Working Capital Management Effects on Investment-Cash Flow Sensitivity: Evidence from Pakistan

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APPROVAL SHEET

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To All Loved Ones in my Family and Friends

Abstract

In 21st century, financial management theory and practices are improving with economic globalization, knowledge and electronic commerce. In this study, the point of debate is not only bound to association between corporate performance and working capital (WC) but also extended to the concept of sensitivity of investment to cash flow, financing constraints and the role of working capital. We use panel of about 450 manufacturing firms of Pakistan listed in Karachi Stock Exchange (KSE). We empirically investigate the relationship between investment in fixed capital, investment in working capital and financing constraints. The results provide significant evidence that the firms with higher level of working capital exhibit high sensitivity of investment in working capital to cash flow (WKS) as compared to sensitivity of investment in fixed capital to cash flow (FKS). We estimate fixed investment and working capital investment equations by using a two step system Generalized Method of Moments (GMM) approach.

We then construct firm level sensitivity of fixed capital (FKS) and working capital (WKS) and explore the fact that, despite external financing constraints the firms with low FKS and high WKS shows high level of fixed investment rates. These results suggests that working capital management may help firms to alleviate the severe effects of negative cash flow shocks during financing constraints on firm's fixed investment.

Keywords: Fixed Capital Investment, Working capital investment, cash flow, financing constraints, system GMM, asymmetric information

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List of Abbreviations

General Abbreviations

A/R	Account Receivables
CCC	Cash Conversion Cycle
GDP	Gross Domestic Product
GMM	Generalized Method of Moments
KSE	Karachi Stock Exchange
OLS	Ordinary Least Square
ROA	Return On Assets
UK	United Kingdom
WCM	Working Capital Management

Technical Abbreviations

AR (2)	Arellano-Bond (2)
CF	Cash Flow
CF/K	Cash Flow/Fixed Capital
Coef.	Coefficient
DSI	Days Sale of Inventories
DSO	Days Sale Outstanding
FKS	Fixed Investment-Cash Flow Sensitivity
FWC	Financial Working Capital
FWK/K	Financial Working Capital/Fixed Capital Stock
HH	High High

HIGHWK	High Working Capital
HL	High Low
I/K	Fixed Investment/Fixed Capital Stock
I/S	Inventories/Sales
Inv/K	Inventories to Fixed Capital Stock
Inv/K	Inventories/Fixed Capital Stock
IS	Inventories/Sales
ITO	Inventory Turnover
Lev	Leverage
LH	Low High
LL	Low Low
LOWWK	Low Working Capital
SG	Sales Growth
Std.Err.	Standard Error
TA	Total Asset
Tang	Tangibility
W	Working Capital
W/K	Working Capital/Fixed Capital Stock
WCS	Working Capital Stock
WCS/K	Working Capital Stock to Fixed Capital Stock
WI/K	Working Capital Investment/Fixed Capital
WKS	Investment-Cash Flow Sensitivity

CHAPTER 1

INTRODUCTION

1.1 Background

In 21st century, financial management theory and practices are improving with economic globalization, knowledge, and electronic commerce. Financial management plays a vital role in decision-making process of corporations, like investment decision, asset management, and financing decision etc. External factors like corporate competition, technological changes, economic uncertainty, and interest rate volatility also augment the role of financial management in corporate decisions. Failure of corporate promotion caused by the defective financial plans hence presence of sound financial management is essential for the working of any corporation (Brigham and Gapenski (1997)).

The seminal work of Modigliani and Miller (1958) shows that investment decisions and financial structure of a firm are independent of each other when financial markets are frictionless.[1] They argue that in a frictionless market internal and external source of capital are same and they are perfect substitute of each other. However, in last couple of decades, number of studies (e.g. Abel and Blanchard (1987), Greenwald et al. (1984), and Myers and Majluf (1984)) took place which extended the model of business investment and denied the irrelevance of investment and financial decisions. As frictionless markets do not exist in real world and the reason of imperfection in the market is asymmetric information.[2] Hence, presence of information asymmetric makes external finance costly than internal financing.

[1] A trading environment in which cost associated with transactions is disappeared or does not exist and market is complete and perfect. In real life there is no frictionless market and trade is always associated with certain costs such as tax.

[2] It is a study in which in a trading environment one party has more or better information than other. This situation may cause market imperfection and sometimes leads to market failure.

The information asymmetry or capital market imperfection raises question about the role of financing constraints that will help to verify the investment decisions of corporation. Due to costly external finance, firms use their internal funds for investment and hence the cash, which a firm may hold, influences firm's investment, known as sensitivity of investment to cash flow (FKS).

Corporate investment divided into two parts; Fixed Capital Investment and Working Capital Investment. Investment in fixed capital represents maintenance and acquisition of long-term assets. Fixed investment can be in the form of tangible assets (such as building and machinery) or intangible assets (such as intellectual property). Investment in working capital represents acquiring short-term assets and liabilities. It refers to the use of financial resources in day-to-day transactions. The previous work on business investment stresses on the separate study of fixed investment and capital investment.

There is a large literature on the relationship between a firm's investment and cash flow as well as the impact of financing constraints on this relationship. According to Fazzari et al. (1988), the condition of frictionless capital market is not possible. Therefore, all firms do not have same access to external funds, which increases the wedge between internal and external finance. Due to these financing constraints, firms are unable to raise external funds and internal cash flow movements become important in order to determine a firm's investment. Many researchers have done empirical research to support the idea of Fazzari et al. (1988), for example Schaller (1993) and Shin and Park (1999) use data of Canada and Korea, respectively, and show that the sensitivity of investment to cash flow is higher for financially constrained firms. The study of Lyandres (2007), Lewellen and Lewellen (2016) and Mulier et al. (2016) also support their hypothesis. The recent study of Deng et al. (2017) demonstrate the fact that investment-cash

flow sensitivity for investment varies and after controlling financing constraints this sensitivity positively and significantly correlates with investment.

Another strand of literature criticized this view and challenged the findings of Fazzari et al. (1988). For instance, Kaplan and Zingales (1997) raised question on the validity of findings of Fazzari et al. (1988) results and argue that financing constraints are not the reason to measure the sensitivity of investment to cash flow. Their findings imply that the firms, which are unconstrained, demonstrate a higher level of investment cash flow sensitivity as compared to those firms, which are highly constrained. They give the reason behind these opposite findings that the firms which exhibit stronger sensitivity actually their managers mostly rely on internal cash flow to invest and reluctant to use external funds even on low cost.

The previously stated literature has paying attention on the long-term financial management of firms. However, the short-term financial management i.e. working capital management (WCM) had least concentrated by researchers. Maintaining optimal level of working capital is important for corporate profitability so managers are prone to attain this level (Lamberson (1995)). Previously, researchers have focused on the separate effect of WCM, on corporate profitability, risk and securities (Petersen and Rajan (1997) and Faulkender and Wang (2006)).

The debate on the issue of investment cash flow is going on, but, Fazzari and Petersen (1993) do some changes in their previous exertion of Fazzari et al. (1988). They include a third variable working capital and explore its impact on the investment cash flow relationship. Hence, we can say that they study fixed investment and working capital investment together first time. The study of Sokoloff (1984) on this issue investigates the manufacturing investment structure during early industrialization. They document the importance of working capital investment in early industrialization era. As, financial constraints make investment sensitive to internal cash flow

hence according to Fazzari and Petersen (1993) working capital is an important variable which mitigate the worst impact of cash flow shock on a firm's investment.

Ding et al. (2013) follow the work of Fazzari and Petersen (1993) and replicate their study on Chinese corporate sector and further contribute to the research of Allen et al. (2005), Ayyagari et al. (2010) and Cull et al. (2009). These studies emphasized that Chinese financial sector is poorly developed but with the passage of time the growth rate in fixed investment is increasing. They tried to find out the reasons of this development. The findings of Ding et al. (2013) suggest that due to cash flow fluctuations, firms need adjustment in their investment. However, the firms with high ratio of working capital are capable to optimize their spending and remove the impact of cash flow shock on fixed capital.

From the above discussions, we found the following three diversified views. The study of Fazzari et al. (1988) show that the sensitivity of investment to cash flow is stronger when the difference between cost of internal and external sources of funds is greater and this cost indicates that financial constraints are higher. While another argument is that sensitivity of investment to cash flow is high for the least constraint firms (Kaplan and Zingales (1997)). The findings of Cleary (1999) support their idea. Due to these diversified arguments some researchers involve a third variable "working capital" and examine the sensitivity of investment to cash flow (Fazzari and Petersen (1993) and Ding et al. (2013)).

1.2 Gap in the Literature

In this study, we use working capital as a mediator between investment and cash flow, while finding out the sensitivity of investment to cash flow. We check whether involvement of working capital makes the relationship between investment and cash flow stronger or weaken. Most of the studies done in Pakistan merely examine the correlation between WCM and corporate

profitability and they found inverse relationship (Raheman and Nasr (2007) and Raheman et al. (2010)).

Afza and Nazir (2007) have investigated different working capital policies that a firm may adopt. According to them, firms adopt aggressive working capital policy when they have low percentage of current assets to total assets. Conservative working capital policy is adopted by those firms who have high level of current assets. Limited literature is found on financing constraints and corporate investment in Pakistan. For example, Azam and Haider (2011) explore the impact of external and internal constraints on corporate investment. For this purpose, they collect data from KSE listed firms and evaluate that there is a positive relationship between size of firm and corporate investment. The older and larger firms have better choices to invest as compared to younger and smaller firm.

Previous studies e.g. Fazzari and Petersen (1993) and Ding et al. (2013) have focused on the investment cash flow sensitivity and the role of working capital for U.S and China firms, respectively. However, there is limited literature on Pakistan, which has focused on this issue. Our study fills this gap by examining whether working capital is a useful variable in order to mitigate the sensitivity of investment to its internally generated cash flow or not.

1.3 Objectives of the Study

The objectives of this study are:

- To explore the role of working capital in mitigating the influence of cash flow shocks on a firm's investment policy.
- To examine the sensitivity of investment in working capital and investment in fixed capital to cash flow.
- To evaluate the impact of financing constraints on investment-cash flow sensitivity

1.4 Importance and Relevance

According to World Development Indicators (2014), Pakistan gets only 16% of domestic credit to private sector (% of GDP) as compared to other South Asian countries like Sri Lanka (31.0%), Bangladesh (41.8%), India (51.8%), and Maldives (44.7%) in the year 2013. This indicator exhibits that Pakistan's financial markets are underdeveloped as compared to other South Asian and developing countries such as India, Bangladesh, etc. According to the survey of World Bank 2007, the part of working capital financed through commercial banks is 6.5% which is very low and 83% of working capital is financed through internal sources (World Bank Survey of Investment Climate (2009)).

The economic environment is uncertain and public sector borrowings are more and due to that private sector are unable to get credit and firms face financial constraints. Therefore, the present study will be highly beneficial for Pakistan's corporate sector. In this context, managing working capital is an important technique through which they can handle these financial constraints as well as negative cash flow shocks.

