INVESTMENT DYNAMICS OF FINANCIALLY CONSTRAINED AND UNCONSTRAINED FIRMS OF MANUFACTURING SECTOR OF PAKISTAN: AN EMPIRICAL INVESTIGATION

THESIS

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Shagufta Ahmad

DEDICATION

This research work is dedicated to

My Beloved Parents

For their prayers, moral support and encouragement that enlightened my way and made it possible for me to reach at this stage

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ABSTRACT

This study investigates investment dynamics of financially constrained and unconstrained firms of manufacturing sector of Pakistan by taking the sample of 498 firms for the period of 1974 to 2012 for empirical analysis. Financial variables are constructed using firm level data from more than 15,000 financial statements of manufacturing sector firms. Generalized methods of moments (GMM) technique is applied on investment model. Firms finance their investments by three sources of financing i.e. internal finance, debt and Equity. Under financial hierarchy hypothesis firms prefer to use internal finance over external finance as the firms find external financing costly. Hence internal finance is of significance importance in determining firms' investments when financial constraints are present as firms' are mainly dependent upon their internal funds to finance their investment activities. Cash flows are used as a source of internal finance and sales are incorporated in the model to capture investment opportunities.

Firms are divided in financially constrained and unconstrained categories via financial constraints measures including Operating income, Net income, Interest Coverage ratio and Dividend Payout ratio to analyze their general investment behavior. Firms are further distributed in different categories accordingly financial constraints levels present in them via Dividend Payout ratio, Interest Coverage ratio, Firms' tangibility and Size to observe the comparison of firms' investment behavior at different constraints levels. Probability of Financial Constraints Risk for each firm is calculated using the logit model. Afterwards firms are distributed in Quartiles to check whether firms' investments vary with their financial constraints risk level. The investment model is estimated across different political regimes to compare firms' investment behavior across time periods. Lastly, investment model is estimated across several industries i.e. Textile-Synthetic, Textile-Cotton, Chemical, Engineering and Sugar and allied industry to compare to compare their investment behavior.

Empirical results confirmed financially constrained and unconstrained firms behave differently. This study accepted the financial hierarchy hypothesis in case of financially unconstrained firms. The Investment-Cash flows sensitivity is found positive in case of unconstrained firms revealing that these firms are more sensitive towards change in cash flows. Whereas, it was found either zero or negative in case of constrained firms. Firms' tangibility and size is explored significantly important for effecting firms' investment behavior. Financial constraints risk analysis suggests that firms' with lower risk level are dependent upon evolution of internally generated funds for their investments as evident by their cash flows and sales. Political regime analysis shows that firms are constrained by internal finance in Democratic era. Industrial analysis reveals that investment in Textile-Cotton, Textile-Synthetic and sugar industries are sensitive towards change in internal finance.

Keywords: Financial constraints, Internal finance, PFCR, Investment-Cash flows sensitivity, External constraints, FC and FUC firms

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ABBREVIATIONS AND ACRONYMS

PFCR	Probability of Financial Constraints Risk
KZ	Kaplan and Zingales
GDP	Gross Domestic Product
FC	Financially Constrained
FUC	Financially Unconstrained
R&D	Research and Development
GMM	Generalized methods of moments
EFC	Extremely Financially Constrained
SFC	Slightly Financially constrained
MFUC	Moderately Financially Unconstrained
MFC	Moderately financially constrained
SBP	State Bank of Pakistan
IPS	Im, Pesaran and Shin
LLC	Levin, Lin and Chu
IFS	International Financial Statistics
FHP	Fazzari, Hubbard and Peterson

Chapter 1

INTRODUCTION

1.1 BACKGROUND

Firms' Financial decisions have influencing role in determining their investment activities. To perform investment activities firms' usually have three main sources of financing i.e. internal financing that includes retained earnings and external financing which includes debt and equity financing. Firms' need finance to grow either by generating it internally or to have access to external sources of finance accordingly their financial policy. In view of Modigliani and Miller (1958), there exist perfect capital markets and external funds are perfect substitute of internal finance thus they stated that firms financial decisions are irrelevant in determining their investment behavior[1]. However, Fazzari *et al*. (1988), Whited (1992), Bond and Meghir (1994) and Kaplan and Zingales (1997) investigated investment behavior for empirical evidence of financial constraints and developed the equilibrium model by incorporating market frictions in business cycle fluctuations. Their studies clearly support that frictions are present in capital market signifying that internal and external capital are not perfect substitutes.

