THE INTERNATIONAL JOURNAL OF BUSINESS & MANAGEMENT

Determinants of Inventory Holdings in Listed Brewery Firms in Nigeria

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Abstract:
The study empirically assessed the firm-specific and macro-economic factors influencing investments in inventories in quoted firms of the Nigerian Brewery sub-sector. This became imperative as these firms are the only ones that have not divested to much more conducive nearby economies such as Ghana, South Africa, Egypt, etc. It adopted the ex post facto research design as secondary data were used. It spanned an 11-year period (i.e., 2011 to 2021). Diagnostic tests carried out indicated the absence of both unit roots and heteroskedasticity. Panel least squares regression analysis (Prais-Winsten regression, correlated panels corrected standard errors) showcased the statistical relevance of these associations. Except for inflation (a macroeconomic variable), the remaining predictors exerted very strong influences on investment in inventories to total sales. Brewery firms' profits are highly influenced by such macro-economic variables as interest and exchange rates, given that bulk of raw materials are sourced from overseas. Given a negative relationship between the cash conversion cycle, firms should always try to limit the time between sales and collection of advanced credits to enhance investment in inventories and earnings. Managers should manage their working capital in more efficient ways by reducing the number of days inventories are held to an optimal level in order to enhance their profitability as well as create value for their shareholders.

Keywords: Inventories, macro-economic factors, total assets

1. Introduction

Inventories are maintained primarily for the smooth running of operations and to fill in gaps created by uncertainties in demand and supply chains (Liu, Ma & Wu, 2021). Conversely, inventory management is focused on maintaining an adequate supply of goods and their equivalents to meet demand in a timely and efficient manner to prevent stock-outs, simultaneously allowing a reasonable amount as safety stock (Zaheeruddin, 2013; Hagberg & Ingram, 2018). The significance of effectively managing inventory cannot be overstated. In any manufacturing industry, a substantial portion, ranging from 60% to 70%, of the total funds invested is tied up in current assets, with inventories being the most prominent component (Carter, 2002). In terms of cost structure, raw materials typically account for approximately 50% of the budget and control of materials for most products (Zanto, 2008 in Eneje, Nweze and Udeh, 2012). The management of inventory is necessitated by the fact that inventories constitute a considerable proportion of operational expenses (Oniwon, 2011), with raw materials alone comprising at least 50% of the overall production costs (Ramakrishna, 2005). Additionally, Adeyemi and Salami (2010) suggested that effective inventory management serves as a means of achieving effectiveness and efficiency within firms. It involves planning and controlling neither too much nor too small stock and its implications. Effective inventory management would have ensured managers order and reorder the right quantity at the right time, keeping the right buffer and safety stocks, minimizing stock-outs and overstocking costs, thereby achieving the overall objective of most firms in these recessive periods: profit optimization (Keth, Muhlemen and Oakland, 1994; Ivanov, Tsipoulanidis and Schonberger, 2019).

Manjhi and Kulkarni (2012) assert that current assets consist of cash, bank, cash equivalents, inventories, receivables, debtors, prepayments, etc. Of all these elements of current assets, inventories take the largest chunk and contribute more to profitability. Proper handling of inventory is at the heart of a sound and efficient working capital structure. According to Zaheeruddin (2013), a firm's proper inventory control facilitates solving the acute problem of liquidity and enhancing cost minimization via a substantial reduction in the working capital needs. Moreover, such tools as calculation of stock level (minimum, maximum, danger and average), calculation of safety stock, economic order quantity (EOQ), always better control analyses (A-B-C) and vital essential desirable analyses (VED) are very vital techniques of inventory planning and control. Manufacturing firms in Nigeria have withered one by one over the years due to improper management of inventory, unethical practices of top management, etc. (Oba, 2008). Since inventory management is

important in working capital management decisions, examining the determinants influencing corporate investment in inventories is necessitated. Firms experience difficulties in managing inventories, especially where the products are not fast-moving (Mathuva, 2013).

