THE IMPACT OF FINANCIAL CONSTRAINTS ON INVENTORY INVESTMENT: EMPRICAL EVIDENCE FROM JORDAN

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Abstract

This study aims at investigating whether Jordanian industrial firms have a target inventory level, and how fast they move toward it when any deviation exists. In addition, it investigates whether the financial constraints have an impact on inventory investment related to the target level, and the speed of adjustment. Using the panel data for a sample of 50 industrial firms listed on the Amman Stock Exchange (ASE) over the period (2001-2014). The empirical results suggest that Jordanian industrial firms have a target inventory level. However, Jordanian industrial firms adjust their actual inventory holding to their target level slower than their counterparts in developed and developing countries. Moreover, the results show that the financial constraint do affect inversely the adjustment speed, and makes the financially constrained firms reduce their level of inventory beyond the target level by more than others.

Keywords: Inventory Investment, Financial Constraints, Pecking Order Theory, Amman Stock Exchange

1. INTRODUCTION

Several models are used to explain the behavior of inventory, such as stock-adjustment model (Lovell, 1961), production-smoothing model and (S,s) model (Obembe *et al.*, 2012). Lovell's target adjustment model (1961) assumes that each firm identifies its optimal level of inventory relative to the sales they would like to maintain by making a partial adjustment when any target deviation exists. According to Lovell (1961) adjustment toward the target level of inventory partially takes place because of the costs involved in changing the level of stocks and the heterogeneous nature of stocks; stocks are replaced at infrequent intervals. As well as, Yue (2011) shows that the immediate adjustment to desired level requires a premium on purchasing costs, due to fast delivery in small amounts.

According to Eichenbaum (1989), the basic hypothesis behind the production smoothing model is that firms hold inventories in order to smooth their production in case of fluctuating in demand, and increasing in cost of productions. While, the (S,s) model indicates that firms adjust their inventory to the upper limit "S", whenever it hits the lower limit "s" (Blinder & Maccini, 1991).

The optimal level of inventory firm tries to maintain, depends on the trade-off between its benefits and its costs. To reach the optimal level, firms must maximize benefits and minimize the cost of inventory. According to Mathuva (2013), the size of optimal inventory order is determined by the marginal benefits and costs of holding inventory.

The presence of capital market imperfection restricts firms from generating funds externally. Hence, any fluctuation in the internal funds will affect the firms fixed investment and inventory investment, by restricting them from financing all of their positive investment, and thereby, their inventory holdings. Muthuva (2013) shows that inventory holdings are influenced by the firm's ability to generate internal recourses.

Moreover, Cunha and Paisana (2011) argue that the imperfections in capital markets can hinder firms from accessing to external funds, leading to fluctuations in inventory investment, Moreover, firms prefer to reduce inventory investment, when they are confronted with a negative shock in internal finance, than reduce the fixed investment. As well as, the speed of adjustment depends on how severe market frictions are. Firms that have little friction in accessing the market will move toward their target level faster than others.

This research aims at contributing to the empirical literature by investigating whether Jordanian firms have an optimal level of inventory, and how fast they move towards it, when any deviation exists. Moreover, it investigates the impact of financial constraints on inventory investment, which might force firms to hold inventory beyond their target level, and makes financially constrained firms to move slower than others toward it.

2. WORKING CAPITAL MANAGEMENT

According to Besley & Brigham (2008, p 566) "working capital management involves the management of short-term assets (investment) and liabilities (financing sources)". Consequently, "it involves the decision of the amount and composition of current assets and the financing of these assets" (Muhammad *et al.,* 2012, p 156). The current assets represent the portion of investment which convert from one form to another, while the current liabilities include the firm's short-term

financing which include all the debt that must be paid in one year or less, (Gitman, 2009). Current assets (short-term assets) include inventory, accounts receivable, cash, and marketable securities. According to Gitman (2009), the aim of short-term financial management for both current assets and current liabilities, is to achieve a balance between profitability and risk, which contributes positively to firm's value. Therefore, an efficient management of working capital has a positive effect on the firm's value. Aminu & Zainudin, (2012, p 730) state that, "efficient and effective management of working capital is an important component of overall corporate strategy to create value for the business". Moreover, Muhammad *et al.,* (2012) conclude that an efficient working capital management leads to increasing the profitability of the firm.

Since inventory is an important element of working capital, it forms more than 50% of current assets of manufacturing firms (Ranganatham, 2011). Therefore, efficient management of inventory investment will have significant effect on working capital management. This supported by Singh (2008), who finds that the size of inventory affects the working capital and its management. Moreover, a firm which neglects the management of inventory will have to face serious problems relating to long-term profitability and may fail to survive (Singh, 2008). The significant role of inventory management is to minimize the costs associated with inventory and increases the benefit of it. In other words firms should determine the size of inventory that makes a trade-off between the benefit and the costs of holding it. According to Mathuva (2013), the size of optimal level of inventory is determined according to the marginal benefit and the marginal cost of holding it. Therefore, firms in determining their level of inventory should take into considerations the costs of inventory holdings, customer requirements, and smoothing the production process. According to Michalski (2009) inventory management decision is complex, excess inventories incur high costs (finance, holding, opportunity cost), and decreases the risk of production failures, while holding low inventory level can carry out problems related to meeting supply demands.