1.5 Research Questions

Q1. How working capital management influence the relationship between a firm's investment and cash flow in presence of financing constraints?

Q2. Whether investment in working capital is more sensitive to cash flow than investment in fixed capital?

Q3. Whether financing constraints are the reason for sensitivity of investment to cash flow or not?

1.6 Hypothesis

H1: The sensitivity of investment in working capital to cash flow is high.

H2: The sensitivity of investment in fixed capital to cash flow is high.

H3: The firms who use high ratio of working capital to fixed capital are able to smooth out the cash flow shocks on investment.

H4: Financing constraints are the reason for investment-cash flow sensitivity.

H5: Small size firms are unable to attract external finance.

H6: Tangibility increases the access to external finance.

H7: The sensitivity of investment is high for the firms with high leverage.

1.7 Scheme of the Study

The remainder of the dissertation is organized as follows. Chapter II includes the theoretical and empirical literature to overview the existing evidence and their connection towards study. Chapter III discusses the data and the methodology employ in the study. Chapter IV presents the results and their analytical review. Chapter V wraps up the dissertation.

CHAPTER 2

LITERATURE REVIEW

2.1 Theoretical Literature

There are different economic and finance theories which explain the investment behavior of a firm. In this section, we explain some important theories related to the impact of cash flow on firm investment and working capital management. In Section 2.2, we explain theories relating to investment, while Section 2.3 describes the policies relating to working capital management.

2.2 Investment Theories

2.2.1 Tobin's Q Theory

Tobin's Q theory of investment proposed by Brainard and Tobin (1968) suggests that the rate of investment is a function of q. Tobin's q is defined as the ratio between market value of a capital (the going price in the market for exchanging existing asset) to its cost of replacement (the price of newly produced commodities in the market). Hence, we say that some sort of adjustment cost also lies behind this theory. This theory shows the firm's motivation to invest in capital (Bolton et al. (2011)).

The q theory of investment is operational only when we are able to observe the value of q. The marginal q is the ratio of market value of an additional unit of capital to its replacement cost. While average q is the ratio of the market value of existing capital to its replacement cost which is actually observable. The study of Hayashi (1982) explores the relationship between average q and marginal q. According to their findings the relationship depends upon whether firm is price-taker or price-maker. If the firm is price taker and has constant returns to scale, then marginal q

is equal to average q. When firm is price-maker then the value of average q is greater than marginal q. They also explore that this relation could be modified through taxes and depreciation allowances. The marginal q is relevant to investment decisions, which indicate tax behavior (i.e. corporate tax rate, investment tax credits and depreciation methods).

The study of Bolton et al. (2011) provide evidence that the relationship between marginal q and corporate investment depends upon the source of financing. The source of financing that a firm can avail may b cash or credit line. When the cash is source of financing, investment and marginal q both increase with the increase of cash holdings because firms become less financially constrained. On the flip, when source of financing is credit line then investment and marginal q both move inverse position. When leverage increases it has a negative impact on investment because firm cut investment to delay cost of equity issuance. In contrast, marginal q increases with the increase in leverage because an additional unit of capital relaxes firm's borrowings by decreasing the debt to capital ratio. Thus, at that time average q is the more helpful indicator for investment.

If value of is q is greater than 1 ($q > 1$), it means that the market value of capital installed is more than its replacement cost. This shows that the firm should acquire more capital to raise its market value and support the firm to invest more. If value of q is less than 1 ($q < 1$), the market value of capital is less than its replacement cost, and firm does not replace its capital and let it depreciate. In a steady-state equilibrium ($q = 1$), the market value of capital installed is solely equal to its cost of replacement. The market value of capital which is installed is obtained through number of outstanding shares times their price in the market while the replacement cost depends upon the situation in the goods sector.

The q-theory of investment assumes i) Investment decisions are made by firm itself and the capital goods, which are purchased by firms, are installed. ii) When firms invest in capital goods,

there is certain cost of adjustment, which shows the cost of installation. iii) These adjustment costs are strictly convex which shows that cost of adjustment increases with the level of investment.

2.2.2 Pecking Order Theory

In corporate finance, the pecking order theory suggests that the financing cost increases due to information asymmetry (Myers and Majluf (1984)). There are three major sources of financing: internal funds, debt, and equity. There are two main characteristics of pecking order theory. The first one is that firms prefer internal financing over external financing for investment and other requirements of business. The second aspect is that when retained earnings are insufficient to fulfill investment and other needs, than debt financing is more advantageous than equity financing. When outside funds are necessary, the firm prefers debt to equity because information cost associated with debt is lower. Hence, initially firm's utilizes internal financing (retained earnings and cash which is most liquid) when it exhausted, then less risky debt is issued and when firms are unable to issue any more debt, then they chose external equity financing as a last option.

This theory implies that businesses stick to a hierarchy of source of financing and favor internal financing when available, and debt is preferred over equity if external financing is required. The lack of information increases the cost of external finance. The knowledge of management of a firm is more than outside investors. Hence, firms are unable to sell the securities for their exact value. As a consequence, the firm will issue shares at a low price and refuse a net present value of investment which may be positive. In order to avoid this cost firm may keep sufficient internally generated funds to fulfill future business needs. Asymmetric information is higher in equity financing as compared to debt financing and firm managers are in

the favor of debt issuance. There is also cost (bankruptcy cost, interest payment, financial distress, agency conflicts, debt overhang, etc.) associated to debt financing which makes debt issuance less attractive in the presence of internally generated funds. In the presence of asymmetric information and transaction cost associated with equity and debt financing respectively, managers adjust cost and benefit of both financing decisions and chose the optimal level of financing. Hence, an inverse relation exists between leverage and stock of firms.

Empirical literature supports the pecking order theory. Fama and French (2002) explores that highly profitable firms hold higher amount of cash through internally generated funds and hence they are less levered. The study of Frank and Goyal (2003) suggests that internally generated funds insufficient for financing and firms utilize equity financing faster than debt financing. They also confirm the inverse relation between leverage and equity.

The Pecking order theory also suggest that when a firm's investment is greater than retained earnings then firm utilizes external financing and when retained earnings are more than investment then firm exploit their internal funds and not move towards external financing. This theory reveals the fact that corporate managers issue new stock in order to fulfill business needs because it is less costly as compared to debt financing. Similarly, firms which are larger in size have no issue of insolvency cost in contrast to small size firms, therefore large size firms utilize more debt and less equity.

Summarizing the pecking order theory, managers fulfill their financing needs by utilizing internal cash flow or retained earnings and last option is external finance. Due to asymmetric information and transaction cost associated with external sources make external finance much expensive and the motive of a rational manager is to boost the value of a firm. To fulfill this motive they try to focus on internal funds their first priority as a source of financing.

2.3 Working Capital Policies

Working capital management exists because markets are imperfect. In order to accommodate these imperfections firms need to maintain day to day operations by choosing patterns of short term assets and liabilities. Working capital level determines whether a firm is aggressive or conservative in its operations (Kungu et al. (2014)).

2.3.1 Aggressive Working Capital Policy

A firm may implement an aggressive working capital policy in which current assets as percentage of total assets is low. It may also be exploiting for the financing decisions of the firm in which level of current liabilities is high as percentage of total liabilities. Unnecessary levels of current assets may have a negative effect on the firm's profitability while a low level of current assets may lead to lower level of liquidity and stock outs and firm may suffer difficulties in maintaining the day to day business transactions (Van Horne and Wachowicz (2004).

Aggressive working capital policy has an anticipation of higher profitability as well as larger liquidity risk. It lowers the investment in current assets and increases in long term assets and leads to liquidity problem because of lower level of investment in current assets (Islam and Mili (2012)).

The studies of Weinraub and Visscher (1998) examine the relationship between aggressive and conservative working capital policies on industry level data, which shows that there is very high and important relationship between policies for assets and liabilities of industries. The authors have studied group of ten different industries to see the comparative relationship between aggressive and conservative policies. This study implicates that when a firm/industry pursue the comparatively aggressive working capital policies, these policies are balanced by comparatively

conservative working capital policies. The conclusion of this study was that the industries have distinguishing and considerably different policies for working capital management.

The relationship among aggressive WC policy/management and profitability was discussed between the US firms, this relationship was carried out by utilizing the Cash Conversion Cycle (CCC) which is used as the measure of working capital policy/management. In this case the CCC is representing the aggressiveness of the working capital policy/management. The results/outputs of this study explore an important but negative relationship among CCC and profitability. This negative impact implies that if the working capital policy/management is more aggressive than it is directly associated/linked with higher profitability (Jose et al. (1996)).

2.3.2 Conservative Working Capital Policy

Conservative working capital policy is a passive approach in which a firm may invest a greater proportion of investment in current assets and sacrifice the proportion of investment in order to maintain higher liquidity. The opportunity cost of investing in current asset is low level of profit. According to Sathyamoorthi and Wally-Dima (2008), during high business volatility mostly firms adopt a conservative working capital policy in order to avoid risk of non liquidation. For example firms in unpredictable or seasonal industries like construction, farming, tourism etc. may adopt conservative WC policies to cover against risk. As firms maintain high level of current assets in a conservative policy their state of liquidity will be very high, it also lowers short term loans and decreases the risk of insolvency as well as bankruptcy (Hassani and Tavosi (2014)).

Chowdhury and Amin (2007) have discussed the significance of the working capital policy/management in the pharmaceutical industry. They said, it plays a very important role in analyzing the level of return on assets (ROA). In this study, the results shows that any firm could

increase their return on assets by adopting aggressive policy towards the working capital management, or firm can keep their current assets very low and at the same time the firm needs to follow the conservative approach towards financing of their current assets which means that it would be good if the firm will finance their working capitals by medium term rather using short term loans. Study has remarkable findings, which suggest the increase in inventory turnover within days.

There are long debates in several studies on the return or risk tradeoff among different working capital policy/management (Gardner et al. (1986) and Weinraub and Visscher (1998)). If the firm adopts the aggressive working capital policy/management then it is directly linked with higher risk and higher return while on the other hand if conservative policy is adopted it is directly linked with lower returns and lower risks.

2.3.3 Moderate Working Capital Policy

Working capital policies are mainly talking about the risk and returns. If the firm adopts the moderate working capital policy/management then it means the risks of the firm are lower and similarly the return strategies are lower. This approach is also called as matching approach, which clearly states that if you have same level of risk than the return strategies would also be the same. The difference between the conservative and moderate working capital policy is that the risks and returns are lower in case of moderate policy but very low risk and return is defined as conservative approach. This study is done by Weinraub and Visscher (1998) and backed by Brigham and Gapenski (1997) and Pinches et al. (1973).

2.4 Empirical Literature

The study of investment decisions of firms has received considerable attention from past couple of decades. For investment decisions, internal and external capital is the major sources of finance. For instance, if external capital markets are perfect and complete, then firms have an easy excess to external finance than firm has no need to manage their internal funds in order to avail the investment opportunities (Islam and Mozumdar (2007)).

