

# THE IMPACT OF INVENTORY MANAGEMENT ON PROFITABILITY OF MANUFACTURING SHARE COMPANIES – AN EMPIRICAL STUDY FROM ETHIOPIA

**Fentahun Alebachew Demissie,**

Research Scholar, DCMS, Andhra University, Visakhapatnam, Andhra Pradesh, India

&

**Prof. P. Venkateswarlu,**

Professor, DCMS, Andhra University, Visakhapatnam, Andhra Pradesh, India

**Abstract:** *Inventory management is the determination and maintenance of an optimal level of inventory, which is a level that is neither inadequate nor excessive. This study aimed at investigating the impact of inventory management on the profitability of manufacturing share companies in Ethiopia. The study used secondary data of 42 manufacturing share companies of 12 years (2005-2016). The population of the study was 65 manufacturing share companies currently working in Ethiopia at least for the last 12 years. A stratified random sampling method was used to collect data. Descriptive analysis, Pearson's correlation and ordinary least square regression analysis have been used to analyze the collected data. ROA measured with income before income tax divided by total assets was identified as the dependent variable and DIO & ITR were identified as independent variables in the model. The study revealed that ROA had significantly strong association with DIO & ITR of manufacturing share companies in Ethiopia. Therefore, effective inventory management is one of the factors to be considered by these firms to improve their profitability.*

**Keywords:** Manufacturing firms, Inventory management, and profitability.

## 1. Introduction

Inventory is the value locked up at both ends of the production system, input and output. For manufacturing firms, inventory comprises of raw material, work in process, and finished goods stocks held for sale. Proper inventory management requires close coordination among the sales, purchasing, production, and finance departments. The two goals of inventory management are (1) to ensure that the inventories needed to sustain operations are available, but (2) to hold the costs of ordering and carrying inventories to the lowest possible level<sup>1</sup>.

Inventory management is about determining and maintaining an optimal level of inventory. That is a level that is neither inadequate nor excessive. Possessing a high level of inventory for a long period of time increased inventory storage, obsolescence and spoilage cost. Conversely, too low inventory level is not good because as business runs the risk of losing out on potential sales and potential market shares. The essence of inventory management is, therefore, to arrive at the optimal level of inventory<sup>2</sup>.

Inventories have been described as the life wire of any manufacturing organization. Inventories represent investment designed to assist in production activities and/or serve customers, without any doubt, inadequate supply of inventories may grind manufacturing operations into a halt. The mode of control and management of inventories can be a crucial factor in the success or failure of any manufacturing concern<sup>3</sup>.

## 1.2 Statement of the Problem

For Ethiopia, a country graduating through the early stages of economic development, industrial sector expansion is essential for sustained long-term growth and poverty reduction. The manufacturing sector contribution to the GDP in 2016 was 4.34%. The performance of the sector has been affected by low productivity of workers and use of obsolete technologies, which is attributed to the poor state of physical infrastructure, limited access to finance, limited research and development, poor institutional framework, and inadequate managerial technical skills<sup>4</sup>.

This (low GDP share and low performance) issue of the manufacturing share companies in Ethiopia initiated the researcher to investigate their profitability concentrating one of the working capital parts of the financial management process, Inventory Management. In short, one of the problems challenged by manufacturing share companies in Ethiopia seems to be attributed to the inefficiency of inventory management. Therefore, the problem to be examined in this study is the impacts of inventory management on the profitability of manufacturing share companies.

## 1.3 Objective of the Study

The main objective of this study is to investigate the impacts of inventory management on the profitability of manufacturing share companies in Ethiopia for the period 2005-2016.

## 1.4 Research Hypothesis

The following research hypothesis can be made in view of the impact of inventory management on the performance of manufacturing share companies in Ethiopia based on the research objective mentioned above:

**H<sub>1</sub>:** Inventory holding periods have significantly, negatively related to the return on assets of manufacturing share companies in Ethiopia.

**H<sub>2</sub>:** Inventory Turnover Ratios have significantly positively related to the return on asset of manufacturing share companies in Ethiopia.

## 2. Literature Review

### 2.1 Theoretical Reviews

Inventory is the value locked up at both ends of the production system, input and output. For manufacturing firms, inventory comprises of raw material, work in process, and finished goods stocks held for sale. Thus the definition of inventory is specific to the nature of the business.

