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The Relationship between Inventory Management and Profitability: A Comparative Research on Turkish Firms Operated in Weaving Industry, Eatables Industry, Wholesale and Retail Industry

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***Abstract*—**Working capital is identified as firm's all current assets. Inventories which are one of the working capital elements are very important among current assets for firms. Because, profitability is an indicator for firms' financial success is provided with minimum cost and optimum inventory quantity. So in this study, it is investigated as comparatively that the effect of inventory management on the profitability of Turkish firms which operated in weaving industry, eatables industry, wholesale and retail industry in between 2003 – 2012 years. Research data consist of profitability ratios and inventory turnovers ratio calculated by using balance sheets and income statements of firms which operated in Borsa Istanbul (BIST). In this research, the relationship between inventories and profitability is investigated by using SPSS-20 software with regression and correlation analysis. The results achieved from three industry departments which exist in study interpreted as comparatively. Accordingly, it is determined that there is a positive relationship between inventory management and profitability in eatables industry. However, it was founded that there is no relationship between inventory management and profitability in weaving industry and wholesale and retail industry.

***Keywords*—**Profitability, regression analysis, inventory management, working capital**.**

I. Introduction

MANAGEMENT of scarce capital and used strategies are one of the most important factors in determining the future of a firm. Because today's competitive environment, in order to provide their survival, companies must have enough working capital. Otherwise, they can be involved in a bankruptcy.

Daily business activities are necessary for working full capacity, continuing production without interruption, and to able to pay short-term debts and interest. In order to carry out these activities successfully, firms must have sufficient cash and marketable securities and assets that have features as converted into cash less than 1 year. Working capital identified as required cash and cash equivalents and assets that can be converted into cash less than 1 year in order to carry out firms' daily activities [1]. However, elements of working capital in current assets are basically three. These are cash and marketable securities, receivables and inventories.

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Working capital policy is identified as determining appropriate amount of balance sheet items that makes current assets in order to conduct firms' activities without any failure and deciding how and by which resources are they financed. Managing current assets within the framework of this policy is called as "Working Capital Management" [2].

In realizing the goals of business, working capital management has a very important role. Working capital management is important in terms of extending business volume, reducing the risk of not meeting the liabilities, increasing credibility, preventing the falling in difficult situations in exceptional conditions, carrying out the activities in profitable and efficient way [3].

In the theory of finance, it is accepted that there is a significant relationship between managing working capital as a whole or managing its elements separately with firms' profitability. In this paper, the relationship between inventory management which is one of the elements of working capital and profitability is investigated.

In some studies in the literature review, Kiracı determined that there is a positive relationship between inventory turnover and return on assets and net profit margin and there is a negative relationship between inventory turnover and gross profit margin [4]. In the study conducted by Lazaridis and Tryfonidis, it is determined that there is a significant relationship between cash conversion period and gross profit margin [5]. The study conducted by Deloof has revealed that there is a positive relationship between profitability and cash conversion cycle and inventory keeping period [6]. In the paper conducted by Garcia- Teruel and Martinez-Solano, it has been founded that while the cash conversion period and inventory keeping period decrease, profitability increases [7]. In the Raheman and Nasr's study, there is a negative relationship between inventory holding period and firm's profitability [8].

The purpose of this study is investigating whether a difference in the profitability and inventory management strategies between the firms operating in the different sectors in BIST. For this purpose, Firms operating in weaving, eatables, wholesale and retail sector in BIST were analyzed.

II. The Importance and Purpose of Inventory Management

Inventory is the monetary value of physical assets which are included directly or indirectly into produced goods in production system and which are kept for future or with the intention of selling [9].

Inventories have important functions in terms of ensuring the continuity of businesses' activities, adapting business activities against to demand fluctuations, sustaining business activities against to problems which can be experienced with suppliers and price changes. In this context, inventories are kept mainly in the fulfillment of business activities and with the aim of meeting the demand [10].

The reasons why businesses keep inventories are listed as follows in a broader way [11]:

- Being predictable,
- Minimizing the effects of fluctuations in the demand,
- Avoiding any unexpected situation which can be aroused from suppliers,
- Being protected from changes in prices,
- Benefiting from quantity discounts,
- Reducing order costs.

