

## Backflush Accounting and Financial Performance of Listed Manufacturing Firms in Nigeria

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**Abstract:** This study examines the impact of backflush accounting on the financial performance of listed manufacturing companies in Nigeria. Specifically, the study aims to examine the impact of the commodity inventory turnover ratio on Return on Assets (ROA) and evaluate the impact of the cost/revenue ratio on Return on Equity (ROE) among these companies. Backflush accounting, a streamlined accounting method that records costs after production has ended, is gaining attention for its potential to improve operational efficiency and financial performance. The study used balanced panel data derived from the annual reports of selected manufacturing companies listed on the Nigerian Stock Exchange covering the period from 2013 to 2019. A random effect panel regression estimation technique was used, and the analysis was performed using E-View's version 10. The empirical results showed that the inventory turnover ratio has a significant positive effect on both ROA and ROE, indicating that effective inventory management contributes to improved profitability. However, a negligible negative effect on earnings per share (EPS) was observed, suggesting that the benefits may not immediately translate into shareholder value. Based on these findings, the study recommends that manufacturing companies in Nigeria adopt backflush accounting practices, as it has been shown to improve financial performance and promote better resource management.

**Keywords:** Backflush Accounting; Financial Performance; Inventory and Turnover Ratio; Operational Efficiency; Return on Equity (ROE); Business Environment; Accounting Techniques; Technological Advancements.

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### 1. Introduction

One of the fundamental characteristics of today's business environment is its dynamic nature, which is highly complex, competitive, and the means of survival become unpredictable. These changes in the business environment have been very rapid, with an intensive global competitive pressure. The survival of these trends, therefore, rests squarely on the ability of companies to adapt and map out survival strategies to remain in business and compete favourably with other competitors. Michael et al. [4] argued that economic variables have been complex both in form and have impacted on business practices, such that consumers and clients have been showing complex behaviours both in local and international market operations. Thus, the most

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dramatic changes have been those exhibited by competitive pressure, where competitors have to use one strategy or the other to adapt to the dynamic changes and unpredictable business environment.

In the highly competitive work environment, companies have to find ways to compete effectively with their competitors [24]. Therefore, they must identify measures to reduce costs, enhance product quality, increase customer satisfaction, and ensure timely information for management decision-making. Additionally, they need to address technological advancements and environmental factors, which have led to the introduction of back-flush accounting. Backflush accounting is a new accounting technique that enables the production of goods and services at a reduced rate or the bare minimum, allowing customers to afford them at a lower cost while maintaining high product quality and customer satisfaction throughout every production stage. This is a paramount and necessary condition that must be met or taken into consideration when goods are produced or manufactured and services are rendered. This is done by looking at the output of goods produced by the organisation and then working backwards to allocate cost between the cost of goods sold and inventory. Backflush accounting provides and makes available all necessary information relating to or concerning the cost of goods produced in an uninterrupted manner, such that a firm's financial performance can be ascertained at every point in time. Thus, the management accounting system should provide the necessary and different kinds of information that enable companies or firms to produce goods at affordable costs, with customer satisfaction, high product quality, and timely production of information, without compromise.

Backflush accounting techniques provide information leading to the financial performance of firms, whether financial and nonfinancial information, long-term or short-term, with the use of suitable accounting techniques such as backflush accounting, just-in-time (JIT), strategic management accounting, life-cycle costing, target costing, as well as throughput accounting. These are all innovations in accounting literature [9]. Thus, backflush accounting is an innovation in modern management accounting practices where the financial performance of firms is appraised or evaluated through cost reduction processes to improve the quality of goods and services, increase customer satisfaction, and timely production of information for management-informed decisions. Mahdi et al. [13] opined that financial performance is the main objective of every profit-seeking company. Therefore, the implementation of backflush accounting philosophy in accounting will have a profound impact on the financial performance of firms, more especially in an intensely competitive business environment. In the intensive global business environment where firms are struggling to survive, most companies or firms around the world have applied different innovative thinking, such as backflush accounting to management practices, and began to examine technology as a means leading to improved manufacturing flexibility, product quality, and reduction in product cost of goods and services [15].

Backflush accounting, therefore, focuses on the extent to which goods and services are being produced at low cost, high product quality, and customer satisfaction being taken into consideration or given priority. In a competitive environment such as ours, managers of most manufacturing companies or firms have learned that the survival of their companies rests on the ability to produce affordable goods and services at a reduced rate such that consumers will be willing to patronise or buy at every given time, time with high quality of product and low price considered [21]. Backflush accounting is a cost accounting technique or system that focuses on the output of an organisation by working backwards to allocate costs between the cost of goods sold and inventory. Backflush accounting is primarily concerned with allocating costs to the output of goods produced by an organisation, and then working backwards to allocate costs between the cost of goods produced, sold, and the inventories.

Chartered Institute of Management Accountants asserts that costs do not mirror the flow of products through the production process, but are attached to the output produced (finished goods, inventory, and cost of sales, on the assumption that back flush costing is a realistic measure of the actual cost incurred during the production processes. Backflush accounting focuses on the output of an organisation and then works backwards when allocating costs between cost of goods sold and inventories. Inventories refer to the stock of goods that a firm is producing for sale. Ama [6] defines inventory as the stock of goods a firm is producing for sale and the components that make up the goods. Such inventories include: raw materials, i.e, those basic input materials that are converted into finished goods, work-in-progress (W.I.P.), which are partly completed goods, as well as finished goods or the entire completed goods.

Ahmad et al. [1] opined that one of the uses of backflush accounting is that it does not have any separate accounts for raw materials and work-in-progress (W.I.P) accounts. Both are maintained in a single account called a raw and in-process account (R.I.P.), otherwise known as the raw material account. Backflush accounting is a widely accepted accounting practice known throughout the world today by manufacturing companies or firms because of its innovative techniques, such as better product quality, cost reduction, timely production of information for management decision making, and satisfaction of customers' demand at every point in time, as well as improving the financial performance of firms. The backflush accounting techniques or system enhances better production quality, reduces inventory, and shortens product lead time [23]. Thus, the use of backflush accounting techniques by manufacturing firms or companies cannot be overemphasised.