2.5 Sensitivity of Investment to Cash Flow

Since the work of Fazzari et al. (1988), an outsized literature is there to explore the relationship between firm's investment and internal cash flow. They investigate the Tobin's Q theory[3] of investment in their research paper. According to them, internal finance has a cost advantage over external finance and also many firms do not have full access to external finance, hence their investment spending show high sensitivity to cash flow movements. For this purpose, Fazzari et al. (1988) use dividend payout as a proxy for financing constraints and they show that the sensitivity of investment to cash flow is high for those firms who have low dividend payout. They concluded that firms which utilize their internal funds for quick growth have higher level of investment cash flow sensitivity because external finance is not possible.

At the same time, some researchers present conflicting views on this issue. Kaplan and Zingales (1997) and Cleary (1999) invalidate the findings of Fazzari et al. (1988). According to Kaplan and Zingales (1997) financing constraints is not the reason of sensitivity of investment to cash flow. For this purpose, they done empirical research and collect the data of 49 firms with

[3] Tobin's Q theory of investment was proposed by Brainard and Tobin (1968). Tobin's q is defined as the ratio between market value of a capital to its cost of replacement. The market value of installed capital is obtained through number of outstanding shares times their price in the market while the replacement cost depends upon the situation in the goods sector.

low dividend payout. Their findings suggest that firms, which are unconstrained, demonstrate a higher level of sensitivity of investment to cash flow than those firms, which are highly constrained. They give the reason behind these opposite findings that firms which exhibit stronger sensitivity actually their managers mostly rely on internal cash flow to invest and reluctant to use external funds even on low cost. In their sample of 49 firms all least financially constrained firms follow this rule and show higher sensitivity of investment to cash flow.

However, their study face criticism of small data sample and this gap is filled by Cleary in 1999. He follows the study of Kaplan and Zingales (1997) and supports their idea using large sample data. He not only extended the data sample but also used a bootstrap methodology to confirm their findings. His results show that firms have higher degree of credit worthiness[4] their investment is more sensitive to internal cash flow as compared to those firms which have low credit worthiness. Cleary gave the same reason that firms which have more free cash prefer to invest more and delay their investment expenses until internal funds become available. Constrained firms tend to reduce their debt while unconstrained or less constrained firms are able to increase this level of debt.

Fazzari et al. (2000) further criticized on Kaplan and Zingales (1997) that their findings are difficult to interpret because the sample firms they have taken are almost homogenous for testing capital market imperfection. They raised question on the validity of Kaplan and Zingales (1997) classification of constrained and unconstrained firm due to which their results may also biased.

Almeida and Campello (2002) also contribute to the debate of investment-cash flow sensitivity and role of financing constraints. They proposed alternate ways for studying the impact of financing constraints on firm's investment. As previously discussed that this sensitivity

[4] The ability of a firm or individual to borrow money from bank or any other organization. If someone has a better credit worthiness, there are chances that lender may extend credit.

increases with degree of financing constraints but their findings predict that this sensitivity decreases with financing constraints. They show that when firms are less constrained they borrow more and their investment spending is more sensitive to internal cash flow.

Islam et al. (2002) took data of 31 countries from total publically traded larger-sized firms 6027 from around the world to find a strong relationship between investment cash flow sensitivity and financial development. They estimated regression by using OLS method. Their findings suggest that less financially developed countries have higher sensitivity of investment from internally generated funds because of external funds are costly as well as their availability is lower.

The study of Aggarwal and Zong (2006) supports this idea. According to them, when external capital markets are perfect and complete then internal cash flows have no significant impact on a firm's investment decisions. However, when the external capital markets are incomplete and imperfect, then according to the pecking order theory,[5] firms prefer to use internally generated funds and this creates a positive relationship between investment and internal cash flow. The reason behind using internal funds is that market has asymmetric information, which increases cost of financing. The results of their study indicate that investment is highly sensitive to internal cash flow in financially constrained firms as compared to financially unconstrained firms.

Arslan et al. (2006) also conduct research on this issue. They focus on cash holdings as a key variable for discriminating the constrained and unconstrained firms. They investigate the hedging role of cash balances. According to them, when firms hold high cash reserves their ability to

[5]The pecking order theory was suggested by Donaldson (1961) and modified by Myers and Majluf (1984)Myers and Majluf in (1984). It defines the capital structure of a firm and how it makes its financial decision. In corporate finance, pecking order theory states that the financing cost increases with asymmetric information. Hence companies prioritize their financing sources from internal finance to debt and then equity financing.

undertake investment opportunities is also high. Their results show that sensitivity of investment to cash flow is greater for constrained firms as compared to unconstrained firms.

The literature suggests that sensitivity of investment to cash flow is high because of wedge between internal and external funds. The internal finance has twofold impacts, First, it increases the sensitivity of investment to cash flow. Second, it has a negative impact on level of investment. The study of Lyandres (2007) supports this hypothesis. According to him, the most important determinant of cost of capital is asymmetric information. He uses firm size as a proxy for information asymmetry. He claims that the older and established firms face lower degree of information asymmetry as compared to newly established firms. His results show that when cost of external financing is low the firm's investment increases. The important point in his study is that investment-cash flow sensitivity is decreasing when external finance is available on cheap rates.

Unlike prior studies, Hovakimian and Hovakimian (2009) document somehow different findings on the sensitivity of investment to cash flow. They show that during shortfall of funds, managers utilize financial slack and net working capital, which enables them to invest more than their sources. While in high cash flow years, when internal funds are sufficient than managers decide low investment and hoard excess slack and networking capital for future need.

Marhfor et al. (2012) extended data source and collected data from 44 developed and emerging countries. They classify firms on the bases of country-level variables instead of firm-level variables to distinguish firms into constrained and unconstrained. Due to this classification, they somehow overcome the problem of endoginiety. They took stock price information as a measure of asymmetric information. Because according to them greater information about stock price means that firms has more information about future earnings and they face less information

asymmetry. Finally their results are consistent with Fazzari et al. (1988) that sensitivity of investment to internally generated cash is lower for less financially constrained firms.

2.6 Role of Working Capital

The controversy in the literature leads researchers to involve a third variable "working capital" and then investigate the sensitivity of investment to cash flow. The study of Fazzari and Petersen (1993) investigates that due to number of reasons firms are unable to alter the level of fixed investment but working capital is highly reversible and adjustable. Their findings suggest that the sensitivity of working capital investment to cash flow is higher from sensitivity of fixed capital investment to cash flow. Hence, firms employ the efficient working capital strategy to eliminate the cash flow distress on fixed investment.

Few researchers examine the impact of financing leverage or financing constraint on the relationship between working capital management and corporate value. Almeida and Eid (2014) provide evidence, which is different from previous studies. Their findings suggest that the investment in working capital is worth less for corporation as compared to investment in real cash. They perform regression analysis and found that investment in working capital is less worthy because maintenance of excessive levels of working capital can easily result in lower returns and lower company valuation by the market. Their results are consistent with the studies of Shin and Soenen (1998) and Deloof (2003).

According to Caballero et al. (2012), when working capital is at lower level firm have to invest in it in order to increase its sales and to get discount from their suppliers from early payments. But when level of working capital is high enough, then investment in working capital is not a wise decision because it creates extra interest expense which leads to bankruptcy. Hence an optimal level of investment in working capital is required to increase a firm's value.

The study of Ding et al. (2013) discover the intuitive role of working capital management to explain the reason that Chinese firms invest at a high rate and maintain a higher level of growth rate in spite of this investment rate. They define working capital as the difference between current assets (cash, receivable, and inventories) and current liabilities (short term debt & payables). Their findings suggest that all firms show a higher level of investment sensitivity to cash flow, which reveals the face that they face liquidity constraints. They found that in the presence of cash flow shocks only those firms are able to adjust their investment, which have a higher level of working capital investment because WC is highly reversible.

Both of these studies (Fazzari and Petersen (1993) and Ding et al. (2013)) are the basic motivation for this study because according to my knowledge sensitivity of investment to cash flow is not yet study in Pakistan. And the inclusion of working capital as a mediator makes our study unique because no work has been done before on this issue in Pakistan.

2.7 Studies on Working Capital Management and Investment in Pakistan

Previous researches on working capital in Pakistan have merely focused on the relationship between WCM and corporate profitability or the external finance and firm growth. Many studies have been conducted in Pakistan on the issue of working capital management and found that Pakistani firms are following conservative working capital management and in general face problem of collection and payment policies.

The study of Raheman and Nasr (2007) investigates the impact of working capital variables (i.e. current ratio, CCC, average receivable and payment period and inventory turnover in days) on the profitability and performance of the 49 Pakistani firms listed in KSE. They found a negative relationship between WC variables and firm's profitability. Their study support the findings of Afza and Nazir (2007), who done their research on 208 publically traded firms listed

in KSE and found strong negative relationship between working capital variables and firm's profitability and growth.

Another study conducted by Azam and Haider (2011) investigates the impact of working capital management on the performance of non-financial institutions in Pakistan which are listed at KSE. They use canonical correlation analysis and find that firms can increase return on asset and value of shareholders by managing working capital properly (i.e. decreasing inventory, CCC etc).

A limited work has been done on the issue of financing constraints and a firm's investment in Pakistan. Muhammad and Shah (2011) conducted a study to investigate the impact of internal and external financial constraints on business investment. They took of 9 major industrial sectors of Pakistan and firms are listed at KSE. By applying regression analysis, they took investment as a dependent variable and regress it on 4 independent variables firm size, firm age, and dividend payout ratio. They found that firm size has a significant positive impact on firm's investment which means that the firms who are larger in size they are able to make higher investment as compared to smaller firms While firm's age and dividend payout ratio have a negative impact on firm's investment. As we know that when firms pay higher dividend they have lesser amount to invest and as firms grow older they decreases the level of fixed investment as compared to earlier years.

According to Ahmed and Hamid (2011), the growth of firms in Pakistan is bound through access to finance. They used instrumental variable approach to determine the impact of external financial constraints on the firm's growth. For this easy access, a better infrastructure is needed to access external finance. Their findings suggest that some external factors such as firm size human capital management and export status are important determinants of external financial access.

CHAPTER 3

DATA AND METHODOLOGY

3.1 Data and Sample Description

To examine the impact of working capital management on the investment-cash flow sensitivity in Pakistan we construct an unbalanced panel dataset from all manufacturing firms listed at KSE. The study covers the time period from 2001 to 2013. The firm-specific data have been taken from the "Financial Statement Analysis of Companies (non-financial) published by State Bank of Pakistan. The sample size consists of about 450 firms.

