Inventory conversion period and profitability relationship of the listed pharmaceutical firms of Jordan

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C H R O N I C L E	**A B S T R A C T**
	The study objects for determining whether or not a relationship exists between inventory management of the listed pharmaceutical firms at Amman Stock Exchange, and the profitability of these firms, and whether or not inventory management affects firm profitability. Only three pharmaceutical firms were found listed at Amman Stock Exchange by the end of 2020, and therefore, the annual data of the three firms along the period 2009-2019 were collected and used in the analysis and hypothesis testing. Inventory turnover and average inventory holding period were used as indicators for inventory management at a reciprocal form, whereas, return on assets was used as a measure of firm profitability. Using the Pearson correlation method, the analysis and hypothesis testing demonstrated that a significant positive relationship exists between inventory turnover and return on assets, and a negative significant relationship exists between average inventory holding period and return on assets. Moreover, using the ordinary least square method, the study shows that inventory management has a positive significant effect on firm profitability. More studies regarding inventory management and firm profitability relationships, are recommended to be performed on other manufacturing industries than pharmaceutical firms.

1. Introduction

Drugs producing firms play an important economic and humanitarian role in most countries around the world, especially in light of the spread of the coronavirus pandemic. Producing drugs is not a traditional process, but it depends on research and investigations results for a long period of time. It is true that drugs are a product, but it is different in nature, because it has a direct effect on people' health. These days, not all countries produce all of their needs for drugs. To continue importing drugs from outside is costing and will affect the balance of payments. Most developing countries produce some of their needs for drugs, but it is better to produce most of their needs for drugs, especially where importing drugs from the developed countries is not allowed for some countries, due to political situations and sanctions, and in case it is allowed, it needs for higher financial resources. Producing drugs needs raw materials, where some materials may be available, while others may be unavailable, and a significant amount of time is needed to be received. Nevertheless, drugs producing needs for an efficient and effective management of its inventory in order to be more successful. These firms are required to manage their inventories in an efficient form, because a shortage of drugs production needs leads to production stoppage, and in opposite, keeping large inventory to maintain continuous operations leads to high inventory cost. So, the issue needs professional management to maintain

continuous processes of production and at the same time, to keep only the required needs of production, without holding extra materials of production.

The study is justified because inventory is a material and significant asset in amount for different manufacturing firms, including drugs producing firms. Inventory can be considered the largest asset in different manufacturing firms. As a result, inventory deserves to be managed carefully by efficient managers among those having the required knowledge, experience, desire, and ability. When inventory is managed carefully, where processes are continuous without having extra materials than the needs, it will lead to less cost and higher profitability and liquidity. In contrast, when inventory is managed using traditional methods, and avoiding the scientific methods of inventory management, cost will jump, and profitability, and therefore liquidity will decline. Actually, the pharmaceutical industry of Jordan, and the outputs of drugs products, have a good reputation, and its products are more preferred than similar products that are produced in neighboring countries, therefore giving the inventory of pharmaceutical firms more attention and managing it by competent managements, is assumed to lead for less costs and better profitability. Based on this justification, the problem of the study can be well presented through the following question. Will a good inventory management lead for less cost and better profitability? The answer to the question needs for more investigations of how inventory is managed, based on the data of these firms. The issue of inventory management of the drug industry of Jordan is of high importance, because it is assumed that good inventory management decreases the cost of materials, and therefore increases the profitability. In addition, the Jordanian pharmaceutical industry is actually considered as one of the most important industries, because of cost reduction and lower prices, so this will improve the competitive situation of drug firms, and it will be able to offer its products with less prices than the prices of competitive products. The study objects for determining the nature of the relationship between the management of inventory and profitability of listed pharmaceutical firms at Amman Stock Exchange (ASE). In more details, it looks for identifying whether profitability has a relationship with inventory management. Moreover, the study objects for identifying whether inventory management has an impact on the profitability level of the listed pharmaceutical firms of Jordan. In addition, the study aims for more analysis of inventory, in order to add more literature regarding the inventory of pharmaceutical firms of Jordan, and its relation with profitability.

The remainder of the study is organized to be as follows: section 2 presents the related literature to inventory management and profitability, whereas section 3 lists the related prior research and its findings. Section 4 shows the hypothesis development, whereas section 5 demonstrates the methodology that it is followed while studying the relationship between inventory management and firm profitability. Section 6 includes the results and analysis, while section 7 shows the findings of the study.