Firms hold inventories for different reasons. There are three specific motives for holding inventory by firms: (1) **Transaction Motives**: the basic purpose of holding inventory is to carry out production or procurement and /or selling transaction in an uninterrupted manner. (2) **Precautionary motives**: related to uncertainty and associated risks there might be uncertainty associated with the supply of basic inputs or with demand for output. It is associated with holding inventory to guard the risk of unpredictable changes in demand and supply forces and other factors. (3) **Speculative Motives**: refers to increasing or decreasing inventory level so as to get advantages of price fluctuation in the future<sup>5</sup>.

The objective of inventory management is to maintain an optimal level of inventory investment. The optimum level of inventory laid between the two threats points of excessive and inadequate inventories. Excessive inventory occurs when a firm maintains a large size of inventories. That is maintaining the large size of raw materials and work in process for efficient and smooth production, and large size of finished goods for

uninterrupted sales operation. Inadequate inventory occurs when a firm maintains a minimum investment on inventories to maximize inventories by reducing the cost of inventory.

### 2.1.1 Deciding the Optimal Level of Inventory

The optimal level of inventory involves a tradeoff between carrying cost and ordering cost. At this point, the total cost is the minimum amount. *Carrying cost* is the cost of maintaining inventories in the firm's warehouse. It is also known as holding cost. Ordering costs are costs that are incurred at a time an order is placed. These costs are normally periodic and are constant regardless of the size of the order. They are also called reorder cost or setup cost. They include all costs associated with writing and placing an order such as the cost of processing order, cost of follow up with order, cost of receiving the new shipment, cost of handling the account payable invoices, etc. These costs do not vary with the size of order but with a number of orders. Total order cost decreases as the number of units ordered (order size) increases<sup>5</sup>

### 2.1.2 Inventory Management Techniques

In managing inventory the firm's objective should be in harmony with the shareholders share maximization principle. To active this, the firm should determine the optimum level of inventory. To manage inventories efficiently the following questions should be answered: (1) how much should be ordered? (2) When should be ordered? The first question relates to the problem of determining economic order quantity (EOQ) and is answered with the costs of maintaining a certain level of inventory. The second question arises because of uncertainty and is a problem of determining to reorder point.

**Economic Order Quantity – EOQ:** One of the major inventory management problem to be resolved is how much inventory should be added when inventory is replenished, which is order quantity problem. Determining an optimum level quantity involves two types of costs: ordering and carrying a cost. The economic order quantity is the inventory level that minimizes the total ordering cost and carrying a cost. There are three approaches to arrive at the optimum level of order size (EOQ). These are trial and error, the formula and the graphic approach. EOQ refers to the size of inventory that is most economical to procure and hold. It is calculated by a formula as follow:

$$EOQ (Q) = \frac{\sqrt{2DO}}{C} \quad \text{where, } D = \text{Demand; } O = \text{Ordering Cost} \text{ \& } C = \text{Carrying Cost}$$

At Q, both ordering cost and carrying cost are equal, which is the point of the tradeoff between ordering cost and carrying a cost. At this point, the total cost of inventory is the lowest, which is the most economical quantity that can be ordered by the firm.

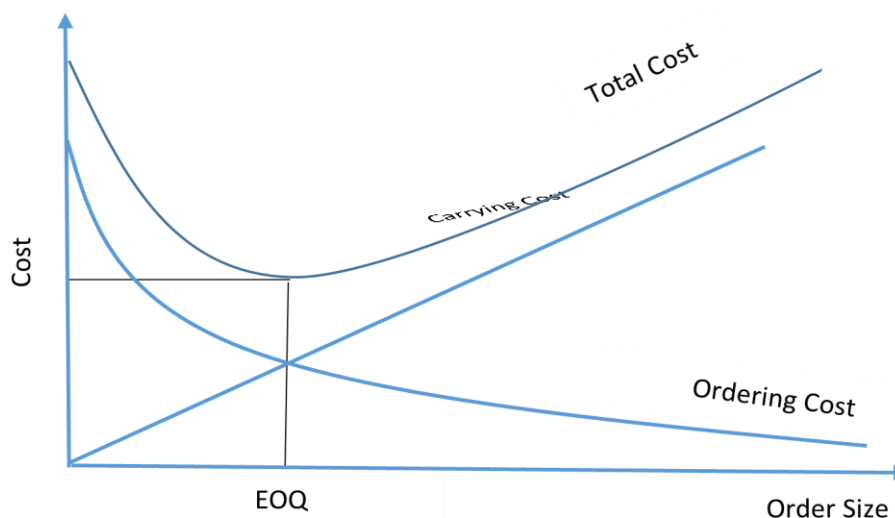


Figure 2. 1 Inventory Cost and EOQ

Combining the ordering cost and carrying cost show that total inventory costs decrease up to a point with increase in inventory but beyond this point, total inventory costs increased with increasing inventory as shown in the above figure, this point is EOQ<sup>1</sup>.