According to Koumanakos (2008), in the realm of inventory management, a company encounters a dual challenge.

- Firstly, it must ensure the presence of substantial inventories of raw materials and work-in-progress to facilitate seamless production and finished goods for uninterrupted sales operations.
- Secondly, it needs to minimize the investment in inventories to maximize profitability (Minizi, 2016).

Concurrently, in economies marked by uncertain conditions, businesses often face difficulties in maintaining a consistent inventory flow (Koumanakos, 2008). This implies that inventory management is affected by both firm-specific and economy-specific variables. Under conditions of uncertainty, firms are forced to maintain buffer inventories to safeguard against possible stock-outs in the future. In inflationary and economically unstable economies, this seems economically plausible. It should, however, be noted that inventory investment is primarily determined by the business cycle-given cum trends in the sales levels. Koumanakos (2008) explained that firm profitability is only one factor that may influence the level of investment in inventories. He further stated that variables such as the size of the firm, the cash conversion cycle, capital expenditure, and inflation have been found to be relevant in explaining the inventory holdings of firms. However, there is a dearth of research on inventory management in Nigeria, particularly when it comes to utilizing data from the Nigerian Brewery sector. It is crucial to address this gap and conduct a study that examines the factors influencing inventory holdings for these companies. Specifically, the study aims to investigate the following aspects:

- The correlation between cash inflows and investment in inventories for quoted brewery firms in Nigeria
- The relationship between the cash conversion cycle (CCC) and investment in inventories for quoted brewery firms in Nigeria
- The association between firm size and investment in inventories for quoted brewery firms in Nigeria
- The impact of inflation on investment in inventories for quoted brewery firms in Nigeria
- The sensitivity of investment in inventories to capital expenditure of quoted brewery firms in Nigeria

The exclusion of the foreign listings is based on the intent to localize the study while using only Nigerian-incorporated firms. However, this study is limited in scope to the brewery subsector. This became necessary as it constitutes the bulk of the manufacturing firms surviving the persisting depression in the local economy. In addition, firms in this subsector hold large chunks of inventories; hence, the need to ascertain their determinants of inventory holdings.

2. Review of Related Literature

2.1. Conceptual Review

Inventory and Inventory Management: Inventory, as defined by Brealey, Myers, and Allen (2013), refers to a stock of goods that a business maintains in anticipation of future demand. This definition aligns with Schroeder's (2000) assertion that inventory management affects various aspects of a business, including operations, marketing, accounting, and finance. Schroeder identified three motives for holding inventories: transaction, precautionary, and speculative. The transaction motive arises when stock is necessary to meet production and sales requirements. Additionally, a firm may hold extra inventory as a precautionary measure to account for uncertain future demand. The speculative motive for inventory holding involves purchasing larger quantities of materials in anticipation of abnormal profits, such as acquiring raw materials in inflationary periods.

In a manufacturing company, inventories encompass the products being manufactured for sale and the components that compose those products (Onikoyi, Babafemi, and Aje, 2017). Pandey (2005) classified inventories in manufacturing companies into three forms: raw materials, work-in-progress, and finished goods. Raw materials and work-in-progress stocks facilitate production, while finished goods stock supports smooth marketing operations (Hadley, 2006). When it comes to inventory management, Pandey (2015) noted that companies face the challenge of meeting two conflicting needs. On one hand, they must maintain substantial inventories of raw materials and work-in-progress for seamless production and finished goods for uninterrupted sales operations. On the other hand, they should aim to minimize inventory investment to maximize profitability. The objective of inventory management is to determine and maintain an optimal level of inventory investment, which typically falls between the two extremes of excessive and inadequate inventories. Therefore, inventory plays a critical role in shaping production, marketing, and purchasing activities. Effective strategic inventory management contributes to overall profitability (Filbeck, Krueger, & Preece, 2007).