3. FINANCIAL CONSTRAINTS AND INVENTORY INVESTMENT

Firms might be exposed to financial constraints either internally or externally. Marouene & Abaoub (2013) state that external finance constraints refer to asymmetric information which reflect difficulty in raising funds externally, while internal finance constraint refer to the level of internal funds that is generated by a firm and is available for use. *Greenaway et al.,* (2007, p 380) define a financially constrained firm in which "it is difficult or too expensive to obtain external finance such as loans, will in fact only invest if it has sufficient internal funds, and will invest more the higher of its cash flow". While, Kaplan & Zingales (1997, p 172) state that firms are classified into financially constrained "if they face a wedge between internal and external cost of funds". According to pecking order theory when firms want to invest in a new investment, they can finance their investment First, by using internal funds (accumulative profit), Second, by borrowing either from banks or through the issue of financial assets such as (long-term) bonds or (short-term) commercial paper and finally, by issuing new shares of stock (Myers, 1984). Firms might be subject to financial constraints due to some limitations in raising funds externally, in financial markets, especially in the period of recession, when there are restrictions to access to external financing due to its higher costs[9], which in turn prevent the firm from undertaking all of their profitable investments. Fazzary and Athey (1987) state that, in the presence of market imperfection, firms that need to generate funds externally may be forced to forego some of their investment which may negatively influence their market value.

Inventory investment, like other investments need to be financed, either internally or externally and it is affected by the ability of the firms to access external funds. Firms that have restrictions to access to external funds because of information costs might affect their ability to achieve their desired level of inventory. Carpenter et al. (1998) find that the fluctuations in internal funds are absorbed through change in inventory investment for small firms. Moreover, Guariglia & Mateut (2010) argue that financial variable has significant effect on the level of inventory investment for the firms that suffering from financing constraints (small, young, and more risky firms).

External financing constraints force firms to depend on their internal finance (cash flow) when they decide on the level of the profitable investment they are going to accept. Moreover, firms that have restrictions to access external funds will be more sensitive to internal funds comparing with firms with less financial constraints. Their level of investment will be positively related to their amount of internal funds. Fazzari *et al.,* (1988) state that, when firms face tight external financial constraints, it will depend on their internal funds. This is supported by Cunha & Paisana (2010) who conclude that firms that face either higher asymmetric information or weak financial situation, demonstrates higher sensitivity to cash flow. In the presence of market imperfection, declines in internal funds will affect all kinds of investments. The highest effect among these investments will be on inventory investment. Inventory investment has low adjustment costs compared with capital investment, therefore it is used by the firms that suffering from financial constraints to compensate them for financial distress (decline in cash flow). This might force the firm to decrease its investment in inventory. Empirically, Hubbard (1998) argues that the reduction in inventory investment will be larger than the reduction in fixed capital in response to fall in net worth; this because of the lower adjustment costs of inventories relative the adjustment costs of fixed capital. Also, Carpenter *et al.,* (1994) state that since inventory investment has low adjustment costs relative to those of adjusting fixed capital and R&D investment, the decline in inventory investment caused by the contraction of internal funds will be

9. According to Fazzari et al. (1988) external finance is more costly than internal finance because of: transaction costs, tax advantages, agency costs, costs of financial distress, and asymmetric information.

large relatively to fixed investment, which means that firm prefer to reduce its inventory investment when facing shock in internal finance than decline the fixed investment level. So, it is expected to find that the financial constraints have a significant effect on inventory investment.

The literature suggests that the financial constraints have an impact on inventory investment. Carpenter et al. (1994) find that swings in cash flow (internal finance) has an impact on inventory investment for both small and large firms, but it seems to be stronger on small firms. Zakrajsek (1997) finds that fluctuations in internal funds produce a large portion of the fluctuations in aggregate retail inventory. Carpenter *et al.,* (1998) find that inventory investment at small firms is more sensitive to cash flow. Moreover, Guariglia (2000) finds that financial constraints have a stronger impact on inventory decisions at firms with poor balance sheet (either low coverage ratio or high short-term debt to inventories ratio), than of firm with stronger balance sheet. In another study Tsoukalas (2006) finds that inventory investment at small firms is more sensitive to the shocks of cash flow than at large firms.

Based on above results it is expected to find that the financial constraints do have an impact on inventory investment, which makes the financially constraints firms to hold inventory beyond their target kevel by more than the un-financially constraints firms.

4. INVENTORY BEHAVIOR

There are several models that explain inventory behavior which motivates firms to hold inventories. These models are the production smoothing model (PSM), the (S,s) models, and stock out avoidance motive (Benito, 2005).

The basic hypothesis behind the production smoothing model is, firms hold inventories in order to smooth their production when they face fluctuation in demand, and convex cost functions (Eichenbaum, 1989). According to Benito (2005) the production smoothing model helps a firm to sustain its cost production when the marginal cost of production rise and demand fluctuate over the time. Moreover, Hornstein (1998) states, if firm's sales are changing and its marginal cost remain constant, then firms minimize costs by smoothing productions, and it declines (increase) its inventory whenever sales more than (less than) productions. This indicates that sales and inventory investment are negatively related. Moreover, inventory act as a buffer-stock by absorbing any fluctuation in demand. The (S,s) model assumes a steady distribution of the inventories over the period (S,s); it does not take the sales and the previous inventory levels into consideration (Iturriage, 2000). In this model a firm determines its lower limit of inventory as "s" in which it will not allow its inventory to go beyond it. Whenever its level of inventory hits this point, it places an order large enough to return its inventory to its upper limit, S (Blinder & Maccini, 1991). Large order of inventory decreases the unit-cost of order, while in the same time firms will forego additional interest on income which is used in financing the large order. So, it needs to make a trade-off between the two costs. Moreover, Kahn (1992) states that stock out avoidance motive suggests that inventories help firms to avoid any short of stock, which might impose costs on firms due to loss of its sales.

