

Inventory Management and Performance in Energy Industry in Saudi Arabia: Empirical Evidence

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Abstract

This study empirically examines the association of inventory management with performance of listed energy industrial corporations in Saudi Arabia for the periods ranging from 2005 to 2018. The final sample in this study consists of 53 observations. The Pooled OLS regression shows that inventory management is associated negatively with performance. The results of this study are important for policy makers at the country and corporate levels on issues related to inventory management and corporate performance. Further, the results of this study can be used in future research to gain a deeper understanding of the issues of inventory management and corporate performance.

Keywords: *inventory management; performance; energy industry; Saudi Arabia.*

1. Introduction

Recent research has demonstrated the issues or problems that exist in corporations, these are organizations where the shares can be bought or sold by the shareholders. The concerns are unsettled due to economic factors and issues in countries such as Asia and the Russian Federation. Moreover, the financial crisis in Brazil began in 1997. The relationship between the management of an organization and its performance is significant in facilitating the making of public regulatory policies, (Kao et al., 2019). The study is also concerned with the fall of well-known and reputable firms such as Xerox, WorldCom, Enron, and Parmalat. These organizations are in the United States of America. At the beginning of 2006, there was a crash on the Saudi Stock Exchange, and it is not an exception in this case. For a company to achieve enhanced performance, it needs to deal with the issues, which originate from the crises, (Cubbin & Leech, 1983; Aydin et al., 2007; Al-Twajiry, 2007; Al-Abbas, 2008; Al-Hussain, 2009; Al-Hamid, 2010; Al-Moataz & Basfar, 2010).

Minimizing conflicts of interest are essential. It can be achieved through the implementation of proper strategies to ensure that all parties are contented. Considering ownership as a different aspect of management is a source of agency issues. Another contributing factor is the conflicts of interests between ownership and control. The leading cause of the financial crisis in the world is ineffective governance in institutions, (Kao et al., 2019). It has come to the attention of many companies that investigating corporate governance practices is relevant. It is the case considering that there have been several instances of unethical practices or strategies and misconduct in the firms. It has led to falling of many large companies such as Xerox,

WorldCom, Tyco, Enron, Adelphia Communications, and Global Crossing, (Porwal & Kumar, 2003; Teng et al., 2011).

It is well-established that inventory management can have a fundamental impact on the profitability of a given organization as it can reduce the costs associated with holding stock and ensure that production processes run in a seamless way (Cheung et al., 2004; Shin et al., 2015). The profitability ratio provides an indication of an organization's financial performance and the effectiveness with which it generates a profit (Brigham & Ehrhardt, 2013). According to Bourne and Walter (2005), inventory management has a direct impact on company performance. Any management failings will lead to significant waste in the form of the costs associated with holding inventory and the higher risk of damage or loss (Lwiki et al., 2013). To perform effectively, organizations need to generate the highest revenue at the lowest cost (Mohamad et al., 2016). Management of inventories has a direct impact on costs and, as such, influences profitability and the performance of a firm (its return on assets) (Fullerton et al., 2003; Swamidass, 2007; Koumanakos, 2008; Steven & Britto, 2016; Lin et al., 2018). As such, there is a direct link between ROA and inventory management (Eroglu & Hofer, 2011; Sahari et al., 2012). Maintaining inventory levels at the optimum level will significantly improve the financial performance of an organization (Abd Karim et al., 2018).

This study is intended to provide more insights into inventory management and firm performance among energy corporations in Saudi Arabia. To the best of the researchers' knowledge, an empirical study links inventory management and firm performance does not exist. The importance of the energy industry stems out of the fact that the majority of the developing nations prioritize having reliable energy, which companies and

institutions can rely on in performing certain activities. Some of these activities are such as expanding the industry, trading tasks, and transportation. The vitality part in the creating nations must accomplish financial productivity in their venture choices and actions through the act of sound monetary standards. Besides, making the energy affordable eases the burden on people on paying the bills. Many investors are convinced that adopting alternative sources of energy is essential. It is because the energy industry affects the economy of the country where it uses resources such as capital and labor in its production. The energy sector assists individuals with getting away neediness and make better lives. The goals of development necessitate that the advancement of the energy area must happen in a way with the end goal that the welfare of society is boosted. This is regarding monetary variations that exist among the rich and the poor in the Third World (Yergin & Gross, 2012; Ruti & Felice, 2013).