Tabitha [24] asserts that cost accounting practices in the late 19th century did not include the allocation of fixed costs to products or periods, but, rather, the practice of measuring and allocating overhead costs to products through scientific management

processes. These processes, which involved measuring and allocating overhead costs, were essentially a traditional costing method, OBS, and, of course, resulted in a loss of relevance. Adeyeye et al. [11], as cited in Ogbo and Ukpere [3], argue that the backflush accounting strategy enhances the performance of firms or companies. Standard costing, Absorption costing, and marginal costing have been heavily criticised for loss of relevance. The criticism of loss of relevance arises from the fact that the cost accounting techniques or system were mostly traditional techniques, capable of producing inadequate information for evaluation of firm's financial performance or performance appraisal, more- especially the inability to reduce cost, increase customer satisfaction and timely production of information for management decision making, hence the birth of a new cost accounting techniques known as backflush accounting, throughput accounting, target costing, life cycle accounting, Just- in-time accounting as well as activity based costing among others.

All these new cost accounting techniques have made remarkable contributions, impacts, or improvements in accounting practices, as well as increasing the financial performance of firms or companies. Backflush accounting techniques are closely tied to the objectives of meeting customer demand, driving advances, and fostering innovations in the production of goods and services. Thus, the reality is that despite the numerous benefits derived from backflush accounting by companies or firms, some firms are still finding it difficult to key- into or cope with the modern cost accounting techniques, system or practices due to its nature, lack of technological advancement, lack of understanding of the relevance and uses of back flush accounting [5]. Therefore, despite the performance implications of the backflush accounting strategy among manufacturing firms or companies in Nigeria, little empirical study has been carried out that relates to the working and operation of backflush accounting. Adeyeye et al. [11] as cited in Lucey [14] asserts that the traditional management accounting techniques produces a wrong measurement which give firms or companies a wrong direction, reward managers for damaging the business and provide no incentives for improvement, thus, the best we can do is to switch them off, stop using them and move to the backflush accounting strategy and other modern cost accounting techniques. The purpose of this study, therefore, is to investigate the backflush accounting and financial performance of listed manufacturing firms in Nigeria. The following specific objectives therefore guide the study:

- To ascertain the effect of raw material inventory turnover ratio on Return on assets of listed manufacturing firms in Nigeria.
- To evaluate the effect of the cost/revenue ratio on the Return on equity of listed manufacturing firms in Nigeria.

The problem of the study is therefore to establish the extent to which backflush accounting affects the financial performance of listed manufacturing firms in Nigeria. In an attempt to address the problem stated above, null research hypotheses are formulated.

**H<sub>0i</sub>:** There is no significant effect of raw material inventory turnover ratio on Return on assets of listed manufacturing firms in Nigeria.

**H<sub>0ii</sub>:** There is no significant effect of cost/revenue ratio on Return on equity of listed manufacturing firms in Nigeria.

**H<sub>0iii</sub>:** To examine the effect of raw material inventory turnover on earnings per share of listed manufacturing firms in Nigeria.

## 2. Review of Related Literature

### 2.1. Concept of Backflush Accounting

Backflush accounting refers to the method, form, or system of cost accounting techniques used or designed to reduce costs, improve product quality, increase customer satisfaction, and provide timely information for management to make informed decisions. It is an entirely new costing approach used to reduce the cost of the product produced by ensuring that customer satisfaction is always protected at every given point in time. In a backflush accounting system, the costing of goods is delayed until the entire production process is complete. Then, costs are flushed backwards through a cost accounting system by assigning costs to every product produced. Backflush accounting can be viewed as a novel approach within the just-in-time system, where product costs are reduced, quality is improved, or enhanced to meet customer needs promptly.

Ramezani and Mahdloo [18] assert that backflush accounting is a new accounting system that focuses on the output of an organisation produced and then works backwards to allocate cost to inventory and cost of sales based on the characteristics of the cost. The traditional accounting system employs the successive tracking method to track the physical sequence of cost items as they progress from raw materials to work-in-progress and then to finished goods, which can cause delays in the costing process. Delay in this context refers to the sequential tracking of physical cost elements through the manufacturing processes, from raw material production to the work-in-progress stage and ultimately to the finished goods stage. The traditional system implies that cost elements are tracked as the production processes progress.

Backflush accounting system is a new technique developed in just-in-time to replace the traditional cost accounting system, where customers are informed with the right stock of goods produced, at the right or exact quantities needed, required, or

demand, and on time. This leads to a reduction in the inventory carrying cost and profit maximisation. Just-in-time management techniques involve supplying customers with the exact quantity of stock required at the right time [10]. Amahalu et al. [12] argued that backflush accounting is a system in a just-in-time environment that delays the recording of costs until after all the events have been completed. i.e., all the production processes are completed.

Omah and Okolie [16] opined that backflush accounting eliminates or removes the preparation of different sets of accounts or separate work-in-progress as well as raw materials accounts. Both accounts are now consolidated into a single account, enabling cost reductions at every level of production processes and organisational activities. Backflush accounting techniques are one of the simplest methods for accumulating costs over goods produced by firms or companies that have adopted the just-in-time approach or system of producing goods. It is typically a new cost accounting system that is connected with the objectives of responding to the requirements of the just-in-time production system [2]. Ramezani [17] posits that backflush accounting is a product costing approach that is used in a just-in-time (JIT) operating environment, where costing is delayed until production of goods is completed or finished. Then costs are flushed backwards through the system by assigning costs to every product produced.

This process implies that the traditional cost accounting system's detailed tracking of cost items, which it normally uses at every stage of the production process, is eliminated. The traditional cost accounting system usually tracks cost items as production progresses through the manufacturing stages of raw materials through the work-in-progress to the finished goods stage. Thus, at each stage of the manufacturing process, more costs are added and recorded with the traditional cost system or method. Backflush accounting method, therefore eradicate the whole of these processes and allocates costs to the output of goods after situation more-especially in the highly environments where consumers need accounting system allows costs to be allocated after all production processes have been completed: Costs are not built up as work progresses from one stage to another, hence, accumulated after the whole 'production work is completed. All relevant cost information is delayed until production is completed, or even at the time of sales. Then, the cost is adjusted backwards and assigned to every product produced up to the point where inventories remain.