The reasons of keeping inventories are listed above, a balance should be established between the advantages gained from keeping sufficient inventories level and the losses that will arise when inventories are inadequate. Excessive storage of inventories may cause the expenses like storage and insurance, insufficient inventory also may cause disruptions of productions, loss of customers and reducing the market share. To eliminate all these drawbacks and determining optimal amount of inventory, observation method, double-box method, ABD method, fixed order method, economic order method and a number of method have been developed [1].

The amounts of inventory vary from sector to sector, this amount constitutes of between 20% and 60% of company's assets. Therefore, inventory management is important in determining profits of businesses [10].

In recent years the understanding of just in time production has increased the importance of inventory management because it has proposed the minimizing inventories, the flexible production must meet the demand quickly and shortening the product life cycle [10].

Inventory management is the process of supplying the assets in the inventories, processing, planning the process of delivering the finished goods to customers, organizing, conducting and controlling. According to these definitions, inventory management deals with the issues as procurement, transporting, producing, storing, and delivering. This process is realized in three stages according to different stages of product flow, these are, pre-production, during production and post- production. For an effective inventory management, first of all inventory management system must be established. Apart from this, determining most appropriate inventory control method, classifying inventories accurately, estimating the demand accurately, inventory tracking system, systemizing the period of supply and calculating the inventory costs truly and the requirements of effective inventory management [9].

The main purpose of inventory management is determining and maintaining the optimal level of inventory investments. Thus, orders can be met on time and inventory cost can be minimized and customer's expectations can be met. As a result customer satisfaction and profit will be provided [10].

The main purpose of effective inventory management is monitoring all inventory movements, determining when and how much order will realized for each inventory item [2]. Since the effectiveness in the inventory management is ensured with keeping inventory and minimizing the costs of inventory keeping. All these cost greatly affects the firm profitability.

Inventory costs include inventory prices, inventory carrying costs, supply (order) costs and the cost in the absence of inventory [4]:

1) Inventory Prices: Regarding inventories, the first and main cost factor is their prices. For example, the purchase prices of raw material and goods.
2) Order Costs: It includes the expenses which are realized for procuring the inventories and making ready for using. For example: written and all kinds of communication expenses, quality control analysis.
3) Inventory Carrying Costs: It is described as the costs vary depending on the inventory amount; it increases if the amount of inventory increases and decreases according to the inventory amount [3]. These costs are exemplified as follows: financing costs, storage, loading and unloading expenses, rent of warehouse, depreciation, maintenance, repairs, heating, cooling, lighting etc., inventory service costs, insurance costs, inventory keeping risks (deterioration costs, dropping the prices, changing customers demands), theft and loosed arises from natural disasters.
4) The Cost of not Carrying Inventory: Costs arising from when there is a demand for inventories but there is no inventory; this cost has a feature that sows alternative cost. For example: missing the profitable sales opportunities, stoppage of production and interruption of production and losing the customers' confidence.

There is an inverse relation between supply (order) of inventory cost and inventory keeping costs. Depending on this inverse relation, economic order method which minimizes total inventory cost is shown in Fig. 1:

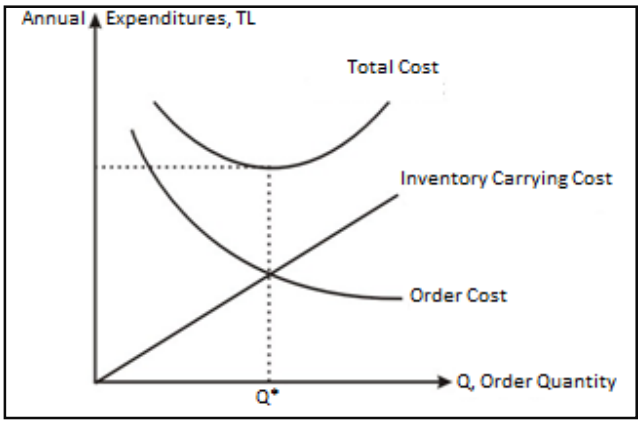

Fig. 1 Economic order amount

Expenditures arising from keeping inventory like investment costs, transportation costs, insurance costs, storage costs, deterioration and obsolescence costs increase when the inventory amount increases. Ordering costs decreases when the amount of order increases. In Fig. 1, combination of these two costs gives total cost. Total cost shows a decreasing trend firstly, then after a certain point it begins to increase. The point the reduction in total cost is minimum corresponds the intersection of inventory carrying costs and decreasing order costs. This point (Q*) as shown in the figure gives economic order amount and minimum inventory costs [12].