According to Sangalli (2013), there are several models used to determine the short-run variability of inventories: target adjustment models (Lovell, 1961), production smoothing models (Blinder and Maccini, 1991), and production-cost smoothing models (Eichenbaum, 1989). More specifically, target adjustment models are set to explain the returning of firms' inventory toward the optimal level (target level). This model will be used in this study in order to determine whether Jordanian firms have optimal level of inventory, and how fast they move toward it when any deviation exists.

5. DETERMINANTS OF INVENTORY INVESTMENT

According to Mathuva (2013) the most important determinants of inventory investment are:

1. Ability to generate internal resources: Internal funds have a significant effect on investment including inventory investment. Carpenter *et al.,* (1994) show that the fluctuations in internal funds have an impact on all components of investments, as a result of negative shock of internal funds, financially constraint firms will reduce their accumulation of all assets, because of low adjustment costs of inventory investment, its decline will be the large relative to fixed investment. Moreover, they conclude that cash flow has a significant positive impact on inventory investment for both small, and large firms, but it seemed to be stronger for small firms.

2. Volatility in expected sales: sales has a significant effect on inventory investment, if sales in a given period seemed to be higher than expected, then the level of inventory investment for that period will be lower than anticipated. Gaur *et al.,* (2005) find that sales are negatively related to inventory investment. Moreover, Mathuva (2014) finds that unexpected sales have a negative effect on inventory investment, implies that, an increasing in sales lead to reduction in inventory investment.

3. Firm size: Most of empirical research use the size of the firm as a proxy to split it into financially constraints/un-constraints (Cunningham, 2004; Guariglia, 2008; Azam and Shah, 2011). Firm size has a positive effect on inventory investment, small firms are likely to be more financially constraints than large firms, because large firms have a wider access to external finance than others. Guarigilia & Mateut (2010) find that inventory investment of smaller firms is more sensitive to financial variable than large firms. Moreover, Tosukalas (2006) finds that inventory investment is more sensitive to cash flow for smaller firms relative to large firms.

4. Leverage: According to Ramadan (2012), the leverage ratio that is widely used, is the one that includes the short-term debt, long-term debt, tangible asset and intangible assets. It can be calculated by adding the long and the short term debt and dividing it by total assets (tangible + intangible). Leverage ratio is an indicator to what extent the firm depends on external finance in financing its investment. Ramadan (2012) states that as this ratio increases the ability of the firm access external funds decline. As a result, a firm with high

leverage ratio will be in financially constraints if it doesn't have sufficient internal funds. Therefore, financing inventory through debt may be costly relative to internal finance. There is a mix in the relationship between inventory investment and the leverage ratio, some studies show that they are negatively related, while others find they are positively related (Mathuva, 2013).

5. Liquidity: Lopez (2008, p 1) defines the liquidity as "the ability of a financial firm to meet its debt obligations without incurring unacceptably large losses". Liquidity level affects the level of inventory investment. Kashyap *et al.,* (1994) find that the inventory investment of firms without neither access to external funds (public debt market) nor have large internal funds is significantly liquidity constrained, especially during recessionary period. On the contrary, Mathuva (2013) and Obembe *et al.,* (2012) find that liquidity has no significant impact on the level of inventory investment.

6. Age: Most research uses the age of the firm as a proxy to classify firms into financially constraints and financially un-constraints (Guariglia & Mateut (2010), Cunha & Paisana (2011), and Cunningham (2004)). Information asymmetric has a greater effect on young firms, due to the little public information available for them. Therefore, Hartarska & Gonzalez-Vega (2006) state that young firms are more constrained to the amount of internal funds and likely to face higher information costs for external funds. Since the age of the firm restricts the accessing to external funds, the inventory investment is likely to positively relate to firm age. Guariglia & Mateut (2010) find that younger firms show higher sensitivities of inventory investment to financial variable.

7. Length of cash flow conversion cycle: Mathuva (2013) states that the studies present mixed finding associated to the relationship between cash flow conversion cycle and inventory investment. He finds that firms with longer conversion cycles have higher inventory investment.

6. METHODOLOGY

6.1. Data Description

Our data are taken from firms' annual reports which are publicized on the Amman Stock Exchange (ASE) website. It covered the period from (2001-2014) on an annual basis. The population of the study consists of all industrial (manufacturing) firms listed on the ASE, during the period (2001-2014). The reason behind using the manufacturing firms in the study is the presence of inventory item in their balance sheet. The total number of industrial firms listed on ASE at the end of 2014 is 76 firms.

Firms to be included in the sample of the study must meet the following selection criteria: First, firms with missing data over the study period are excluded. Second, firms that have stopped their operations or have been liquidated during the period of study are excluded.