Bhimani et al. [2] pointed out that backflush cost accounting is a technique of costing that is normally associated with the just-in-time (JIT) production system, which applies only to the costing of output of products after production is completed. Costs do not narrow the flow of products through any production process; rather, costs are attached to the output produced on the assumption that such costs have been backflushed and cost accordingly, hence giving a realistic measure of the actual costs incurred during the production processes. Thus, backflush costing has been made in response to the advances and innovations in the production of goods by manufacturing companies or firms around the world today. The benefits of the backflush accounting system include the elimination of continuous tracking of cost items at every stage of production, thereby delaying costs until production is completed [1].

Apart from that, the backflush cost accounting system or techniques keep the cost of inventory of raw materials as low as possible, such that ordering for raw materials for the production of goods will be scheduled in such a way that the goods will arrive before the commencement of every production. Thus, by the time of invoicing and receiving materials, the products are sold at a rate that covers the expenses incurred. Backflush accounting is, therefore, a strategy that involves delaying the allocation of the costing process until the production of goods and services is completed. Once the production cycle is completed, the costs are allocated to the operation in a manner that determines the costs to the manufactured product, and the sale price is then determined and set accordingly. The implication of applying a backflush accounting system is that costs associated with the product manufactured are known immediately after the production is completed. Then, the selling prices are set forth accordingly.

## **2.2. Concept of Raw Material Inventory Turnover**

Raw material inventory turnover refers to those basic input materials that are converted into finished products through the manufacturing process and have the ability or quality to be sold and replaced regularly, as the case may be. Thus, raw materials inventories are those units of input that have been purchased and stored for future production. It is also known as the stock of goods a firm is producing for sale or replaces from time to time. A company's or firm's raw material inventory turnover ratio shows the number of times its average inventory is sold during a period. It specifically relates to a measure of sales volume concerning the average amount of goods a hand can produce to achieve this sales volume.

Stefanou and Athanasaki [22] assert that raw materials inventory turnover is a measure of how often the company sells and replaces its inventory. It is the ratio of the annual cost of sales to the latest inventory. Raw materials inventory turnover is the number of times a company or firm sells and replaces its inventory or stock for another production period. It is specifically the amount of stock turnover concerning the time or period of replacement. Raw materials inventory turnover is a key performance indicator that measures the number of times a firm sells and replenishes its inventory or stock within a given period [5]. Thus,

raw materials inventory turnover is calculated by dividing the cost of goods sold by the average inventory level. A relatively low raw material turnover may indicate ineffective inventory management. The formula is therefore: -

$$\text{Raw material inventory turnover} = \frac{\text{Cost of goods sold}}{\text{Average inventory turnover level}}$$

Taleghani et al. [25] argued that a company's raw material inventory turnover refers to how quickly goods enter and leave the storage of the business as quickly as possible. Raw materials inventory turnover in the passage represents the movement of raw materials in terms of sales and replacement to meet the next production date, a period. It is how quickly a company or firm is pulling in product for sales [20]. Therefore, to determine the inventory turnover, the company or firm needs to closely track the movement of stock in and out of the company's storage.

### 2.3. Concept of Cost Ratio

The cost ratio is the proportion of the cost of goods available to the retail price of those goods. The ratio is a component of the retail method, which is used to estimate the amount of ending inventory. Retailers use the concept. In estimating the ending inventory under the retail method, the cost ratio is the cost of goods available divided by the retail value of the goods available.

### 2.4. Concept of Firm Size

The size of a business unit means the size of a business firm. It means the scale or volume of operation turned out by a single firm. The term 'size of businesses' refers to the scale of organisation and operations of a business enterprise. De Wit [7] opined that size is observed as a major determinant of performance in any firm. It has always been the objective of the firms to multiply in size to have an edge over their competitors. Economies of scale theoretically explain the positive relation between size and performance. Firm size is equal to the logarithm of the total assets of a firm. It is mathematically represented thus;

$$FS = \log (\text{total asset})$$

### 2.5. Concept of Financial Performance

Financial performance of a firm or companies is normally associated with the degree to which a company or firm is successful, in terms of its level of profitability, return on assets (ROA), return on capital employed (ROCE), earnings per share (EPS), as well as Return on equity. Ezelibe et al. [5] argued that the concept of financial performance in accounting literature usually refers to the financial aspect, such as profit, return on assets (ROA), and economic value added (EVA), of the firms or companies. Financial performance represents the profitability index of a company or firm, or how well a company is doing in terms of profit-making after tax deduction, expenses, and other charges.

Gonzalez and Gonzalez [10] also assert that financial performance is categorised into market-based performance and accounting-based performance. Market-based performance refers to the stock price, earnings per share, and dividend payout of a company or firm during a period. In contrast, accounting-based performance encompasses metrics such as Return on Assets, Return on Equity, and earnings per share. Both market-based performance and accounting-based performance are what is known or referred to as the financial performance of a company. A company or firm cannot be financially viable in terms of its performance without considering or talking of the stock price, earnings per share (EPS), return on assets (ROA), as well as Return on equity (ROE) of the firms or companies over a given period. These entire performance indexes define the financial performance of any company or firm during a particular period.

Akinleye and Ademiloye [8] posit that the financial performance of a firm is a subjective measure used by firms to interpret the way a firm uses its assets from its primary mode of business to generate higher revenue. Thus, firm's financial performance is always evaluated, measured and appraised in terms of its cash flow index which differentiate the amount of cash at the end of a given period and the amount of cash at the beginning of the same period, using different ratios such as Return on assets, return on investments, return on capital employed (ROCE). Therefore, financial performance is normally attributed to the profitability index and growth of a firm during a given period.