In review of Pakistan's case, financial market is not perfect which leads to finance becoming the foremost obstacle in firms' investment level (Ahmad and Naveed 2011). This realism clearly supports the phenomenon presented by previous studies. Hence Firms mostly prefer to employ internal financing initially for investment activities. According to Bond and Meghir (1994) there exists financial hierarchy which states that internally arranged funds are

[1] Modiglinani and Miller (1958) irrelevance theorem

cheaper than external financing[2]. Those firms which are not having enough internal funds to finance their investments are said to be internally financially constrained as these firms do not have sufficient amount of internal funds to employ in investment activities and vice verse[3]. But in general there comes a situation for firms which are not internally constrained where only internally generated funds i.e. cash flows are not enough to finance in investments which seem to be valuable in future. Thus these firms need external sources of finance to increase their investments level by investing in profitable opportunities.

Imperfections in Capital market lead to information asymmetries between lender and borrower as lender do not have fully information about borrower firms' investment projects thus these firms are charged with higher risk premium for external financing by lenders. In case when internal funds are insufficient to meet their expenses due to these market imperfections, consequently financial constraints come in to existence in financial markets. Thus firms are called financially constrained when they have lack of internal funds or financial constraints can either be defined as the barriers that refrain firms to employ funds for their investments. Therefore, firms are internally constrained when they are having lack of availability of internal funds and are external constrained for the reason that firms find external financing costly. Firms which do not have access to external funds become financially constrained so these firms keep check upon their cash flows to progress further. Whereas, firms that have access to financial markets are financially unconstrained firms and normally use mixed pattern of financing.

At first Cash flows have considerable part in determining investment behavior of both constrained and unconstrained firms because initially firms are dependent upon their internal

[2] Bond and Meghir (1994) Hierarchy of finance assumption states that internally generated funds are preferred over external resources

[3] For details see Guariglia (2008)

funds for investment activities so firms are initially to be called constrained when they do not have sufficient internal finance. The probability of financial constraints in firms rises with the higher debt and decreases with the higher capital stock[4]. External finance premium depends on the level of debt and as well as capital stock of the firm. Thus, a higher level of debt will increase external finance premium and a superior capital stock will decrease this premium. The provision of finance from external sources i.e. banks and capital markets depends upon firms specific characteristics like assets base, risks involved, financial strength and performance due to the risk averse nature of financial institutions.

1.2 LITERATURE GAP

In literature, a large extent of estimation findings are based on generally dividing firms in different categories i.e. constrained, partially constrained and unconstrained etc through measures of financial constraints. Literature in case of Pakistan focused on firms' capital structure for ten to twelve years and tries to find optimum capital structure for them. Some work has been done on dividing firms in financial constrained and unconstrained on the basis of cash flow volatility[5]. Additionally firms' size and age are incorporated in investment model to study their impact on investment behavior. Size is found as an important determinant affecting investment positively[6]. Hamid (2011) explored finance as the main constraint in growth of Pakistani firms and size indirectly affect the growth of firms[7].

Literature in case of Pakistan is limited to explore the internal financial constraints among firms and their sensitivity towards firms' investment. Moreover, work on firms' investments in

[4] Kai Kirchesch (2004) Financial risks, Bankruptcy probabilities and Investment behavior of Enterprises
[5] See Sehrish et al. (2013)
[6] Azam and Shah (2011) "Internal Financial constraints, External Financial constraints and Investment choice"
[7] See Ahmed and Hamid (2011) for details

context to internal financial constraints levels has not been done along with investment models. Additionally, the affect of macroeconomic and microeconomic factors which are important in determining firms' Probability of financial constraints risk have not been discovered. This study tries to fill the literature gap by observing measures of internal financial constraints and their incorporation in investment model using firm level data of publicly listed firms of manufacturing sector. This study further divides constrained and unconstrained firms in subcategories to assess the intensity of financial constraints present in firms. Furthermore, macroeconomic and microeconomic factors which can be the cause of financial constraints risk are studied.

