (E-View).

### Variables Measurements and Model Specification

The econometric technique employed was panel data regression approach. Descriptive analysis was used to summarize key aspects of inventory control and provide detailed information about each relevant variable. The study used firm size (FS) as a control variable to isolate the specific impact of inventory management on return on assets (ROA). It is employed to account for the structural differences (e.g. economies of scales, operational capacity, larger resources etc.) that might otherwise bias the results of the analysis, because the FS is a major determinant of inventory capacity and profitability in the Nigeria industrial sector.

### i. Variables Measurement

| S/N | Variable Type | Variable                    | Measurement                                                             |
|-----|---------------|-----------------------------|-------------------------------------------------------------------------|
| 1   | Dependent     | Return on Assets            | $\frac{PAT \times 100}{\text{Total Assets}}$                            |
| 2   | Independent   | Inventory Conversion Period | $\frac{\text{Inventory} \times 365 \text{ days}}{\text{Cost of Sales}}$ |
| 3   | Independent   | Inventory Turnover Ratio    | $\frac{\text{Cost of Goods Sold}}{\text{Inventory}}$                    |
| 4   | Independent   | Inventory to Sales Ratio    | $\frac{\text{Inventory}}{\text{Net Sales}}$                             |
| 5   | Control       | Firm Size                   | Natural log of total assets                                             |

Source: Author Compilation (2025)

### ii. Model Specification

Model for this study was adapted from Akinola et al. (2024) and is specified below:

$$ROA = \beta_0 + \beta_1(ICP)_{it} + \beta_2(ITR)_{it} + \beta_3(ISR)_{it} + \beta_4(FS)_{it} + e_i$$

Where:

ROA = Return on Assets

ICP = Inventory Conversion Period

ITR = Inventory Turnover Ratio

ISR = Inventory to Sales Ratio

FS = Firm Size

$\beta_0$ : Intercept

$\beta_1 - \beta_3$ : Coefficients representing the effect of independent variables

$e_i$ : error term

## Data Analysis and Interpretation

### Descriptive Statistics

Table 1: Descriptive Statistics

|             | ROA      | ICP      | ISR      | ITR      | FS       |
|-------------|----------|----------|----------|----------|----------|
| Mean        | 10.79188 | 122.5711 | 0.206381 | 3.182896 | 17.35987 |
| Median      | 10.00946 | 115.3123 | 0.183004 | 3.165318 | 16.41123 |
| Maximum     | 19.77389 | 207.4446 | 0.386000 | 5.308846 | 21.17457 |
| Minimum     | 2.653958 | 68.75317 | 0.075763 | 1.759506 | 14.56507 |
| Std. Dev.   | 4.805404 | 32.85612 | 0.086512 | 0.829908 | 2.268511 |
| Skewness    | 0.091972 | 0.693980 | 0.461706 | 0.539929 | 0.442870 |
| Kurtosis    | 1.930055 | 2.904633 | 2.068703 | 3.191880 | 1.587803 |
| Jarque-Bera | 1.718817 | 2.822648 | 2.508342 | 1.754243 | 4.052469 |
| Probability | 0.423413 | 0.243820 | 0.285312 | 0.415978 | 0.131831 |
| Sum         | 377.7157 | 4289.989 | 7.223331 | 111.4014 | 607.5956 |

|              | ROA      | ICP      | ISR      | ITR      | FS       |
|--------------|----------|----------|----------|----------|----------|
| Sum Sq. Dev. | 785.1249 | 36703.83 | 0.254465 | 23.41743 | 174.9688 |
| Observations | 35       | 35       | 35       | 35       | 35       |

**Source:** E-view Output (2025)

The descriptive statistics in Table 1 reveal the central tendencies and dispersions of the variables over the study period. The average Return on Assets (ROA) is 10.79%, with a maximum of 19.77% and a minimum of 2.65%, suggesting moderate profitability among the sampled firms. The standard deviation of 4.80% reveals a notable variation in performance across the firms. Inventory Conversion Period (ICP) has a mean value of approximately 122.57 days, which implies that, on average, firms take around four months to convert inventory into sales. The dispersion (Std. Dev. = 32.86) highlights variability in operational efficiency.

The mean Inventory to Sales Ratio (ISR) is 0.21, indicating that inventory represents about 21% of sales on average. The relatively low standard deviation (0.087) implies consistency across the firms. The Inventory Turnover Ratio (ITR) has a mean of 3.18, which means inventory is turned over roughly three times per year, reflecting moderate inventory activity. Its variability is modest (Std. Dev. = 0.83).

Firm Size (FS), proxy by the natural logarithm of total assets, has a mean of 17.36 with values ranging between 14.57 and 21.17, demonstrating size diversity among the sampled firms. Skewness and kurtosis values suggest that most variables are moderately normally distributed, while Jarque-Bera statistics indicate that none of the variables deviate significantly from normality at a 5% level.