2. Literature Review

The efficient management of inventory is that management which holds enough inventory just for ensuring continuous operations and for satisfying the needs and orders of buyers, because holding too much extra amount of inventory leads to higher costs, and therefore, less profitability. In contrast, the shortage in inventory, especially the shortage in raw materials will increase the likelihood of operations stoppage, and a shortage in finished goods will prohibit the firm of profit opportunities, and thereafter less customer satisfaction. Too much, or too less inventory will lead to high cost of inventory, and therefore low profitability. An efficient management of inventory is important, and also required, because a substantial amount of funds is normally invested in inventory. Good inventory management should ensure that inventory is ready and low, because it is the most important asset in manufacturing and merchandising firms. Inventory represents around 40 percent of the total invested capital in industrial organizations, and about 33 percent of its working capital (NdiranguKung'u, 2016). Inventory is defined by NdiranguKung'u (2019), as "the stock purchased with the purpose of resale in order to gain a profit". Samanta (2015), states that a difference is available regarding what the term inventory means in the USA and UK. In American English, and in accounting context, the word inventory refers to what a firm holds of materials for the purpose of resale, and the word stock refers to the capital invested in a business. The word stock is more commonly used in the remaining English speaking countries and inventory is recognized as a synonym. A popular form of inventory management is what is known as Just-in-Time (JIT), which originated by the Toyota system of production. JIT is based on decreasing both inventory level and lead time, in addition to improving the quality of products and services (Shin & Ennis, 013). JIT is seen as a new way of thinking, planning, and performing with respect to manufacturing (Canel et al., 2000). The best description of JIT is what was provided by Schonberger, (1982), where underline this description, JIT implementing firms have to produce and deliver finished goods JIT to be sold, subassemblies JIT to be assembled into finished goods, fabricated parts JIT to go into the subassemblies, and purchased materials JIT to be transformed into fabricated parts. Grahame (1998) described JIT as a toolbox of techniques that based on inserting a significant improvement in operating efficiency through reduced level of inventory, lead time, and overhead. Vrat (2014) defines JIT as "JIT or zero inventory system is an idealized concept of inventory management wherein we are able to supply whatever material is required, wherever required, and whenever required JIT, with 100 percent supply assurances without keeping an inventory on hand". The following factors initiates the necessity for implementing JIT in operations (Singh & Ahuja, 2012):

1. The need for continuous global completion, and satisfying customers globally,

2.   Eliminating threats resulting from hard completion, in addition to the increase of raw material prices and other needs of production,
3.   Improving the organization's culture and mindset,
4.   Increasing employees' efficiency through training and motivations,
5.   Reducing product cost and improving its quality,
6.   Reducing the number of breakdowns in operations,
7.   Ensuring that a product is produced just when needed, and its raw materials received just when needed to be used in operations,
8.   Reducing inventory level, lead time, and ensuring the optimum use of human resources, machines, and capital.

The Economic Order Quantity (EOQ) is an efficient method for controlling profitability. The optimal quantity of inventory to be purchased, is determined when ordering costs of inventory are equal to holding cost. The least total cost of inventory is identified at the point where ordering and holding cost are equal. The EOQ method is based on holding inventory at amount just to keep operations continuous. In other words, holding excess amounts of inventory than the needed, will increase cost, and therefore decrease profitability. In contrast, keeping less amounts of inventory will lead to inventory shortages and therefore production stoppage when the shortage of inventory occurs at raw materials and other needs of production, and as a result, operations stoppage will increase cost because the firm will continue paying for employees and other fixed costs, while no production taking place. The issue of EOQ adoption is not easy, because of an opposite relation between holding and ordering cost. Moreover, several terms or conditions should be met by a firm when it needs to apply EOQ. Using EOQ has several assumptions, of these; (1) annual demand is known, (2) evenly spread demand throughout the period, (3) stable lead time, (4) each order is received separately, (5) no quantity discounts, and (6) steady usage of stored materials (NdiranguKung'u, 2016). The EOQ can be easily determined for a single item or few items, but it can be more cumbersome when the number of inventory items is large, and in this case more efficient management of inventory is required, and necessary.