After applying these criteria, the final sample is reduced to (50) industrial firms, and data on variables is collected from the annual report of these firms that are publicized on ASE website (www.ase.com.jo/ar).

6.2. Empirical Model Specification

The empirical model of the study depends on Lovell's target adjustment model (1961). Lovell (1961, pp295) indicates that, "entrepreneurs are assumed to make only partial adjustment of stocks to the equilibrium level each period". The reasons behind this as stated by Lovell (1961) are due to the heterogeneity nature of stocks, and due to the fact that each term of inventories is ordered in infrequent interval. Other reason that makes firms to partially adjust toward the target is the cost associated with the immediate adjustment. Yue (2011) states that ordering in small amounts and fast delivery requires premium cost, which increases the cost of purchasing. This model indicates that each firm has a desired target level of inventory- which is a linear function of excepted sales - it would like to maintain, and if actual inventory deviates from the desired one, firms make partial adjustment toward the target level. According to Yue (2011), it is difficult for firms to maintain their inventory investment at desired level because of sales shock and forecasting errors. Therefore, firms will follow partial adjustment procedure in adjusting their inventory towards the optimal level. Based on these ideas, partial target-adjustment model seems to be the most suitable model to be used in this study. Most previous studies use the same model, and augmented it by several financial variables, as proxies for the financial position of the firms, and as measures of internal funds, which are different from one study to another.

Therefore, to determine the relationship between the financial constraints and inventory investment this study will build a model based on the Lovell's target adjustment model (1961), and augment it with two financial variables as a proxy for the financial position of firms. These financial variables are: cash flow (CF), and leverage ratio (LVR). The justifications of using these variables will be discussed later.

Following Braun (1981), Blinder & Maccinia (1991), Bechter & Stanely (1992), Carpenter et al. (1998), and *Bo et al.,* (2002) the study will employ the widely used inventory investment model:

$$\Delta I_{it-1} = \lambda\left(I_{it}^{*} - I_{it-1}\right) - \kappa(S_{it} - ES_{it}) \quad (1)$$

where:

I_{it}^{*}, I_{it-1} represents the target level of inventory in the period t and the actual level of inventory at the end of previous period respectively. Sit, ES_{it} represents the actual and the expected sales in period t respectively. λ represents the speed of adjustment. $0< \lambda<1$. κ measures the extent to which inventory serve as a buffer stock against unexpected changes in sales (Bechter & Stanely, 1992).

According to Guariglia & Mateut (2010), target inventory in period t (I_{it}^{*}) depends on the volume of sales in that period. (See also, Carpenter et al. (1998), Bechter & Stanely (1992), Braun (1981), Carpenter et al. (1994).

$$I_{it}^{*} = \alpha + \beta S_{it} \quad (2)$$

b is the marginal desired stock, it can be considered as an accelerator effect: if sales are anticipated to increase, then target stock of inventories will also increase (Guariglia & Mateut (2010)). However, expected sales in period t are not perfectly known in previous periods, so actual sales in previous period can be used (see Bechter & Stanely, 1992 ; Iturriage, 2000)

$$ES_{it} = S_{it-1} \tag{3}$$

Substituting 3 into 1 create the following model:

$$\Delta I_{it} = \lambda\left(I_{it}^{*} - I_{it-1}\right) - \kappa(\Delta S_{it}) \tag{4}$$

Model (4) will be augmented by two financial variables (lagged cash flow and lagged leverage ratio) as a proxy for the financial position of the firms, and by denoting $(I_{it}^{*} - I_{it-1})$ by TD_{it} therefore model (4) can be written as follows:

$$\Delta I_{it} = \alpha_0 + \alpha_1 TD_{IT} + \alpha_2 \Delta S_{it} + \alpha_3 CF_{it-1} + \alpha_4 LVR_{it-1} + v_i + v_{jt} + v_t + e_{it} \tag{4.1}$$

In order to determine whether being financially constrained has an impact on inventory investment, especially on the target level and on the speed of adjustment toward the target, firms are classified into two groups: financially constrained, and financially unconstrained.

Empirical studies categorized firms into financially constrained/unconstrained relatively to their high or low information costs. Information costs rise as a reaction to the level of information asymmetry between firms and outsiders. The proxy used in this classification is based on: size, age, and risk (Guariglia & Mateut, 2010; Cunha & Paisans, 2011; Cunningham, 2004).

This research uses firm's size in order to split firms into financially constrained and financially unconstrained. Several studies have determined the size as a measure of financial constraints (Carpenter *et al.,* 1994 ; Himmelberg & Peterson, 1994 ; Gertler & Gilchrist, 1994 ; Cunningham, 2004 ; Tsoukalas, 2006; Guariglia, 2008; Azam & Shah, 2011; Czarnitzki & Hottenrott, 2011; Fee *et al.,* 2009; Almeida & Campello, 2010; Kasseeah, 2012).