According to Morris (1995), the primary objective of inventory management is to maintain an optimal amount of assets, whether they are human or material resources, to enhance the overall value of an organization. Keth et al. (1994) emphasize that effective inventory management and control aim to provide managers with crucial information regarding reordering quantities, timing, frequency of orders, and appropriate safety stock levels to minimize stock-outs. The ultimate goal of inventory management is to ensure the availability of needed items while minimizing instances of being out of stock.

Pandy (2005a) identified three main reasons for holding inventories:

- Transactionary motives,
- Precautionary motives, and
- Speculative motives

Transactionary motives entail maintaining inventory to facilitate smooth day-to-day production and sales operations. Additionally, a firm may choose to hold extra stock to account for potential underestimation of future

production and sales requirements, reflecting a precautionary motive that arises when demand is uncertain. The precautionary motive involves holding inventory to mitigate the risks associated with unpredictable changes in demand, supply forces, and other factors. The speculative motive influences inventory decisions by encouraging companies to increase or decrease inventory levels in response to price fluctuations. This motive may tempt firms to purchase larger quantities of materials than usual in anticipation of abnormal profits.

2.1.1. Financing Firm Inventory

Investment and financing decisions give rise to future cash flows, which, when discounted by an appropriate cost of capital, determine the market value of a company. However, such decisions will only result in the expected benefits for a company if attention is also paid to short-term decisions regarding current assets and liabilities. *Current assets and liabilities*, assets and liabilities with maturities of less than one year, need to be carefully managed. *Net working capital* is the term given to the difference between current assets and current liabilities. Current assets may include inventories of raw materials, work-in-progress and finished goods, trade receivables, short-term investments and cash. On the other hand, current liabilities may include trade payables, overdrafts and short-term loans. The level of current assets is a key factor in a company's liquidity position. A company must have or be able to generate enough cash to meet its short-term needs to continue in business. Therefore, inventory management is a key factor in the company's long-term success: without the 'oil' of working capital, the 'engine' of non-current assets will not function. The greater the extent to which current assets exceed current liabilities, the more solvent or liquid a company is likely to be, depending on the nature of its current assets.

2.1.2. Inventory Control Systems

Inventory control is the activity that organizes the availability of items to the customers. It co-ordinates purchasing, manufacturing and distribution functions to meet marketing needs. This role includes the supply of current sales items, new products, consumables, spare parts, obsolescent items and all other supplies (Wild, 2002). Wild (2002) adds that the purpose of the inventory control function in supporting the business activities to optimize the following three targets:

- Customer Service,
- Inventory Costs and
- Operating Costs

The most profitable policy is not to optimize one of these at the expense of others. The inventory controller has to make value judgments. If profit is lacking, the company goes out of business in the short term. If customer service is poor, the customers disappear and the company goes out of business longer term. Balancing the financial and marketing aspects is the answer: the stock controller has a fine judgment to make.

2.2. Theoretical Framework

2.2.1. Theory of Constraints (TOC)

The study is anchored on Eliyahu Goldratt's mid-1980s theory of constraints (TOC: a thinking process that enables people to invent simple solutions to seemingly complex problems) regarding inventory minimization and short-term profit maximization (Goldratt, 1990). The theory is employed in conjunction with the *multi-period stochastic continuous inventory model* for obtaining the optimal size of inventory. A firm's bottlenecks (which may include cash flow problems, transportation problems, obsolete inventory, low inventory turnover and high amount of inventory in storage, idle workers or machines, machine breakdown, large amounts of scrap pieces and the necessary retooling and reworking needed) are identified (Reinaldo, Fernando, João, & Artur, 2010). The theory enables the firms to achieve profit optimization by synchronizing the entire supply chain (Gaither and Frazier; 1999) given that every business concern has a set of processes working together to achieve a common goal (in this instance, profit maximization) and each process has, at least, a single constraint that limits it from higher performance. Sales and contribution must be maximized albeit limited to the constraint's exertion on productivity. Identifying the constraint (e.g., size of investment in inventory for a manufacturing firm) and focusing the entire firm's effort towards exploiting and fixing it ensures a reduction in inventory, more productive machines, ability to meet shorter lead times, more flexibility, improved customer service/relationship and enhanced product mix. For TOC to work optimally, individual goals of each process must be aligned with the goal(s) of the entire supply chain to avoid goal incongruences (Santos et al., 2007; Simatupang et al., 2004).