A popular inventory management method is called ABC, or Pareto method. ABC is considered an important method that can be followed for efficient management of inventory. When ABC inventory management method is adopted, the cost of inventory can be substantially declined, and therefore profitability improvement will be achieved. The Pareto principle is applied on ABC method, where 20% of inventory items, establishes 80% of the annual dollar value of demand (Goldman, 2010). According to the ABC inventory management method, inventory items are classified into three categories based on item dollar value, where underline this method A's items are few in number or volume but have the highest dollar value, and as a result special attention is required to be done for the items that are classified as A items. In more details and according to ABC, Beheshit, Grgurich, and Gilbert (2012), stated that A items constitute around 70-80% of the annual dollar demands, but constitute 15-20% of the line items, whereas, B items constitute only 15-25% of the annual dollar demand, but it composes about 25-30% of inventory items in size, and C items only constitute about 5-10% of the annual dollar demand, but compose the remaining percentages of inventory volume. As a result, inventory items should be given more attention. Additional other techniques can be adopted by a business organization, especially manufacturing firms, when a firm looks for improving the management of its inventory, in addition to JIT, EOQ, and ABC. Whatever the method adopted by a firm in managing inventory, each of which takes into consideration holding low quantities just to ensure continuing operations, and hooding these quantities for a short period of time. Other factors should be taken into consideration while a firm follows one technique, such as suppliers, the geographic location of raw materials, number of items that acquired from one supplier, supplier credit policy, opportunity cost, et al. Most managements of firms of developing countries, may find that it is difficult, if not possible to adopt JIT, because it is more applicable and successful in Japanese management, and managements prefer holding more inventory to insure operations continuity, but it can be partially adopted for selected items, such as those items where its suppliers can supply those items, just in time when needed and within a short period of time, and when suppliers providing these items are available inside the country, and therefore can supply the requirements of materials from a close location to the purchasing firm. With regard to EOQ technique, it is possible to be applied, especially where the number of needed items on inventory is low, and the form insures the commitment of its suppliers. ABC is important, especially it can be easily applied because it takes into consideration the opportunity cost of capital. In occasion the fast development in communication technologies, make ABC more applicable.

3. Prior Researches

Despite the fact that inventory is often the largest asset in most manufacturing and merchandising firms, the relationship between inventory management and profitability has not been given enough attention by authors. Few studies investigated the inventory management and profitability relationship in the developed world, but fewer investigations and analysis in the developing world, had been done regarding this relation. Some related studies and its finding regarding this issue are given in this section. Golas (2020) studied the causal link of inventory performance with the profitability of food firms, over the period 2005-2017. The author used the panel data methodology of Polish food industry, and took account of inventory mix including raw materials, work-in-process, and finished goods inventory. The data analysis showed a decline in the share of each inventory component in current and total assets along the study period. In addition, the data analysis showed that the number of days sales in inventory

tends to decline. Using the panel regression model, the study demonstrated that an improvement in inventory management leads to improvement in profitability, and a positive significant relationship exists between inventory management and profitability.

A study focused on the inventory techniques was carried out by Chebet and Kitheka (2019). The purpose of the study was to identify whether inventory management tools including, JIT and Economic Order Quantity (EOQ), affect the performance of business organizations. The authors of the study used an empirical evidence to analyze the findings. The study showed that EOQ should be reviewed in a continuous manner, and the inventory control system was closely controlled over time to be effective. The study recommended more usage of EOQ and system application production technology, since these two techniques found affecting performance. George (2019) carried out a study for the purpose of determining the impact of inventory management on profitability. The data covering 5 years (2011-2015), of a sample consisting of 5 steel firms, had been collected and used in the analysis to achieve the purpose of the study. Using the correlation method, the study shows that a significant negative relationship exists between inventory conversion period and the profitability of firms. Farooq (2019) investigated the effect of inventory turnover on profitability of nonfinancial firms of Pakistan. The study is based on several variables including, return on assets, return on equity, and net profitability margin, as measures of profitability, in addition to inventory turnover ratio, where sales growth, net working capital and size of firms were taken in the study as control variables. The data covering the period (2016-2019), of samples consisting of 79 firms of cement, sugar, and automobile industries, were gathered, analyzed, and used in hypothesis testing. Using the regression method in hypothesis testing, the study showed no significant the effect of inventory turnover ratio on assets turnover ratio. Moreover, the study showed that sales growth, firm size, and net working capital, each of which, had a significant effect on inventory turnover. The study did not reveal a significant effect of inventory turnover, net working capital, log of sales, sales growth ratio, on return on equity, but the study demonstrated that log of sales has a significant effect on return on equity. Using one among the three models, the study showed that there is a significant effect of log of assets on firm profitability, but no significant effect of log of assets on net profit margin. Muchaendepi et al. (2019), made an important contribution to inventory management-profitability relationship. The authors of the study assessed the inventory management strategies used by small and medium manufacturing enterprises of Harare, Zimbabwe. The study used qualitative research design and it was descriptive in nature. The data is primary in nature, and a number of 244 responded to the questionnaire. The study showed that small and medium enterprises use Just-in-Time method, and no knowledge available for them regarding the other computerized systems. Therefore, the study recommends more studies regarding the issue of inventory-management relationship.