Concerning all the mechanisms presented above, this study will observe financial constraints and their impact on investment behavior of firms of manufacturing sector.

1.3 OBJECTIVES OF THE STUDY

The core objective of our study is to compare investment behavior of financially constrained and unconstrained firms. Moreover the study also considers the following aspects;

- To assess the impact of financial constraints on firms' investment behavior
- The study will explore whether investment-Cash flows sensitivity varies across financially constrained and unconstrained firms
- Whether investment behavior is diverse across firms with different financial constraints levels
- How firms' investment behavior varies with different Financial constraints risk levels
- To explore the impact of financial constraints on firms' investments across different industries and time periods

Firstly, investment model for whole sample of 498 firms for the period 1974 to 2012 is estimated. Secondly, to identify firms' financial status as constrained or unconstrained the sample is distributed generally accordingly internal financial constraints measures and afterwards investment model is estimated for each data set. The objective is to check how financial constraints at different levels affect firms' investment behavior and to observe that either constrained or unconstrained firms are dependent upon internal finance.

Thirdly, to assess the intensity of financial constraints actually present in firms; financially constrained and unconstrained firms are further distributed in sub categories accordingly financial constraints measures. Afterwards, the investment model is estimated for each sub category to compare the investment approach across firms with higher, moderate and lower financial constraints.

Fourthly, to observe how macroeconomic factors along with microeconomic (firm specific) variables determine the financial constraint risk of the Manufacturing firms. Firms are distributed in Quartiles accordingly their probability of Financial constraints risk and afterwards investment model is estimated for comparison across Quartiles.

Further objectives of the study are to compare the investment behavior of different industries of Manufacturing sector of Pakistan i.e. Textile Cotton, Textile synthetic, sugar, Engineering and Chemical. Moreover, to observe firms' investment dynamics across different political regimes i.e. 1978-1988, 1989-1999 and 2000-2008 to actually assess that in which political regime firms' actually face financial constraints.

1.4 HYPOTHESIS DEVELOPMENT

- Firms' investment initially depends upon internal finance

- Investment behavior is diverse across financially constrained and unconstrained firms
- Investment-Cash flow sensitivity varies across Financially constrained and unconstrained firms
- Financial constraints levels have diverse impact on firms' investments
- Firms' investment behavior varies accordingly their probability of financial constraint risk
- Investment behavior of financially constrained and unconstrained firms is diverse across different political regimes and industries of manufacturing sector

1.5 SIGNIFICANCE OF THE STUDY

This research is essential for the reason that financial constraints have important role in affecting firms' investments. In context to Pakistan's case, as manufacturing sector is under concerned so this study will give intimation that how much investments of different sectors of manufacturing are affected by internal financial constraints. Secondly, this study observes how much intensity of financial constraints is present in manufacturing firms and analyzes how differently financial constraints levels affect investment behavior of manufacturing firms. This study will benefit policy makers to review the financial policy of constrained firms showing higher intensity of constraints in order to make them secure from becoming prone towards financial distress in future.

Additionally, the empirical findings of impact of firms' tangibility and firms' size on investment dynamics will give a way forward to the policy makers to review their policy regarding lending behavior in order to reduce the intensity of financial constraints to negatively

impact investment decisions of firms and to formulate a policy that should not aggravate the constraints. Furthermore, this study will benefit the manufacturing sector to identify that how much these firms are risky to be in financial constrained and hence they can review their policy accordingly to make them financially stable and healthy.

Finally, cross-industry analysis will benefit manufacturing sector in a sense that it will be known which industry is more dependent upon internal funds and is deeply affected by the ups and downs in internally generated funds due to the constraints it is facing externally. This will help policy makers to such an environment which is suitable for firms' investment and growth overtime.