III. Performance Measures of Inventory Management and the Relationship between Profitability

In an enterprise, the efficiency level of inventory management is determined according to a set of performance measures. These performance measures grouped under five headings [10]:

1) Customer Satisfaction: It is measured by customers should find products whatever they want, whenever they want and how much they want. For these performance measures, various ratios can be used;

a) Fulfilled Request/Demand: If this ratio is higher, it means that inventory management is efficient.

b) Inventories/Sales: If this ratio is lower, it means inventory management is efficient.

2) Inventory Turnover Ratio: How many times inventories are transferred within a year. If inventory turnover ratio is high, inventory management is efficient and while it reduces storage costs, profitability increases.

3) Inventory holding time: How long inventories are holding in the warehouses. The higher waiting time, the higher inventory carrying cost is. If inventory holding time is short, it indicates that inventories are managed efficiently.

4) Return/Total Demand: If this ratio is high, it is an indicator of not meeting customers demand and it indicates inventory management is inefficient and it affects profits in negative way.

5) Customer Complaint Ratio: It is the ratio of total number of complaints from customers to total customer. If this ratio is high, it means inventory management is in efficient and it affects profits negatively.

According to above listed performance measures, it has been founded that if a business efficiently manages inventories, its profits are high. Especially the relationship between profitability ratios (gross profit margin, net profit margin, return on assets, and return of equity ratio) and inventory turnover ratio is used in effective inventory management. Thus in this study an analysis was done with this efficiency ratios.

IV. Research Design

A. Sample Selection and Hypotheses

In this study, the relationship between inventory management and profitability of firms operating in the weaving, industry, eatables industry and wholesale and retail industry were analyzed. The data used in the study was obtained from financial statements of firms traded in BIST operated in these 3 industries in the years between 2003-2012. From 31.01.2014 on, the number of firms registered to BIST and traded continuously for 10 years in weaving industry is 16, in eatables industry is 14 and in wholesale and retail industry is 11.

The hypothesis of the model was established as follows;

- H_0: Inventory management has no impact on gross profit margin.
- H_0: Inventory management has no impact on net profitability.
- H_0: Inventory management has no impact on return on assets.
- H_0: Inventory management has no impact on return on equity.

B. Model

In the study, in order to determine the efficiency of inventory management, inventory turnover ratio is used. Firm's profitability is represented by gross profit margin, net profit margin, return on assets and return on equity. In the model, 4 dependent and 1 independent, a simple regression and correlation analyzes were conducted. The variables in the study and the abbreviations used for providing convenience are as follows:

1) Dependent Variables;
GPM= Gross Profit Margin (Gross Profit / Net Sales)
NPM= Net Profit Margin (Net Income /Net Sales)
ROA= Return on Assets (Net Income / Total Assets)
ROE= Return on Equity (Net Profit / Equities)

2) Independent Variable;
ITR= Inventory Turnover Ratio (Net Sales /Inventories)

The results of regression and correlation analyzes of each sector have been shown separately in the tables and have been interpreted.

C. The Relationship between Inventory Management and Profitability in Weaving Industry

The result of correlation analysis between inventory management and profitability of firms operating in the weaving industry is as follows:

TABLE I
WEAVING INDUSTRY CORRELATION ANALYSIS

		GPM	NPM	ROA	ROE	ITR
GPM	Pearson-Cor.	1	-231**	,182*	-,024	-,125
	Sig(2-tailed)		,003	,021	,763	,116
	N	160	160	160	160	160
NPM	Pearson-Cor.		1	,066	-,003	,048
	Sig(2-tailed)			,405	,968	,549
	N		160	160	160	160
ROA	Pearson-Cor.			1	-,003	,038
	Sig(2-tailed)				,966	,633
	N			160	160	160
ROE	Pearson-Cor.				1	,041
	Sig(2-tailed)					,609
	N				160	160
ITR	Pearson-Cor.					1
	Sig(2-tailed)					
	N					160

**Correlation is significant at the 0.01 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).

When above the table is analyzed, in weaving industry there is a negative relationship between GPM and ITR, positive but weak relationship between NPM, ROA and ITR; and positive relationship between ROE and ITR.