A case study had been carried out by Kakeeto et al. (2017), in Uganda, when they investigated the impact of inventory management on profitability of Gumutindo Coffee Cooperative Enterprise Limited. Only a single hypothesis developed and tested in this study, where the hypothesis states that inventory management involves an effect of firm profitability. A descriptive research design used in the study using a questionnaire. Out of 200 staff, 168 responded to the questionnaire. The study showed 0.455 Pearson's coefficient of correlation between inventory and profitability of Gumutindo, and 0.20 coefficient of determination. In brief, the study found that inventory management significantly affects profitability, and inventory explains a substantial amount of change in profitability. Folinas et al. (2017) made an attempt for the purpose of identifying whether IT affects the firm financial performance in Greek. A qualitative research method had been followed to identify the key elements of JIT, followed by a quantitative research method to identify the effect of JIT practices on financial performance. The results showed that no clear significant effect of JIT practices and zero inventory on financial performance. Moreover, the study demonstrated that the examined investigations must be seen from the viewpoint of different business ideas. Mulindabigwi and Mulyungi (2017) followed a descriptive research design when they investigated the impact of inventory management on the financial performance, as a case study. The objective of the study was to investigate the effect of inventory management of BRALIRWA Ltd, Rwanda. The study exactly examined the effect of lean management, lead time, demand and supply, information technology, and demand and supply, on the financial performance of f BRALIRWA Ltd. A self administered questionnaire was developed and 98 employees from different departments in the company out of 130 received the questionnaire. The study demonstrated a positive significant relationship between each of the above mentioned independent variables and financial performance. NdiranguKung'u (2016), carried out a study to determine the impact of inventory control on profitability of industrial allied firms of Kenya. Inventory control is explained in the study by the EOQ model, where based on this model, total inventory cost is at lowest when a balance exists between ordering cost and holding cost. Correlational research had been adopted in this study, where two parts of data had been collected and employed, secondary and primary through a questionnaire. The data due to a sample consisting of 71 industrial and allied Kenyan firms, had been selected from a total of 399, and used in the analysis, depending on Pearson's correlation method. The study demonstrated a positive significant relationship between inventory control and profitability of industrial and allied firms. The contribution of Panigrahi (2013) is important, when the author investigated the impact of inventory management on profitability of Indian cement firms. The purpose of the study was to examine the relationship between inventory conversion period and profitability. The gross operating profit is used in this study as an indicator for profitability. The relationship between inventory conversion period and profitability is investigated in this study based on the data of 5 large Indian cement firms over the period 2001-2010. In the examination of the relation using the regression method, three variables were used as control variables including size, current ratio, and financial

debt ratio. The most important finding of the study is that there is a significant negative relationship between inventory conversion period and firm profitability.

Capkun, Hameri, and Weiss (2009), carried out a study regarding the relationship between inventory and financial performance of industrial firms of the U.S.A. The purpose of the study was to investigate the relationship between inventory as a total and its types including, raw materials inventory, work in process inventory, and finished goods inventory in one hand, and the financial performance in the other hand. Based on regression and correlation testing models, in hypotheses testing and data analysis, the study finds a significant positive correlation between inventory in total, as well as types, and the financial performance of manufacturing firms. Raw materials inventory showed the highest correlation with all financial performance measures. Moreover, the study found that work in process has higher correlation with gross profit measures than finished goods, but finished goods inventory has higher correlation with operating profit measures than work in process inventory. Koumanakos (2008) carried out a study to identify whether inventory affects the profitability of firms. The objective of the study is to identify whether efficient lean management improves the financial performance. The data over the period 2000-2002 of a sample consisting of the largest Greek manufacturing corporations was used in the analysis and hypothesis testing. The study shows that the higher the level of inventory preservation or the higher departing from lean management, the lower the rate of return. A cross-sectional, ex post facto study describing inventory turnover, gross margin return on investment, and profitability during 1983, had been prepared by Parrish et al. (1986), in Alabama Community pharmacies. Authors objected in this study for determining the relationship between gross margin return on investment and net profit. Using the stepwise regression method, the study showed that gross margin return on investment is a useful predictor, where gross margin return on investment is a ratio of gross margin as a percent of net sales multiplied by average inventory turnover. Authors called this ratio as "earn and turn ratio". The authors of the study considered and reported values between 150% and 250% as positively associated with profitability. Moreover, the study demonstrated that gross margin return on investment for the prescription department, pharmacy gross margin, and prescription inventory turnover predicted net profit with 0.645 correlation coefficient, and accounts for 37.5 percent of variance.

4. Study Hypotheses

The literature review of inventory and the consideration of the prior researches regarding inventory management and firm profitability relationship, and regarding the impact of inventory management on firm profitability, had been made to acquire more knowledge regarding the findings of these researches and studies. The review of the literature and the prior researches showed different findings. Different studies investigated the impact of inventory management on firm profitability. Other prior studies analyzed the relationship between inventory management and firm profitability. The findings of the different studies are also different. Some studies demonstrated that there is an impact of inventory management on firm profitability, whereas other studies showed no impact. Some prior studies which investigated the relation between inventory management and firm profitability, found that there is a significant relationship between inventory management and firm profitability, while others found no relation, where some of these demonstrated a positive relationship exists between inventory management and profitability of firms, while others showed a negative relationship. Therefore, two hypotheses were developed in the study, one regarding the assumed relationship between inventory management and firm profitability, and the other is regarding the assumed impact of inventory management on firm profitability. Both hypotheses are listed below, in their null form.