The progress of organizations and the development of agency issues may have resulted due to the existence of different policies. Saudi Arabia has made efforts to take part in a market economy. It has created numerous approaches, techniques, and regulations. The discoveries of this investigation ought to bear some significance with policymakers in Saudi Arabia. Similarly, this is the case to those developing markets in the Middle East in light of the likenesses in the institutional and economies, (La Porta & Lopez-de-silanes, 1999). There is a high possibility that these investigations will result in having more questions arising about the inventory management. Many stakeholders will be interested to know how inventory management may influence the firm performance.

The following sections of the paper are organized as follows. The literature is reviewed and the hypotheses are developed in Section 2. The data collection and research design is highlighted in Section 3. Section 4 displays the results and discussions. Conclusions and implications were discussed in the final section, Section 5.

2. Literature review and development of hypothesis

Inventory is a very common item on a statement of financial position. It is a business-critical asset that needs to be effectively managed by the senior management of a given organization, regardless of the size of that firm (Elsayed & Wahba, 2013; Abd Karim et al., 2018). One of the main reasons as to why inventory is so important is because storing and handling items of inventory can be very expensive and complex. This is particularly the case in more contemporary systems (Dennis & Meredith, 2000). Furthermore, inefficient management of inventory can lead to delays and, subsequently, render an organization unable to meet consumer demand (Baron et al., 2010; Ahmad & Zabri, 2018). To manage inventory effectively, organizations need to ensure that they hold the optimal amount of raw materials and finished products in stock to fulfil customer demands without generating waste (Heizer & Render, 2014; Ahmad & Zabri, 2018).

The majority of product-producing companies hold some level of inventory and, as such, are required to put inventory management processes in place (Mohamad et al., 2016). Regardless of what systems are used to manage inventory, it imperative that the company achieves the right balance between having access to stock and raw materials without incurring waste. The term inventory management is a broad definition that relates to all the tasks that are involved in maintaining and managing inventory, which can consist of the raw materials required to produce products, partially finished products, and completely finished products. Companies that hold inventory need to ensure that they have adequate stock available as any over or under stocks will result in waste in the manufacturing process (Kotler, 2002). The primary objective of inventory

management is to ensure that an optimal stock level is in place in accordance with several factors including customer, product, customer, and process (Toomey, 2000). In addition, given the important position that inventory occupies on the balance sheet, it can be strategically managed in situations in which organizations seek to present favorable financial projections (Coyle et al., 2003). Inventory management plays a fundamental role in all product-producing organizations as any inventory issues may lead to a loss of business and/or incur high costs. Furthermore, effective inventory management can support a healthy sales pipeline and, as such, provide a company with a competitive advantage. In light of all the above, it is critical that organizations put robust inventory management systems in place and ensure that these systems are monitored and managed by appropriately qualified individuals on an ongoing basis (Mohamad et al., 2016).

According to Chase et al. (2006), the term inventory can be used to describe the resources or stock that an organization holds in storage. Effectively, inventory management is best understood as the processes or systems by which inventory levels are strategically tracked and managed to ensure optimal inventory is held at all times (Abd Karim et al., 2018). It represents a continual process of monitoring, planning, and managing that is designed to maintain the optimal level of inventory to meet market needs without incurring waste (West, 2009; Abd Karim et al., 2018). Inventory management can have a fundamental impact on the profitability of a given organization as it can reduce the costs associated with holding stock and ensure that production processes run in a seamless way (Cheung et al., 2004; Shin et al., 2015). The profitability ratio provides an indication of an organization's financial performance and the effectiveness with which it generates a profit (Brigham & Ehrhardt, 2013).