3.2 Variables

The main objective of our study is to explore the sensitivity of investment in fixed capital and working capital to cash flow. Furthermore, our study determines the role of working capital management in order to smooth the impact of cash flow shocks on fixed capital investment. As we follow the study of Ding et al. (2013) therefore we use same variables related firm's investment, working capital, and fixed capital. The definitions of underlying variables are given below

Table 3.1: Variables Definitions and Expected Signs

Variable Name	Abbreviations	Expected Signs	Definitions
Dependent Variables:			
Fixed investment	$(I/K)_{it}$		Book value of tangible asset in current period - book value of tangible asset in previous period + depreciation of current period. While book value of tangible asset is total assets - intangible assets- liabilities.
Working capital investment	$(IW/K)_{it}$		Working capital investment is defined as the difference between working capital stock in current period and working capital stock in previous period.
Independent Variables			
Lag of fixed investment	$(I/K)_{it-1}$	+ve	The previous year fixed investment.
Lag of working capital investment	$(IWK/K)_{it-1}$	-ve	The previous year working capital investment.
Cash flow	(CF/K)	+ve	Cash flow is defined as the ratio of Net income plus depreciation of the year to total assets.
Control Variables:			
Tangibility	Tang	+ve	The ratio of plant, property and equipment to total assets.

Leverage	Lev	+ve	Leverage is the ratio of current and non-current liabilities to total assets.
Sales Growth	SG	+ve	The difference between the natural log of sales in current and previous year is a measure of sales growth.
Firm Size	LTA	+ve	Natural log of total assets.
Inventories	Inv	+ve /-ve	Inventory is the raw material, work in process goods or finished goods that are ready for sale.
Working capital stock	WCS	+ve	Working capital stock is the difference between current assets and current liabilities.
Financial working capital	FWK	-ve	Financial working capital is defined as the working capital stock net of inventories.

3.3 Empirical Models

In order to examine the association between investment cash flow sensitivity and working capital management, we estimate four different models for manufacturing firms by following Ding et al. (2013) and Fazzari and Petersen (1993).

3.3.1 Empirical Model for Fixed Investment-Cash flow Sensitivity

The first model estimates the impact of internally generated cash flow on a firm's fixed investment. The center of attention of our study is to see the impact of internally generated cash flow on the firm's fixed investment. We analyze whether cash flow fluctuation has a significant impact on firm's investment or not. The model also includes lagged dependent variable (first lag

of fixed investment to capital stock) in order to examine the impact of previous year investment on current investment. The model inaugurates different control variables like firm size, tangibility, leverage and growth because these variables may affect dependent variable directly or through independent variables.

$$\left(I/K\right)_{it} = \alpha_0 + \alpha_1\left(I/K\right)_{it-1} + \alpha_2\left(\mathrm{CF}/\mathrm{K}\right)_{it} + X_{it}\beta + \upsilon_i + \upsilon_t + \varepsilon_{it} \qquad (1)$$

$\left(I/K\right)_{it}$ represent the ratio of fixed investment to capital stock for current period and $\left(I/K\right)_{it-1}$ represents the lagged value of fixed investment to fixed capital stock . Where *i* and *t* denotes firms and years respectively, *I* represent plant and equipment investment for firm, *K* represents beginning of period's capital stock and *CF* represents cash flow (Fazzari and Petersen (1993)).

X_{it} is a vector of firm-specific control variables including firm size, sales growth, leverage, and tangibility. α_0 shows the value of fixed investment to capital stock when cash flow to capital stock is zero. α_1 and α_2 are the coefficients of independent variables.

υ_i = Firm-specific time-invariant component, υ_t= time-specific factor for possible business cycle effect, ε_{it} = error term

3.3.2 Empirical Model for Sensitivity in Working Capital Investment to Cash flow

The second model which we estimate includes working capital investment as a function of internally generated cash flow. We analyze whether cash flow fluctuation has a significant impact on firm's working capital investment as well or not. The model also includes lagged dependent variable (first lag of working capital investment to capital stock) in order to see the impact of previous year working capital investment on current investment. The model

inaugurates different control variables like firm size, tangibility, leverage and growth because these variables may affect dependent variable directly or through independent variables.

$$\left(\mathrm{IWK}/\mathrm{K}\right)_{it} = \beta_0 + \beta_1\left(\mathrm{IWK}/\mathrm{K}\right)_{it-1} + \beta_2\left(\mathrm{CF}/\mathrm{K}\right)_{it} + X_{it}\beta + \upsilon_i + \upsilon_t + \varepsilon_{it} \qquad (2)$$

$\left(\mathrm{IWK}/\mathrm{K}\right)_{it}$ shows investment in working capital to capital stock in current period. Where IWK_{it} is a firm's investment in working capital, $\left(\mathrm{IWK}/\mathrm{K}\right)_{it-1}$ shows 1st lag of working capital investment to capital stock and CF = cash flow,

As firms have an advantage, they adjust working capital with lower cost as compared to fixed capital (Ding et al. (2013) and Fazzari and Petersen (1993)). To check the validity of this statement we further estimate our second equation. As we are interested to get the high ratio of working capital investment and cash flow, hence the β_2 coefficient should be larger than α_2. If we get large value of β_2 then we can say that firms are able to offset the negative shocks of cash flow on fixed capital by decreasing the working capital stock.

3.3.3 Empirical Models for Investment-Cash Flow Sensitivity with Different Levels of Working Capital

To support our third hypothesis, we estimate equation (3) and (4) presented below. Adjustment in cash flow relies on working capital amount that a firm may hold. If level of working capital is high, the impact of cash flow on investment is high for those firms and hence they are able to smooth out the shocks of cash flow on fixed investment through changing the amount of working capital (Carpenter et al. (1994)). To check this, we generate two sets of

dummies[6] that allow us to separate the firm's utilizing low level of working capital to firm's utilizing high level of working capital. We enter a low working capital (LWK)[7] dummy (D_i^{LWK}) which is equals to '1', if ratio between working capital and fixed capital is negative and '0' otherwise.

$$\left(I/K\right)_{it} = \delta_0 + \delta_1\left(I/K\right)_{it-1} \times D_{it}^{LWK} + \delta_2\left(I/K\right)_{it-1} \times D_{it}^{HWK} + \delta_3\left(CF/K\right)_{it} \times D_{it}^{LWK} + \delta_4\left(CF/K\right)_{it} \times D_{it}^{HWK} + X_{it}\beta + \upsilon_i + \upsilon_t + \varepsilon_{it} \quad (3)$$

Then we enter a high working capital (HWK)[8] dummy (D_i^{HWK}) equals to '1', if ratio between working capital and fixed capital is positive and '0' otherwise.

$$\left(WK/K\right)_{it} = \gamma_0 + \gamma_1\left(WK/K\right)_{it-1} \times D_{it}^{LWK} + \gamma_2\left(WK/K\right)_{it-1} \times D_{it}^{HWK} + \gamma_3\left(CF/K\right)_{it} \times D_{it}^{LWK} + \gamma_4\left(CF/K\right)_{it} \times D_{it}^{HWK} + X_{it}\beta + \upsilon_i + \upsilon_t + \varepsilon_{it} \quad (4)$$

In equation (3) δ_3 should be greater than δ_4 while in equation (4) γ_4 should be greater than γ_3 only then we can conclude that negative cash flow shocks could be eliminated through adjustment in working capital.

3.4 Dependent Variables

3.4.1 Fixed Investment

Fixed investment refers to the investment in physical assets i.e. land, building, machinery, technology, and installation. Investment decisions are prepared by managers and investors. Investment decisions are influenced by market information and factors. In conventional financial

[6] We prefer the framework of interacting the both dummies with the variable of interest. Because this approach enable us to make direct comparison of the marginal impact of the variable of interest on investment in fixed capital and investment in working capital of firms having high and low working capital. This approach is very common in the literature these days (Ding et al. (2013)).

[7] LWK show the lower level of working capital. Which means that firm's liquidity level is low hence it may not smooth out the impact of cash flow shock on investment.

[8] HWK show the greater level of working capital. Which represent the stronger level of liquidity and firm is able to offset the negative impact of cash flow on investment.

theory, a firm's manager assumed to be rational and will choose optimal level of investment considering risk-return pattern (Jagongo and Mutswenje (2014)).

In our study, we measure fixed investment following the method used by Ding et al. (2013), as difference between the book value of tangible fixed asset in current and prior period and adding up depreciation of current period. Investment in fixed capital shows maintenance and acquisition of long term assets. Real investment may depend on financial factors. There are two types of finances through which we can finance investment i) internal financing, ii) external financing. External financing is more costly than internal financing due to cost associated with external financing, hence investment is being sensitive to internally generated funds (Gertler (1988)).

3.4.2 Investment in Working Capital

Investment in working capital shows obtaining short term assets and liabilities i.e. current assets and current liabilities. Sustaining optimal level of working capital is very important for profitability and growth of a firm and hence managers put their efforts to attain this level. Following Ding et al. (2013) and Fazzari and Petersen (1993) we define working capital as the difference between a firm's current assets (cash, inventories, account receivables) and current liabilities (short term debt and payables).

The objective of management is to administer current assets and current liabilities most advantageous that level of working capital should sustain. The problem of insolvency arises when this level is not satisfactory. Hence running everyday business activities, importance of working capital is not denied. Working capital management is commonly used to measure liquidity of firm. According to Pindyck (1991), the basic difference between fixed capital investment and working capital investment is liquidity and reversibility of latter.

3.5 Explanatory Variables

3.5.1 Lag of Fixed Investment

In alignment with prior literature (Carreira and Silva (2010), Kalatzis et al. (2011), and Ding et al. (2013)) prior investment is also an important determination of present investment. The previous year investment is calculated the same with the present investment. We measure it as the difference between beginning and end of year tangible fixed assets by adding up the depreciation of same year, the period vary one year and calculation remains same.

The study of Eberly et al. (2012) investigates that whether past investment is a good measure of current investment or not. For this purpose they take into account two more predictors of investment that are Tobin's Q and cash flow and they found that lagged investment is an important driver of current investment. Their findings are consistent with the survey of Bloom et al. (2012). The authors found that, when senior management decides investment budget of plant managers, they set this budget equal to the previous year budget and then plant manager argue for changes.

3.5.2 Lag of Working Capital Investment

The change in working capital does not mean the difference. Change in working capital is a cash flow item and represent how changes in working capital bring changes in cash flow. As working capital is the difference between current assets and current liabilities, change in the value of these two items also change the level of cash flow. If current asset is increasing it shows cash is being used while increase in current liabilities shows that less cash is being used by firm and firm is extending its payment.

When the final value of change in working capital is negative, it shows that change in current assets has increased higher than current liabilities. This represent that firm needs more capital to grow and working capital is actually increasing. If changes in working capital are positive, it shows that change in current liabilities has increased higher than current assets. Positive working capital depict that firm can grow with less capital because of delayed payments.

3.5.3 Cash Flow

To see the investment-cash flow sensitivity we take the sum of net profit before tax and depreciation for the year. The resulting value shows the efficiency of a firm's management to use internal funds in order to finance their investment projects. Jordan et al. (2011) used the following definition of internally generated cash flow: *'Internal finance simply refers to what the firm earns and subsequently plows back into the business, such as retained earnings or depreciation.'* This cash is generated by the business itself. Empirical literature focuses on the importance of internally generated funds as a source of financing in the presence of financing constraints or cost associated with external finance (Fazzari et al. (1988), Almeida and Campello (2002), and Lopez and Sogorb (2014)).

According to Frank and Goyal (2003), firms who are experiencing high profitability prefer their externally generated funds (cash flow) and less rely on external financing (debt and equity financing). Financially constrained firm rely mainly on their internally generated funds leading to a positive relationship between investment and cash flow (Bond et al. (2003)).