The stochastic continuous inventory model(s) for obtaining the optimal size of inventory given fluctuations of the inventory level is imperative as developing economies are plagued with market imperfections resulting in uncertainty of future demand and lead time with respect to the inventory of raw materials, work in process and finished products. In other words, it involves optimization of the inventory constraints. The solution is derived by using standard mathematical/analytical methods. If the derived solution is optimal, it results in the best level of investment in inventory. In practice, the assumptions of the economic order quantity (EOQ) formula do not hold as demand is neither known with certainty nor uniform over the time period. It is also not easy to measure the carrying cost and the ordering cost precisely. Further, the EOQ assumption of zero lead-time (i.e., inventory level approaches zero at the time of the next replenishment) is not feasible as stock depletion is rarely uniform and gradual. The constraints of floor-space, *capital investment*, competing firms, industrial peculiarities, and so on in stocking the items in the inventory system ought to be considered (Abayomi & Adeyemi, 2014).

In the recent period of the computer age, the two-bin systems have been largely replaced by computerized inventory systems. Each addition to inventory and each sale causing a withdrawal are recorded electronically so that the current inventory level always is on the computer. Therefore, the computer will trigger a new order once the inventory level has dropped to the reorder point.

2.2.2. Resource Dependence Theory (RDT)

Resource Dependence Theory presents inter-firm governance as a strategic response to conditions of uncertainty and dependence between exchange partners (Pfeffer & Salanchik, 1978; Heide, 1994), building on the social exchange theoretical perspective (Emerson, 1962; Thibaut & Kelly, 1959). RDT focuses on how some firms become reliant on others for needed resources such as goods and materials and how firms can effectively manage such relationships (Pfeffer & Salanchik, 1978). The asymmetric interdependence that is present in such relationships is often considered critical for the reduction of environmental uncertainty (Ketchen & Hult, 2007). In the materials management context, organizations should ensure that there is adequate material for the continued production of goods and services to stock-outs. Therefore, firms, suppliers and consumers are becoming increasingly dependent on each other. Thus, RBT offers a strong explanatory power in this context. Several authors discuss the implications of this theory for key aspects of materials management (Crook & Combs, 2007; Ireland & Webb, 2007). In summary, RDT complements the RBV in that it views the organization as seeking to exploit and recombine unique and inimitable resources that may be outside the realm of the organization and where strategic orientation towards the relationships could lead to the appropriation of these resources (Fynes et al., 2004).

2.2.3. Economic Theory Explaining Inventory Behavior

Obembe and Arawomo (2012) noted that the Production Smoothing Model and the (S,s) inventory model are among the economic theory explaining inventory behavior. Hornstein (1998) explained that if a firm's sales are subject to changes over time while the marginal cost schedule is constant, then the firm can minimize cost by smoothing production. Inventories are reduced (increased) anytime sales exceed (fall short of) production. Production is hence made less volatile than sales and in this case, sales tend to be negatively related to inventories. A firm with increasing marginal cost wants to use inventories to smooth production, irrespective of whether or not changes in sales are predictable (Obembe & Arawomo, 2012). If, on the other hand, changes in sales were random, whereby firms decide on current production before the level of sales is known, inventories are used as buffer stock by reducing the level of inventories in the face of an unusually high level of demand thereby further reinforcing the negative relationship between inventories and sales.