1.6 ORGANIZATION OF THE STUDY

The remainder of the concerned research is structured as follows. Chapter 2 reviews the existing literature on financial constraints and firms' investments. Chapter 3 explores the theoretical framework for the model and estimation methodology applied in this study. Chapter 4 discusses data selection, variables construction, estimation technique and overall sample results. Chapter 5 is about different internal financial constraint measures and their impact on firms' investment behavior. Chapter 6 discusses firms' different levels of financial constraints measures and compares investment behavior across these levels. Chapter 7 explores the comparison of investment behavior of firms with different financial constraints risk levels. Chapter 8 studies financial constraints and firms' investments in different political regimes in Pakistan's history. Chapter 9 is related to cross-industry comparison of financial constraints and firms' investments. Chapter 10 gives policy recommendations and concludes the study. Following the said sequence, the next chapter will discuss Literature review in detail.

Chapter 2

LITERATURE REVIEW

Financial resources have important role for firm's investment. Financially constrained firms do not invest in attractive investment opportunities due to lack of resources and hence become financially constrained. Firms' with different characteristics have different influences of constraints on investment behavior. This chapter discusses previous work being done on financial constraints and their investment behavior.

2.1. FINANCIAL CONSTRAINTS AND FIRMS' INVESTMENT BEHAVIOR

In Literature different financial constraint measures have been taken i.e. firm size, age, dividend payout ratio and credit rating etc to identify the nature of firms. In recent research, Carriera and Silva (2013) investigated whether the firm's size, age and dividend payout ratio may be used as proxies for measuring financial constraints for Portuguese firms as these measures have been used by numerous authors. For empirical estimation they split the sample according to the said proxies after then observed investment cash flow sensitivity and cash-cash flow sensitivity among firms. They found contrary relationship between size, dividend payout ratio and financial constraints and hence recommended that higher size and payout behavior definitely reduces financial constraints faced by firms. On the other hand results showed some doubt between age and financial constraints. Additionally findings are in a view that the relationship between size and financial constraints faced by firms' is U-shaped in general.

A detailed research to examine the sensitivity of investment to availability of internally generated funds using hierarchy of finance model has been done by Bond and Meghir (1994).

They adopted the Standard Euler equation approach to explore the investment behavior of firms in different regimes of financial status classified according their dividend paying behavior. Their results for the whole sample indicated that firms' current investment level depends upon their investments in previous years and lagged cash flows. Moreover their results signified that neither the standard neoclassical investment model nor hierarchy of finance justified the investment behavior clearly. Besides this, they found that standard neoclassical Euler model is valid in describing investment behavior of unrestricted firms but do not supports the case of restricted firms. Further their results implied that lagged investment, sales and low debt ratio have positive effect on investments.

In recent work, the split sample approach by distributing firms in deciles by their lagged cash flow to current investment ratio has been done by Ruano (2006) on the basis of assumption that probability of financial constraints decreases with the augment in this ratio. Ruano (2006) adopted the methodology of Bond and Meghir (1994) by estimating the Euler equation model across ten categories of firms. Findings indicate that firms in upper deciles are unrestricted as their cash flow to investment ratio is positive whereas firms in initial deciles imply that their investment dynamics are determined with the availability of internal funds and hence these firms are financially restricted. These results are in line with the model of Bond and Meghir (1994) which is valid for describing investment behavior of firms in absence of financial constraints.

The Standard Euler equation model of investment of Bond and Meghir (1994) has been adopted by Bishop *et al.* (2004) by employing optimal capital accumulation model in the presence of convex adjustment costs. The study followed the objective to explore the differences between firms with foreign owners and firms with local owners in context to the access to financial capital in presence of financial constraints. Results recommend that lack of foreign

ownership lead firms to be dependent on internal funds hence small firms are financially constrained by having limited access to external funds. On the other hand foreign ownership firms face ease in investment activities for their growth for the reason that these firms have more access to external finance.

Market friction problems not only lead to disturb the ability of firms to obtain external funds but also their investment behavior. The said argument has been clearly supported by Whited (1992) in his study. For estimation the standard Euler investment model is altered by inclusion of binding debt constraint effect which improved Euler equation model by taking in to account investment and capital stock of firms. Findings imply that firm's investment can be undoubtedly assessed with its ability to access for external financing.