3.6 Control Variables

Control variables are used to exclude idiosyncratic factors, other than the factors which are tested, which may influence the independent or dependent variables and hence, indirectly the

relationship between internal finance and investment (De Veaux et al. (2008)). Babbie (2007) define the control variable as: 'A *variable that is held constant in an attempt to clarify further the relationship between other variables.*' In order to robust and control the biasness of results it is necessary to include control variables. In association with prior studies Ding et al. (2013) and Fazzari and Petersen (1993) different control variables are used in this research. The control variables are tangibility, leverage, firm size, sales growth, inventories, and financial working capital.

3.6.1 Tangibility

$TANG_{i,t}$ shows assets tangibility of a firm in current year. The ratio of plant, property and equipment (tangible assets) to total assets is used as a measure of tangibility. The study of Almeida and Campello (2007) shows the importance of tangibility for the decisions of financially constrained firms. According to them, tangible assets support a firm's borrowing because these are used as collateral to get credit and boost future investment. Tangibility reduces the chances of default and it is an important aid to obtain external finance (Harc (2015)).

The pecking order theory also suggests that asset tangibility has a negative impact on capital structure and decrease the cost of issuing equity. Hence firm's lower their reliance on debt financing and move towards equity financing. Another hypothesis is that tangible assets are negatively related to leverage which indicates that that firms that utilize higher level of tangible assets seem to rely more on internal funds generated from these assets, which is also predicted by the pecking order theory.

3.6.2 Leverage

A firm requires finance to meet its short term as well as long term financial requirements. There are several options for the firm to finance these funds, it may be obtain through debt financing (leverage) or equity financing. The perspective of investor's, the lenders and the firm is to utilize optimal level of different types of financing (Demarzo and Fishman (2007). Leverage ratio shows the use of borrowed money to boost production, sales, and earnings. It measures financial position of the firm and indicate how much debt is needed to meet financial obligations of the firm. It is calculated as the ratio of total debt to total assets. The higher value of this ratio indicates that firm is over levered and has to pay higher level of interest which negatively affects the firm's earnings.

In our study, we use leverage as a control variable because it may affect the sensitivity of investment-cash flow to some extent. Empirical literature shows the relationship between investment, leverage and agency problem. Agency problem arises when managers of a firm overinvest to increase their personal benefits and compensation (Lang et al. (1996)). According to Aivazian et al. (2005), leverage is negatively related to investment and the effect of this negative relation is higher on firms with low growth opportunities as compared to high growth opportunities. There are many studies that relate leverage and investment but reach contradictory conclusions. The study of Whited (1992) indicates that the investment-cash flow sensitivity is higher for the firms with high leverage and low levered firms are less sensitive.

3.6.3 Firm Size

In corporate finance, firm size is frequently used as an important, fundamental firm characteristic. There are different measures of firm size which are empirically used by different

authors. Soumaya (2012) uses market capitalization as a measure of firm size (Number of outstanding shares*Share Price), while Dang and Li (2015) explore three different measures to investigate firm size which include total assets, total sales, and market value of equity.

The natural log of assets in a year is used as a measure of firm size in our study. Empirical literature shows the impact of firm size in investment-cash flow sensitivity. According to Vogt (1994) and Kadapakkam et al. (1998), the investment cash flow sensitivity is higher for larger scale firms as compared to small size firms. But the study of Devereux and Schiantarelli (1989) depict the contradictory results. According to their findings, the sensitivity of investment to cash flow decreses as firm size increases because their results suggest this conclusion.

Firm size has been use an indicator of firm's access to external finance. Small firms face higher level of firm-specific risk, low level of collateral and are generally younger, are not able to attract external finance and hence financially constrained (Gertler and Gilchrist (1994)). However, the all evidences are not in the same direction. The study of Fazzari et al. (1988) indicates that after splitting their data into small and large scale firms, small scale firms exhibit low coefficient of cash flow. The seminal work of Hu and Schiantarelli (1998) also support their results and conclude that large size firms are more financially constrained.

3.6.4 Sales Growth

Sales growth indicates the rate of increase a firm may earn on sales per share, and it is considered the best measure of how rapidly a firm's business is growing. According to Baumol (1959), the main goal of corporate sector managers is to exploit revenue and a continuous increment in sales even at the cost of low profit. He stated that it is the behavior of oligopolists

that they have their unique price policy through which they can increase their sale and minimum adequate level of profit.

Following the study of Ding et al. (2013), we use the difference between the natural log of sales in current year and previous year (LSt - LSt-1) is a measure of sales growth in our study as well. According to Fazzari and Petersen (1993), sales growth reduces the quantitative effect of cash flow and working capital. The impact of sales growth on cash flow is two ways, i) growth effect and ii) effect on management decisions to handle sales. The management optimizes sales revenue through better credit terms or through changes within the promotion and marketing function and it will further have a great impact on cash flow.

3.6.5 Inventories

A wholesaler, distributor or a merchandiser purchases inventory in order to sell it in the future to the customers. Inventory reported as a current asset in balance sheet. Excess level of inventory brings cash flow problems, additional expenses and losses if items expired. Less inventories cause lost sales and lost customers. Hence, a balance level of inventory is important for a firm growth.

Capital market imperfection is the reason due to which internally generated funds or firm's cash flow fluctuates, which ultimately affect all components of investment. However, inventories should be especially sensitive to such imperfections. During a negative cash flow shock, financially constrained firms will reduce their accumulation of assets based on their liquidity and adjustment cost. As inventory investment has the low adjustment cost, its decline from total investment is larger relative to other uses of funds (i.e. fixed investment). The presence of financing constraints induces a positive relation between inventory investment and internally generated funds (Petersen and Rajan (1997)).

3.7 Estimation Method

To examine the investment-cash flow sensitivity, there are several estimation methods have been used in the literature. Fazzari et al. (1988), Bond and Meghir (1994) and Cleary (2006) used OLS regression analysis and estimate the Q model of investment. While Ağca and Mozumdar (2008) and Ding et al. (2013) used first difference GMM estimator proposed by Arellano and Bond (1991) to tackle the problems related measurement error. By this approach, the model is transform into first difference and lagged levels are used. Although, the difference GMM estimator is superior from other estimators but it suffers poor finite sample properties when the series are persistent and instruments are weak predictors of endogenous changes.

To overcome this problem, the Arellano and Bover (1995) and Blundell and Bond (1998) expand the difference GMM by making an addition assumption that the first difference of instruments has no correlation with the fixed effects. This augmented model known as the two step system dynamic panel data estimator generalized method of moments (system GMM) approach. This approach used lagged differences of the dependent variable as instrument for equations in level, in addition to lagged level as instrument for equation in first differences.

In our study, we employ two step system GMM approach to estimate the empirical models. Our model has a dynamic nature because we use lagged dependent variable in our model as independent variable. This estimator (system GMM) is designed for the situation in which large number of individual and small number of time period lies (Large N and small T), heteroskedasticity and autocorrelation within individual, independent variables having endogenous nature and fixed individual effects (Roodman (2009)).

This methodology permits researchers to make use of different instruments with different lag structure for both the levels and the first-differenced equations. The system GMM method

eliminates the time-invariant unobservable firm-specific effects by taking the first difference of each underlying variable effectively controlling for the correlation between the regressors and the residuals and mitigates the problem of endoginiety.[9]

3.8 Estimation Procedure

In order to estimate our empirical models discussed in previous section, we use two step system GMM approach developed by Blundell and Bond (1998). The estimation procedure we undertake combines two types of equations known as level equation and difference equation and by using the lagged independent variables as instruments we manage the problem of endoginiety. Validity of these instruments is tested through J-statistic of Hansen (1982). The estimation results produced from J test indicates that instruments that are used in the model are appropriate and satisfactory. In order to check the serial correlation in error term we employed the test of Arellano-Bond AR (2).

[9] The problem of endoginiety occurs when the independent variable is correlated with the error term. It can arise as a result of measurement errors, auto regression, autocorrelation, and omitted variables.

CHAPTER 4

EMPIRICAL RESULTS

This chapter presents the empirical findings of the analysis and interpretation of results. First of all we present the summary statistics of firm-specific variables. The next part of this chapter shows the results of system GMM estimator of our four models. As these results depict only single investment in fixed capital and working capital to cash flow results and data is heterogeneous. To deal this problem we analyze different combinations of fixed and working capital investment. For this purpose we show the results of firm-level sensitivities to identify the characteristics of firms with high and low fixed investment-cash flow sensitivity (FKS) and firm with high and low working capital investment-cash flow sensitivity (WKS). Further we also estimate the different combinations of high FKS/WKS and low FKS/WKS.

4.1 Summary Statistics

Summary statistics are presented in Table 4.1 to discuss the most relevant information of the data we are analyzing. These statistics give us the proper economic understanding and the meaning of the estimated parameters of the regression analysis and at the same time it helps to explain internal consistency of whole data set. Table 4.1 specifically presents the mean, standard deviation and median for the variables which are included in this model. These variables are grouped in two panels: (i) Panel A and (ii) Panel B. Variables in Panel A are further categorized as (a) general firms characteristics and (b) financial variables. General firm characteristics includes fixed investment/fixed capital stock, assets and sales growth. Financial variables includes cash flow/fixed capital, leverage, tangibility and inventories/sales. Variables in Panel B

are further categorized as (a) working capital related variables and (b) indicators of efficient working capital management.

Working capital related variables are working capital investment to fixed capital, working capital to fixed capital stock, working capital, inventories to fixed capital and financial working capital to fixed capital stock. Indicators of working capital management efficiency are ITO ratio i.e. cost of goods sold to inventories, DSO ratio i.e. (account receivable to sales)*365 and DSI ratio i.e. (inventories to cost of goods sold)*365. Mean is basically the simple average and is a measure of the central tendency which usually point out the mid or central value of the variables under observation. Standard deviation calculates the variation or spread of the specific variable and helps in explaining that how far is the variable from its mean or actual value. Median is basically the center/middle value of the data under observation.