### 2.6. Concept of Return on Assets (ROA)

Return on assets is simply a measure used to determine a firm's performance. It is usually a measure used to evaluate a firm's performance in utilising its assets to generate earnings independently of the financing of those assets. It specifically relates to the results of operating performance to the investment that a firm has made, without regard to how the acquisition of these

investments was financed. Return on assets measures a firm's performance by using its assets independently to finance itself. The ratio of Return on assets is calculated as follows:

$$\text{Return on asset (ROA)} = \frac{\text{Profit before tax}}{\text{Total assets}} \times \frac{100}{1}$$

Return on assets (ROA) is an indicator of how profitable a firm or company is, relative to its total assets. It provides insight into how efficiently management utilises its assets to generate earnings for the company or firm. Return on assets ratio is usually called Return on total assets because it is the profitability ratio used to measure the net income produced by the total assets of the company or firm. Return on assets ratio is usually called Return on total assets because it is the profitability ratio used to measure the net income produced by the total assets of the company or firm. Thus, the higher Return on assets is an indication that the company or firm is doing well. However, a low rate of Return on Assets indicates that the company's or firm's management is either inefficient or not utilising its existing assets effectively to generate the expected return. Therefore, return on assets is considered an effective means of measuring the financial performance of a company or firm when the expected rate of Return on assets is very high.

### 2.7. Concept of Return on Equity (ROE)

This is also a very widely used measure of financial performance. It reveals the proportion of profit earned by the core capital invested in the firm. This reflects management's ability to utilise shareholders' funds in generating profits. This also reveals the returns that are accruable to the investors of the firm. Return on capital employed is one of the most important ratios used in assessing a company's financial performance. It is simply the company's profit, expressed as a percentage of shareholders' funds. Return on equity is an indicator used to assess the profitability of a company over a given period. Thus, in calculating the financial performance of a company, using Return on equity, the profit figure is obtained from the profit and loss account of the firm or company, and the capital that was employed from the balance sheet. It is crucial to note that using Return on Equity (ROE) can lead to two significant issues. Firstly, comparing figures across different companies or periods requires a consistent basis, ensuring that asset values are up to date. Secondly, when comparing like with like, the performance of a company or firm for a given period can be evaluated using Return on Equity. Equity represents the shareholders' fund, which should be compared with the profit. Therefore, return on equity is calculated by dividing the profit after tax by shareholders' equity as follows:

Operating profit 100

$$\text{Return on equity (ROE)} = \frac{\text{Operating profit}}{\text{Total equity}} \times \frac{100}{1}$$

From the above formula, return on equity is simply the percentage of Return generated by the total funds of shareholders employed to finance the operations of a company or firm during an accounting year.

## 3. Theoretical Review

This study is anchored on the theory of contingency.

### 3.1. Contingency Theory

Contingency theory is the theory upon which this study is anchored. Contingency theory is an approach to the study of organisational behaviour that explains how contingent factors such as technology, culture, and the external environment influence the design and function of an organisation. The essence of contingency theory is that best practices depend on the contingencies of the situation. Contingency theory is a behavioural theory that explains that there is no single best way to design organisational structures. Thus, a company or firm is contingent upon the internal and external conditions of the firm. The contingency approach to organisation is designed to enable the organisation to handle any environmental uncertainties that may arise.

### 3.2. Empirical Review

The following are some empirical studies in support of the study: Oluyang et al. [15] conducted a study on the effect of backflush accounting on the financial performance of food and beverage companies listed on the Nigerian stock exchange. Exchange from 2010 to 31st December, 2015. The study employed an ex-post factor research design, formulating and testing three hypotheses using the coefficient of correlation and ordinary least squares regression with Stata 13 statistical software. The

study's results revealed that backflush accounting has a positive statistical effect on Return on Assets. Return on equity and earnings per share of food and beverage companies in Nigeria. Swenson and Cassidy [23] conducted another research study on the effect of backflush costing using a just-in-time (JIT) management cost accounting system. The study based its findings on twenty-two (22) quoted companies. The findings of the study revealed that the implementation of backflush accounting techniques reduced scrap, re-work, and set-up time and total inventory.

Saleh [20] did an empirical investigation on the adoption of the backflush accounting system among Kenyan manufacturing firms. Data for the study were collected from a well-structured questionnaire collected from fifty-six (56) firms listed on the Kenyan stock exchange table. Descriptive statistics and Spearman correlation were used to analyse the data. The study's results show that backflush accounting and throughput accounting techniques have a positive relationship with the financial performance of firms in Kenya. Salehi and Valizadeh [21] examined backflush accounting in Iran using an empirical study to explore the significance of backflush accounting in manufacturing firms in Iran. The study's results revealed that backflush accounting estimates the values of inventories less than other systems during the year. Secondly, it was also revealed that backflush accounting is most closely associated with private companies that use just-in-time manufacturing systems for inventories or an activity-based costing system. In the study conducted by Rehana and Mahmuda [19], which examined the appraisal of cost management tools in manufacturing organisations in Bangladesh, the researchers used backflush accounting techniques. The study used a total of seventy (70) manufacturing organisations as the population of the study. Multiple regressions were used to analyse the data. The results of the study revealed that five cost management tools have a significant positive relationship with overall satisfaction with cost management tools, including backflush accounting techniques.

#### 4. Methodology

The study adopts an ex-post facto research design to holistically examine the effect of backflush accounting on the financial performance of listed manufacturing firms in Nigeria. Data for the study were generated from the annual reports of the selected firms for the period from 2013 to 2019. The study employs random fixed panel regression estimation techniques, utilising the economic view (E-view) version 10 statistical analysis. The Hausman test was employed to determine the effect of backflush accounting on the financial performance of listed manufacturing firms in Nigeria.