2.3. Empirical Reviews

In their research titled 'Financial Constraints and Inventory Investment of Listed Non-Financial Firms in Nigeria,' Obembe, Arawomo, and Afolabi (2012) highlighted that firms may face financial constraints during periods of contractionary monetary policy by the monetary authority. They found that firms with strong internal sources of funds tend to be unaffected during such periods, while those with limited internal funding and high asymmetric information with lenders are expected to face financial constraints. To investigate this hypothesis, they analyzed a sample of 76 quoted firms on the Nigerian Stock Exchange using the GMM method of econometrics. Surprisingly, their results indicated that financial constraints had no significant impact on inventory investment. This implies that asymmetric information between borrowers and lenders may have limited or no effect on the credit market in Nigeria.

Guariglia and Mateut (2010) studied the impact of financial constraints on 994 firms in the UK from 1968 to 1991. The firms were separated into financially constrained and unconstrained firms based on their coverage ratio, short-term debt-to-sales ratio and net leverage ratio. Separate regressions were run for total inventory growth, work-in-progress inventory growth and raw material inventory growth. Findings from the study also confirmed the existence of a significant link between financial variables and inventory investment which were found to be much stronger in firms with weak balance sheets during periods of recessions and tight monetary policy.

Fazzari and Petersen (1993), in their study titled 'Working Capital and Fixed Investment: New Evidence on Financing Constraints' demonstrated that capital expenditure competes for funds with levels of working capital when firms have financial constraints. Estimating regressions for fixed investment on cash flows, investment on cash flows, working capital as a source and use of funds, they found that the availability of profitable capital investments means that, if faced with liquidity constraints, the firm would have to forego better investments. This implies that increased investment in inventories decreases funds available for capital investment. Paul and Agbo (2014) conducted a study to examine the influence of working capital management, specifically the number of days accounts receivable are outstanding (DAR), the number of days inventory is held (DINV), and the cash conversion cycle (CCC), on the profitability of the Nigerian Cement Industry. The research spanned eight years, from 2002 to 2009, and data from a sample of four out of the five cement companies listed on the Nigerian Stock Exchange (NSE) were analyzed using descriptive statistics and multiple regression analysis. The findings of the study indicated a significant positive relationship between profitability and the cash conversion cycle (CCC), leading to the conclusion that the profitability of cement companies quoted on the NSE during the study period is influenced by DINV and CCC.

Agyemang and Michael (2013) conducted a study to assess the impact of working capital management on the profitability of companies listed on the Ghana Stock Exchange, specifically focusing on manufacturing companies in the Accra metropolis. The researchers utilized secondary data from the Ghana Stock Exchange to investigate whether working capital management practices influenced the profitability of manufacturing firms in Ghana. The study revealed that key

components of working capital management, including inventory days, accounts payable, and the cash conversion cycle, had a significant influence on the profitability of manufacturing companies.

In a similar vein, Muhammad, Abdul, and Zahid (2014) examined the relationship between the cash conversion cycle (CCC) and the performance of the cement industry in Pakistan. The study selected a sample of 16 firms from the Pakistani cement industry for a period of six years, spanning from 2007 to 2012. Through correlation and regression analyses, the researchers explored the association between the cash conversion cycle (CCC) and the firm's performance, specifically measured by return on assets (ROA). The study also investigated the impact of different variables within the cash conversion cycle, including the receivables collection period (RCP), inventory conversion period (ICP), and payables deferral period (PDP). The findings indicated a negative relationship between the firm's cash conversion cycle and profitability.

Eroglu and Hofer (2011) conducted a study titled 'Inventory Types and Firm Performance: Vector Autoregressive and Vector Error Correction Models.' Their research aimed to examine the effects of various inventory types on firm performance. Analyzing data from U.S. manufacturing industries, the study found that the relationship between inventory and performance varied depending on the type of inventory and the industry. The researchers employed vector autoregressive and vector error correction models to explore intertemporal interactions between firm size, raw materials inventory, work-in-process inventory and finished goods inventory. The results indicated a positive correlation between the natural logarithm of assets (as a proxy for firm size) and inventories of raw materials, work-in-progress, and finished goods.