### Correlation Result

The correlation analysis provides insights into the relationships among return on assets (ROA) and inventory management variables showing their interactions.

**Table 2: Correlation Result**

|     | ROA       | ICP       | ISR       | ITR       | FS        |
|-----|-----------|-----------|-----------|-----------|-----------|
| ROA | 1.000000  | 0.119749  | -0.056290 | -0.104921 | -0.410281 |
| ICP | 0.119749  | 1.000000  | 0.889127  | -0.948756 | -0.379333 |
| ISR | -0.056290 | 0.889127  | 1.000000  | -0.819538 | -0.342493 |
| ITR | -0.104921 | -0.948756 | -0.819538 | 1.000000  | 0.323735  |
| FS  | -0.410281 | -0.379333 | -0.342493 | 0.323735  | 1.000000  |

**Source:** E-view Output (2025)

The correlation matrix in Table 2 explores the pairwise linear relationships among variables. ROA and ICP ( $r = 0.120$ ) exhibit a weak positive correlation, indicating that a longer inventory conversion period is slightly associated with higher returns. However, this is counter-intuitive and may reflect firm-specific strategic inventory policies. ROA and ISR ( $r$

= -0.056) show a weak negative correlation, suggesting that a higher proportion of inventory relative to sales slightly reduces profitability. This aligns with the notion that excessive inventory ties up capital and increases holding costs. ROA and ITR ( $r = -0.105$ ) indicate a weak inverse relationship, which may suggest that increasing inventory turnover does not automatically translate into higher profitability for these firms, possibly due to quality control issues or discount-driven sales strategies.

ROA and FS ( $r = -0.410$ ) present a moderate negative correlation, implying that larger firms tend to report lower ROA. This could be attributed to diminishing marginal returns or capital intensiveness in larger firms. Strong negative correlation is observed between ICP and ITR ( $r = -0.949$ ), confirming that longer inventory cycles are associated with slower inventory turnover. Overall, the correlation results suggest weak relationships among inventory management metrics and profitability, thus justifying the need for regression analysis to understand the multivariate effects.

### Random Effect Result

The random effect results on Table 3, analyze how inventory management variables influence return on assets (ROA).

**Table 3: Random Effect Result**

| Variable              | Coefficient | Std. Error         | t-Statistic | Prob.    |
|-----------------------|-------------|--------------------|-------------|----------|
| C                     | 30.71784    | 18.98796           | 1.617753    | 0.1162   |
| ICP                   | 0.047595    | 0.071048           | 0.669894    | 0.5080   |
| ISR                   | -60.58466   | 22.95470           | -2.639314   | 0.0131   |
| ITR                   | -2.380965   | 1.683448           | -1.414339   | 0.1676   |
| FS                    | -0.327066   | 0.731989           | -0.446818   | 0.6582   |
| Effects Specification |             |                    |             |          |
|                       |             |                    | S.D.        | Rho      |
| Cross-section random  |             |                    | 4.864575    | 0.8399   |
| Idiosyncratic random  |             |                    | 2.123895    | 0.1601   |
| Weighted Statistics   |             |                    |             |          |
| R-squared             | 0.283687    | Mean dependent var |             | 2.068118 |
| Adjusted R-squared    | 0.188179    | S.D. dependent var |             | 2.455180 |
| S.E. of regression    | 2.212144    | Sum squared resid  |             | 146.8075 |
| F-statistic           | 2.970290    | Durbin-Watson stat |             | 1.290458 |
| Prob(F-statistic)     | 0.035248    |                    |             |          |

**Source:** E-view Output (2025)

Table 3 presents the results of the random effect regression model, which examines the relationship between inventory management variables and return on assets (ROA) among listed industrial goods firms in Nigeria. Inventory Conversion Period (ICP) shows a positive but statistically insignificant relationship with ROA ( $\beta = 0.047595$ ,  $p = 0.5080$ ), suggesting

that the time taken to convert inventory into sales does not significantly influence profitability. Inventory to Sales Ratio (ISR) has a significant negative effect on ROA ( $\beta = -60.58466$ ,  $p = 0.0131$ ). This indicates that higher inventory relative to sales reduces profitability, likely due to increased holding costs or inefficient inventory management. Inventory Turnover Ratio (ITR) exhibits a negative but insignificant relationship with ROA ( $\beta = -2.380965$ ,  $p = 0.1676$ ), implying that turnover speed alone does not meaningfully affect profitability.

Firm Size (FS) has a negative and insignificant coefficient ( $\beta = -0.327066$ ,  $p = 0.6582$ ), indicating that variations in firm size do not substantially influence return on assets under the random effects specification. The model is statistically significant overall ( $F$ -statistic  $p = 0.035248$ ), and the R-squared value of 0.284 suggests that approximately 28.4% of the variation in profitability is explained by the inventory variables and firm size. The Hausman test supports the use of the random effect model ( $p = 0.1620$ ) as depicted in appendix 2.