##### 4.1. Model Specification

The model adopted by the researcher modifies the approach of Amahalu et al. [12] and expresses financial performance (FP) as a function of inventory turnover, cost/revenue ratio, and firm size, as follows:

$$FP = f(INTO, CSTR, FS12) \dots \quad (1)$$

This is further restated mathematically, using three proxies of financial performance, as indicated in Equations 2 to 4:

$$ROA = \beta_0 + \beta_1 INVTO + \beta_2 CSTR + \beta_3 FSIZ + \mu \dots \quad (2)$$

$$ROE = \beta_0 + \beta_1 INVTO + \beta_2 CSTR + \beta_3 FSIZ + \mu \dots \quad (3)$$

$$EPS = \beta_0 + \beta_1 INVTO + \beta_2 CSTR + \beta_3 FSIZ + \mu \dots \quad (4)$$

Where ROA = Return on assets

ROE = Return on equity

EPS = Earnings per share

INVTO = Inventory turnover ratio

CSTR = cost/revenue ratio

FSIZ = Firm size (log of total assets)

$\beta_0$  = Intercept

$\beta_1, \beta_2, \beta_3, \& \beta_4$  = Regression Coefficients

$\mu$  = Error term

The a priori expectations are: Model 1:  $\beta_1 > 0 > \beta_2, \beta_3$

##### 4.2. Empirical Results and Discussion

The data employed for the study are presented in Table 1.

**Table 1:** Inventory management and financial performance indices

<b>Company</b>	<b>Year</b>	<b>INVTO</b>	<b>CSTO</b>	<b>FSIZ</b>	<b>ROA</b>	<b>ROE</b>	<b>EPS</b>
Flourmills of Nigeria	2013	7.70	0.90	18.97	0.05	0.11	3.72
	2014	5.28	0.88	19.21	0.05	0.11	4.31
	2015	4.15	0.87	19.26	0.01	0.03	0.92
	2016	6.00	0.90	19.27	0.04	0.10	3.97
	2017	5.11	0.87	19.66	0.03	0.09	3.75
	2018	4.71	0.87	19.59	0.03	0.06	3.52
	2019	4.94	0.91	19.57	0.03	0.06	4.71
NASCON	2013	7.66	0.58	16.25	0.24	0.39	1.02
	2014	5.07	0.66	16.35	0.15	0.30	0.70
	2015	6.11	0.73	16.61	0.13	0.30	0.79
	2016	4.55	0.68	17.02	0.10	0.30	0.91
	2017	5.66	0.63	17.22	0.18	0.46	2.02
	2018	4.12	0.70	17.23	0.15	0.37	1.67
	2019	4.89	0.79	17.47	0.03	0.12	0.70
Champion Breweries	2013	7.22	0.99	16.03	-0.3	0.26	-1.31
	2014	7.51	0.81	16.08	-0.08	-0.13	-0.24
	2015	7.15	0.71	16.15	0.01	0.01	0.01
	2016	5.28	0.72	16.11	0.05	0.07	0.07
	2017	5.72	0.71	16.13	0.05	0.06	0.07
	2018	4.83	0.75	16.17	-0.03	-0.03	-0.03
	2019	7.11	0.72	16.21	0.02	0.02	0.03
Vitafoam	2013	3.00	0.65	16.05	0.04	0.12	0.64
	2014	2.84	0.68	16.22	0.06	0.18	0.82
	2015	3.60	0.72	16.28	0.02	0.05	0.20
	2016	2.52	0.67	16.39	0.03	0.09	0.41
	2017	3.00	0.74	16.38	0.01	0.04	0.18
	2018	2.82	0.73	16.38	0.03	0.10	0.47
	2019	2.96	0.63	16.53	0.13	0.27	1.26
Nestle	2013	7.74	0.57	18.50	0.21	0.55	28.08
	2014	7.49	0.57	18.48	0.21	0.62	28.05
	2015	7.76	0.55	18.60	0.020	0.62	29.95
	2016	5.16	0.59	18.95	0.05	0.26	10.00
	2017	5.99	0.59	18.80	0.23	0.75	42.55
	2018	6.59	0.57	18.91	0.26	0.86	54.26
	2019	4.68	0.55	19.08	0.24	1.01	57.63
Nigerian Breweries	2013	6.40	0.49	19.35	0.17	0.38	5.70
	2014	4.59	0.49	19.67	0.12	0.24	5.62
	2015	5.27	0.51	19.69	0.10	0.22	4.82
	2016	5.70	0.57	19.72	0.08	0.18	3.58
	2017	5.20	0.65	19.76	0.08	0.18	4.13
	2018	6.87	0.69	19.78	0.05	0.11	2.43
	2019	4.98	0.59	18.91	0.26	0.10	2.01
Unilever	2013	5.37	0.63	17.59	0.11	0.51	1.25
	2014	4.13	0.64	17.64	0.05	0.32	0.64
	2015	6.18	0.64	17.73	0.02	0.15	0.81
	2016	5.01	0.71	18.10	0.04	0.26	0.32
	2017	4.70	0.64	18.61	0.06	0.10	1.78
	2018	5.02	0.68	18.70	0.08	0.13	1.84
	2019	4.64	0.92	18.46	-0.07	-0.11	-1.29
Cadbury	2013	12.05	0.63	17.58	0.14	0.25	1.92
	2014	9.44	0.74	17.18	0.05	0.12	0.75
	2015	9.76	0.68	17.16	0.04	0.09	0.61
	2016	4.60	0.77	17.16	-0.01	-0.03	-0.16