The relationship between firms' investments and their financial status has been explored by Johansen (1994) who advocated that increase in debt ratio is responsible for costly external financing. This research followed Euler equation model Bond and Meghir (1994) with convex adjustment costs for estimation of panel dataset of Norwegian manufacturing firms to examine the investment behavior. Findings anticipated that there holds positive relation between firm's debt ratio and its capital return. This indicates that firms with higher debt ratio bear costly external financing therefore these firms rely mainly on internal funds for their investment activities and thus become financially constrained.

To explore the literature on financial constraints and their influence on investment behavior of enterprises, Kirshecsh (2004) established a connection between investment decisions and firms' financial risk in his study. Therefore bankruptcy risks are included in neoclassical model of investment by altering profit maximizing computation on the basis that future expected

revenues will be weighted with firms' probability of survival. Probability of bankruptcy is measured across firms through Altman's Z-score and Ohlson's O-score. The probabilities of bankruptcy obtained for each firm is then incorporated in its modified neoclassical investment model to check the investment which accounts for risk of bankruptcy as an indication of firm's financial risk. Findings from empirical investigation clearly confirm the assumption that bankruptcy risk is significant in determination of firm's investment behavior. Moreover suggest that survival probability measured from bankruptcy prediction model is genuine in linking between firm's investment and its financial risk. Findings suggest that higher debt to capital ratio indicates that the firms face obstacles in capital markets regarding external financing and hence become financially constrained.

To explore whether the financial constraints are present in Malaysian market affecting firms' behavior, Ismail *et al*. (2010) obtained panel data of Malaysian firms for estimation. Q accelerator model of investment is used in the study. Findings from panel GMM estimation rejected the neoclassical investment theory which assumed perfect capital market where only factor prices and technology determine the capital stock of firms by implying that financial constraints are present in Malaysian markets which hinder firms from accessing external financing. Results confirmed that investment activities of firms are greatly affected by their cash flows or retained earnings.

By reviewing in context to Pakistan's case, the impact of internal and external constraints has been studied by Azam and Shah (2011) to assess their influence on investment choice of Pakistani firms. They applied multiple regression analysis to inspect the relationship between firm's size, age and dividend payout ratio and investment. Empirical analysis showed that there exists positive relationship among firm's size and its investment whereas an inverse relationship

holds among firm's age and its investment. Besides these results they found that dividend payout behavior of firms have negative effect on investment too. This shows that if a firm grows old or pay high dividends consequently it will reduce its investment level.

Similarly, financial constraints are present in Brazilian firms as evidenced by the study of Crisóstomo *et al.* (2012) for panel of Brazilian non financial firms. Firm size explored to be having influencing effect on investments of Brazilian firms. Lima Crisóstomo *et al.* (2012) observed that small sized firms are more responsive towards progression of internal funds and hence are constrained by internal finance as compared to unconstrained firms. Similar are the results of Abid Ismail *et al*. (2010) for Malaysian firms. Their study stated that presence of financial constraints in Malaysian capital markets creates hurdles for firms in attaining external finance thus internal finance is of considerable importance for these firms. Using Q model of investment their results showed that large sized firms are not financially constrained while severity of constraints is present in case of small sized firms.

In literature, the lag of investment to capital ratio is found to be positively effecting current investment to capital ratio as confirmed by the studies of Kirchesch (2004), Ismail *et al*. (2010), Bond and Meghir (1994) and Ruano (2006). While it is found negative in studies of Terra (2002), La Cava (2005), Guariglia (2008) and Butzen *et al*. (2001).

2.1.1. INVESTMENT CASH FLOW SENSITIVITY: A VALUABLE MEASURE OF FINANCIAL CONSTRAINTS

Bulk of empirical studies exists highlighting the existence of financial constraints that potentially limit the capability of firms to grow overtime by becoming barrier in their investment behavior. The initiative empirical study in context to financial constraints was done by Fazzari, Hubbard

and Peterson (1988) to observe whether financial constraints justify the sensitivity of investment to cash flows by testing the hypothesis for the q, neoclassical and accelerator model of investment across firms by classifying them accordingly their dividend payout behavior. Empirical results indicated that external funds are not perfect substitutes of internal financing and there exists hierarchy of finance in which firms have cost advantage of internal financing over external financing. Moreover their results clearly state that investments of constrained firms are more sensitive towards cash flows as compared to unconstrained firms because changes in their financial status and liquidity position have significant impact on low dividend paying firms hence these firms have to rely more on internally generated firms. Consequently, investment cash flow sensitivity of firms increase with the level of financial constraints.