Overall, these studies shed light on the significance of working capital management, cash conversion cycle, and different inventory types in influencing the profitability and performance of companies in various industries.

Zanoni, Mazzoldi and Jaber (2014) used mathematical modelling to show that inventory management systems performed better when operated under Vendor-Managed Inventory (VMI) and showed the potential to reduce the traditional inventory holding costs. Adoga and Valverde (2014) analyzed the warehouse and inventory management system in Shell Petroleum Development Company (SPDC) in Nigeria and demonstrated the utility of ICT as a veritable value-added tool in inventory management practice. Ali et al. (2013) also tried to justify the use of a modified Wagner-Whitin (WW) logistic-based approach to managing the inventory of perishable products. Kurano, McKay and Black (2014) used statistical process monitoring tools with inventory levels and stock-outs as key metrics in achieving proactive inventory policy intervention in the context of cooperative supply chains. Their results showed the possibility of detecting out-of-control supplier signals beforehand and significantly reducing stock-outs through dynamic adjustments of inventory levels. Relatedly, in the Nigerian context, Takom (2014) used a combined case study/survey methods to provide some useful insights into how Nigerian manufacturers optimized inventory management in terms of lead-time delivery and reduced stock-outs of products, goods and materials.

El-Maude and Shuaib (2016) conducted a study to investigate the impact of working capital management on the profitability of Food and Beverages companies listed in Nigeria. The researchers employed a correlational research design and utilized secondary data from a sample of ten Food and Beverages firms over a five-year period from 2010 to 2014. By employing the Ordinary Least Squares (OLS) technique for data analysis, the study revealed that inventory turnover and accounts receivable had a significant positive effect on the profitability of listed food and beverages firms in Nigeria. On the other hand, the cash conversion cycle and accounts payable had a significant negative effect on profitability. The study recommended that Food and Beverages companies in Nigeria should aim to reduce the duration of their cash conversion cycle, as it would enhance performance by increasing profit generation and allowing for the distribution of free cash flow to shareholders at the end of the accounting period. Wanjogu, Iravo and Aranian (2015) analyzed the effect of inventory control and information communication technology; on materials management in small and medium-sized manufacturing firms. The research involved a cross-sectional survey of small and medium manufacturing firms in Nairobi and adopted a descriptive research design to determine factors affecting materials management. A sample size of 46 respondents was selected from a list of 455 manufacturing firms and data were collected through a questionnaire which was self-administered and analyzed using SPSS. A regression model was used to show the relationship between independent and dependent variables. The study found that good inventory control is important in materials management because it reduces stock levels and hence increases profitability.

Atnafu and Balda (2018) looked empirically at the vulnerability of firms' competitive edge and financial performance to the nature of inventory management systems in practice. The study collated data from 188 micro and small manufacturing firms in Ethiopia. The results employing structural equation modeling showcased a direct relationship between enhanced inventory management and improved financial performance. Further, there exists a collinear relationship between competitive advantage and organizational/financial performance. Umar, Suleiman and Haruna (2019) investigated the determinants that ensure proper management of inventory maximizes/optimizes the profitability of firms using a content analytical approach. The study surmised via reviewed literature that inventory and its efficient and effective planning and control are paramount to a firm's survival and growth in the long run.

Gurtu (2021) analyzed how price, weight and volume of items optimize (minimize) inventory carrying costs. Assuming a unified carrying cost in a case study warehouse, the study tested variations in the carrying cost of varied items in the same warehouse. The results indicated a small negligible variation for firms with homogeneous input costs and vice versa.