H_{01}: There is no relationship between inventory management and the profitability of the pharmaceutical listed firms at Amman Stock Exchange.
H_{02}: There is no impact of inventory management on the profitability of the listed pharmaceutical firms at Amman Stock Exchange.

5. Research Methodology

Only three pharmaceutical firms were found listed at ASE by the end of 2020. The number of listed pharmaceutical firms at ASE declined year by year, along the recent few years ago. Because only 3 pharmaceutical firms are listed at ASE, the study takes into account the entire 3 firms. The data collected and used in the analysis and hypothesis testing is secondary in nature, where data covering the period 2009-2019, had been gathered through the website of ASE, in addition to other resources, and thereafter used in the analysis and hypotheses testing. In brief, the sample and the population of the study is considered the same, because the data of the entire three listed pharmaceutical firms had been taken into consideration in the study. Only two variables are taken into consideration, inventory management, and firm profitability. Inventory turnover ratio, and average inventory holding period, are used in a reciprocal form to measure inventory management, whereas Return on Assets (ROA) is used as a measure of firm profitability. Descriptive statistics such as the mean and the standard deviation are used in data analysis, and two statistical methods are used in hypothesis testing, where the Pearson correlation method is used in testing the first hypothesis, and the ordinary least square method is used in testing the second hypothesis. With regard to the ordinary least square method, two models were used, one based on inventory turnover, and the other is based on average inventory holding period, as follows.

$$ROA = \alpha + \beta \times ITR + e \tag{1}$$
$$ROA = \alpha + \beta \times AHP + e \tag{2}$$

where, ITR refers to inventory turnover, AHP, refers to average holding period of inventory, a, is a constant referring to the value of ROA, when the value of ITR or AHP equals zero, and b, is also a constant referring to the slope, or in more details, it refers to the change in ROA as a result of change in ITR or AHP. The decision making base in the study, is to accept the null hypothesis when the computed t-value is less than the corresponding tabulated one, and in opposite, to reject the null hypothesis when the computed t-value is higher than its corresponding tabulated one. In addition to the rule of comparison between the calculated and tabular t-value, the value of the coefficient of significance is used as an additional decision rule, where underline this rule, the null hypothesis is accepted when the computed coefficient of significance is higher than the predetermined one, which equals 0.05, and in opposite, the null hypothesis is rejected, when the computed coefficient of significance is less than the predetermined one. On occasion, both rules of decision lead to the same conclusion.

6. Results and Analysis

6.1. Data Description

Inventory is one among the most important assets, especially in manufacturing and merchandising firms. Inventory is a current asset, but it is less liquid than other assets such as receivables and marketable securities, because it needs for a longer time than the time needed for the rest of current assets to be converted to cash. Some of the related literature and prior researches mentioned that inventory is considered the most significant asset in industrial firms. Therefore, the relationship of inventory to each of current assets and total assets, is computed for the listed pharmaceutical listed firms at ASE. Table 1 shows the relationship of inventory to current assets and to total assets, for all firms that the study takes its data into consideration, and over the period of the study. The table shows that the proportion of inventory to current assets is somewhat high in some years, whereas it is less in some other years. The highest proportion of inventory to current assets equals 40 percent and occurred in year 2009 at firm 3, whereas the least proportion equals 0.13, and occurred in different years at more than one firm. The table also shows that the highest proportion of inventory to total assets, equals 27 percent and occurred at firm 3, whereas the least inventory to total assets proportion equals 0.02, and occurred in more than one year at firm 2. In addition, the table shows that the highest mean of inventory proportion to current assets is 0.293, and occurred in 2011, and the highest mean of inventory to total assets ratio is 0.186 and also occurred in 2011.

Table 1
Proportion of Inventory to Each of Current and Total Assets

| Year | Firm 1 | | Firm 2 | | Firm 3 | | Mean | Mean |
	Ratio to Current Assets	Ratio to Total Assets	Ratio to Current Assets	Ratio to Total Assets	Ratio to Current Assets	Ratio to Total Assets	Inv. To Current Assets	Inv. to Total Assets
2009	0.25	0.17	0.16	0.08	0.40	0.27	0.270	0.173
2010	0.28	0.22	0.16	0.08	0.38	0.23	0.273	0.176
2011	0.26	0.19	0.24	0.13	0.38	0.24	0.293	0.186
2012	0.21	0.12	0.21	0.13	0.39	0.22	0.270	0.156
2013	0.21	0.13	0.16	0.10	0.30	0.21	0.223	0.146
2014	0.20	0.12	0.22	0.02	0.22	0.17	0.213	0.103
2015	0.20	0.11	0.19	0.02	0.18	0.14	0.190	0.09
2016	0.18	0.11	0.15	0.02	0.14	0.10	0.156	0.076
2017	0.29	0.16	0.13	0.02	0.13	0.10	0.183	0.093
2018	0.26	0.14	0.13	0.02	0.13	0.11	0.173	0.09
2019	0.29	0.15	0.16	0.02	0.13	0.11	0.193	0.093

Table 2 lists the most important descriptive statistics for inventory, inventory turnover, net profit, inventory average holing period, and ROA.