Similar argument is presented by Chapman *et al*. (1996) by studying role of cash flow as a determining factor of investment in fixed assets at firm level. Chapman *et al*. (1996) classified firms as constrained or unconstrained by cash flows by taking sample of Australian firms. Their results pointed out firms reveal larger cash flow sensitivity when are financially constrained and lower sensitivity when are unconstrained. Moreover sales also have valuable role in case of unconstrained firms.

Contrary to the argument presented above, the investment cash flows sensitivity among firms does not monotonically increases with the increase in financial constraints according to the study of Kaplan and Zingales (1997) which supported that the investment cash flow sensitivities do not indicate support for presence of financing constraints. They studied the importance of financial constraints in determining firm's investments and applied the approach developed by Bond and Meghir (1994) based on regressing current investment on preceding investment and its square, sales, cash flows, debt square. They classified firms in different categories accordingly

different financial constraints measures like debt to capital, dividend payout, and interest coverage ratio and then observed their investment behavior. Their findings are conflicting to the arguments of FHP (1988) by proposing that least financially constrained firms reveal greater investment cash flow sensitivity than those of unconstrained firms and there exists positive correlation among degree of financial constraints and investment cash flow sensitivities.

Similar work to observe firm's financial status and its impact on their investment behavior has been done by Cleary (1999) by distributing firms in different groups' accordingly financial variables which measure financial constraints. Firms' financial status is measured through multiple discriminant analysis for predicting bankruptcy which allows reclassification of firms' accordingly different periods reflecting that firms' financial constraint level changes overtime. The empirical results are perfectly consistent with the opinion of KZ (1997) signifying that investment decisions of firms with high creditworthiness according to prevailing financial measures are particularly sensitive towards internal funds availability to as that of the firms with low creditworthiness. Observed results clearly state that internal finance is the leading source of financing for firms and firms increase their investments with the availability of cash flows.

The findings that investment cash flow sensitivities do not hold in the case of financing constraints of the study of KZ (1997) were criticized by FHP (2000) who suggested that there is monotonicity in investment cash flow sensitivity with respect to financing constraints. Their results contradict on two bases i.e. there may me lack of heterogeneity in the sample secondly, they claim that the firms taken in KZ (1997) are financially distressed instead of financially constrained and unconstrained firms are in fact constrained. FHP (2000) also criticized Cleary (1999) on the same grounds that found relatively low sensitivity for partially constrained firms

but not distressed firms. They still undoubtedly argue that investment sensitivities increase with the degree of financial constraints.

In respond to the criticism of FHP (2000) valid explanation has been presented by Kaplan and Zingales (2000) provided theoretical and empirical evidence that differential sensitivity is not a suitable measure of financing constraints. In their argument there is no such monotonicity in the relationship between degree of financing constraints and investment sensitivities.

Firms' Asset tangibility positively impacts the investment-Cash flow sensitivity as far as financially constrained firms are concerned. Almieda and Campello (2007) provided such evidence in their study by analyzing constrained and unconstrained firms accordingly their higher or lower asset tangibility. They observed that sensitivity of investment towards cash flows increases with firms' assets tangibility but this result is absent in case of firms' with higher assets tangibility.

Investment cash flow sensitivity is found to be having positive effect on group and ungrouped firms. George *et al*. (2010) observed the data set of business group firms and found that investment cash flow sensitivity is relatively more in grouped firms than that of the ungrouped firms.

