

Impact of Inventory Performance on Industrial Financial Performance of Pakistan

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ABSTRACT

This study empirically evaluates the impact of inventory performance on firm performance in Pakistan for non-financial firms listed on KSE-100 index for the period 2010-2014. Correlation, OLS, GLM and Hausman Test is used evaluate the panel data. Correlation indicates that ROA has weak positive relationship with Inventory turnover ratio. ROE has a positive weak relationship with Inventory turnover, total assets and Leverage ratio. Total Asset has positive impact and Financial Leverage has significant negative impact on ROA. Inventory performance has positive impact on ROE significantly and Total Asset has positive impact and FLR has significant negative impact on ROE. GLM test is replicating the same results as by indicated by the OLS in the above results. Huasman test is significant which reports that we could make use of either the fixed effects or random effects. This study provide basis for future investigation of the phenomena in emerging economies like Pakistan, where very little attention to the underlying topic is given in academic research on operations management in Pakistan.

Keywords: *Inventory Performance, Firm Performance, ROA, ROE, OLS, GLM*

INTRODUCTION

The paramount matter of the operation management literature for last two decades has to seek the operations excellence in the organizations. Inception of operational excellence could be traced back to various industries like automotive industry, industries of assembly and job shop but, all of these studies were based on small sample size. The firms who applied all the above-mentioned techniques to enhance the efficiency and effectiveness of their operations achieved better market share, profitability and products of better and superior quality. This study is inspired to seek support for this hypothesis to visualize results of enhancing the inventory management. Plethora of research has been perpetrated to estimate the influence of performance of inventory management over financial performance has been carried out in developed markets in developed economies. Our study aims to augment the evidence of inventory performance on firm performance in a developing market environment. To our best knowledge now, very little research on the under consideration topic has been carried out in Pakistan.

The chief objective or function of any Production and Inventory Control department is to control the inventory levels of their organizations. A considerable amount of capital is tied as a result of poor inventory control and as a result in reduction on investment. Due to

noteworthy effect on productivity and profitability of firm, numerous techniques have been introduced to manage the inventory. Techniques like MRP, MRPII, JIT, Kanban, EOQ and zero inventory method has been deployed by numerous industrial nations in last couple of decades. Nevertheless, most of the fore said techniques were applied and developed in repetitive industrial environment. Moreover, it is observed in previous studies that decrease in company's profitability is because of low inventory turnovers.

The management of the inventory is acknowledged as an impregnable tool towards enhancing the productivity of the assets of the organization, turns of inventory, targeting of the customers and positioning of the products in a markets that are diverse and also boosts the network of intra organization and inter organization and thus, stirring technological advancements and capabilities for producing the products of superior quality and therefore, contributing the efficiency and effectiveness in the relationship within the organizations. This study explains that why enhanced inventory management can help to enhanced firm performance how it adds financial value of the firm as well.

Inventory is one of the key elements that makes operational management effective but efficient as well and firms all across globe are managing their inventory to reduce theory costs to the minimum possible point, in Pakistan material management is also observed in few firms but in an old fashioned way it needs to be handled with fresh or contemporary approach therefore, our study is focusing on inventory performance and inventory is the eternal part of operations management and there is lack of evidence in Pakistan on relationship between performance of the inventory and performance of the firm. Gap of study is addresses that the inception of practices of operational management in Pakistan is not very ancient and most of the firms in the country lack the culture of operational excellence. As per our knowledge there is no notable empirical study done, addressing the underline relationship between role of inventory performance on firm performance in Pakistan. Like most of the emerging economies, Pakistan also lack empirical evidence on the underlying relationship. Therefore, this area is yet to be addressed in Pakistani context and this study will cover this gap by presenting empirical evidence on effect of management of inventory over the performance of the firms in listed KSE100 manufacturing firms.

REVIEW OF LITERATURE

To date, printed literature has not solely created mixed findings, however conjointly centered on offering experimental evidence from countries that are classified as developed.

Capkun, Hameri, and Weiss (2009) examined the relationship between financial performance and inventory management of manufacturing companies from 1980-2005. Financial performance proxy of gross profits and operating profit is used and the proxy for Inventory management in relation to raw materials, WIP and finished products is taken. The outcomes revealed that a positive correlation between a firm inventory management and financial performance. They also explain that degrees of correlation vary, depending upon type of inventory management and financial performance reference.