According to Bourne and Walter (2005), inventory management has a direct impact on company performance. Any management failings will lead to significant waste in the form of the costs associated with holding inventory and the higher risk of damage or loss (Lwika et al., 2013). To perform effectively, organizations need to generate the highest revenue at the lowest cost (Mohamad et al., 2016). Management of inventories has a direct impact on costs and, as such, influences profitability and the performance of a firm (its return on assets) (Fullerton et al., 2003; Swamidass, 2007; Koumanakos, 2008; Steven and Britto, 2016; Lin et al., 2018). As such, there is a direct link between ROA and inventory management (Eroglu & Hofer, 2011; Sahari et al., 2012). Maintaining inventory levels at the optimum level will significantly improve the financial performance of an organization (Abd Karim et al., 2018).

The existing empirical studies that have sought to better understand the correlation between inventory management and business performance have generated some mixed outcomes. Some researchers have found that there is a positive correlation between effective inventory management and company performance (Jonsson & Mattsson, 2008; Capkun et al., 2009; Pong & Mitchell, 2012; Sahari et al., 2012; Gaur & Kesavan, 2015; Ahmad & Zabri, 2018; Lin et al., 2018). Specifically, these researchers have found that organizations that have lower inventory ratios and more likely to generate high sales, have a higher return on investment, and maintain a competitive position in the market. On the contrary, other researchers argue that there is a significant and negative correlation between inventory management and the performance of an organization (Deloof, 2003; Fullerton et al., 2003; Demeter, 2003; Chen et al., 2005; Boute et al., 2006; Chen et al., 2007; Koumanakos, 2008; Koliass et al., 2011; Elsayed & Wahba, 2016; Mohamad et al., 2016). These researchers found that companies that had high inventory ratios were more likely to exhibit poor financial performance, low returns on stock over a long-term basis, and a lower rate of return on investment. Regardless of the significant evidence that has been generated to support the findings of previous studies in relation to the correlation between company performance and

inventory management, there is a lack of substantial evidence to unequivocally support the association between inventory management and company performance (Vastag & Whybark, 2005; Cannon, 2008; Obermaier & Donhauser, 2012; Folinias & Shen, 2014). Overall, empirical evidences on the inventory management with company performance relationship produce mixed results. Thus, the following hypothesis is suggested:

H1: Ceteris paribus, inventory management is associated with firm performance.

3. Data collection and research design

3.1. Sample selection and data collection

The sample of this study consists of energy listed companies on Saudi Stock Exchange (Tadawul) for the years ranging from 2005 to 2018. We conduct a cross-sectional review of financial reports of the sample companies as depicted in Table 1.

	Totals
Total listed companies	4 firms
Number of years observed	14 years
Total observation	56
Missing data	(3)
Final sample	53

Table 1. Sample Selection from 2005 to 2018

We include several control variables which have been found to be associated with firm performance. These variables are audit quality (*IQ*), board size (*BD_SIZE*), board meetings (*BD_MEET*), and firm leverage (*LEV*).

The control variables are based on prior researchers regarding firm performance. The relationship between firm performance and auditor type has been predicted through information suppression hypothesis and agency theory (Jensen & Meckling, 1976; Fama & Jensen, 1983). It is proposed that increased audit quality could lower agency costs, regulate opportunistic management behaviors; hence, grow the value of the firm in the marketplace (Grayson, 1999). In line with this coincidence, several empirical studies reported a positive association between audit quality and firm performance (Fan & Wong, 2005; Aljifiri & Moustafa, 2007; Kao et al., 2019; Omer, et al., 2020). Based on the above discussions, the expected sign for the effect of board of audit quality and firm performance is positive.

According to previous studies, it is evident that the size of the board is a critical attribute in influencing firm performance, (Lipton & Lorsch, 1992; Yermack, 1996; Eisenberg et al., 1998; Boone et al., 2007; Coles et al., 2008; Larmou & Vafeas, 2008; Aljaaidi & Omer, 2020). Boards that are composed of more members are more efficient and active as compared to those that consist of a few members. The Resource Dependency Theory explains this. It is the case considering that the members have different ideas and perceptions, and they integrate them in coming up with an ultimate decision that will be beneficial to all the stakeholders of the firm, (Pearce & Zahra, 1992; Brown et al., 2011). The members of the board of directors will have different skills, experience, and qualifications, which will enhance their managerial skills. The management and control of a large board are perceived to be more efficient and capable of making better decisions. It will be in a position to integrate all the necessary and relevant aspects of the corporation, which will lead to higher productivity. It is believed that having a larger board leads to a rise in the firm performance, (Pfeifer, 1972; Alexander et al., 1993; Goodstein et al., 1994). Furthermore, another research supports the same concept that an organization that has quite a good number of members in the board is likely to be performing very well in managing and controlling various activities within the firm, (Dalton et al., 1999).