2.1.2. INTERNAL FINANCIAL CONSTRAINTS AND FIRMS' INVESTMENTS

Investment cash flow sensitivity is absent in the case of financially distressed firms with the argument that these firms behave different from financially healthy firms according to the studies discussed above. The investments of financially distressed firms are observed by the study of Bhagat *et al*. (2005) which analyzed firms' internal health by observing their net and operating income, payout ratio, firm size and tangibility ratio as measure of internal and external

constraints for firms. The objective followed to examine whether the investments of financially distressed firms differ from financially healthy firms. For investigation distressed firms were divided in two groups i.e. firms with operating profits and other with losses. Results from the study of Bhagat *et al.* (2005) advocated positive investment cash flow sensitivity for firms with operating profits indicating that when distressed firms faces profits their investment behavior is consistent with financially unconstrained firms. While on the other hand firms with losses exhibit negative sensitivity of investment to cash flows. Moreover results indicated that some firms have more investments in current year even if they faced losses in previous year because these firms are funded by equity claimants who have the approach to invest in risky projects.

In previous literature, internal financial constraints are also observed to draw the conclusion regarding investment behavior of firms which have limited or efficient availability of internally generated funds to finance their investments. Guariglia (2008) studied the impact of both internal and external financial constraints on firms' investments observing the panel of UK firms. Using cash flows as a measure of internal financial constraints and firm size as a measure of external financial constraints he observed differential effects of financial constraints on investments. Empirical results signified that cash flows are either insignificant showing zero cash flow sensitivity or negative showing negative investment cash flow sensitivity in case when firms are lacking internal finance and positive when firms have sufficient internal finance. The sensitivity of investment to cash flows is massive when external constraints exist and internal financial constraints are not present.

The observed results of Guariglia (2008) are confirmed by Marouene *et al*. (2013). Marouene *et al*. (2013) took cash flows as a measure of internal financial constraints to analyze the impact of internal financial constraints on investment behavior of Tunisian firms. He

distinguished firms' accordingly positive and negative cash flows and individually studied their investment behavior. Firms with negative cash flows showed negative investment cash flow sensitivity and results confirmed that the specific firms are prone towards financial distress in future. Whereas, firms' with sufficient internal funds proved investment to be positively related to cash flows indicating that investment and cash flow sensitivity is significant for financially unconstrained firms. Findings of Chay and Suh (2008) also support above presented phenomenon that FC firms are not sensitive towards shocks to internal funds. They found that investments of FC firms are visibly much sensitive to external finances as compared to internally generated funds.

Firms' investments usually decrease in response to decrease in internal funds as observed by Cleary *et al*. (2004) that observed how internal funds influence firms' investment behavior in presence of capital market frictions. Study found negative relation between internal finance and investments with lower or negative level of internal funds. However, with lower availability of internal funds firms tempt to invest more due to the fact that through investments firms produce additional revenue which benefits firms' in several ways thereby observing U-shaped investment curve. Hovakimian (2009) also found that financially constrained firms with lower cash flows are negatively sensitive to cash flow whilst least constrained firms show higher cash flows and tend not to sensitive towards cash flows and have lower growth opportunities.

The proposition of Fazzari *et al*. (1988) regarding firms' underinvestment problems in response to negative shocks to internal finance in presence of capital market imperfections is also supported by study of Allayannis and Mozumdar (2004). In their research, Allayannis and Mozumdar (2004) observed negative investment-cash flow sensitivity and positive investment-cash flow sensitivity in case of constrained and unconstrained firm respectively. However, they

excluded firms with negative cash flow observations and observed strong positive cash flow sensitivity in unconstrained firms afterwards and concluded higher investment-cash flow sensitivity in unconstrained firms. Their conclusion is consistent with the studies of KZ (1997) and Cleary (1999) showing that both the studies presented strong sensitivity in case of least constrained firms after excluding distressed firms proxied by negative cash flows.

2.2. FINANCIAL CONSTRAINT RISK AND MACRO-MICRO ECONOMIC FACTORS

Research in financial economics depicted that have revealed that stock prices are affected systematically by several macroeconomic factors like interest rate, inflation and money supply etc. The stock price sensitivity to macroeconomic variables is in turn affected by firm specific micro variables. Tirapat and Nittayagasetwat (1999) in their study developed two step logit model based on firms' sensitivities to macroeconomic variables and firms financial variables. The macro linked micro crisis model used the specifications of direct and indirect risk analysis. The model depicts that macro factors i.e. money supply, industrial production, inflation and interest rate are significant determinants of firm's probability of financial crisis. Their results showed that systematic risk of a firm exposed to inflation and financial variables i.e. shareholder equity and working capital to total assets significantly affect the probability of firm's financial distress.