Eneje, Nweze and Udeh (2012) studied the effects of raw materials inventory management on the profitability for the period 1989–2008 by using ordinary least squares. Results indicates that the local variable is used to confine effect of efficient management for raw material inventory by a firm on its profitability and hence conclude that it is strongly significant and

have positive influence on the profitability of the brewery firms of Nigeria. They further concluded that efficient management of raw material inventory is a major factor contained by Nigerian brewers for enhancing or boosting their profitability.

Sahari, Tinggi and Kadri (2012) analyzed the relationship between inventory management and firm performance along with the capital intensity ratio for the period 2006–2010. They concluded that inventory management is positively correlated with firm performance. They further identified that there is a positive relation between inventory management and capital intensity.

Anichebe and Agu (2013) examined the effect of inventory management on organizational effectiveness. They used descriptive statistics, correlation and linear regression. The outcomes indicated that significant relationship exist between superior inventory management and organizational effectiveness. The inventory management has significant impact on organizational productivity. So, strong positive correlation exists between organizational profitability and the inventory management. Results concluded that inventory management having vital role in success and growth of organizations. The firms profitability tied with the volume of products sold having direct relationship with products quality. The outcomes suggested that inventory management system of a firm should diversify for specific level of production and closely monitor or manipulate for the production consistency and profitability of the firm.

Agha (2014) studied the creditor's turnover, inventory turnover ROA, account receivable turnover, and current ratio as proxies for inventory management and working capital management respectively. The results indicate that the proxy of working capital management has positive impact on profitability. Therefore, managers may increase the firm's profitability by reducing the inventory turnover, account receivables ratio and by decreasing creditors turnover ratios but there is no significant effect of increasing or decreasing the current ratio on profitability.

Sitienei, E. and Memba, F. (2016) used the variables for Inventory turnover, inventory conversion period, Inventory levels, storage cost, size of firm, gross profit margin, return on assets and growth of firm for the period 1999- 2014 Ordinary least squares is applied in the form of a multiple regression model. Results reveal that there exist a negative relationship between inventory turnover, inventory conversion period and storage cost with profitability of the company. In addition, it is concluded that inventory level is directly related to the firm's size and storage cost.

Prempeh, K.B. (2016) studied impact of inventory management on the profitability for the period 2004-2014. The study used ordinary least squares stated in the form of a multiple regression model for data analysis. Results indicate that strong significant positive correlation between the main variable, raw materials inventory management and profitability of manufacturing firms in Ghana. Efficient management of raw material inventory is a major factor to be considered by Ghanaian manufacturers in enhancing or boosting their profitability.

METHODOLOGY

This study used the data from 46 manufacturing companies listed on KSE from various sectors for the period 2010-2014. The primary purpose of this study is to estimate the

relationship or link between the inventory management and the performance of the firm and to visualize the impact of Inventory management proxies on firm performance. Firm performance (independent variable) is measured from Return on Assets (ROA) and the second one is Return on Equity (ROE).

Following measures have been used to compute the performance measures.

ROA	Profit before Taxes to Total Assets
ROE	Total Equity to Total Assets
Inventory Turnover ratio	Average Inventory in Days to Sales
Total Assets	Total Assets of the firm
Financial Leverage ratio	Total Debt to Total Assets
Capital Intensity ratio	Fixed Asset to Total Assets

Hypothesis of the Study

H0: Inventory performance has no impact on firm performance in manufacturing sector of Pakistan.

H1: Inventory performance has impact on firm performance in manufacturing sector of Pakistan.

Econometric Model

The following equations represent models that estimate the relationship between inventory management and firm performance.

Model 1:

If ROA is used as proxy of Firm Performance.

$$ROA_{it} = \alpha + \beta_1 IP_{it} + \beta_2 TA_{it} + \beta_3 FLR_{it} + \beta_4 CIR_{it} + \varepsilon_{it} \dots \dots \dots (1)$$

Where

ROA = Return on Assets.

IP = Inventory Performance.

TA = Total Assets.

FLR = Financial Leverage Ratio.

CIR= Capital Intensity Ratio.

Where β_1 , β_2 and β_3 are coefficients of exogenous variables.

ε_{it} : is the error term.

Model: 2

If ROE is used a proxy of Firm Performance.

$$ROE_{it} = \alpha + \beta_1 IP_{it} + \beta_2 TA_{it} + \beta_3 FLR_{it} + \beta_4 CIR_{it} + \varepsilon_{it} \dots \dots \dots (2)$$

These following two equations are used to run the final regression for our study.

$$(ROA)_{it} = \alpha + \beta_1 \ln(IP_{it}) + \beta_2 \ln(TA_{it}) + \beta_3 FLR_{it} + \beta_4 CIR_{it} + \varepsilon_{it} \dots \dots \dots (3)$$

$$(ROE_{it}) = \alpha + \beta_1 Ln(IP_{it}) + \beta_2 (TA_{it}) + \beta_3 FLR_{it} + \beta_4 CIR_{it} + \varepsilon_{it} \dots \dots \dots (4)$$

In final equations we will take the log of ROA, ROE, Inventory turnover ratio and Total Assets for the scaling purpose.