	2017	4.10	0.78	17.16	0.01	0.03	0.16
	2018	4.78	0.78	17.13	0.03	0.06	0.44
	2019	5.11	0.79	17.18	0.04	0.08	0.57
Dangote Sugar	2013	6.80	0.74	18.32	0.15	0.25	1.13
	2014	5.15	0.77	18.39	0.12	0.20	0.99
	2015	5.50	0.77	18.49	0.12	0.19	1.05
	2016	3.11	0.85	18.99	0.08	0.19	1.18
	2017	3.25	0.73	19.09	0.19	0.38	3.15
	2018	3.32	0.71	19.00	0.14	0.24	2.15
	2019	3.40	1.50	18.98	0.07	0.12	1.07
Guinness Nigeria	2013	5.35	0.54	18.61	-0.10	-0.26	7.93
	2014	4.30	0.53	18.70	0.07	0.21	6.36
	2015	5.91	0.54	18.62	0.06	0.16	5.18
	2016	4.62	0.59	18.74	-0.01	-0.05	-1.34
	2017	3.36	0.62	18.80	0.01	0.04	1.28
	2018	5.06	0.67	18.85	0.04	0.08	3.30
	2019	3.63	0.69	18.90	0.03	0.06	2.50
PZ	2013	5.18	0.82	17.73	0.04	0.07	1.23
	2014	4.31	0.84	17.76	0.10	0.18	1.16
	2015	4.52	0.82	17.69	0.10	0.17	1.02
	2016	4.01	0.83	17.88	0.01	0.01	0.47
	2017	1.76	0.46	18.11	0.03	0.07	0.84
	2018	1.95	0.68	18.13	0.02	0.05	0.41
	2019	1.83	0.74	17.98	0.01	0.02	0.15
Honeywell	2013	3.78	0.83	17.83	0.05	0.15	0.36
	2014	3.95	0.81	17.97	0.05	0.16	0.42
	2015	3.31	0.85	18.03	0.02	0.06	0.14
	2016	8.33	0.91	18.15	-0.04	-0.18	-0.38
	2017	8.97	0.80	18.54	0.04	0.08	0.54
	2018	7.06	0.78	18.54	0.04	0.08	0.56
	2019	3.93	0.74	18.74	0.00	0.00	0.01
International Breweries	2013	3.97	0.56	16.95	0.10	0.25	0.71
	2014	4.29	0.52	17.01	0.09	0.19	0.71
	2015	4.14	0.56	17.22	0.06	0.16	0.59
	2016	4.32	0.54	17.33	0.08	0.19	0.81
	2017	1.14	0.33	19.52	0.01	0.04	0.48
	2018	3.69	0.61	19.58	-0.01	-0.12	-0.45
	2019	3.84	0.64	19.72	-0.08	-3.72	-0.78
Berger Paints	2013	3.05	0.58	15.10	0.07	0.10	0.89
	2014	3.31	0.56	15.11	0.04	0.06	0.51
	2015	3.58	0.54	15.18	0.08	0.13	1.14
	2016	2.62	0.57	15.23	0.05	0.09	0.77
	2017	3.20	0.61	15.28	0.06	0.09	0.85
	2018	3.13	0.56	15.33	0.07	0.11	1.11
	2019	2.26	0.54	15.44	0.09	0.15	1.55
Beta Glass	2013	3.29	0.77	17.12	0.05	0.11	2.95
	2014	5.31	0.73	17.11	0.09	0.15	4.78
	2015	3.52	0.77	17.12	0.07	0.10	3.98
	2016	3.60	0.79	17.32	0.11	0.18	7.60
	2017	3.37	0.76	17.46	0.11	0.16	8.23
	2018	3.20	0.76	17.65	0.11	0.17	10.11
	2019	3.30	0.73	17.77	0.11	0.16	11.16
Dangote Cement	2013	14.68	0.93	20.53	0.26	0.37	12.34
	2014	3.54	0.35	20.69	0.19	0.29	10.90
	2015	3.40	0.34	20.84	0.19	0.28	12.51
	2016	3.19	0.42	21.13	0.25	0.38	21.61

	2017	2.55	0.29	21.20	0.16	0.26	14.94
	2018	2.85	0.28	21.27	0.28	0.37	28.25
	2019	2.67	0.30	21.32	0.14	0.20	15.34
Portland Paints	2013	2.13	0.53	14.60	0.05	0.12	0.89
	2014	1.97	0.83	14.64	0.07	0.16	0.37
	2015	2.06	0.59	14.46	-0.12	-0.34	-0.58
	2016	1.62	0.59	14.38	0.00	0.01	0.02
	2017	1.80	0.70	14.53	0.03	0.04	0.08
	2018	2.41	0.62	14.63	0.09	0.13	0.26
	2019	1.85	0.63	14.63	0.04	0.05	0.11
MCNICHOLS	2013	9.79	0.74	12.68	0.07	0.12	0.09
	2014	12.98	0.72	12.84	0.11	0.18	0.15
	2015	12.75	0.80	12.95	0.14	0.23	0.17
	2016	11.72	0.83	13.07	0.12	0.19	0.17
	2017	19.18	0.85	13.20	0.07	0.12	0.11
	2018	12.49	0.82	13.62	0.05	0.12	0.13
	2019	10.89	0.84	13.49	0.02	0.05	0.06
CAP Plc	2013	5.26	0.49	14.93	0.47	1.12	2.02
	2014	5.84	0.49	14.94	0.54	1.41	2.37
	2015	5.11	0.49	15.04	0.51	1.14	2.49
	2016	3.75	0.51	15.41	0.33	0.70	2.29
	2017	3.25	0.54	15.43	0.30	0.67	0.76
	2018	4.56	0.52	15.66	0.32	0.72	2.90
	2019	4.23	0.53	15.72	0.26	0.67	2.55
CUTIX Plc	2013	4.90	0.71	13.89	0.14	0.25	0.05
	2014	3.65	0.71	14.37	0.12	0.30	0.12
	2015	2.79	0.73	14.49	0.08	0.20	0.05
	2016	4.31	0.74	14.45	0.10	0.22	0.08
	2017	2.42	0.73	14.66	0.11	0.25	0.11
	2018	2.68	0.70	14.86	0.16	0.34	0.50
	2019	2.40	0.70	14.87	0.17	0.30	0.27

Source: Company's Annual Reports

### 4.3. Data Analysis

The data is presented in Table 1. One was analysed using both descriptive and inferential tools. These include descriptive and correlation statistics, as well as fixed-effect panel least squares regression statistical techniques. These varied analytical processes were employed to enable the researcher to gain an in-depth knowledge of the characteristics of the variables employed.

### 4.4. Descriptive Statistics

Descriptive statistics provide information concerning the basic characteristics of the data, such as the mean, standard deviation, skewedness, kurtosis, and normality etc. It also enables the researcher to make a comparative assessment of the variables under study. The Result of the descriptive statistics is shown in Table 2.