Moreover, for the organizations in Russia, it is evident that board size is directly related to financial performance,

(Berezinets et al., 2017). Following the research that has been done in Saudi Arabia, it is believed that large board size is linked to having minimized earning used in management, (Al-Abbas, 2008; Al-Ghamdi, 2012). This was concluded after the findings collected from the different companies in Saudi Arabia. In contrast, another research performed by Palaniappan (2017) found that there is no significant relationship between the board size and the performance of an organization. These conclusions were as per the research carried out in the Indian manufacturing industry. In the countries in the Gulf Cooperation Council (GCC), it is stated that the size of the board is between 6.7 in the United Arab Emirates (UAE) and 8.5 in Qatar. A lot of studies have been performed in the past, and they are in support of this concept. Many researchers engaged themselves in proving that it is correct that financial performance and board size are related. Some of these researchers are such as Pfeffer (1972), Zahra and Pearce (1989), Adams and Mehran (2005), Dalton and Dalton (2005), Kyereboah-Coleman and Biekpe (2005), Coles et al. (2008), Sheikh and Wang (2012), Muller-Kahle et al. (2014), Rodriguez-Fernandez et al. (2014), Yasser et al. (2016), Bhatt and Bhattacharya (2017), and Mishra and Kapil (2017). Thus, according to the aforementioned discussion, the expected sign for the effect of board of directors' size on firm performance is positive.

The board of an organization has significant roles which it plays in keeping the business progressing successively. The board needs to meet regularly to discuss any issues in the company. It is a factor that leads to higher performance in the organization, (Lipton & Lorsch, 1992; Jensen, 1993; Vafeas, 1999). It should keep on reviewing the performance of the company to be informed of areas that they need to work on and direct their resources, (Latendre, 2004). The agency theory indicates that the boards in different companies demonstrate their functions by providing better advice on some issues and monitoring the management. Besides, the top managerial staff can be proactive through gatherings and be bound to handle any problem, as illustrated by the resource dependency theory, (AL Nasser, 2019). Brick and Chidambaran (2010) archived that one of the significant board's oversight work is board action. Vafeas (1999) performed empirical research, and the findings were based on 307 organizations. The conclusions were that the board meets mainly after a disaster has happened. In such a case, it calls for a meeting for the members to combine ideas and find a solution. It leads to improved overall performance. In Indian manufacturing industry, Palaniappan (2017) found that the board meetings influence the firm performance negatively. Local studies carried out by Aljaaidi and Omer (2020) uncovered that the board meeting is associated negatively with firm performance in the context of Saudi Arabia. In the same direction, Al-Ghamdi (2012) found that there is a negative relationship between executive gatherings and income management in Saudi Arabia. These outcomes are following the preconceived idea that a more prominent recurrence of executive meetings brings about improved monitoring of activities. Moreover, research has demonstrated that the consequences of executive gatherings on the performance of an organization vary depending on the country-specific CG, legal practices, and firm-level attributes (Karamanou & Vafeas, 2005). Therefore, based on the above-mentioned the expected sign for the effect of board of directors' meetings on firm performance is positive.

Debt financing is known to control and restrict the incentives of the managers. It indicates that the behaviors and the actions that the managers engage in would be strictly followed, (Jensen & Meckling, 1976; Myers, 1990). Therefore, debt financing is regarded to be more effective than equity. Agency theory is in support of this fact. This is a concept that the managers would implement in making more profits and leading to higher productivity. Debt finance is known to make the managers more concerned about the decline in the value of an organization, (Grossman & Hart, 1982). This can be the case when the executive is not in a position to control the company activities