OLS Regression

Linear Least Square or Ordinary Least Square is a statistical method used for estimating the parameters in linear regression model that are unknown. The main goal is to mitigate the differences between observed responses in some random dataset and the anticipated responses of linear data approximation. The resulting estimator can be articulated through a simple formula, specifically in the case of right hand side single regressor. When the regressors are exogenous the OLS estimator is consistent and there doesn't exist any perfect multi-collinearity and is optimal in the unbiased estimator class in case the errors are homoscedastic and is uncorrelated serially. In such scenarios minimum variance estimation is provided by OLS, where errors have limited variances. Taking this assumption that the error distribution is normal, OLS will be best estimator for this situation. OLS is utilized in econometrics (economy), engineering, and political science along with variety of applications in various areas. The extended version of OLS is Multi-fractional order estimator.

GLM Regression

To estimate the unknown parameters in a linear regression model there is a statistical technique called as Generalized Least Model (GLM). When there is certain degree of correlation between residual in a regression model GLM is used to perform linear regression. In such scenarios OLS and weighted least square is inefficient statistically.

Huasman Test

Hausman specification test also known as Durbin-Wu-Hausman is a statistical test provided in an econometrics discipline for testing hypothesis. The reliability of this renowned estimator is tested and evaluated when compared to less efficient, estimator or to an alternative which is already known to be constant. If the resulted statistical model relates to the provided data, it will help one to evaluate. This statistical tool is used to segregate panel data effects amongst fixed effects model and the random effects model. In case of null hypothesis random effects (RE) is chosen reason is that the efficiency higher, but in the scenario of fixed effects (FE) alternate hypothesis will be preferred.

RESULTS AND DISCUSSION

Descriptive Statistics

Table 1 indicates that ROA has 0.1355 mean values with a standard deviation 0.1007 and ROE has 0.3169 mean value with 0.2537 standard deviation. Whereas Inventory performance proxy has 2.16 mean value. All variables are positively skewed except Total Assets and CIR.

Table 1: Descriptive Statistics

	ROA	ROE	Ln(IP)	Ln(TA)	FLR	CIR
Mean	0.1355	0.3169	2.1660	16.3882	0.4670	0.9549
Median	0.126	0.2728	2.0831	16.3289	0.4528	0.9632
Maximum	0.3792	1.619	4.1604	19.1958	0.9411	0.9981
Minimum	-0.0831	-0.2289	-0.1392	13.1310	0.0541	0.8504
Std. Dev.	0.1007	0.2537	0.7367	1.1849	0.2052	0.0330
Skewness	0.3816	1.2249	0.2442	-0.2214	0.1198	-1.0626
Kurtosis	2.7344	6.0672	3.0042	3.2690	2.0479	3.4579
Jarque-Bera	6.2601	147.68	2.2877	2.5735	9.2372	45.2951
Probability	0.0437	0	0.3185	0.2761	0.0098	0
Sum	31.183	72.90	498.18	3769.30	107.42	219.63
Sum Sq. Dev.	2.3246	14.74	124.29	321.52	9.6516	0.2504
Observations	230	230	230	230	230	230

Correlation Matrix

Table 2 shows the correlation matrix that contains rank correlation coefficients among the return on assets (ROA), Return on Equity (ROE), Inventory Performance, Total Assets, Leverage Ratio and Capital Intensity Ratio. The salient features of present study are that the ROA has weak positive relationship with Inventory turnover ratio. However, ROA has significant negative relationship with Financial Leverage Ratio (LR) and Capital Intensity Ratio (CI). The Return on Equity (ROE) has a positive weak relationship with Inventory turnover, total assets and Leverage ratio. But, there is weak negative relationship of ROE with Capital Intensity Ratio (CI).

Table 2: Correlation Matrix

	ROA	ROE	Ln(IP)	Ln(TA)	FLR	CIR
ROA	1					
ROE	0.5943	1				
IP	0.0530	0.1956	1			
Ln(TA)	0.0147	0.1473	0.2684	1		
FLR	-0.2902	0.2891	0.1664	0.1413	1	
CIR	-0.2737	-0.1104	0.2440	0.2592	0.2359	1

$$\text{Model No 1. } (ROA)_{it} = \alpha + \beta_1 Ln(IP_{it}) + \beta_2 Ln(TA_{it}) + \beta_3 FLR_{it} + \beta_4 CIR_{it} + \varepsilon_{it}$$

Table 3 indicates the impact of inventory performance on ROA. TA has positive impact and FLR has significant negative impact on ROA.