Small firms are considered to be more financially constrained than large firms. These firms may incur higher costs in accessing the external funds. There are several reasons to believe in that. According to Carpenter *et al.,* (1994), these reasons are: First, small firms have low public information, which in turn increases asymmetric information. Second, small firms rely on bank debt, and they rarely issue corporate bonds or commercial paper. Hovakimian & Titman (2006) present other reasons that explain why small firms are likely to be more financially constrained. First, empirical research shows that transaction cost declines with issue size, which in turn makes the external funds for small firms to be more expensive than large. Second, small firms have more restrictions in obtaining funds externally because of adverse selection problem. Third, it is easy for large firms to obtain debt, because they are more diversified and they might have less probability of bankruptcy. Cunha & Paisana (2011), add other reasons which support that small firms are more financially constrained. First, large firms have an easier access to capital market; they use their assets as collateral. Second, larger firms have more sources of funding than smaller firms, which allow them to reduce the financing risk. Following Cunningham (2004), Small firms are classified as those that have total asset values of less than the median of total assets in period t, firms that have total asset values greater than or equal to the median are considered to be large. According to this classification, the firm may be classified as small in one period and large in another. So, it is allowed for firms to move between size classes.

To investigate the impact of financial constraints on inventory investment, the study uses a dummy variable (D_{it}) which is equal to 1 if firm i is financially un-constrained, and equal to 0 otherwise. Model (4.1) can be rewrite as follows to be the model of study:

$$\Delta I_{it} = \alpha_0 + \alpha_1 TD_{IT} + \alpha_2 D_{it} + \alpha_3 (D_{it} * TD_{it}) + \alpha_4 \Delta S_{it} + \alpha_5 CF_{it-1} + \alpha_6 LVR_{it-1} + v_i + v_{jt} + v_t + e_{it} \tag{4.2}$$

where:

- i, refer to firms and industries respectively.
- t refer to time, t =2001-2011.
- ΔI_{it} (dependent variable) represents the fraction of inventory investment required to adjust the stock of inventories to equilibrium level.
- $TD_{it}\left(I_{it}^{*} - I_{it-1}\right)$ represents the difference between the target and the actual inventory and is used to measure how far the actual inventory deviates from the target one.
- $\Delta S_{it}\left(S_{it} - S_{it-1}\right)$ represents the difference between current and lagged sales. Sales are measured by firm's total sales (as defined by Guariglia & Mateut, 2010; Cunha & Paisana, 2011 ; Yue, 2011).
- CF represents Cash Flow (Operating Cash Flow).
- LVR represents Leverage ratio, measured by Total Liabilities/Total Assets (as defined by Yue, 2011). Mathuva (2013) defines the leverage ratio as (short-term debt + long-term debt) divided by total assets.
- v_i, v_{jt}, and v_t are included to control firm specific-effects, industry-time specific effects, and time specific effect respectively.
- e_{it} refer to idiosyncratic components.
- α_1 measures the speed of adjustment toward the target level. α_5, α_6 capture the effect of lagged cash flow, and lagged leverage ratio on inventory investment respectively.

7. REGRESSION RESULTS

Table 1 presents the estimation results of model (4.2). The results indicate that the panel data analysis is better than the pooled data analyses for estimating the empirical model of inventory investment

Table 1. The Estimation Results of Model 4.2

Independent Variables	Fixed Effect Model	Random Effect Model
Cons.	16.2491 (0.000)*	9.4393 (0.000)*
Target inventory(TD)	0.3513 (0.019)**	0.3210 (0.021)**
DUM-CON	2.5625 (0.433)	2.3672 (0.376)
INVTD.CON	0.0862 (0.050)**	0.0625 (0.054)**
Change in sales	0.1417 (0.003)**	0.2535 (0.000)*
Leverage	0.3180 (0.804)	1.735 (0.059)**
Cash Flow	0.1820 (0.020)**	0.2810 (0.000)*
OBSERVATIONS	446	446
R-sq (over all)	0.4459	0.4835
F-statistic	4.03 (0.0001)*	
Chi² Hausman test	Chi² =41.55 Prob> Chi²=(0.0000)*	
Chi² Heteroskedasticity test	Chi² =1.023 Prob> Chi²=(0.235)	
Langrangian Multiplier	Chi² =22.67 Prob> Chi²=(0.0000)*	

*Note: *,**,*** denote variable is significant at 1%, 5%, 10% level respectively. DUM-CON: is a dummy variable of financial constraints. INVTD.CON: is the target inventory by interacting the financial constraints*

This finding comes out from the significant value of Langragian Multiplayer (LM) where the **Chi²**value is estimated to be 22.67 with p-value of 0.000<0.05, suggesting the presence of firm and time specific effect, as a result the OLS regression will not be efficient to estimate the empirical model.

Hausman test was performed. Hausman test is found to be statistically significant at 1% level, where the **Chi²** is 41.55 with p-value of (0.000<0.05). Therefore, the null hypothesis that the random effect model is appropriate in estimating the model can be rejected, and the alternative hypothesis that the fixed effect model is appropriate in estimating the model will be accepted. Therefore, the fixed effect model will be the preferred model for estimating the panel data set. The discussion of the results will be restricted to the fixed effect random, which has been found to be the best. Bressch-Pagan test is found to be statistically insignificant at 5% (p-value=0.235<0.05). Implying that we can't reject the null hypothesis that the variance of error term is homogeneous, and hence the heterskedasticity problem does not exist for the sample of the study.