**Table 2:** Descriptive statistics

	INVTO	CSTR	FSIZ	ROA	ROE	EPS
Mean	5.004204	0.678319	17.26934	0.090571	0.179156	3.991219
Median	4.535867	0.696076	17.46460	0.070000	0.151547	0.890000
Maximum	19.17544	1.498196	21.32429	0.540000	1.408151	57.63000
Minimum	1.138716	0.275413	12.67941	-0.130000	-3.723443	-1.340000
Std.Dev.	2.752428	0.157043	1.994267	0.103665	0.415139	9.076437
Skewness	2.059236	0.606472	-0.248136	1.554151	-5.483912	3.908048
Kurtosis	8.830097	7.486119	2.399348	7.343557	57.88205	19.76116
Jarque-Bera	297.2191	125.9796	3.541232	166.4135	18271.94	1995.163

Probability	0.000000	0.000000	0.170228	0.000000	0.000000	0.000000
Sum	700.5886	94.96468	2417.707	12.68000	25.08183	558.7707
Observation	140	140	140	140	140	140

Source: E-views 10 Output Computed by Researcher

From the results in Table 2, INVTO, CSTR, and FSIZ have mean values of 5.0, 0.678, and 17.3, whereas ROA, ROE, and EPS have means of 0.09, 0.17, and 3.99, respectively. The mean INVTO value of 5 indicates that the firms, on average, sell off their inventory within a little over two months. The variables are skewed to the right except for FSIZ and ROE. The standard deviations indicate that there is moderate variability in the spread of the variables. Lastly, the Jarque-Bera statistics and associated probabilities, however, show that only FSIZ is normally distributed.

#### 4.5. Correlation Test

The test for correlation shows the degree of association among the variables employed in the study. It also gives an indication of the existence or non-existence of multicollinearity among the independent variables.

Table 3: Correlation matrix

	INVTO	CSTR	FSIZ	ROA	ROE	EPS
INVTO	1.000000					
CSTR	0.271874	1.000000				
FSIZ	-0.161902	-0.134207	1.000000			
ROA	0.077550	-0.393737	-0.037921	1.000000		
ROE	0.073937	-0.191070	-0.105877	0.657080	1.000000	
EPS	0.052416	-0.307546	0.379438	0.394939	0.330658	1.000000

Source: E-Views 10 Output Computed by Researcher

In Table 3, INVTO and CSTR have weak positive and negative correlations with all three measures of financial performance: ROA, ROE, and EPS, whereas FSIZ has negative associations with both ROA and ROE but a positive correlation with EPS. Furthermore, the weak correlations between INVTO and both CSTR and FSIZ also indicate the absence of multicollinearity between the independent variables.

#### 4.6. Fixed/Random Effects Regression Test

The fixed effect panel regression tests were carried out in a bid to vividly determine the effect of the various estimates on the financial performance indicators, as shown in Tables 4 and 5.

**Dependent Variable:** ROA

**Method:** Panel EGLS (Cross-section weights)

**Date:** 24/10/2024 **Time:** 15:23

**Sample (adjusted):** 2013-2019

**Periods included:** 7

**Cross sections included:** 20

**Total panel (balanced) observations:** 140

Linear estimation after one-step weighting matrix

White cross-section standard errors & covariance (d.f. corrected).

Table 4: Multiple regression test (model 1)

Variable	Coefficient	Std. Error	t-Statistics	Prob.
C	0.806481	0.125537	6.424261	0.0000
INVTO	0.006144	0.002077	2.957485	0.0038
CSTR	-0.172684	0.025356	-6.810309	0.0000
FSIX	-0.036453	0.006996	-5.210497	0.0000
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.764752	Mean dependent var	0.100328	
	0.720517	S.D. dependent var	0.084089	

Adjusted R-squared	0.0488 17	Sum squared resid	0.278828	
S.E. of regression	17.28851	Durbin-Watson stat	1.664227	
F-statistic	0.000000			
Prob(F-statistic)				
Unweighting Statistics				
R-squared	0.810604	Mean dependent var	0.090571	
Sum squared resid	0.2829 11	Durbin-Watson stat	1.636308	

Source: Researcher's Computation using E-views

**Dependent Variable:** ROE

**Method:** Panel EGLS (Cross-section weights)

**Date:** 24/10/2024 **Time:** 00:04

**Sample (adjusted):** 2013-2019

**Periods included:** 7

**Cross-sections included:** 20

**Total panel (balanced) observations:** 140

Linear estimation after one-step weighting matrix

White cross-section standard errors & covariance (d.f. corrected).

**Table 5:** Multiple regression test (model 2)

Variable	Coefficient	Std. Error	t-Statistics	Prob.
C	3.643992	0.382764	9.520214	0.0000
INVTO	0.011875	0.004980	2.384700	0.0187
CSTR	-0.3 87156	0.102825	-3.765201	0.0003
FSIX	-0.188869	0.022608	-8.354059	0.0000
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.73 1038	Mean dependent var	0.469588	
Adjusted R-squared	0.680464	S.D. dependent var	0.55578 1	
S.E. of regression	0.273 879	Sum squared resid	8.776 130	
F-statistic	14.45483	Durbin-Watson stat	1.525668	
Prob(F-statistic)	0.000000			
Unweighting Statistics				
R-squared	0.488114	Mean dependent var	0.179156	
Sum squared resid	12.26242	Durbin-Watson stat	1.45090 1	

Source: Researcher's Computation using E-views

**Dependent Variable:** EPS

**Method:** Panel Least Squares

**Date:** 24/10/2024 **Time:** 18:45

**Sample (adjusted):** 2013-2019

**Periods included:** 7

**Cross-sections included:** 20

**Total panel (balanced) observations:** 140

White cross-section standard errors & covariance (d.f. corrected) (Table 6).

**Table 6:** Multiple regression test (model 3)

Variable	Coefficient	Std. Error	t-Statistics	Prob.
C	-8.970038	5.530780	-1.621839	0.1075
INVTO	-0.066306	0.151101	-0.438823	0.6616
CSTR	-4.590613	1.964135	-2.337219	0.0211
FSIX	0.950064	0.354403	2.680741	0.0084
Effects Specification				

Cross-section fixed (dummy variables)			
R-squared	0.8228 13	Mean dependent var	3.991219
Adjusted R-squared	0.789496	S.D. dependent var	9.076437
S.E. of regression	4.164333	Akaike info criterion	5.840092
Sum squared resid	2028.975	Schwarz criterion	6.323362
Log likelihood	-385.8065	Hannah-Quinn criteria	6.036479
F-statistic	24.69638	Durbin-Watson stat	1.309730
Prob(F-statistic)	0.000000		

Source: Researcher's Computation using E-views

#### 4.7. Testing of Hypotheses

Under this subsection, the hypotheses were tested using the Panel Least Squares Regression method, and the decision rule for the acceptance or rejection of the formulated hypotheses was to reject the null hypothesis if the p-value of the statistic is greater than 0.05 (5%), and vice versa. The hypotheses and the results of the tests conducted are presented in Table 7.