The results of regression analysis in the weaving industry are as follows;

TABLE II
WEAVING INDUSTRY INVENTORY TURNOVER- PROFITABILITY REGRESSION ANALYSIS

	Dependent Variables			
	GPM	NPM	ROA	ROE
The hypothesis	H_0: In Weaving Industry Inventory management has no impact on gross profit margin.	H_0:In Weaving Industry Inventory management has no impact on net profitability.	H_0:In Weaving Industry Inventory management has no impact on return on assets.	H_0:In Weaving Industry Inventory management has no impact on return on equity.
R	0,125	0,048	0,038	0,041
R^2	0,016	0,002	0,001	0,002
F	2,499	0,360	0,229	0,263
P (Sig.)	0,116	0,549	0,633	0,609
Result	Accepted	Accepted	Accepted	Accepted

Considering above the statements, as a result of regression analyses in weaving industry, the explanation ratio of ITR variable for GPM variable was calculated as 0,125 and this is the highest value. Then other high explanatory power from highest to lowest are respectively: NPM, ROE and ROA. In addition, since p values are higher than 0, 05, this model is not statistically significant. Thus, it can be interpreted that there is no relationship between inventory management and profitability in weaving industry.

D. The Relationship between Inventory Management and Profitability in Eatables Industry

The results of correlation analysis between inventory management and profitability of firms operating in the eatables industry are shown in the following table:

TABLE III
EATABLES INDUSTRY CORRELATION ANALYSIS

		GPM	NPM	ROA	ROE	ITR
GPM	Pearson-Cor.	1	,408**	,440**	,103	,307**
	Sig(2-tailed)		,000	,000	,224	,000
	N	140	140	140	140	140
NPM	Pearson-Cor.		1	,909**	,409**	,283**
	Sig(2-tailed)			,000	,000	,001
	N		140	140	140	140
ROA	Pearson-Cor.			1	,321**	,235**
	Sig(2-tailed)				,000	,005
	N			140	140	140
ROE	Pearson-Cor.				1	,226**
	Sig(2-tailed)					,007
	N				140	140
ITR	Pearson-Cor.					1
	Sig(2-tailed)					
	N					140

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

Analyzing above the table, there is a positive, strong and meaningful relationship between GPM, NPM, ROA and ROE variables with ITR variable of firms operating in the eatables industry. Accordingly, the increase in ITR makes the firms' profitability operating in this sector increases.

The results for the correlation analysis as seen above, the regression analysis for the food industry results are as follows;

TABLE IV
EATABLES INDUSTRY INVENTORY TURNOVER RATIO AND PROFITABILITY REGRESSION ANALYSIS

	Dependent Variables			
	GPM	NPM	ROA	ROE
The hypothesis	H_0:In Eatables Industry Inventory management has no impact on gross profit margin.	H_0:In Eatables Industry Inventory management has no impact on net profitability	H_0:In Eatables Industry Inventory management has no impact on return on assets.	H_0:In Eatables Industry Inventory management has no impact on return on equity.
R	,307	,283	,235	,226
R^2	,094	,080	,055	,051
F	14,399	12,026	8,057	7,456
P (Sig.)	0,000	0,001	0,005	,007
Result	Rejected	Rejected	Rejected	Rejected

Regarding above the statements, as a result of regression analysis in the eatables industry, explanation ratio of ITR variable for GPM, NPM, ROA and ROE variables is generally calculated over 20 %. The highest explanation ratio belongs to GPM variable with 30,7 % . Then explanatory power from the highest to lowest are respectively: NPM, ROA and ROE. In addition, in all analyzes, p values are less than 0.05, so this model is statistically significant and hypothesis are rejected. It can be interpreted that there is a relationship between inventory management and profitability in Eatables industry.

After this stage, the model is established by looking at the following table of coefficients.