### 2.1.3 Inventory Monitoring and Control Techniques

Monitoring inventory focuses on optimization of available inventory resources through a proper tracking of the entire value chain while inventory control trusts on optimization of the total cost inventory that includes carrying, ordering and stock-out costs. A proper monitoring system is followed by an effective control system. Some of these monitoring and control techniques are explained hereunder:

**Ratio Analysis:** We can monitor inventory by looking at financial ratios in much the same way as we can monitor receivables as follow:

Inventory Turnover ratio expresses the relation between goods sold to the goods that were in the inventory. It indicates, on average, how many times inventory flows through (from raw materials to goods sold) during the period. If the turnover is above the average, this may suggest a possible stock-out. A lower than usual ITR may be due to either slowdown in production or sluggish sales. The ratio can be calculated using the following formula:

$$\text{Inventory Turnover} = \frac{\text{Cost of Goods Sold}}{\text{Average Inventory}}$$

The inventory holding period is the ratio of the monetary value of inventory to the total cost of goods sold per day. It suggests the number of days' worth of sales on hand which is why alternatively known as analysis of aging of inventory. Combined with the demand projection this ratio helps in scheduling production and procurement.

$$\text{Inventory Holding Period} = \frac{\text{Average Inventory}}{\text{Cost of Goods Sold}} \times 365$$

Comparison of inventory turnover and holding period with their respective averages facilitate in inventory monitor and control.

**ABC Analysis:** In ABC analysis inventory is categorized according to relative importance for the purpose of monitoring and control as category A, B and C. Category "A" represents the most important items that generally consists of 15 to 25 percent of the volumes of inventory and accounts for 60 to 75 percent of the value of inventory on average. This category is most important from the viewpoint of inventory control as value blocked by this is highest. Category "B" represent around 20 to 30 percent in both volume and value, is of moderate importance from inventory control perspectives. Category "C" consists of 10 to 15 percent of the values of inventory, and 40 to 60 percent of the volumes of inventory. This category is the list important for monitoring and control of inventory as its contribution in value term is least although these items are larger items of the volume of inventory<sup>6</sup> (Shim & Siegel, 1998).

**Vendor managed inventory:** Vendor managed inventory is an arrangement between the buyer and a supplier of a product whereby a buyer passes on to supplier selected information regarding the level of inventory on the buyer stock of the products supplied by the supplier, and the supplier takes full responsibility for maintaining an agreed inventory of his supplier in buyer's stock.

A third party logistics provider involved making sure that the buyer has the required level of inventory by adjusting the demand and supply gaps. The concept of shared responsibility is the most important feature of vendor managed inventory.

**Just-In-Time – JIT:** Just-in-Time is a Japanese concept of inventory management developed by the chief engineer of TOYOTA Company/ its underline philosophy is to reduce the level of inventory to zero so that the firm is able to cut down its carrying cost. It considers the cost of carrying cost as waste as it does not add any value to the firm. The JIT ensures the supply of inventory just at the time they are needed. Thus it does away the need for excess inventory. Its mote is, therefore, “have the right material at the right time, at the right place and in the exact amount”.

**Outsourcing:** Outsourcing refers to the delegation of non-core operation from the internal production to an external entity specializing in the management of that operation, without the compromisation of the quality of the product. It enables the firm to cut down costs as the supplier will produce with fewer costs using economies of scale than internal operation. It saves time and resources which can be used to focus on the core operating area.

#### 2.1.4 Computerized Inventory Control System

The computerized inventory control system is an automatic system of counting inventories recording, withdrawals, and revising the balances. There is an inbuilt system of placing an order as the computer notices have been reached. It is inevitable for large retail stores, which carry thousands of items. It enables a company to easily track a large item of inventories. The computer information system of a buyer and supplier are linked to each other. As soon as the supplier's computer received an order from the from the buyer's system, the supply process is activated.

### 2.2 Empirical Reviews

Prempeh (2016)<sup>7</sup> tried to evaluate the impact of efficient inventory management on the profitability of manufacturing firms in Ghana. He used cross-sectional data from 2004 to 2014 for analysis. He applied the analysis of the Ordinary Least Squares stated in the form of a multiple regression model. His final study showed that the raw materials inventory management (designed to capture the effect of efficient management of raw material inventory by a company on its profitability) is significantly positively related and impacts on the profitability of the manufacturing firms in Ghana.