Table 3

Dependent Variable: ROA

Method: Panel Least Squares

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IP	0.012380	0.009088	1.362222	0.1745
Ln(TA)	0.013364	0.005546	2.409758	0.0168**
FLR	-0.149392	0.031981	-4.671196	0.000***
CIR	-0.043293	0.094476	-0.458247	0.6472
R ²	0.087683	MDV		0.135581
Adjusted R ²	0.075572	S.D. dependent var		0.100753
S.E.R	0.096871	AIC		-1.813634
SSR	2.120784	SIC		-1.753841
LL	212.5679	H-Q		-1.789515
D-W	0.514973			

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

$$\text{Model 2: } (ROE)_{it} = \alpha + \beta_1 \text{Ln}(IP_{it}) + \beta_2 \text{Ln}(TA_{it}) + \beta_3 \text{FLR}_{it} + \beta_4 \text{CIR}_{it} + \varepsilon_{it}$$

Table 4: Inventory Performance on ROE, OLS Estimates

Table 4 indicates the impact of inventory performance on ROE. Inventory performance has positive impact on ROE significantly and Total Asset has positive impact and FLR has significant negative impact on ROE.

Dependent Variable: ROE

Method: Panel Least Squares

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IP	0.048153	0.022313	2.158029	0.0320**
Ln(TA)	0.037744	0.013617	2.771911	0.0060***
FLR	0.337624	0.078524	4.299605	0.000***
CIR	-0.591784	0.231967	-2.551151	0.0114
R ²	0.133115	MDV		0.316973
Adjusted R ²	0.121607	S.D. dependent var		0.253779
S.E.R	0.237849	AIC		-0.017126
SSR	12.78527	SIC		0.042667
LL	5.969461	H-Q		0.006993
D-W	0.764463			

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 9 indicates that GLM test is producing same results as produced by the OLS in the above results.

Table 9: GLM Regression for ROA

Dependent Variable: ROA

Method: Generalized Linear Model (Newton-Raphson / Marquardt steps)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
IP	0.012380	0.009088	1.362222	0.1731
Ln(TA)	0.013364	0.005546	2.409758	0.0160**
FLR	-0.149392	0.031981	-4.671196	0.0000***
CIR	-0.043293	0.094476	-0.458247	0.6468
MDV	0.135581	S.D. dependent var		0.100753
SSE	2.120784	LL		212.5503
AIC	-1.813481	SC		-1.753688
HQ	-1.789362	Deviance		2.120784
DS	0.009384	PSSR		2.120784
PS	0.009384	Dispersion		0.009384

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 10 shows that GLM test is replicating the same results as by indicated by the OLS in the above results.

Table 10: GLM Regression for ROE

Dependent Variable: ROE

Method: Generalized Linear Model (Newton-Raphson / Marquardt steps)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
IP	0.048153	0.022313	2.158029	0.0309
Ln(TA)	0.037744	0.013617	2.771911	0.0056
FLR	0.337624	0.078524	4.299605	0.0000
CIR	-0.591784	0.231967	-2.551151	0.0107
MDV	0.316973	S.D. dependent var		0.253779
SSE	12.78527	LL		5.951865
AIC	-0.016973	SC		0.042820
HQ	0.007146	Deviance		12.78527
DS	0.056572	PSSR		12.78527
PS	0.056572	Dispersion		0.056572

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

In Table 7 the p-value of the Huasman Test is significant which implies that we could make use of either the fixed effects or random effects. Therefore we reported above results of GLM effects model results for the equation 3.

Table 7: Hausman Test (ROA)

Correlated Random Effects - Hausman Test

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	14.230481	4	0.0066
Period random	0.000000	4	1.0000
Cross-section and period random	10.773492	4	0.0292

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
IP	0.025232	0.026744	0.000025	0.7626
Ln(TA)	0.006563	0.011284	0.000326	0.7937
FLR	-0.335580	-0.244518	0.001119	0.0065
CIR	-0.932875	-0.941698	0.098765	0.9776

In Table 7 the p-value of the Hausman test is significant which implies that we could make use of either the fixed effects or random effects. Therefore we reported above results of GLM effects model results for the equation 3.

Table 8: Hausman Test (ROE)

In Table 8 the p-value of the Hausman test is significant which reports that we could make use of either the fixed effects or random effects. Therefore we reported above results of GLM effects model results for the equation 3.