### Test of Hypotheses

The coefficients and  $p$ -values from the random effect result are used to test the hypotheses. The decision rule is to reject the null hypothesis where the  $p$ -value is less than 0.05 and accept otherwise.

**Table 4 Summarized Regression Result**

| Variable | Co-efficient | Prob.  |
|----------|--------------|--------|
| C        | 30.71784     | 0.1162 |
| ICP      | 0.047595     | 0.5080 |
| ISR      | -60.58466    | 0.0131 |
| ITR      | -2.380965    | 0.1676 |

Source: E-view Output (2025)

$H_{01}$ : Inventory Conversion Period (ICP) has no significant effect on the profitability of listed industrial goods firms in Nigeria.

The coefficient of Inventory Conversion Period (ICP) from the random effects model is 0.0476, with a  $p$ -value of 0.5080, which is greater than the 5% significance level. This implies that although the ICP has a positive relationship with Return on Assets (ROA), the effect is not statistically significant. Therefore, we fail to reject the null hypothesis. This suggests that changes in the time it takes a firm to convert inventory into sales do not significantly influence profitability among listed industrial goods firms in Nigeria. The positive coefficient implies that a longer inventory conversion period may marginally improve profitability, but this relationship is weak and not economically meaningful within the model.

$H_{02}$ : Inventory to Sales Ratio (ISR) has no significant effect on the profitability of listed industrial goods firms in Nigeria.

The coefficient for Inventory to Sales Ratio (ISR) is -60.5847, and the corresponding p-value is 0.0131, which is less than 0.05. This result is statistically significant, indicating a strong negative effect of ISR on profitability. Hence, we reject the null hypothesis and conclude that ISR has a significant negative impact on the profitability of listed industrial goods firms. The magnitude of the coefficient implies that for every one-unit increase in ISR, ROA decreases by approximately 60.58 units, suggesting that holding excessive inventory relative to sales can drastically reduce firm profitability. This result emphasizes the importance of maintaining a lean inventory strategy to maximize profitability.

H<sub>03</sub>: Inventory Turnover Ratio (ITR) has no significant effect on the profitability of listed industrial goods firms in Nigeria.

The coefficient for Inventory Turnover Ratio (ITR) is -2.3810, with a p-value of 0.1676, which is above the 0.05 threshold. This indicates that the ITR has a negative but statistically insignificant impact on profitability. Consequently, we fail to reject the null hypothesis. The negative coefficient implies that a higher inventory turnover, in this study, may not necessarily translate to improved profitability, possibly due to the cost implications of frequent inventory cycling or potential stock-outs.

### **Discussion of Findings**

The empirical results revealed that ICP had a positive but statistically insignificant effect on profitability, suggesting that while quicker inventory conversion may be desirable in theory (as supported by EOQ and TOC), it did not significantly determine ROA in the sampled firms. This finding aligns with the studies of Usaini and Abdulrahman (2021) and Asamoah et al. (2023), who found no significant effect of ICP on profitability in Ghanaian manufacturing firms, but it diverges from Amahalu et al. (2023), who found a significant positive relationship, and Nworie and Ofoje (2022), who found a significant negative relationship.

The Nigerian market differs from other West African market because it experiences high cost of energy/infrastructural deficits, exchange rate fluctuation which makes the duration of holding inventory (ICP) less relevant to profitability than the availability of stock itself but in other West African markets some of these inefficiencies might only cause marginal, rather than significant, financial

With respect to ISR, the study indicates a significant negative relationship between ISR and ROA, indicating that higher inventory levels relative to sales adversely affect profitability. This finding is consistent with Moedu et al. (2023), Usaini and Abdulrahman (2021) and Kolawole et al. (2019), who similarly identified the detrimental effect of excessive inventory levels on firm profitability. This strongly supports the EOQ theory, which discourages overstocking due to associated holding costs and inefficiencies. Likewise, TOC supports leaner inventory systems to avoid capital lock-up and operational bottlenecks.

In more developed markets in West Africa, a higher ISR might be seen as a strategic buffer but in Nigeria, it signifies inefficient inventory management or low market demand due to

weak consumer purchasing power as a result of inflation and cost of capital. Consequently, a high ISR might correlate to lower profitability, making ratio a critical factor in Nigerian firm's profitability compared to others.

For ITR, the result showed a negative but statistically insignificant relationship with ROA, indicating that frequent inventory turnover, although theoretically expected to boost profitability through efficient inventory cycling, did not meaningfully impact profitability in the sampled industrial goods firms. This result aligns with Akinola et al. (2024), who found an insignificant relationship, but contrasts with Ejike (2019), who reported a significant positive relationship between ITR and profitability.