Lwiki et al (2013)<sup>8</sup> examined the impact of inventory management practices on the financial performance of sugar manufacturing firms in Kenya from the period 2002- 2007. The primary data was collected using structured and semi- structured questionnaires administered to key informants in the organizations. Secondary data was obtained from annual financial performance statements available in the year Book sugar statistics. Descriptive statistics was used to test the impact of inventory management practices and Correlation analysis was used to determine the nature and magnitude of the relationship among inventory management variables. The results indicate that there exists a positive correlation between inventory management and Return on Sales and also with Return on Equity which were found to be statistically significant at 5% level.

Panigrahi (2013)<sup>9</sup> examine the relationship between inventory conversion period and firms profitability for a sample of five top Indian cement companies over a period of ten years from 2001-2010. He employed Regression analysis to determine the impact of inventory conversion period over gross operating profit taking current ratio, size of the firm, financial debt ratio as control variables. His study result indicated that there is a significant negative linear relationship between inventory conversion period and profitability.

Shin & Spurlin (2015)<sup>10</sup> examined financial statement data for U.S. manufacturing firms to explore the relationship between inventory management efficiency and firm profitability. The results show that a lower ratio of inventory to sales for a firm is associated with higher profit margin for the firm. In addition, small size firms can receive a larger benefit (as measured by profitability) from increased inventory efficiency when compared to medium and large size firms.

Sitienei & Memba (2015)<sup>11</sup> evaluated the effects of inventory management on the profitability of the Cement manufacturing firms in Kenya from 1999 to 2014. They used the ordinary least squares (OLS) stated in the form of a multiple regression model to analyze to establish the relationship between inventory management and firm's profitability. They identified inventory turnover, inventory conversion period, Inventory levels, storage cost, size of firm, gross profit margin, Return on assets and growth of firm as variables. Their findings showed a negative relationship between inventory turnover, inventory conversion period and storage cost with profitability of the company. In addition, inventory level was found to be directly related to firm's size and storage cost.

### 3 Methodology

#### 3.1 Sampling Method and Sample Size

##### 3.1.1 Sampling Method

The stratified random sampling method has been used in the study for the sake of data collection process. The reason behind this selection is that stratification is an efficient research sampling design; it provides more information with a given sample size; it ensures homogeneity within each stratum but heterogeneity (variability) between strata. It will accurately reflect the population on the basis of the criteria used for stratification<sup>12</sup>.

##### 3.1.2 Sample Size

The population of this study is manufacturing share companies registered and working in Ethiopia at least for the last 12 years. There are around 65 manufacturing share companies currently working in Ethiopia (ECCSA, 2016). But around twenty of them are young companies which have had less than 10 years of age. As a result, they are excluded from the sample selection. Therefore, the population size of the study has been reduced to 45. Thus a total of 42 companies have been taken as a sample size. This sample size has been selected using the online sample size calculator with a 95% confidence level. The total sample size is, therefore, 42 manufacturing share companies currently working in Ethiopia, which is above 91% of the population<sup>13</sup>.

#### 3.2 Description of Variables

*Table 3.1 Definition and Measurement of Study Variables*

s/n	Type of variable	Name of the variable	Measurement	Acronym
1	Dependent	Return on Asset	Income before tax total assets	ROA
2	Independent	Days Inventory outstanding	Average inventory cost of goods sold	DIO
3	Independent	Inventory turnover ratio	CGS/average inventory	ITR
4	Control	Receivable turnover ratio	Net sales/average receivables	RTR
5	Control	Debt Ratio	Total debt/total asset	DR
6	Control	Current Ratio	Current assets current liabilities	CR

Source: author's construction based on available theories.



Table 4.1 Descriptive statistics of sample manufacturing share companies (2005-2016)

Statistics	ROA	DIO	ITR	RTR	CR	DR
Mean	0.1472	154	3.0981	4.1632	2.0785	0.5017
Median	0.1458	153	3.0367	3.9875	1.5891	0.4905
Maximum	0.5954	207	4.0510	6.0628	9.8022	1.2701
Minimum	-0.2620	97	2.4346	3.0437	0.2544	0.0662
Std. Dev.	0.1496	20	0.4569	0.8238	1.5641	0.2193

Source: EViews output of sample manufacturing share companies (2005-2016)

## 4.2 Pearson's correlation analysis

Pearson's correlation coefficient is the test statistics that measures the statistical relationship, or association, between two continuous variables. It gives information about the magnitude of the association, or correlation, as well as the direction of the relationship. Table 4.1 shown below presented the correlation between the variables of the study. As it can be seen from this table, ROA has a significant correlation with RTR, ITR, and DIO, by a coefficient of 0.534, 0.476 and -0.429, respectively. The coefficient of DIO has a negative sign with a p-value of less than 1%, which means the two variables are associated in the opposite direction; Increasing in DIO will result in decreasing ROA and vice versa.