Table 4.1: Descriptive Statistics

	Mean	Std. Dev	Median	Min.	Max.
Panel A					
General firm characteristics					
Fixed investment/fixed capital stock (I/K)	0.06	2.11	0.04	-106.13	93.64
Assets	6890.24	23191.42	1244.30	10.20	414011
Sales growth (SG)	0.06	0.83	0.08	-12.27	12.45
Financial variables					
Cash flow/fixed capital (CF/K)	1.54	22.06	0.11	-151.5	766.1
Leverage	0.70	0.50	0.64	0.14	9.81
Tangibility	1.15	0.30	1.11	1	19.32

Inventories/Sales (I/S)	0.38	6.17	0.10	0	285.54
Panel B					
Working capital related variables					
Working capital investment/fixed capital (WI/K)	0.94	54.50	0	-614.08	2605
Working capital/fixed capital stock (W/K)	1.35	1.73	1.01	0	42.32
Working capital (W)	7.52	176.94	1.28	0	11563
Inventories/fixed capital stock (Inv/K)	9484.37	470610.70	141.76	0	3.28e+07
Financial working capital/fixed capital stock (FWK/K)	-9476.85	470445.80	-139.30	-3.28e+07	2728.4
Indicators of efficient working capital management					
ITO ratio: Cost of goods sold/inventories	24.79	247.47	5.34	-0.0009	12518
DSO ratio: (Account receivable/sales)*365	43.37	352.51	1.59	0	129093
DSI ratio: (Inventories/cost of goods sold)*365	95.1539	19091.77	44.09	-422205	1227840
Observations	4885	4885	4885	4885	4885

The mean value of the fixed investment to capital stock (I/K) is 0.057 and median is 0.041, which shows that observation of fixed investment to fixed capital stock are positively skewed because mean value is greater than median. Similarly, investment in working capital to fixed capital stock (IW/K) is also positively skewed as mean value of working capital investment is 0.94 while median is 0. The standard deviation of I/K is 2.10 while for IW/K is 54.49, which shows that IW/K is more volatile than I/K. Firm size is measured by natural log of sales, where its mean is 0.058 and median is 0.07 indicating firm size is negatively skewed. Cash flow to capital stock has a mean value of 1.53 and standard deviation of 22.06 which shows that the

internal generated funds are highly volatile. The mean value of leverage and inventory to sales and tangibility is 0.70, 0.37, 1.15 and median is 0.64, 0.10, 1.1 respectively indicating that leverage, inventory to sales and tangibility is also positively skewed.

In Panel B the results of working capital related variables and indicators of cfficient working capital management will be elaborated further. We analyze high average investment in working capital to fixed capital ratio which is 94.4%. Moreover, the other two ratios of working capital stock exceed 100%. Correspondingly, the ratio of financial working capital and fixed capital is negative but exceeds 100% in absolute value. These high fractions signify that working capital is employ as a financing source by firms during high volatility shocks of cash flow. Furthermore, the ratio of inventories to fixed capital exhibit high average value of 94.84%.

When the firms experience higher percentage of inventories it shows that most of the money tied up in inventory and customer cannot pay off any of their obligations. These results indicate that firms manage working capital inefficiently. To answer this question we employ the results of three indicators of efficient working capital management ITO, DSO, and DSI.

ITO is the first indicator of efficient management of working capital that we examine. This ratio indicates the conversion of inventory into sales in a whole year. If the value of ITO is high it shows that not too much products are left idle in store. In our sample the value of ITO is 5.35 which show approximately 6 time a firm's inventories converted into sale process which shows good management of inventory by the firms.

Second measure of working capital efficiency is DSO (Days sales outstanding ratio). This ratio shows that how many days a firm needed to collect its payment. The value of this ratio should be lower because higher ratio indicates poor management of working capital because

it takes longer time to collect payment. The median value of DSO is 2 days which shows that it takes only two days to collect payment after making sales. The smaller value indicates tight policy by management to customer.

4.2 The Impact of Cash Flow on Firm's Investment

In this section, we discuss different model test carried out to evaluate the impact of cash flow on firm's investment. In order to examine how cash flow impact on a firm's investment decisions, we use two different measures of investment namely, fixed capital investment and working capital investment. Both these models are amplified with industry-specific time dummies. For robustness of our results we differentiate firms on the basis of the level of their working capital. In Table 4.4 and 4.5, we investigate how low or high ratio of working capital to fixed capital has an effect on the investment-cash flow sensitivity of working capital and fixed capital.

While estimating the impact of cash flow on a firm's investment decisions, we also use several firm-specific control variables which have a significant impact on the sensitivity of investment to cash flow. We employ tangibility, leverage, firm size, sales growth for fixed investment model and working capital stock, inventory to fixed capital stock and financial working capital for working capital investment model. Previous analysis provides single coefficient for fixed investment and working capital investment to cash flow.

Finally, to avoid problem of heterogeneity, we employ the methodology of Hovakimian and Hovakimian (2009) in order to analyze the sensitivity of investment in fixed and working capital to cash flow. First, we utilize these sensitivities to recognize the firm's characteristics with low and high fixed investment-cash flow sensitivity (FKS), and with low and high

working capital investment-cash flow sensitivity (WKS). Secondly, we identify a firm's characteristics by employing multiple combinations of FKS and WKS. The purpose of this exercise is to examine the adequacy of these measures for financing constraint and to investigate that how firms manage their level of working capital during cash flow shocks in order to alleviate the adverse effect of financing constraints on fixed investment.

4.2.1 Results for Fixed Investment

To examine the cash flow impact on a firm's fixed investment, we estimate equation (3.1) which is presented in previous chapter and the results are shown in Table 4.2. Before we examine the impact of cash flow on investment, we observe the role of lagged dependent variable and other firm- specific control variables on investment. The value of lagged investment is significant and has a positive sign. The value of lagged investment shows that if firm has 100% of previous year investment they are able to invest 26 percent in current year from their stock.

According to our expectations, the coefficients of all other firm- specific control variables are positive and significant. The positive sign of tangibility indicates that level of fixed investment increases as firm has more tangible assets. The tangibility coefficient indicates that an additional unit of tangible assets tends to increase investment by 1.90 units. The study of Almeida and Campello (2007) shows the importance of tangibility for the decisions of financially constrained firms. According to them, tangible assets support a firm's borrowing because these are used as collateral to get credit and boost future investment. Tangibility reduces the chances of default and it is an important aid to obtain external finance. The positive sign of leverage indicates that firm utilizing credit facility in order to boost investment. The study of Whited (1992) indicates

that the investment-cash flow sensitivity is higher for the firms with high leverage, whereas, low levered firms are less sensitive.

Firm size which is measured by total assets in our study and sales growth also exhibit significant and positive impact on investment. Firm size has been used as an indicator of firm's access to external finance. Small firms face higher level of firm-specific risk, low level of collateral and are generally younger, are not able to attract external finance and hence financially constrained (Gertler and Gilchrist (1994)). While according to Fazzari and Petersen (1993), sales growth reduces the quantitative effect of cash flow and working capital. The impact of sales growth on cash flow is two ways, i) growth effect and ii) effect on management decisions to handle sales. The inventory to sales ratio indicates the external liquidity needs and is positive and significant in our sample. Overall, our key findings regarding firm-specific control variables are according to the literature.

Now we move to inspect the impact of cash flow on a firm's investment decisions and result shows that all firms display positive and precisely determined coefficient of cash flow. Our result indicates that if cash flow changes by 1 unit we have expected investment to change by 0.027. In Pannel B, the Arrelano-Bond AR (2) test does not provide any significant evidence of the rejection of the null hypothesis, i.e. Ho: No 2^{nd} order serial correlation. This shows that the model specification is valid. The Hansen test is applied to ensure the validity of the instruments used in the robust two-step system GMM estimators. The estimated value of Hansen test (0.131) also does not provide any evidence in favor of rejecting the null hypothesis and indicates that the instruments used in the model are valid. Thus, we can say that our instruments are appropriate and robust. These tests also explain that the residuals are free from the problem of 2^{nd} order serial correlation.

Table 4.2: Estimation Results for the Impact of Cash flow on Fixed Investment Model

Panel A: Estimation Results		
Variables	**Coef.**	**Std.**
Lag (fixed investment/fixed capital stock)	0.261 ***	0.0003
Cash flow/fixed capital stock	0.027***	2.13E-05
Tangibility	1.970***	0.004
Leverage	0.104***	0.002
Total assets	0.002***	3.76E-05
Sales growth	0.004***	6.26E-05
Inventories/sales	0.056***	0.002
Constant	-2.056***	0.007
Panel B: Diagnostic Tests		
Firm – Years		2808
Firms		341
AR (2)		-0.95
p-value		0.341
J-statistics		307.76
p-value		0.131

Note: *** denotes statistically significant at the 1% level of significance.

4.2.2 Results for Working Capital Investment

We then estimate equation (3.2) in order to examine the relationship between cash flow and working capital investment and report the results in Table 4.3. First of all we examine the role of lag dependent variable and then proceed further. The previous year stock of working capital investment has an impact on current period investment which ultimately refers to how the cash

flow changed based on the working capital changes. The changes in working capital items depict the cash flow fluctuations. When current assets are increasing, cash is being used but when current liabilities are increasing, less cash is being used.

If changes in working capital show a negative value it means increase in the value of current assets is higher than the increase in current liabilities and company needs more capital to grow, this shows the actual increase in working capital. If changes in working capital are positive the increase of current liabilities is more than the increase in current assets and company grow less capital because of payment delay, working capital actually decreasing. In our case of value of lag working capital is significant and has a negative sign (-0.7) which shows that if previous year stock of working capital increases by 100% it may increase the current year investment by 70%.

The cash flow coefficient has a significant positive value which shows a positive relationship between investment in working capital and cash flow. The 1 unit increase in cash flow brings 0.067 unit increase in working capital investment. This value also proves that firms are financially constrained and rely on their internally generated funds as compared to external funding. Another important finding is that the cash flow coefficient of working capital investment model is higher (has the value 0.067 approximately) than the cash flow coefficient of fixed capital investment is 0.027 approximately) this shows the lower adjustment cost of working capital than of fixed capital.

All other firm-specific control variables have significant values and also have expected signs. We observe a positive significant value of working capital to fixed capital ratio. This shows that current assets are more than current liabilities and firms are managing working capital efficiently. An additional unit of working capital stock brings 0.037 units increment in the level of investment. The results also support the analysis that firms are able to adjust cash flow distress on fixed investment by utilizing optimal level of working (Ding et al. (2013)).

As presented in the previous model, Panel B of Table 4.3 also shows that the value of Arelleno-Bond AR (2) test fails to reject the null hypothesis, and prove that the model specification is valid. The Hansen test value (0.087) also does not show the significant evidence to reject the null hypothesis and indicates that the instruments used in the model are appropriate and our results are robust. It also explains that the problem of 2nd order serial correlation is not present in the residuals.

Table 4.3: Results for Impact of Cash flow on Working Capital Investment Model

Panel A: Estimation results		
	Coef.	**Std. Err.**
Lag of working capital investment/fixed capital stock	-0.909***	0.001
Cash flow/fixed capital stock	0.067***	0.004
Working capital stock/fixed capital stock	0.037***	0.001
Inventory/fixed capital stock	-0.020***	0.002
Constant	-0.260***	0.100
Panel B: Diagnostic tests		
Firm – Years		3809
Firms		356
AR (2)		-1.00
p-value		0.316
J-statistics		27.84
p-value		0.087

Note: * denotes statistically significant at the 1% level of significance.**

4.2.3 Results for Fixed Investment Model Differentiating on the Level of Working Capital

In Table 4.4 and Table 4.5, we examine the impact of high or low/positive or negative ratio of working capital to fixed capital on investment-cash flow sensitivity. Table 4.4 indicates that sensitivity of fixed capital investment to cash flow is higher for the firms who have low level of working capital. The coefficient of cash flow for low and high working capital is 0.003 and -0.013 respectively. We obtain similar results when firms were divided into negative and positive working capital in Table 4.5. The coefficient of cash flow for negative working capital is higher as compared to positive working capital. Firms with lower level of working capital have greater marginal value and during adverse cash flow shock they are unable to adjust their fixed investment.