The results presented in table 1 show that Jordanian industrial firms have a target inventory level, and they move gradually toward it when any deviation exists. This finding is assured by the significant of TD_{it} variable at 5% level (p-value=0.019<0.05). As well as, the speed of adjustment toward the target level at Jordanian industrial firms is estimated to be about 35.13% annually, indicating that Jordanian firms do partially adjust their level of inventory toward the target level. However, the speed of adjustment for Jordanian industrial firms is lower than their counterparts in both developed and developing countries[10]. One explanation to the low adjustment speed of Jordanian firms is the presence of transaction cost. The transaction cost will affect inversely the speed of adjustment. Thus, as the transaction cost increases as the speed of adjustment declines, and firms need more time in order to adjust their inventory toward the target level. The presence of market imperfection in Jordan imposes many financial restrictions which prevent firms from raising funds at a reasonable cost, and restricts them from making quick adjustment due to the transaction costs involved.

Turning to the financial variables (Cash Flow, Leverage Ratio), included in the regression, the results indicate that the coefficient on the lagged Cash Flow variable is positive and significant at 5%. This result is consistent with Carpenter *et al.,* (1994), Carpenter *et al.,* (1998), and Cunha & Paisana (2011) who find that the cash flow has a significant positive impact on inventory investment. Moreover, Fazzari & Petersen (1993) find that investment in working capital is highly sensitive to the fluctuation in cash flow, indicates that firms depend heavily on internal funds to finance their working capital including inventory. With respect to Jordanian industrial firms, the result shows that Jordanian industrial firms depend on internal funds (Cash Flow) to finance their inventory. This may be attributed to the imperfection of capital market that may restrict firms from raising external funds at lower cost, and consequently, makes them depend on internal funds as the cheapest way of financing.

With respects to the other financial variable (Leverage Ratio), there is no statistically significant Leverage Ratio; the coefficient on leverage ratio is 0.3180 with a p-value of 0.804. This means that the

10 . Bo et al., (2002) report that the speed of adjustment is 0.398 for Dutch manufacturing firms. Carpenter et al., (1994) find that the adjustment speed is between 13%–30% a quarter for U.S. manufacturing firms. Saggar (2003) estimates the speed of adjustment on Indian firms between 30%–46% per annum in the three sub-period, and 26% for the full period. Obembe et al. (2012) report that the speed of adjustment for Nigerian firms is 47%. Mathuva (2013) on his research on developing countries, finds that the speed of adjustment for Nairobi firms is 48%.

leverage does not have any impact on inventory investment. This result contradicts Sangalli (2013) and Bagliano & Sembenelli (2004) who find a significant negative relationship between leverage ratio and inventory investment. While the result is in line with Mathuva (2013), who finds insignificant effect of leverage on inventory investment. The study results indicate that Jordanian firms do not heavily use the financial leverage (long-term debt) in financing their inventory and depend on internal finance. The reason behind this is that inventory is a current asset, which is one of the working capital components, so Jordanian firms follow an aggressive policy in financing their inventory by heavily relying on short-term debt in case of insufficient internal funds.

To investigate whether the financial constraints have an impact on inventory investment, this study splits firms into financially constrained/unconstrained relative to their size (Total asset). A dummy variable (DUM-CON) is used to indicate the financial position, which is equal to 1 if a firm is financially unconstrained and 0 if otherwise.

Table (2) presents the estimation results of financially constrained and unconstrained firms.

Table 2. The estimation results of model 2 among financially constrained/unconstrained firms

Independent Variables	Fixed Effect Model	
	Un-const.	Const.
Cons.	15.8491 (0.000)*	16.8111 (0.001)*
TARGINV (TD)	0.4321 (0.021)**	0.3253 (0.020)**

*Note: *,**,*** denote variable is significant at 1%, 5%, 10% level respectively. TARGINV (TD): is the target inventory variable. This table is calculated with reliance on table (1) by adding the coefficient of Target inventory (TD) to the coefficient of INVTD.CON to get the coefficient of TARGINV (TD) for unconstrained firms*

As can be seen the estimated coefficient on TD_{it} variable for unconstrained firms is found to be, on average, 0.4321, while for constrained firms it is found to be, on average, 0.3253. This indicates that being financially constrained has an impact on the level of inventory holdings. So, firms that suffer from being financially constrained tend to reduce their level of inventory beyond the target level, and need more time to adjust toward it. This is consistent with the study hypothesis that the financial constraints have an impact on the level of inventory holding. Moreover, this result is in line with several studies which conclude that the financial constraints have an impact on inventory investment (Cunha & Paisana, 2011 ; Sangalli, 2013 ; Bagliano & Sembenelli, 2004).

Since the financial constraints have an impact on the level of inventory holding, the financially constrained firms need more time than others to reach their optimal level. This can be verified from the coefficient of TD variable, which is a measure of the speed of adjustment toward the target level. It is found that the speed of adjustment for constrained firms is lower than it is for the unconstrained firms. The speed of adjustment for unconstrained firms is 43.21%, while for constrained firms it is 32.53%, which means that financially constrained firms adjust their target level of inventory slower than others. This result is in line with the study hypothesis that financially constrained firms move slower than financially unconstrained firms toward the target level. The reason behind this is attributed to the fact that the unconstrained firms have little financial constraints than constrained firms, so they can raise funds externally at lower costs than constrained firms, which in turn makes the unconstrained firms adjust toward the target inventory level faster than constrained firms.