Considering the overall effect of the model, the significance of the F-statistic in the fixed effect result suggests that the explanatory variables taken together (ICP, ISR, and ITR) significantly explain the variation in ROA among the listed industrial goods firms. This implies that although not all individual inventory indicators significantly impacted profitability; their collective influence is statistically meaningful, justifying the relevance of inventory management strategies as a whole in driving firm performance.

### Summary of Findings

- i. Inventory Conversion Period (ICP) has a positive but statistically insignificant effect on profitability, indicating that the speed of converting inventory into sales does not significantly enhance firm performance.
- ii. Inventory to Sales Ratio (ISR) exhibits a significant negative effect on profitability, implying that excessive inventory relative to sales reduces firm efficiency and profitability.
- iii. Inventory Turnover Ratio (ITR) has a negative but statistically insignificant effect on profitability, suggesting that higher turnover may not always lead to improved financial outcomes due to cost or operational factors.
- iv. Overall, the study concludes that inventory management practices, though not all individually significant, collectively have a significant impact on the profitability of listed industrial goods firms in Nigeria. The significant F-statistic underscores the importance of balancing inventory levels with operational efficiency, consistent with EOQ and TOC principles.

## Conclusions and Recommendations

### Conclusions

Drawing from empirical analysis and theoretical insights, the study concludes that inventory management is a critical determinant of firm performance when assessed holistically. While not all individual components of inventory management showed statistical significance, their collective effect was proven to be meaningful. This affirms that inventory-related decisions particularly in balancing stock levels, optimizing conversion time, and maintaining efficient turnover play a strategic role in enhancing profitability in the industrial goods sector.

Furthermore, the study discovered that ineffective inventory practices, particularly excess inventory relative to sales, can erode profitability. This underscores the need for firms to adopt more structured, responsive, and data-driven inventory systems. Effective inventory management enhances not only profitability but also operational flexibility, capital efficiency, and customer satisfaction all of which are essential for sustaining competitiveness in Nigeria's manufacturing industry.

### Recommendations

As a result of the conclusions, the following recommendations are proposed to enhance inventory efficiency and profitability:

- i. Firms should implement inventory optimization models such as EOQ and Just-In-Time (JIT) to strike a balance between stock availability and cost efficiency.
- ii. Management should regularly review inventory-to-sales performance metrics to avoid overstocking, reduce holding costs, and improve asset utilization.
- iii. Venture-managed inventory (VMI) strategies can be adopted to reduce high inventory rates and administrative costs.

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## Appendix 1

### Population of the Study (Industrial Firms in Nigeria)

| S/N | Company Name                | Sector           | Date Incorporated  |
|-----|-----------------------------|------------------|--------------------|
| 1.  | Austin Laz & Company Plc    | Industrial Goods | July 13, 1982      |
| 2.  | Berger Paints Plc           | Industrial Goods | September 1, 1959  |
| 3.  | Beta Glass Plc              | Industrial Goods | June 2, 1974       |
| 4.  | BUA Cement Plc              | Industrial Goods | May 30, 2014       |
| 5.  | CAP Plc                     | Industrial Goods | September 21, 1965 |
| 6.  | Cutix Plc                   | Industrial Goods | November 4, 1982   |
| 7.  | Dangote Cement Plc          | Industrial Goods | November 4, 1992   |
| 8.  | Greif Nigeria Plc           | Industrial Goods | January 20, 1940   |
| 9.  | Lafarge Africa Plc          | Industrial Goods | February 24, 1959  |
| 10. | Meyer Plc                   | Industrial Goods | May 20, 1960       |
| 11. | Notore Chemical Ind Plc     | Industrial Goods | November 30, 2005  |
| 12. | Premier Paints Plc          | Industrial Goods | August 24, 1982    |
| 13. | Tripple Gee and Company Plc | Industrial Goods | April 14, 1980     |

Source: Nigeria Exchange Group, 2025

## Appendix 2

### Hausman Test Result

| Test Summary                                   |            | Chi-Sq. Statistic | Chi-Sq. d.f. | Prob.  |
|------------------------------------------------|------------|-------------------|--------------|--------|
| Cross-section random                           |            | 6.544853          | 4            | 0.1620 |
| Cross-section random effects test comparisons: |            |                   |              |        |
| Variable                                       | Fixed      | Random            | Var(Diff.)   | Prob.  |
| ICP                                            | 0.139637   | 0.047595          | 0.002292     | 0.0546 |
| ISR                                            | -90.036192 | -60.584664        | 262.200786   | 0.0689 |
| ITR                                            | -0.654918  | -2.380965         | 0.794542     | 0.0528 |
| FS                                             | 2.458965   | -0.327066         | 1.732315     | 0.0343 |

Source: E-view Output (2024)