3. Methodology

Creswell (2014) opined that ex-post facto research guarantees that research problems influenced by the environment are systematically and empirically solved. The relations between the variables studied in lieu of the brewery

firms were tested using adjusted *Panel Least Squares Regressions*. Panel data (use of both time series and cross-sectional data) are adopted in many research as it can diminish the impact of a single variable, multiple observations that ensures better management of unobservable firm characteristics (Saunders, Lewis & Thornhill, 2009; Gujarati & Porter, 2009). Data are extracted from the audited annual reports and accounts of five (05) sampled firms (Nigerian Breweries Plc, Guinness Nigeria Plc, International Breweries Plc, Champion Breweries Plc and Golden Guinea Breweries Plc for a period of eleven (11) years (2011 to 2021). *The dependent variable in this study is proxied by investment in inventories (ININV), while the independent variables are made up of cash flows (CF), cash conversion cycle (CCC), firm size (FS), inflation (INF) and capital expenditures (CE).*

Mathematically, the panel least squares general equation is denoted thus:

$$ININV = \beta_0 + \beta_1 CF + \beta_2 CCC + \beta_3 FS + \beta_4 INF + \beta_5 CE + c_{it} + \varepsilon_{it} \dots\dots\dots\dots\dots(1)$$

ININV = Investment in Inventory = Total Inventories / TS

B_0 = Y-intercept, a constant

$B_1, \beta_2, \beta_3, \beta_4, \beta_5$ = Coefficients

CF = Cash flows from internal sources = CF/TS = CFTTS

CCC = Cash Conversion Cycle = $\underline{\text{Accounts Receivable}}$ + $\underline{\text{Inventories}}$ + $\underline{\text{Accounts Payables}}$
                                    Turnover   Cost of Sales   Cost of Sales

FS = Firm Size = Natural logarithm of Total Assets = LnTA

INF = Inflation

CE = Capital Expenditure = Total Non-Current Assets / TS = CETTS

β_0 is the constant term or intercept for firm i in the year t. $\beta_1, \beta_2, \beta_3$ and β_4 are linear regression coefficients to be estimated. c_{it} is the non-observable individual effect, while ε_{it} is the disturbance or error term for firm i in the year t.

4. Results

Var.	Obs.	Mean	Std. Dev. Std. Err Skewness	Kurtosis	Prob	Max	Min		
ininvtts	49	0.1561	0.1032	0.0122	1.1713	3.4753	0	0.4511	0.0001
cftts	49	0.1349	0.1406	0.0027	0.9164 5.6765	0	0.8892	-0.4305	
ccc	49	0.1214	0.0668	0.1049	-1.2677	1.7612	0	0.4306	-0.7718
fs	49 9.2516	0.7062	0.4508	-0.5464	2.0023	.0009 10.1068	5.4397		
inf	49	.1041 .0304	0.0127	-0.5988	2.9736	.9422 .2115	0.5402		
cetts	49	0.5768	0.5116	0.2791	2.0054	6.5129	0	0.9507	0

Table 1: Descriptive Statistics
Source: Authors' STATA 14.2 Outputs

The above figures, as computed via software (STATA and EXCEL), depicted that the mean is an approximate measure of the true population (all breweries in Nigeria). Both the standard deviations and standard errors indicated that all entered variables are very small in comparison to their respective means, given that means, standard deviations and standard errors exist in the same metrics. Specifically, the standard errors are quite small and aligned to the theory that it becomes smaller as a normal sample approaches the true population (it is quite obvious as the five firms represent at least 97% of brewery firms in Nigeria in all ramifications). Except for inflation, the probabilities of both moments for the remaining variables are below 5%. The range (difference between maximum and minimum values) is undulating for the study period. In other words, the values are approximately normally distributed.