Table 7: Testing of hypotheses

	Statement of Hypothesis	Target variable	t-statistic	p-value	Decision
Ho1	There is no significant effect of raw material inventory turnover and return on assets (ROA) of listed manufacturing firms in Nigeria.	ROA	2.957485	0.0038	Reject
Ho2	There is no significant effect of the cost/revenue ratio on the return on equity (ROE) of listed manufacturing firms in Nigeria.	ROE	2.384700	0.0187	Reject
Ho3	There is no significant effect of raw material inventory turnover on earnings per share (EPS) of listed manufacturing firms in Nigeria.	EPS	-0.438823	0.6616	Accept

Source: Tables 2, 3, 4, and 5

#### 4.8. Discussion of Results

The descriptive statistics in Table 2 reveal the mean values of 5.0, 0.6, 8, and 17.3 for INVTO, CST, R, and FSIZ, respectively. On the other hand, ROA, ROE, and EPS had means of 0.09, 0.18, and 3.99. The mean inventory ratio of 5.0 is quite good, indicating that the manufacturing industry in Nigeria sells and restocks every two and a half months, which is likely to result in higher profits. The correlation matrix in Table 3 also revealed that the independent variables have low correlations with themselves, indicating a lower likelihood of multicollinearity among the variables employed in the model. Furthermore, the regression results in Tables 4, 5, and 6 reveal that the independent variables determine 72.1%, 68%, and 78.9% of the variations in ROA, ROE, and EPS, respectively. The F-statistics of 17.3, 14.5, and 24.7 also indicate a high goodness of fit of the model. Furthermore, the t-statistics reveal that all the variables have significant relationships with ROA, ROE, and BPS, except for INVTO, which has an insignificant relationship with EPS. The Durbin-Watson statistic of 1.664, 1.526, and 1.31 suggests the absence of serial autocorrelation in the series.

Also, from the results in Tables 4 and 6, the inventory turnover ratio has significant positive effects on both ROA and ROE (which is in tandem with the a priori expectation). In contrast, it has an insignificant negative effect on EPS. These imply that an increase in the turnover ratio is likely to enhance the financial performance of the selected companies. These results are consistent with those of Tabitha [24] as well as Rehana and Mahmuda [19], whose study on backflush accounting and financial performance of manufacturing firms in Nigeria and Kenya, respectively, revealed a statistically significant positive effect on Return on assets, return on equity, and earnings. The results obtained in the three models also reveal that the cost/revenue ratio has a significant negative effect on all three dependent variables. This implies that the higher the production cost relative to revenue, the lower the profit that can be generated. The high cost of plant and machinery, coupled with increasing operational

costs and high interest expenses on bank loans and advances, results in huge aggregate costs for the firm. Moreover, the low level of infrastructural development, particularly due to the unreliable power supply and minimal government intervention, also hinders output growth. Lastly, the relationship between firm size and financial performance is positive and significant for ROA and ROE, but positive and significant with EPS. This implies that scale economies have not stimulated the financial performance of the firms.

## 5. Summary of Findings

This study was undertaken to examine the effect of backflush accounting on the financial performance of listed manufacturing firms in Nigeria. The specific objectives of the study were to determine the extent to which raw material inventory turnover ratio influenced the returns on assets, returns on equity, and earnings per share of the selected listed firms in Nigeria. In line with the objectives of the study, three hypotheses were formulated. The study also explored conceptual, theoretical, and empirical literatures on the relationship between backflush accounting aggregates and financial performance. The study also utilised panel data for the seven-year period from 2013 to 2019, which were analysed using the fixed effect panel regression technique. The major findings made from the study are as follows:

- Raw material inventory turnover ratio has a significant positive effect on returns on assets of the selected listed manufacturing firms in Nigeria.
- Raw material inventory turnover ratio also has a significant positive effect on returns on equity of the selected listed manufacturing firms in Nigeria.
- Raw material inventory turnover ratio has an insignificant negative effect on the earnings per share of the selected listed manufacturing firms in Nigeria.

### 5.1. Conclusion

In line with the findings made in the course of this study, the following inferences were made. Firms that turn over their inventories more quickly are bound to perform financially better than others. A firm's shareholders are likely to enjoy better returns on their investments when the firm takes a shorter period to realise its inventory. Current tax estimates will directly and significantly affect the financial performance of nonfinancial firms. It can therefore be deduced from the above conclusions that the employment of the backflush accounting technique, to a great extent, enhances the financial performance of firms in the manufacturing subsector in Nigeria.

### 5.2. Recommendations

In consideration of the findings and conclusions made in this study, the following policy recommendations can aid in enhancing the usefulness of backflush accounting in driving the financial performance of listed manufacturing firms in Nigeria. Manufacturing firms in Nigeria should adopt the backflush accounting strategy, since it has been empirically and statistically established that it enhances financial performance. The management of manufacturing firms in Nigeria should also adopt those strategies that are likely to improve their inventory turnover to reap higher financial returns. Management should also ensure that operating costs are minimised to maintain higher profit levels.

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**Data Availability Statement:** This study is based on the dataset titled "Backflush Accounting and Financial Performance of Listed Manufacturing Firms in Nigeria." The dataset is available from the corresponding author upon reasonable request, subject to institutional guidelines.

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**Conflicts of Interest Statement:** The authors declare that there are no conflicts of interest related to this study. All references and supporting sources have been properly cited and acknowledged.

**Ethics and Consent Statement:** Ethical approval was obtained prior to the commencement of the study, and informed consent was secured from both the organization and all individual participants involved in data collection.

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