effectively. It is an instance that can lead to losing reputation in the market hence losing potential customers. Many companies take debts and use the money in funding massive projects that they assume will succeed. If the plans are completed successfully and bring out the results as expected, the company will be obtaining high-profit margins hence paying the debts and use the remaining amount in other relevant activities such as investments. On the other hand, if the project fails, the performance of the company may be affected for quite a long time, (Stiglitz & Weiss, 1981). There are studies which have illustrated a negative relation between leverage and firm performance, (McConnell & Servaes, 1990; Downen, 1995; Short & Keasey, 1999; Weir et al., 2002; Haniffa & Hudaib, 2006; Aljifri & Moustafa, 2007; Palaniappan, 2017). Berezinets et al. (2017) explained that when an organization has higher leverage, it demonstrates that the firm can experience growth by engaging in more projects. This is why the organization will have to borrow some capital to be used in funding these projects, (Black et al., 2006; Berezinets et al., 2017). It was evident that there exists a direct relation between firm performance and leverage. Different researchers have provided contradicting ideas about the relationship between leverage and firm performance. Some such as those performed by Hurdle (1974) indicate a positive association, while others such as Al-Matari et al. (2012), a study carried out on Saudi Arabia, show a negative association. In conclusion, on the relationship that exists between leverage and firm performance, no sufficient evidence is available for all researchers to come into a common agreement. Therefore, the direction of the empirical studies takes a negative direction of the association of leverage with firm performance.

3.2 Regression model and definition of variables

Ordinary-Least Square OLS regression is used to estimate the associations of inventory management with firm performance of energy listed companies in Saudi Arabia for the period ranging from 2005 to 2018. The utilizing of the OLS regression is because the dependent variable in this study is a continuous measure. The functional equation of the OLS model is as follows:

$$\text{PERFORMANCE} = \beta_0 + \beta_1 \text{IM} + \text{Control variables} (\beta_2 \text{AQ} + \beta_3 \text{BD_SIZE} + \beta_4 \text{BD_MEET} + \beta_5 \text{LEV}) + e \quad (1)$$

Where the dependent variable is:

PERFORMANCE = Return on Assets (ROA)

Where the independent variables are:

Test variable

IM = inventory days as a measurement of inventory management

Control variables

AQ = "1" if an auditor is a Big 4, "0" otherwise,
 BD_SIZE = the total number of directors sitting on the board,
 BD_MEET = the number of board meetings during the year,
 LEV = total debt to total assets,
 e = error term.

4. Results and discussions

4.1. Descriptive statistics and correlation analysis

Table 2 predicts the mean, standard deviation, minimum and maximum of each variable in the sample data set.

Panel A: Independent variables				
Continuous Variables	Mean	Std.Deviation	Minimum	Maximum
IM	17.124	12.071	3.610	49.620
DB_SIZE	9	1.838	4	11
BD_MEET	6	1.735	3	10
LEV	1.524	1.794	0.000	6.150
Panel B: Dichotomous variable				
	Big 4	Non-Big-4		
AQ	30 (57%)	23 (43%)		
Panel C: Dependent variable				
PERFORMANCE	0.053	0.052	(0.000)	0.270

Table 2. Descriptive statistics (N = 53 observations)

Table 2; panel A shows that there is a significant range of variation among the considered sample of this study. The range of inventory management *IM* is from 3.610 to 49.620 with a mean of 17.124 and a standard deviation of 12.071. The range board of directors *DB_SIZE* is from 4 to 11 with a mean of 9 and a standard deviation of 1.838. The range of board meetings *BD_MEET* is from 3 to 10 with a mean of 6 and a standard deviation of 1.735. With respect to firm leverage *LEV*, it is from 0.000 to 6.150 with a mean of 1.524 and standard deviation of 1.794. In addition, Panel B shows descriptive statistics for audit quality *IQ*, 57% of the sample companies are audited by Big 4 firms and 43% are otherwise. Furthermore, Table 2; panel C illustrates that the range of firm performance *PERFORMANCE*, the dependent variable, ranges from (0.000) to 0.270 with a mean of 0.053 and standard deviation of 0.052.

	IM	AQ	BD_SIZE	BD_MEET	LEV
IM	1				
AQ	.582	1			
BD_SIZE	0.000	.438**	1		
BD_MEET	.307	-.554**	.460	1	
LEV	0.000	.611**	.146	-.430**	1

** Significant at 1 per cent level (2-tailed)

*Significant at 5 per cent level (2-tailed)

Table 3. Pearson Correlation Analysis results (n = 53 observations)

Table 3 displays the Pearson correlations among the hypothesized variables. The coefficients of correlation are small and the highest correlation was between *IM* and *AQ* (.582), indicating that the higher the audit quality, the higher is the inventory management.