Levin-Lin-Chu unit-root test for all the Variables based on Augmented Dickey-Fuller tests
Ho: All panels contain unit roots   Number of panels (N) = 05
Ha: Panels are stationary   Number of periods (T) = 12
          Asymptotics: N /T → 0

Var.	Unadjusted t	Adjusted t*	1%	5%	P-values)	Lags
ininvtts	-5.7371	-3.4715	-2.58	-1.95	.0012	1
cftts	-3.5228	-2.7489	-2.58	-1.95	.0216	1
ccc	-5.4494	-2.6115	-2.58	-1.95	.0129	1
fs	-3.1728	-2.0411	-2.58	-1.95	.0495	1
inf	-2.8366	-2.6535	-2.58	-1.95	.0254	1
cetts	-4.1836	-3.1629	-2.58	-1.95	.0116	1

Table 2: Panel Data Stationarity Tests
Source: Authors' STATA 14.2 Outputs

From table 2 above, it can be deduced that major diagnostic tests include variance inflation factor (VIF = absence of multi-colinearity) test, Heteroskedasticity test and Levin-Lin-Chu unit root tests depicting the absence of a unit root. *That is, all the entered variables, including the regressand (investment in inventories), contain no unit root indicating the stableness of the distribution. Hence, Fixed effect model, specifically, Prais-Winsten Regression, Correlated Panels Corrected Standard Errors (PCSEs), is best suited to panel least squares regression.*

Prais-Winsten regression, correlated panels corrected standard errors (PCSEs)

Group variable: firm				Number of obs =	49
Time variable: years				Number of groups =	05
Panels: correlated (unbalanced)				Obs per group: min =	4
Autocorrelation: panel-specific AR(1)				average =	9.05
Sigma computed by casewise selection				max =	11
Estimated covariances = 21				R-squared =	0.2816
Estimated autocorrelations = 05				Wald chi2 (5) =	134.75
Estimated coefficients = 6				Prob > chi2 =	0.0000

		Panel-corrected			
Ivinivtts	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]
cftts	.1471246	.0416652	3.53	0.000	.0654623 .2287869
ccc	-2.77e-06	8.24e-07	-3.37	0.001	-4.39e-06 -1.16e-06
fs	.1190658	.0111624	10.67	0.000	.0971879 .1409437
inf	.023817	.0138266	1.72	0.085	-.0032826 .0509166
cetts	.0058458	.0029345	1.99	0.046	.0000942 .0115974
_cons	-.1460014	.1210569	-1.21	0.228	-.3832686 .0912658
Rhos = .3353515	.8151916	.8577	.0836	.060311 ...	.5204098

Table 3: Fixed Effects Regression
Source: Authors' STATA 14.2 Outputs

The table above depicts that the overall influence of the predictors on the dependent variable is statistically very significant at P-value = 0.0000. As regards hypothetical tests, the influence of cash inflows to total sales (cftts) on investment in inventories to total sales (ininvtts) is very significant at P-value = 0.000 < 0.05 level of significance and t-statistic =3.53 > |2|. Further, the sensitivity of investment in inventories to total sales to both cash conversion cycle (ccc) and firm size is also statistically very significant at P-values (0.001 and 0.000) and t-statistics (-3.37 and 10.67), respectively. Only inflation exhibited an insignificant relationship with investment in inventories to total sales, given the P-value = 0.085 > 0.05 and t-statistic = 1.72. The coefficients of the independent variables are quite significant. For instance, 1% increase in cash inflows to total sales increases investment in inventories to total sales by 15%, 1% increase in firm size increases the regressand by 12%, etc.

5. Conclusion

The study examined some internal and macroeconomic factors determining the level of inventories in brewery firms in Nigeria. This became imperative as these firms are the only ones that have not divested to much more conducive nearby economies such as Ghana, South Africa, Egypt, etc. It made use of data already in existence. The latter (panel data) were analyzed to surmise the statistical relevance of the association between variables entered. Except for inflation (a macroeconomic variable), the remaining predictors exerted very strong influences on investment in inventories to total sales. Brewery firms' profits are highly influenced by such macro-economic variables as interest and exchange rates, given that the bulk of raw materials is sourced from overseas. The study suggests an in-depth examination of the relationship between investment in inventories and the aforementioned variables: interest and exchange rates.

6. References

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