8. CONCLUSION

We use a panel of 50 Jordanian industrial firms over the period 2001-2014 to test whether Jordanian Industrial firms have a target level of inventory, and how fast they move toward it when any deviation exists. As well as, test whether the financial constraints have any impact on inventory investment. We estimate the empirical model based on the Lovell's target adjustment model (1961), augmented it with two financial variables, Cash Flow and Leverage Ratio, as indicators of the financial position of firms. Firms are classified as financially constrained/financially unconstrained based on the total asset.

Our results suggest that Jordanian firms do have a target inventory level, and they move toward it when any deviation exists, however the speed of adjustment at Jordanian firms is lower than their counterparts in other countries, this is attributed to the presence of market imperfection in Jordan which imposes many financial restrictions, prevent firms from raising funds at a reasonable cost, and restricts them from making quick adjustment due to the transaction costs involved. The cash flow variable has a significant positive effect on inventory investment, while the leverage ratio has no impact. This is in line with the pecking order theory that firms depend on internal funds to finance their investment as a cheapest way.

Moreover the results indicate that inventory investment is affected by the financial constraints. However, the financially constrained firms tend to hold inventory beyond the target level by more than the financially unconstrained firms; in addition the speed of adjustment at financially constrained firms is lower than others.

REFERENCES

1. Almeida, H. and Campello, M. (2010), "Financing frictions and the substitution between internal and external funds", Journal of Financial and Quantitative Analysis, Vol.45, pp. 589-622.
2. Aminu, Y and Zainudin, N. (2012), "An analysis of proposed framework on impact of working capital management on the profitability of selected manufacturing companies listed on the Nigerian stock exchange", Journal of Economics and Behavioral Studies, Vol. 4, pp. 730-736.
3. Ananbeh, R. (2014), "The impact of financial constraints on inventory investment: Empirical study from Jordan", Unpublished Master Thesis, Yarmouk University, Irbid-Jordan.
4. Azam, M. and Shah, S. A. (2011), "Internal financial constraints, internal financial constraints and investment choice: Evidence from Pakistani firms", Australian Journal of Business and Management Research Vol.1, pp. 18-22.