Table 2
Descriptive Statistics for Inventory, Inventory Turnover, Net Profit, and ROA

	N	Minimum	Maximum	Mean	Standard Deviation
Inventory	33	786,836	21,566,606	5,785,385	6,423,600
ROA	33	-12.18	38.40	6.112	10.37827
Inv. Turnover	33	0.56	2.10	1.0657	0.35202
Net Profit	33	-9663763	9,111,137	995,067	3,932,596
Average Holding Period	33	173.7	650.4	379.45	123.2

The least on hand inventory, along the study period (2009-2019), and in the entire listed firms in the pharmaceutical industry of Jordan, equals JD 786,836, while the highest is JD 2,156,660, with a mean of JD 5,785,385, and a standard deviation of JD 6,423,600. It is clear that in some years, inventory was high enough, and the variation is too high. Considering inventory turnover, it was too low, whereas appearing in the table, the highest inventory turnover is 2.10. These are considered as indicators for holding high inventory, and inventory is kept for a long period of time. The first glance shows that whenever inventory turnover declines, profitability also declines, and as inventory turnover increases, as profitability increases.

Table 3
No. of Days Inventory on Hand

No. of Days	Firm 1	Firm 2	Firm 3
2009	452.59	534.85	629.34
2010	543.17	429.07	650.41
2011	256.71	492.47	538.32
2012	387.27	460.92	576.36
2013	354.58	409.13	254.23
2014	274.03	437.89	173.70
2015	256.97	435.75	217.47
2016	252.27	396.52	356.53
2017	345.36	318.88	273.79
2018	349.97	309.36	256.85
2019	322.22	299.46	275.40

Table 3 shows some statistics with regard to average inventory including the mean, least, highest, and standard deviation. It shows a high number of days inventory held on hand. The average inventory holding period seems long enough, where the mean of inventory average holding period is more than one year, and equals 379 days. The statistics regarding the number of days inventory on hand are available in Table 2. Table 2 shows that the least number of days is 174 days, but the highest is 650 days. This means that pharmaceutical firms purchase its raw materials to cover the usage for a long period of time, or finished goods continue on hand for long enough periods.

6.2 Hypotheses Testing

6.2.1. The First Hypothesis

The first hypothesis of the study was developed to enable testing whether a relationship exists between inventory management and firm profitability. Inventory management is measured using inventory turnover one time, and average inventory holding period another time. With regard to firm profitability, ROA is used as a measure of profitability. The first hypothesis is listed again, in its null form, as follows.

H_{01}: There is no relationship existing between inventory management and the profitability of the pharmaceutical listed firms at Amman Stock Exchange.

Table 4
Correlation Coefficients

		ROA
Inventory.	Pearson Cor.	0.549
Turnover	Sig. (2-tailed)	0.001
Ratio	N	33
Average Inventory	Pearson Cor.	-0.470
Holding	Sig. (2-tailed)	0.006
Period	N	33

The first hypothesis is tested using the Pearson correlation method under 0.05 coefficient of significance. Table 4 includes the statistics that are related to the relationship between inventory turnover, as an indicator for inventory management, and ROA, as an indicator for firm profitability. It also includes the related statistics to the relationship between average inventory holding period, as an indicator for inventory management, and firm ROA, as a measure for firm profitability. The table shows that the coefficient of correlation (R) equals 0.549, with 0.001 coefficient of significance. Because the computed coefficient of correlation is less than the predetermined coefficient that equals 0.05, the null hypothesis is rejected, and instead, its alternative, which states that there is a relationship between inventory management and firm profitability, is accepted. Because R^2 has a positive value of 0.549, with less computed sig than the predetermined, it can be concluded that a significant positive relationship exists between inventory turnover and ROA, which refers to the existence of a positive relationship between inventory management and firm profitability, since inventory turnover ratio is used as a measure for inventory management, and ROA is used as a measure of firm profitability. With regard to the correlation coefficient between average holding period and ROA, which also is shown in Table 4, the table shows that the coefficient of correlation between inventory average holding period and ROA equals -0.470, with 0.006 sig value. Depending on this coefficient and sig between inventory average holding period and

ROA, the first null hypothesis is also rejected and its alternative one is accepted. It is notable that the correlation between inventory average holding period and ROA is negative, where this result grants more reliability and accuracy to the result stemmed based on correlation between inventory turnover and ROA.