The results suggest that firms those have positive and high value of working capital show that the sensitivity of investment to cash flow is much lower than firms with low/negative working capital. In summary, the firms operating under negative and low level of working capital fail to manage their working capital investment during financial distress and ultimately they are forced to make adjustment in fixed capital investment. The consistency of our methodology depends significantly on the strength of the used instruments which we assess by the Sargan-Hansen J-test of over identifying restrictions. This approach is quite elastic and allows the researcher to make use of different instruments with different lag structure. The estimates from the J-test are reported in Table 4.4. The estimated value of J-test reported in Panel B of Table 4.4 and 4.5 is 0.508 and 0.523 respectively which shows that instruments used in the GMM estimations are suitable and satisfy the conditions of orthogonality. We have used different instrument while estimating our models. All other firm-specific control variables have significant and positive values as expected.

Table 4.4: Estimates for Fixed Investment Model: Differentiating Firms on the Level of Working Capital

Panel A: Estimation results

	Coef.	Std. Err.
(Lag of fixed investment/fixed capital stock) x D^{LWK}	0.134***	0
(Lag of fixed investment/fixed capital stock) x D^{HWK}	0.51***	6.38E-05
(Cash flow/fixed capital stock) x D^{LWK}	0.003***	2.18E-06
(Cash flow/fixed capital stock) x D^{HWK}	-0.013***	4.09E-05
Tangibility	0.074***	4.71E-05
Leverage	0.032***	6.19E-05
Total assets	0.006***	4.87E-05
Sales growth	0.002***	2.74E-06
Constant	-0.068***	7.56E-05

Panel B: Diagnostic tests

Firm – Years	3532
Firms	355
AR (2)	-1.05
p-value	0.294
J-statistics	351.83
p-value	0.508

Notes: *** denotes statistically significant at the 1% level of significance.

Table 4.5: Estimation results for Fixed Investment Model: Differentiating Firms on the Level of Working Capital

	Coef.	Std. Err.
Panel A: Estimation results		
(Lag of fixed investment/fixed capital stock)x D^{NEGWK}	0.08***	0
(Lag of fixed investment/fixed capital stock)x D^{POSWK}	0.35***	0.00048
(Cash flow/fixed capital stock)x D^{NEGWK}	0.0996***	1.45E-04
(Cash flow/fixed capital stock)x D^{POSWK}	0.048***	1.64E-05
Tangibility	0.065***	3.67E-05
Leverage	0.034***	2.54E-05
Total assets	0.003***	4.17E-05
Sales growth	0.002***	2.98E-06
Constant	-0.06***	4.39E-05
Panel B: Diagnostic tests		
Firm – Years		3532
Firms		355
AR (2)		-1.23
p-value		0.218
J-statistics		350.82
p-value		0.523

Notes: *** denotes statistically significant at the 1% level of significance.

4.2.4 Results for Working Capital Investment Differentiating on the Level of Working Capital (High/Low)

In Table 4.6, we now examine the impact of high/low ratio of working capital to fixed capital on cash flow sensitivity of working capital investment. Column 1 of Table 4.6 exhibits the fact that this sensitivity is higher for the firms who have high working capital as compared to those with low working capital. The coefficient of cash flow for low working capital has a negative value (-0.036) while for high working capital the value is positive (0.191) as well as significant (at 1% level of significance). The findings suggest that during a negative cash flow shock, only the firms operating under high level of working capital may experienced adjustment in working capital investment. As these firms have low marginal value they can easily offset a negative cash flow shock (Carpenter et al. (1994) and Ding et al. (2013)).

The p-value associated with Hansen J-statistic test (0.619) in table 4.6 indicates that the instruments used in two-step system-GMM estimations are suitable and fulfills the orthogonality conditions. The Arellano-Bond AR (2) test does not give us any proof for the existence of second-under serial correlation in the residuals. This shows that the instruments that we used in our estimation are suitable.

Table 4.6: Estimates for Working Capital Investment Model: Differentiating Firms on the Level of Working Capital

	Coef.	Std. Err.
Panel A: Estimation results		
(Lag of working capital investment/fixed capital stock)x D^{LWK}	0.655***	0.060
(Lag of working capital investment/fixed capital stock)x D^{HWK}	0.365***	0.030
(Cash flow/fixed capital stock)x D^{LWK}	-0.036***	0.011
(Cash flow/fixed capital stock)x D^{HWK}	0.191***	0.025
Working capital stock/fixed capital stock	0.044***	0.005
Inventory/fixed capital stock	-0.019***	0.002
Constant	-0.072***	0.008
Panel B: Diagnostic tests		
Firm – Years		4864
Firms		357
AR (2)		1.11
p-value		0.266
J-statistics		40.58
p-value		0.619

Notes: * denotes statistically significant at the 1% level of significance.**

4.2.5 Results for Working Capital Investment Differentiating on the level of Working Capital (Positive/Negative)

Table 4.7 investigates how a positive or negative working capital / fixed capital affect the sensitivity of working capital investment to cash flow. The results support the above given findings because the cash flow coefficient of firms operating under negative working capital has a negative value (-0.063) while the coefficient has a positive value (0.145) for firms operating under positive working capital. The results imply that during adverse shock of cash flow firms operating under negative working capital may not be able to maintain their working capital and shock can be offset only by the firms operating under positive working capital. Hence, high stock of positive working capital enables firms to shrink the fixed investment - cash flow sensitivity and also maintain the fixed investment on high level.

The p-value associated with Hansen J-statistic test in Table 4.7 is 0.115 which shows that the instruments used in two-step system-GMM estimations fulfill the orthogonality conditions and suitable for model. The Arellano-Bond AR (2) test does not give us any proof for the existence of second-under serial correlation in the residuals. This shows that the instruments that we used in our estimation are suitable.

Table 4.7: Estimates for Working Capital Investment Model: Differentiating Firms on the Level of Working Capital

Panel A: Estimation results		
	Coef.	**Std. Err.**
(Lag of working capital investment/fixed capital stock)x D^{NEGWK}	-0.697***	0.024
(Lag of working capital investment/fixed capital stock)x D^{POSWK}	0.570***	0.027
(Cash flow/fixed capital stock)x D^{NEGWK}	-0.063***	0.006
(Cash flow/fixed capital stock)x D^{POSWK}	0.145***	0.016
Working capital stock/fixed capital stock	0.034***	0.016
Inventory/fixed capital stock	-0.033***	0.005
Constant	0.1889***	0.092
Panel B: Diagnostic tests		
Firm – Years		4494
Firms		357
AR (2)		-1.48
p-value		0.139
J-statistics		36.00
p-value		0.115

Notes: *** denotes statistically significant at the 1% level of significance.

4.3 Analysis of Firm-level Sensitivities

We previously analyze single coefficient for investment-cash flow sensitivity of working capital and fixed capital. As our data comprises outsized heterogeneous firms and to account for

that problem we incorporate another methodology introduced by Hovakimian and Hovakimian (2009). This methodology is also followed by Ding et al. (2013) in order to calculate firm level sensitivity of working and fixed capital investment respectively. These firm-level sensitivities are useful in two aspects. First, we use to recognize the firm's characteristics with low and high fixed investment-cash flow sensitivities (FKS) and firm with low and high working capital investment-cash flow sensitivities (WKS). Secondly, we use different combinations of these two type of sensitivities (FKS/WKS).

The objective of this analysis is to investigate whether these two sensitivities (FKS/WKS) are satisfactory measures of financing constraints or not. Furthermore, we analyze the degree to which, firms are managing their working capital through adverse cash flow shock and mitigate the consequences of financing constraints on fixed capital. The formula through which we calculate sensitivities, fixed investment-cash flow and working capital investment-cash flow is given below respectively:

$$FKS_i = \sum_{t=1}^{n}\left(\frac{(cash\ flow/K)_{it}}{\sum_{t=1}^{n}(cash\ flow/K)_{it}} * \left(\frac{I}{K}\right)_{it}\right) - \frac{1}{n}\sum_{t=1}^{n}\left(\frac{I}{K}\right)_{it} \quad (5)$$

$$WKS_i = \sum_{t=1}^{n}\left(\frac{(cash\ flow/K)_{it}}{\sum_{t=1}^{n}(cash\ flow/K)_{it}} * \left(\frac{IWK}{K}\right)_{it}\right) - \frac{1}{n}\sum_{t=1}^{n}\left(\frac{IWK}{K}\right)_{it} \quad (6)$$

These sensitivities (FKS/WKS) are the difference between cash flow weighted average investment in fixed capital to fixed capital and working capital to fixed capital ratio of a firm and its simple arithmetic time-series ratio. The number of annual observations is given as n for firm i, and t indicates time. As according to the findings of Ding et al. (2013), firms that demonstrate high level of investment and cash flow display higher level of these differences. But these differences are low for the firms with low level investment and cash flow in year. Hence, firms with similar patterns of investment and cash flow expected to tolerate higher level of financing

constraints. When these firms experience an unfavorable shock of cash flow they reduce their investment due to costly external finance.

4.3.1 Descriptive Statistics for FKS

Table 4.8 depicts the descriptive analysis for firms with low and high FKS. These statistics are relative to those variables which are previously used in our regression analysis, those pertaining to general firm level variables, working capital related variables, and financial variables. The Table 4.8 shows that firms having low sensitivity of fixed capital (FKS) exhibit high ratio of fixed investment and working capital investment to fixed capital stock, at the same time these firms also shows high ratio of cash flow to fixed capital, and higher sales growth as compared to firms with high FKS.

The results of leverage and inventory to sales ratio are lower for low FKS which shows that these firms have lower financing needs externally while firms with high FKS coupled with low level of cash flow exhibit the higher need of external funds and leverage. The variables related working capital has higher value for firms characterized with low FKS. These figures lead to the fact that firms with low sensitivity of fixed capital (FKS) are financially healthier as compared to those firms which exhibit high sensitivity of fixed capital (FKS).