Correlated Random Effects - Hausman Test

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	10.706376	4	0.0301
Period random	0.000000	4	1.0000
Cross-section and period random	23.076706	4	0.0001

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
IP	0.034870	0.056280	0.000291	0.2093
Ln(TA)	-0.113598	0.017603	0.002797	0.0131
FLR	-0.035923	0.225078	0.011247	0.0139
CIR	-2.833292	-2.016276	0.929185	0.3967

Considering the evidence obtained from data analysis we can reliably reject or discard the null hypothesis and we will accept the alternative hypothesis which states that there is a positive significant relationship between inventory management and firm performance in Pakistan as indicated by proxy ROE but ROA does not affected by Inventory management policies. This implies that better inventory performance of manufacturing firms in Pakistan leads to superior firm performance perspective our results indicate that operation managers should focus on inventory performance. Our results from different techniques are similar so

the reliability of our evidence is sound. For the managerial to achieve higher firm performance in Pakistan. Our results are in line with previous significant studies of Chen et al. (2005) and with the study of Shah and Shin (2007), Capkun et al (2009) and Eroglu & Hofer (2011). It is therefore that the reciprocal of this ratio highlights about the greater the value of the ratio the better would be the management of inventory by the company. Additionally, our results also provide basis for further academic research on the underlying topic in Pakistan.

CONCLUSION

Descriptive statistics indicates that ROA has lesser mean value than ROE and in the same way standard deviation behave. All variables are positively skewed except Total Assets and CIR. The inventory Turnover Ratio Days has average value indicates that inventory is turned in to sale twice in a year.

Correlation matrix that contains rank correlation coefficients among the return on assets, Return on Equity, inventory turnover, Total assets, Leverage ratio and capital intensity ratio. The salient features of present study are that the ROA has a moderate positive relationship with ROE and weak positive relationship with Inventory turnover ratio. However, ROA has weak negative relationship with total Assets, Leverage Ratio (LR) and Capital Intensity Ratio (CI). The Return on Equity (ROE) has a positive weak relationship with Inventory turnover, total assets and Leverage ratio. But, there is weak negative relationship of ROE with Capital Intensity Ratio (CIR).

We run both equation 3 and 4 separately through OLS regression. We propose that they will have a positive significant relationship between inventory management and firm performance which implies that better inventory management leads superior firm performance. The above results illustrate that there is positive relationship between inventory turnover ratio and ROA and ROE. The coefficient of inventory turnover days is highly significant at 1 % level for both of the equations.

These results support that there is positive significant relationship between inventory performance and firm performance in ROE perspective. Additionally, as expected the controlling variable Leverage ratio and capital intensity ratio are also significant. Before we run GLM regression as a standard practice to determine which GLS effect is used for the regression? For both of our final regression we applied Huasman test to identify the appropriate model for the regression. The p-value of the Huasman test is significant which implies that we can use either of the fixed effects or random effects. So we report the results of GLS random effects model results for the equation 3 and has also confirmed our hypothesis and there is positive significant relationship between inventory turnover ratio and ROA. This also implies that the better inventory management improves the firm performance. Similar to our results in previous section the controlling variable are also significantly related to firm performance. The p-value of the Huasman test is not significant which implies that we can use either of the fixed effects or random effects. So we report the results of GLS random effects model results for the equation 4. Our results of this model support our previous results and indicate positive significant relationship between inventory turnover ratio and firm performance. The coefficient of inventory turnover ratio is significant at 5 %. Results of this model are similar with previous evidence.

On the basis of the evidence obtained from data analysis we can reliably discard or reject the null hypothesis and we can accept the alternative hypothesis that there is positive significant relationship between inventory management and firm performance in Pakistan. This implies that better inventory performance of manufacturing firms in Pakistan leads to superior firm performance perspective our results indicate that operation managers should focus on inventory performance. Our results from different techniques are similar so the reliability of our evidence is sound. For the managerial to achieve higher firm performance in Pakistan. Additionally, our results also provide basis for further academic research on the underlying topic in Pakistan. As a limitation the proposed frame work is not ultimate and much more can be added or contributed. In developing economies like Pakistan researchers are offered very less facilities like formal database. Therefore, to extract data for longer time periods is almost impossible and data for longer time period enhances the accuracy of the results. Furthermore, inventory can be evaluated based on its discrete components (i.e. WIP, FGI and RMI). This study provide basis for future investigation of the phenomena in emerging economies like Pakistan, where very little attention to the underlying topic is given in academic research on *operations management in Pakistan*.

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