Table 4.2 Pearson's Correlation Matrix of Variables

		ROA	DIO	ITR	RTR	CR	DR
ROA	Pearson Correlation	1					
	Sig. (2-tailed)						
DIO	Pearson Correlation	-.429**	1				
	Sig. (2-tailed)	.000					
ITR	Pearson Correlation	.476**	-.827**	1			
	Sig. (2-tailed)	.000	.000				
RTR	Pearson Correlation	.534**	-.024	-.005	1		
	Sig. (2-tailed)	.000	.597	.911			
CR	Pearson Correlation	.021	.001	-.011	.032	1	
	Sig. (2-tailed)	.646	.987	.814	.479		
DR	Pearson Correlation	.033	-.026	.064	.012	-.329**	1
	Sig. (2-tailed)	.458	.561	.153	.794	.000	

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Source: SPSS Output of financial statements of sample companies (2005 – 2016)

## 4.3 Regression Analysis

Regression analysis is better analysis compared to correlation because correlation is a measure of association between two variables and the variables are not designated as dependent or independent. Regression analysis is used to examine the relationship between one dependent and independent variables. It goes beyond correlation by adding prediction capabilities.

Table 4.3 presented the regression output for this study. According to this output, ROA has been significantly affected by DIO, ITR and RTR with coefficients of -0.0038, 0.1705, and 0.0918, respectively. The impact of DIO on profit is indirect. This signals that for an additional day outstanding in inventory, return on asset is predicted to fall by 0.4%. This result is in agreement with the hypothesis which was explained as “there is a significant negative relationship between cash conversion cycle and profitability of firms”. This confirms the concept that a decrease in the DIO will produce more profits for a firm.

The adjusted R<sup>2</sup> of the output is 0.8982 which signal that 89.8% of the variation of independent variable, ROA, is explained by the model. This showed that the model is good in estimating the relation between dependent and independent variables.

**Table 4.3 Result of Regression analysis**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DIO	-0.003834	0.000131	-29.36780	0.0000
ITR	0.170525	0.005329	31.99873	0.0000
RTR	0.091746	0.002997	30.61613	0.0000
CR	0.001956	0.001492	1.310618	0.1907
DR	0.011503	0.011089	1.037342	0.3002
LAG1	0.145648	0.020113	7.241407	0.0000
C	-1.309288	0.031518	-41.54150	0.0000

Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.908563	Mean dependent var		0.161970
Adjusted R-squared	0.898182	S.D. dependent var		0.144937
S.E. of regression	0.046248	Akaike info criterion		-3.211513
Sum squared resid	0.885487	Schwarz criterion		-2.781844
Log likelihood	789.8595	Hannan-Quinn criter.		-3.042349
F-statistic	87.52526	Durbin-Watson stat		2.093124
Prob(F-statistic)	0.000000			

Source: E-views Output of financial statements of sample companies (2005 – 2016)

The model equation which was framed in the methodology, therefore, can be re-written as:

$$ROA_{it} = -1.3092 + 0.0038(DIO_{it}) + 0.1705(ITR_{it}) + 0.0918(RTR_{it}) + 0.0020(CR_{it}) + 0.0115(DR_{it}) + 0.1456(lag1_{it}) + \varepsilon$$

## 5 Conclusions and Recommendations

### 5.1 Conclusions

Inventory management is one of the determinant factors for the profitability of manufacturing firms because inventory is tied up at the initial as well as the final stage of the manufacturing process. The descriptive, correlation and regression analysis output of the study supports this fact. It has been seen in the

study that Inventor management measured with day's inventory outstanding and Inventory turnover ratios has a significant impact on the profitability of manufacturing share companies working in Ethiopia.

## 5.2 Recommendations

The findings of this study revealed that the day's inventory outstanding and return on asset has opposite relation. Therefore, management of the manufacturing share companies in Ethiopia should reduce the DIO periods so that the ROA improved.

It has been also found that inventory turnover ratio has a direct relation with return on asset in the sense that ROA will increase if inventory is converted as many times as possible in each year. So management of manufacturing in Ethiopia should try to increase inventory conversion period by applying different customers' encouraging mechanisms so that more inventory can be sold to customers thereby the ROA is increased.

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