5. Bagliano, F. C. and Sembenelli, A. (2004), "The cyclical behavior of inventories: European cross-country evidence from the early 1990s recession", Applied Economics, Vol. 36, pp. 2031-2044.
6. Besley, S. and Brigham, F.E. (2008), Essential of Managerial Finance, Thomson, New York, NY.
7. Bechter, D. M. and Stanley, S. (1992), "Evidence of improved inventory control", FRB Richmond Economic Review, Vol. 78, pp. 3-12.
8. Benito, A. (2005), "Financial pressure, monetary policy effects and inventories: Firm-level evidence from a market-based and a bank-based financial system", Economica, Vol. 72, pp. 201-224.
9. Bo, H., Kuper G., Lensink, R. and Sterken, E. (2002), "Dutch inventory investment: Are capital market imperfections relevant?", Applied Economics, Vol 34, pp. 15-22.
10. Braun, S. (1981), "The inventory stock-adjustment model reconsidered", Review of Economics and Statistics, Vol. 63, pp. 452-454.
11. Carpenter, R., Fazzari, S., Petersen, B. (1994), "Inventory investment, internal finance fluctuations and the business cycle", Brookings Papers on Economic Activity, Vol. 2, pp. 75-138.
12. Carpenter, R., Fazzari, S., Petersen, B. (1998), "Financing constraints and inventory investment: A comparative study with high-frequency panel data", Review of Economics and Statistics, Vol. 80, pp. 513-519.
13. Cunha, J., Paisana A. (2011), "The financing constraints hypothesis and inventory investment decisions of firms", Business Review, Vol. 10 No. 12, pp. 1265-1278.
14. Cunha, J. Paisana, A. (2010), "The financing constraints hypothesis controversy: Some evidence for the Portuguese manufacturing sector", International Business and Economics Research Journal, Vol. 9, pp. 11-25.
15. Cunningham, R. (2004), "Finance constraints and inventory investment: Empirical tests with panel data", ISSN 1192-5434.
16. Eichenbaum, M. (1989), "Some empirical evidence on the production levels and production cost smoothing models of inventory investment", American Economic Review, Vol. 79, pp. 853-864.
17. Fazzari, S. M. and Athey, M. J. (1987), "Asymmetric information, financing constraints, and investment", Review of Economics and Statistics, Vol. 69, pp. 481–487.
18. Fazzari, S. M. and Petersen, B. C. (1993), "Working capital and fixed investment: New evidence on financing constraints", Rand Journal of Economics, Vol. 24, pp. 328-342.
19. Fazzari, S. M., Hubbard, R. G., Petersen, B. C. (1988), "Financing constraints and corporate investment", Brookings Papers on Economic Activity I, pp. 141-195.
20. Fee, C. E., Hadlock, C. J., Pierce, J. R. (2009), "Investment, financing constraints, and internal capital markets: Evidence from the advertising expenditures of multinational firms", Review of Financial Studies, Vol. 22, pp. 2361-2392.
21. Gaur, V., Fisher, M. L., Raman, A. (2005), "An econometric analysis of inventory turnover performance in retail services", Management Science, Vol. 51, pp. 181-194.
22. Gertler, M. and Gilchrist, S. (1994), "Monetary policy, business cycles and the behavior of small manufacturing firms". Quarterly Journal of Economics, Vol.109, pp. 309-340.
23. Gitman, j. (2009), Principles of Managerial Finance, Pearson, New York, NY.
24. Greenaway, D., Guariglia, A., Kneller, R. (2007), "Financial factors and exporting decisions". Richard Journal of International Economics, Vol. 73, pp. 377-395.
25. Guariglia, A. and Mateut, S. (2010), "Inventory investment, global engagement, and financial constraints in the UK: Evidence from micro data". Journal of Macroeconomics, Vol. 32, pp. 239-250.
26. Guariglia, A. (2008), "Internal financial constraints, external financial constraints, and investment choice: evidence from a panel of UK Firms". Journal of Banking & Finance, Vol. 32, pp. 1795-1809.
27. Hartarska, V. and Gonzalez-Vega, C. (2006), "What affects new and established firms' expansion? Evidence from small firms in Russia", Small Business Economics, Vol. 27, pp. 195-206.
28. Himmelberg, C. P. and Petersen, B. C. (1994), "R&D and internal finance: A panel study of small firms in high-tech industries", Review of Economics and Statistics, Vol.76, pp. 38-51.
29. Hornstein, A. (1998), "Inventory investment and the business cycles", Federal Reserve Bank of Richmond Economic Quarterly, Vol.84 No 2, pp. 49-70. http://dx.doi.org/10.1016/j.jbankfin. 2007.12 .008.
30. Hovakimian, G. and Titman, S. (2006), "Corporate investment with financial constraints: Sensitivity of investment to funds from voluntary asset sales", Journal of Money, Credit & Banking, Vol. 38, pp. 357-374.
31. Hubbard, G. (1998). "Capital Market Imperfection and Investment", Journal of Economic Literature, Vol. 36, pp193-225.
32. Iturriaga, Felix (2000). "A Panel Data Study on Spanish Firms' Inventory Investment", Applied Economics, Vol. 32, pp1927-1937.
33. Kahn, James A. (1992). "Why is Production More Volatile than Sales? Theory and Evidence on the Stock out-Avoidance Motive for Inventory Holding", Quarterly Journal of Economics, Vol. 107, pp481-510.
34. Kaplan, S. N. and Zingales, L. (1997), "Do investment-cash flow sensitivities provide useful measures of financing constraints", Quarterly Journal of Economics, Vol. 112, pp. 169-215.
35. Kashyap, A. K., Lamont, O. A., Stein, J. C. (1994), "Credit conditions and the cyclical behavior of inventories", Quarterly Journal of Economics. Vol. 109, pp. 565-592.
36. Kasseeah, H. (2012), "Financial constraints and leverage decisions in small and medium-sized firms", Journal of Economics and Behavioral Studies, Vol.4, pp55-65.
37. Lopez, J. A. (2008), "What Is Liquidity Risk?" FRBSF Economic Letter, Vol. 2008, pp. 1-3.
38. Lovell, M. (1961), "Manufacturers' inventories, sales expectations and the acceleration principle", Econometrica, Vol. 29, No.3, pp. 293-314.
39. Marouene, F. & Abaoub, E. (2013), "Investment-cash flow sensitivity under financial constraints case of Tunisia". International Journal of Business and Management, Vol. 8, pp. 14-23.
40. Mathuva, D. M. (2013), "Determinants of corporate inventory holdings: Evidence from a developing country", International Journal of Applied Economics and Finance. Vol.7, pp. 1-22.
41. Michalski, G. (2009), "A Value-oriented framework for inventory management", South East European Journal of Economics and Business, Vol. 4, pp. 97-102.
42. Muhammad, M., Jan, W. U., Kifayat U. (2012), "Working capital management and profitability an analysis of firms of textile industry of Pakistan"., Journal of Managerial Sciences, Vol. 6, pp. 155-165.

43. Obembe, O.B., Arawomo, O., Babatunde, A. (2012), "Financial constraints and inventory investment of listed non-financial firms in Nigeria", Business and Management Research, Vol. 1, pp, 106-114.
44. Ramadan, Z, S. (2012), "Does leverage always mean risk? Evidence from ASE", International Journal of Economics & Finance, Vol. 4, pp. 150-158. DOI: 10.5539/ijef.v4n12p150.
45. Ranganatham, G. (2011), "Inventory management (IM) practices in small scale enterprises". Global Management Review, Vol. 5, pp. 15-32.
46. Saggar, S. (2003), "Inventory investment behavior - Evidence from a panel of Indian firms". Reserve Bank of India Occasional Papers, Vol. 3, pp. 1-32.
47. Sangalli, I. (2013), "Inventory investment and financial constraints in the Italian manufacturing industry: A Panel data GMM approach", Research in Economics, Vol. 67, pp. 157-178.
48. Singh, P. (2008), "Inventory and working capital management: An empirical analysis", ICFAI Journal of Accounting Research, Vol. 7, pp. 53-73.
49. Tsoukalas, J. D. (2006), "Financing constraints and firm inventory investment: A reexamination", Economic Letters, Vol. 90, pp. 266-271.
50. Yue, F. (2011), "Financial constraints and firm's activities in China", Durham Thesis, Durham University. Available at Durham E-Theses Online: http://etheses.dur.ac.uk/1407.