6.2.2 The Second Hypothesis

The second hypothesis had been developed to examine the effect of inventory management on the profitability of listed pharmaceutical firms at ASE. The hypothesis is presented again, in its null form, as follows.

H_{02}: There is no impact of inventory management on the profitability of the listed pharmaceutical firms at Amman Stock Exchange.

Table 5 shows the related statistics to the assumed impact of inventory management on firm profitability. Table 4, shows that the computed t-value equals 3.657, and the computed coefficient of significance (sig.) equals 0.001. The comparison between the computed and the tabulated t-values shows that the computed one is higher than the tabulated, which equals 1.96. Moreover, comparing the computed coefficient of significance, and its corresponding predetermined one, which equals 0.05, the comparison demonstrates that the computed coefficient is less than the predetermined corresponding one. This result means that inventory turnover has a significant effect on the profitability of listed pharmaceutical firms at ASE.

Table 5
Statistics Regarding the Impact of Inventory Turnover on ROA

	R	Adjusted R^2	B	T-Value	Sig.
Inv. Turnover	0.549	0.279	16.185	3.657	0.001

Based on information appearing in table 5, the regression model is now as follows:

$$ROA = -11.136 + 16.185 \times ITR + 4.426. \tag{3}$$

When the average inventory holding period is used as a measure of inventory management instead of inventory management, Table 6 shows that the computed t-value equals – 2.961, and the computed coefficient of significance is 0.006. Comparing the computed t-value with its corresponding tabular one, which equals 1,96, reveals that the absolute value of the computed one is higher. In addition, comparing the computed coefficient with the corresponding predetermined one, which equals 0.05, the comparison demonstrates that the computed one is less. Because the computed t-value is higher than the tabulated, and because the computed coefficient of significance is less than the predetermined, the null hypothesis is rejected, whereas its alternative one is accepted. This means that inventory management significantly affects the profitability of the listed pharmaceutical firms at ASE.

Table 6
Statistics Regarding the Average Number of Days Inventory on Hand on ROA

	R	Adjusted R^2	B	T-Value	Sig.
Ave. H_{0l} Period	0.470	0.195	-0.040	-2.961	0.006

When average inventory holding period is used as the independent variable, instead of inventory turnover, the regression model is now appearing as follows

$$ROA = 21.118 – 0.04 \times AP + 0.014 \tag{4}$$

It is notable that both hypotheses had been examined by using inventory turnover in one time, and the average inventory holding period in other time, following a reciprocal form. The results are similar, where a significant correlation exists between inventory management and firm profitability, and inventory turnover has a significant impact on firm profitability. The only difference is that whereas a positive correlation exists between inventory turnover and firm profitability, a negative correlation exists between average inventory holding period and firm profitability. With regard to the effect of a relationship, the difference is only in the direction of this relationship. In other words, t-value was positive when inventory turnover is used as an independent variable, whereas, it was negative when average inventory holding period instead as an independent factor.

7. Conclusions

The main purpose of the study is to determine whether a relationship exists between inventory management, as measured by inventory turnover and inventory average holding period, and firm profitability, as measured by ROA. Using the correlation

method, the study showed a positive significant relationship between inventory turnover ratio and the profitability of listed pharmaceutical firms at ASE. Moreover, when the average inventory holding period is used instead of inventory turnover ratio, the study showed that a negative significant relationship exists between average inventory holding period and the profitability of listed pharmaceutical firms at ASE. With regard to the effect relationship, and using the ordinary least square method, the study demonstrated that inventory turnover has a positive significant effect on the profitability of listed pharmaceutical firms at ASE. When the average inventory holding period is used as an independent variable to measure inventory management, the study revealed that average inventory holding period has a negative significant effect on the profitability of listed pharmaceutical firms at ASE. The study showed that inventory turnover explains a significant amount of change taking place in inventory. The data analysis of the three listed firms showed that listed pharmaceutical firms at ASE hold more inventory and keep this inventory for a long period of time. Most prior studies found that a relationship exists between inventory management and profitability, and several studies demonstrated that inventory affects profitability of firms. Among the prior studies which found a relation or effect relationship are; Goals (2020), Kitheka (2019), George (2019), Kakeeto et al. (2017), Mulindabigwi and Mulyungi (2017), NdiranguKung'u (2016), Panigrahi (2013), Capkun, Hameri, and Weiss (2009), and Parrish et al. (1986). Despite the majority of studies that investigated the inventory-profitability relationship, and few studies found no relation, nor impact, between inventory management and firm profitability, more studies and analysis are required to identify the rest of variables explaining the remaining unexplained portion of the change in firm profitability.