TABLE V
EATABLES INDUSTRY INVENTORY TURNOVER RATIOS AND PROFITABILITY COEFFICIENTS

Coefficients		B	T	Sig
GPM	Constant	,140	9,186	0,000
	ITR	,006	3,795	0,000
NPM	Constant	-,042	-2,431	0,016
	ITR	,006	3,468	0,001
ROA	Constant	-,020	-1,428	,155
	ITR	,004	2,839	,005
ROE	Constant	-,245	-2,957	,004
	ITR	,023	2,731	,007

According to the above the table, the coefficients were examined in Eatables Industry , since the ITR variable is less than 0,05 for explaining GPM, NPM, ROA and ROE variables, it is statistically significant. Accordingly, models for eatables sector are respectively as follows:

GPM_{EI}= 0,140 + 0,006ITR
NPM_{EI}= -0,042 + 0,006ITR
ROA_{EI}= -0,020 + 0,004ITR
ROE_{EI}= -0,245 + 0,023ITR

According to established models, 1 unit change in ITR will lead to 0,006 unit positive change in both GPM and NPM. It means when ITR increase as 1 unit, GPM and NPM also increase as 0, 6 %. Also 1 unit change in ITR will cause 0,004 unit changes in ROA and 0,023 unit changes in ROE.

E. The Relationship between Inventory Management and Profitability In Wholesale and Retail Industry

Regression and correlation analysis between inventory management and profitability of firms operating in the wholesale and retail industry are as follows;

TABLE VI
WHOLESALE AND RETAIL INDUSTRY CORRELATION ANALYSIS

		GPM	NPM	ROA	ROE	ITR
G	Pearson-Cor.	1	,540**	,261**	,093	,115
P	Sig(2-tailed)		,000	,006	,336	,231
M	N	110	110	110	110	110
N	Pearson-Cor.		1	,587**	-,100	,066
P	Sig(2-tailed)			,000	,298	,492
M	N		110	110	110	110
R	Pearson-Cor.			1	,040	,069
O	Sig(2-tailed)				,681	,476
A	N			110	110	110
R	Pearson-Cor.				1	,008
O	Sig(2-tailed)					,936
E	N				110	110
I	Pearson-Cor.					1
T	Sig(2-tailed)					
R	N					110

**Correlation is significant at the 0.01 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).

When above the table was analyzed, since p values are higher than 0,05 among ITR and other variables in wholesale and retail industry, there were no significant relationships.

The results of correlation analysis are fortiori and the results of regression analysis in wholesale and retail industry are as follows:

TABLE VII
WHOLESALE AND RETAIL INDUSTRY INVENTORY TURNOVER RATIO AND PROFITABILITY REGRESSION ANALYSIS

	Dependent Variables			
	GPM	NPM	ROA	ROE
The hypothesis	H_0: In Wholesale and Retail Industry Inventory management has no impact on gross profit margin.	H_0: In Wholesale and Retail Industry Inventory management has no impact on net profitability.	H_0: In Wholesale and Retail Industry Inventory management has no impact on return on assets.	H_0 In Wholesale and Retail Industry Inventory management has no impact on return on equity.
R	,115	,066	,609	,008
R^2	,013	,004	,005	,000
F	1,452	,474	,512	,006
P (Sig.)	,231	,492	,476	,936
Result	Accepted	Accepted	Accepted	Accepted

Regarding above the table, according the result of regression analysis, since p values are higher than 0, 05 in all analysis, the model is not statistically significant so hypothesis cannot be rejected. Accordingly, in wholesale and retail industry inventory management has no impact on profitability.

V. Conclusion

Ensuring the efficiency of working capital management depends on determining optimal working capital level that is needed by companies and managing working capital items effectively. Inventory management that is one of the elements of working capital is important in this respect. It is important that inventory turnover ratio, which shows the success of business in inventory management, should be positively associated with return on assets, gross profit margin, return on equity and net profit margin.

In this paper, the relationship between inventory management and profitability was analyzed with correlation and regression analysis. Accordingly, it is determined that there is a positive relationship between inventory management and profitability in eatables industry. According to the results, for the firms operating in the eatables industry, the more their inventories converted into Money, the more profitability ratios included in analysis. In other words, if the firms operating in this sector sustain their inventory management policies effectively, they increase their profits.

In weaving industry and wholesale and retail industry, it was founded that there is no relationship between inventory management and profitability. It means, for these firms operating in these sectors, the high inventory turnover ratio has no impact on their profits. As a result, inventory management policies adopted by firms according to industry-specific and economic conditions can move them different levels of profitability.

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