Table 4.8: Results for Firm-Specific Investment in Fixed Capital to Cash Flow Sensitivity (FKS)

	Low FKS		High FKS	
	Mean	**Std. Err.**	**Mean**	**Std. Err.**
General firm characteristics				
Fixed investment/fixed capital stock (I/K)	0.041	0.021	0.04	0.021
Assets	6430.26	21349.82	4605.75	16170.37
Sales growth (SG)	0.132	0.501	0.120	0.43
Financial variables				
Cash flow/fixed capital (CF/K)	0.071	2.54	0.046	2.101
Leverage	0.67	0.41	0.75	0.53
Tangibility	1.143	0.144	1.15	0.152
Inventories/Sales (I/S)	0.16	0.525	0.375	6.3
Working capital related variables				
Working capital investment/fixed capital (WI/K)	0.014	0.777	-0.013	0.82
Working capital/fixed capital stock (W/K)	2.35	17.68	2.19	4.28
Inventories/fixed capital stock (Inv/K)	748.19	1426.396	702.87	1536.7
Financial working capital/fixed capital stock (FWK/K)	-745.840	1425.847	-700.68	1536.53
Observations	3216	3216	1018	1018

4.3.2 Descriptive Statistics for WKS

Table 4.9 shows descriptive statistics of firms which have low and high WKS. These statistics contains variables used in the previous regression section, general characteristics of firm, variables relating working capital and firm's financial variables. According to figures reported in table 4.9, forms with high sensitivity of working capital shows high ratio of investment in working capital to fixed capital (WI/K) and also high ratio of working capital to fixed capital (W/K) as compared to firms which show low sensitivity of working capital WKS. These firms also exhibit high ratio of cash flow to fixed capital than low level of WKS. The high WKS firms have higher ratio of fixed investment to fixed capital as compared to firms with low WKS. These firms are characterized small in size and they entail high leverage and lower level of tangibility which may designates that these firms are financially constrained.

To summarize, these figures confirm that only those firms who have higher level of working capital are only able to adjust their working capital investment in the presence of cash flow shocks. The huge difference is also notable in ratio of inventories to fixed capital while financial working capital is lower for high WKS firms as compared to low WKS firms. It is also notable that firms experienced high level of WKS have higher ratio of cash flow to fixed capital, which shows that high WKS firms face less internal financing constraints.

Table 4.9: Results for Firm-Specific Investment in Working Capital to Cash Flow Sensitivity (WKS)

	Low WKS		High WKS	
	Mean	**Std. Err.**	**Mean**	**Std. Err.**
General firm characteristics				
Fixed investment/fixed capital stock (I/K)	0.04	0.021	0.045	0.022
Assets	6573.07	21984.80	4145.05	13089.24
Sales growth (SG)	0.133	0.52	0.12	0.34
Financial variables				
Cash flow/fixed capital (CF/K)	0.051	2.71	0.11	1.23
Leverage	0.71	0.45	0.84	0.42
Tangibility	1.14	0.141	1.10	0.16
Inventories/Sales (I/S)	0.22	3.6	0.19	0.462
Working capital related variables				
Working capital investment/fixed capital (WI/K)	0.010	0.68	-0.001	1.06
Working capital/fixed capital stock (W/K)	1.72	2.99	4.19	31.26
Inventories/fixed capital stock (Inv/K)	709.48	1420.98	825.62	1550.17
Financial working capital/fixed capital stock (FWK/K)	-707.76	1420.64	-821.44	1549.52
Observations	3220	3220	1014	1014

4.3.3 Combining FKS and WKS

The following table represents the descriptive statistics for different group of firms. Panel A shows firms with high FKS and high WKS (HH) and low FKS and low WKS (LL). Panel B refers to firms operating under high FKS and low WKS (HL) and firms operating under low FKS and high WKS (LH). For all firms with low FKS and high FKS, combine with high WKS mostly have higher ratio of fixed investment to fixed capital (I/K) as compared to low WKS. The statistics also confirm our analysis that during cash flow distress the firms characterized by high level of working capital are competent to maintain fixed investment properly. Hence it provides the evidence that good management of working capital allows firms to lessen the adverse effects of financing constraints on fixed capital.

It is also interesting to note that among all four groups (HH, LL, HL, and LH) the fixed investment to fixed capital ratio (I/K) is higher for the firms that display high WKS. Furthermore, HH and LH firms exhibit the high ratio working capital to fixed capital (WK/K) and investment in working capital to fixed capital (WIK/K). Moving towards leverage and tangibility, results show that among all four groups when low FKS combined with high WKS level of leverage is low while tangibility is high as compared to combination where level of WKS is low. Level of financial working capital (FWK) is also at its lowest level. Furthermore, results also depict the high ratio of inventories to fixed capital (Inv/K) and the highest cash flow to fixed capital ratio (CF/K) while LH firms have much higher sales growth rate.

Table 4.10: Estimates for Combining Fixed and Working Capital Sensitivity (FKS and WKS) Types

Panel A	High FKS Mean	High WKS Std. Err.	Low FKS Mean	Low WKS Std. Err.
General firm characteristics				
Fixed investment/fixed capital stock (I/K)	0.034	0.020	0.04	0.021
Assets	3150.11	7452.54	6862.2	22585.50
Sales growth (SG)	0.122	0.353	0.137	0.54
Financial variables				
Cash flow/fixed capital (CF/K)	0.164	0.672	0.07	2.742
Leverage	0.73	0.544	0.70	0.432
Tangibility	1.166	0.159	1.14	0.14
Inventories/Sales (I/S)	0.212	0.65	0.154	0.57
Working capital related variables				
Working capital investment/fixed capital (WI/K)	-0.0014	0.83	0.018	0.641
Working capital/fixed capital stock (W/K)	2.351	3.960145	1.62	2.50
Inventories/fixed capital stock (Inv/K)	664.35	1539.30	705.63	1390.70
Financial working capital/fixed capital stock (FWK/K)	-661.99	1539.23	-704.01	1390.311
Observations	368	368	250	2570
Panel B	**High FKS; Mean**	**Low WKS Std. Err.**	**Low FKS Mean**	**High WKS Std. Err.**
General firm characteristics				
Fixed investment/fixed capital stock (I/K)	0.041	0.021	0.043	0.022

Assets	5429.87	19402.54	4711.84	15381.50
Sales growth (SG)	0.12	0.50	0.116	0.33
Financial variables				
Cash flow/fixed capital (CF/K)	-0.020	2.58	0.075	1.50
Leverage	0.76	0.52	0.584	0.314
Tangibility	1.14	0.1471602	1.16	0.16
Inventories/Sales (I/S)	0.47	4.402	0.176	0.31
Working capital related variables				
Working capital investment/fixed capital (WI/K)	-0.02	0.81	-0.001	1.17
Working capital/fixed capital stock (W/K)	2.10	4.45	5.23	39.02
Inventories/fixed capital stock (Inv/K)	724.68	1536	917.50	1550.03
Financial working capital/fixed capital stock (FWK/K)	-722.60	1535.75	-912.30	1549.22
Observations	650	650	646	646

CHAPTER 5

CONCLUSION

5.1 Thesis Background

Reviewing the existing literature it is obvious that researches on investment and financing constraints merely focused on the sensitivity of investment to cash flow. The empirical literature examined the impact of cash flow fluctuations on a firm's fixed investment, when capital market is imperfect. However, they have ignored the role of other factors which may affect this sensitivity, the most important of which is investment in working capital. Furthermore, the previous literature on working capital investment mainly focuses on the working capital management and the profitability of the firm.

In this study, we hypothesize that in the presence of financing constraints external finance is costly and firms rely on their internally generated funds, and cash flow fluctuations have an impact on firm's investment. In particularly, first of all we examine whether a firm's fixed capital investment is sensitive to cash flow shocks and later we investigate how working capital management mitigate the fixed investment-cash flow sensitivity. Unlike prior studies on the investment - cash flow sensitivity, we use working capital as a mediator in order to eliminate the adverse cash flow shock on firm's fixed investment. Specifically, we have explored the fact that due to number of reasons firms are not able to change the level of their fixed investment but working capital investment is highly reversible and adjustable.

In order to examine this sensitivity, we utilize other firm-specific and financial variables which have significant impact in defining investment and financing structure of firm. We construct unbalanced panel dataset for all manufacturing firms listed at KSE and cover the period

2001 to 2013. To examine the association between investment cash flow sensitivity and role of working capital we employ two step system GMM approach.

5.2 Summary of Findings

In this research, we investigate the impact of adverse shock of cash flow on fixed investment in Pakistan. In particular, we study whether the investment-cash flow sensitivity really exists and how firms eliminate the cash flow shocks from fixed investment by using working capital investment as a mediator. The outcome of this study shows that precise value of cash flow leads to increase the fixed investment which suggests the positive relationship between firms' fixed investment and internally generated cash.

The results suspect that due to unavailability of external funds firms are force to utilize their internally generally funds which give rise to the investment – cash flow sensitivity. We also find that cash flow coefficient for working capital investment is also positive and have higher value as compared to fixed capital investment. These findings lead to the fact that working capital is easy to adjust and reverse because of lower adjustment cost as compared to fixed capital investment.

Moving towards precisely determined results, we regress investment in working capital and fixed capital on cash flow and interact with different levels of working capital and find that the firms with positive and high level of working capital depict high sensitivity of investment in working capital to cash flow and low sensitivity of investment in fixed capital to cash flow. The results recommend that Pakistani firms are able to offset the adverse effects of cash flow shock on investment in fixed capital by managing working capital investment properly.

We also construct the firm level sensitivities of fixed capital and working capital to cash flow, in order to investigate their determinants. We find that highly levered and less collateral

firms tend to adjust their investment in working capital as compared to fixed capital. The firms with high level of working capital depict the higher ratio of cash flow to fixed capital which is a sign that the firms operating under high WKS are less constraint firms. The results also show that firms with low cash flow may adjust their fixed and working capital investment side by side because they face internal constraints of funds.

This study also investigates the combine effect of these two sensitivities FKS and WKS. The findings reveal the fact that by comparing all the combinations, firms operating under low sensitivity of FKS and high sensitivity of WKS, may face more financial constraints and have high ratio of fixed investment to fixed capital. It is also interesting to note that the LH and HH firms also exhibit high ratio of working capital to fixed capita (WK/K), working capital investment to fixed capital (WIK/K) and high inventory to fixed capital ratio (Inv/K). All these results provide the evidence that managing working capital efficiently elevate the adverse cash flow shock on firm's fixed capital investment.

5.3 Policy Recommendations and Future Research Areas

For policy perspective, the findings of our study have several implications. This study is unique because it allows a third variable in order to mitigate the sensitivity of firms' investment. We expect that our analysis is useful for all private and public sector firms which may face financial constraints and are compel to utilize their internally generated funds for investment purpose. We also expect that these findings are useful for firms' managers, financial investor as well as stake holders. These finding would help out firms' managers for effective strategies to eliminate the adverse cash flow shocks and while financing constraints how wisely they can manage their internally generated funds without any loss.

The results are also useful from investor point of view in order to design their investment plans efficiently and give a foresight to them that firms operating under high level of working capital are able to survive during adverse shocks as well because they can handle their financing problem internally. Our findings that due to capital market imperfection and costly external finance firms face financing constraints may imply a suggestion of financial reforms and other legal changes in order to offer funding to private firms. Our findings also suggest that concern authorities should take in to account effective measures which may helpful for private sector.

Although the focus of this study is to examine the impact of working capital management on investment-cash flow sensitivity. However, we only investigate different levels of working capital and their impact on investment-cash flow sensitivity. This could be useful to extend the study by investigating the methods and policies which are useful for firms in order to manage working capital properly. Furthermore, we only undertake the manufacturing sector of Pakistan one can enhance this research by implementing same investigation on other sectors of Pakistan. In this study, we employee annual data for estimation one can execute the research by using quarterly or semiannual data to examine the impact of working capital management on investment-cash flow sensitivity.

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