The multicollinearity problem does not exist in this study as shown by the correlation matrix because none of the correlation is equal or above 0.80 or 0.90. All variables have a correlation of equal or less than 0.582 (Myers, 1990).

4.2. Regression results and discussions

Ordinary-Least Square (OLS) was used to evaluate the level of association of inventory management, audit quality, board size, board meeting, and firm leverage on firm performance. As shown by Table 4, the R^2 is 0.873 which means that this model has explained 87.3% of the total variance in the firm performance.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.934	.873	.853	.01576

Table 4. Model Summary

Table 5 depicts that the *F*-value for the model is statistically significant at the 1% level which means that the overall model can be interpreted.

Model	Sum of Squares	df	Mean Square	F	Sig.
1					
Regression	.055	5	.011	43.951	.000 ^b
Residual	.008	32	.000		
Total	.063	37			

Table 5. ANOVA Analysis

Table 6 illustrates the Pooled OLS regression results. As shown by Table 6 that there is a significantly negative association between inventory management *IM* and firm performance *ROA* ($\beta = -.527, t = -5.406, P = .000$, one-tailed significance). This result is consistent with several previous studies (Deloof, 2003; Fullerton et al., 2003; Demeter, 2003; Chen et al., 2005; Boute et al., 2006; Chen et al., 2007; Koumanakos, 2008; Koliass et al., 2011; Elsayed & Wahba, 2016; Mohamad et al., 2016). These studies results refer to that companies with high level of inventory ratios were more likely to be poor weak financial performers, weak long-term stock returns, the lower its rate of returns, gross margin, firms' profitability and growth stage and the maturity stage. Therefore, hypothesis H_1 is accepted.

Variables	Expected sign	Coeff.	t	p-value	Tolerance	VIF
(Constant)			2.551	.061		
Test variable						
IM	Positive	-0.527	-5.406	0.000	.418	2.392
Control variables						
AQ		0.455	4.708	0.000	.426	2.348
BD_SIZE		-0.081	-0.890	0.380	.481	2.081
BD_MEET		0.143	1.460	0.154	.414	2.416
LEV		-0.591	-5.783	0.000	.381	2.627

Table 6. Pooled OLS regression (n = 53)

Table 6 shows a significantly positive association between audit quality *AQ* and firm performance *PERFORMANCE* ($\beta = .455, t = 4.708, P = .000$, one-tailed significance). This result is consistent with several previous studies (Fan & Wong, 2005; Aljifri & Moustafa, 2007; Kao et al., 2019; Omer, et al., 2020). Furthermore, this study reports that there is a significantly negative association between firm leverage *LEV* and firm performance *PERFORMANCE* ($\beta = -.591, t = 5.783, P = .000$, one-tailed significance). This result is in line with the previous studies such as Palaniappan (2017), McConnell and Servaes (1990), Short and Keasey (1999), Weir et al. (2002), Haniffa and Hudaib (2006) and Aljifri and Moustafa (2007).

5. Conclusions and implications

Our study examines the associations of inventory management with firm performance in Saudi Arabian energy industry for the period ranging from 2005 to 2018. The hypothesis of this study is based on the premise that there is an association between inventory management and firm performance. In particular, the hypothesis predicted by this study is accepted. Therefore, the finding reported by this study adds empirical evidences to the theory and the extant research in the setting of Saudi Arabia and similar markets. In addition, important implications of this finding relate to the issues of firm performance, and inventory management. Saudi government, stock market, companies and accounting and auditing regulators, banks, auditors, investors, financial analysts, researchers and academic community would gain some new insights from this study in terms of understanding the association of inventory management and firm performance. However, there are several limitations relate to the corporate governance mechanisms such as ownership classifications, audit committee characteristics, and other firm-level determinants. Future researches should consider adding the omitted determinants. In addition, the model of this study may be replicated in other GCC countries to examine its validity and other Arab Middle Eastern markets.

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