References

Beheshit, H. M., Grgurich, D., & Gelbert, F.W. (2012). ABC Inventory Management Support Systems With A Clinical Laboratory Application. *Journal of Promotion Management, 18*(4), 414-435, https://doi.org/10.1080/10496491.2019.1685622.

Capkun, V., Hameri, A. P., & Weiss, L. A. (2009). On the Relationship Between Inventory and Financial Performance in Manufacturing Companies. *International Journal of Production & Operation Management, 29*(8), 789-806, https://doi.org/10.1108/01443570910977698.

Canel, C., Drew, R., & Anderson, E.A. (2000). Just-in-Time is not Just for Manufacturing: A Service Perspective. *Industrial Management & Data Systems, 100*(2), 51–60, https://doi.org/10.1108/02635570010286104.

Chebet, E., & Kitheka, S. (2019). Effects of Inventory Management System on Firm Performance–An Empirical Study. *International Journal of Innovative Science and Research Technology, 4*(9), 34-242.

Farooq, U. (2019). Impact of Inventory Turnover on Profitability of Non-financial sector Firms in Pakistan. *Journal of Finance and Accounting Research, 1*(1), 34-51, https://doi.org/10.32350/JFAR.0101.03.

Folinas, D. K., Fotiadis, T. A., & Coudounaris, D. N. (2017). Just-in-time theory: the panacea to the business success?. *International Journal of Value Chain Management, 8*(2), 171-190. https://doi.org/ 10.1504/IJVCM.2017.085485.

George, E. (2019). A Study of the Impact of Inventory Management on Profitability of Firms with Special Reference to Steel Industry. *International Journal of Basic and Applied Research, 9*(5), 756-762.

Golas, Z. (2020). The Effect of Inventory Management on Profitability: Evidence from the Polish Industry: Case Study. *Agricultural Economics, 66*(5), 234-242, https://doi.org/ 10.1257/jep.5.1.73.

Goldman, A, (2010). Pareto Analysis: ABC Inventory. Available on Line at: http://gaebler.com/Pareto-Analysis-ABC.Inventory.htm.

Grahame, I. (1998) Japanisation as mythology. *Industrial Relations Journal, 29*(1), 69–75. https://doi.org/10.1111/j.1468-2338.

Folinas, D. K., Fotiadis, T. A., & Coudounaris, D. N. (2017). Just-in-time theory: the panacea to the business success?. *International Journal of Value Chain Management, 8*(2), 171-190.

Koumanakos, D. P. (2008). The effect of inventory management on firm performance. *International Journal of Productivity and Performance Management, 57*(5), 355-369. https://doi.org/10.1108/17410400810881827.

Mulindabigwij, J. N., & Mulyungi, P. (2017). Effect of Inventory management on Financial Performance of Manufacturing Firms of in Rwanda: A Case Study of Bralirwa. *International Journal of Science and Research, 6*(10), 1368-1371.

Muchaendepi, W., Mbohwa, C., Hamandishe, T., & Kanyepe, J. (2019). Inventory management and performance of SMEs in the manufacturing sector of Harare. *Procedia Manufacturing, 33*, 454-461.

NdiranguKung'u, J. (2016). Effects of inventory control on profitability of industrial and allied firms in Kenya. *IOSR Journal of Economics and Finance (IOSR-JEF), 7*(6), 9-15. https://doi.org/ 10.9790/5933-0706010915.

Panigrahi, A. K, (2013). Relationship Between Inventory Management and Profitability: An Empirical Analysis of Indian Cement Companies. *Asia Pacific Journal of Marketing and Management Review, 2*(7) 107-120.

Parrish, R. H., Berger, B. A., & Features Submission, H. C. (1986). The Relationships Between Profitability, Inventory Efficiency, and Gross Margin Return on Investment in Alabama Community Pharmacies. *Journal of Pharmaceutical Marketing & Management, 1*(1), 11-26. https://doi.org/10.3109/J058v01n01_03.

Samanta, P. (2015). Inventory Management Available on Line at: https://www.researchgate.net/publication.

Shin, S., & Ennis, K. (2013). A Study of Relationship between Inventory Management Efficiency and Profitability: U.S. Manufacturing Industry. *Proceedings of the 44th Decision Science Institute Annual Conference*, Nov. 16-19, 2013, Baltimore.

Singh, G., & Ahuja, I.S. (2012). Just-in-Time Manufacturing: Literature Review and Directions. *International Journal of Business Continuity and Risk Management, 3*(1), 57-98, https://doi.org/10.1504/IJBCRM.2012.045519.

Vrat, P. (2014). *Just-in-time, MRP and lean supply chains*. in Vrat, P. (Ed.): Materials Management, Springer Texts in Business and Economics, New Delhi, pp.151–173, https://doi.org/10.1007/978-81-322-1970-5_9.