Literature in financial economics confirmed that Firms' stock prices are affected by macroeconomic factors. Young *et al*. (1991) took numerous macroeconomic variables i.e. risk premium, term structure, inflation and growth in final sales to check their influence on stock returns of firms'. While for financial variables the young *et al*. (1991) included leverage, payout ratio, liquidity, size and return on investment etc to check their ability to predict systematic risk

factors produced by macroeconomic factors. His results confirmed that stock prices of firms are sensitive towards macroeconomic factors in a country.

The quarterly data on macroeconomic variables like foreign exchange rate, foreign exchange reserve, whole sale price index, industrial production index and money supply etc have been taken by Mohammad *et al*. (2009) in their study to observe their impact on firms' stock prices. Their results confirmed that after financial reforms in 1991, Foreign exchange rate and foreign exchange reserves significantly impacted the stock prices whereas money supply also positively affect stock prices. Industrial production index is considered to be insignificant in affecting the stock prices as per empirical results.

Like macroeconomic variables, firm specific micro variables also have strong considerable impact on indicating probability of financial distress risk for firms. An empirical study of predicting corporate failure prediction by bankruptcy has been done by Ohlson (1980) by taking several financial variables related to firms' financial characteristics. Prediction of firms' bankruptcy probability based on firm specific micro variables included firm size, funds provided through operations by total liabilities, working capital, total liabilities, current liabilities and net income to total assets etc representing firms' financial characteristics.

A detailed study to observe the role of financial ratios in predicting bankruptcy has been done by Beaver (1966) to classify failure and non-failure firms. The study included cash flow to debt ratio, net income to total assets, total debt to total assets, working capital to total assets, current ratio. The cash flows to total debt ratio found to be able to predict bankruptcy among firms efficiently as compared to other financial ratios.

Stock prices are measured to be responsive towards external forces i.e. macro factors. Chen *et al*. (1986) checked the relationship of macro variables i.e. industrial production, inflation, risk premium and term structure with stock prices. Industrial production and risk premium were obtained to be significantly impacting stock prices.

Chapter 3

THEORETICAL FRAMEWORK AND ESTIMATION METHODOLOGY

In literature alternative models for investments are employed to assess firms' behavior i.e. Tobin's Q investment theory, Accelerator model and Euler equation investment model. Mostly Q model of investment has been used in previous researches which suggests that market value of firm affects its investment. The plus point of this theory is that q can check upon market evaluation of firm's investment openings. This theory is criticized over the point that it does not take in to account cash flows which are considered important in determining financial constraints according to many researchers. This Tobin's Q theory of investment is used by Ismail *et al.* (2010) to study the impact of financial constraints on investments of Malaysian firms and observed positive relation between cash flows and investment.

Fazzari, Hubbard and Peterson (1988) used accelerator model of investment which links capital goods demand to a change in firm's output. They incorporated sales in their investment equation arguing that sales have positive impact on investment level. In the same way Hall *et al.* (1998a) criticized Euler equation for being weak also used accelerator model for data on US and France, their results implied positive affect of sales on investment and capital stock of firm and sensitivity of cash flows vary across different regimes in their sample. Bhagat (2005) followed the accelerator model of FHP (1988) and observed investment behavior of financial unhealthy firms with operating profits show positive sensitivity while firms with losses invest less than the previous year and possess almost no cash flow sensitivity. George and Kabir (2010) used both

Tobin's Q investment model and Euler equation to analyze whether cash flow sensitivity is a valid measure of financial constraints.

This study follows the Standard Euler equation investment model of Bond and Meghir (1994) hence this chapter is concerned with theoretical and empirical dimensions which initiates with the theoretical core to econometric specification to derive the neoclassical investment model to develop the methodological equation which will be used for estimation.

The optimal capital accumulation model using Standard Euler equation ignores the q approach. Bond and Meghir (1994) used model of Euler equation for optimal capital accumulation in the presence of convex adjustments cost and adopted the argument that their Euler equation approach is unjustifiable to show the case of constrained firms. They pointed out that Euler equation is accurate in describing the behavior of unconstrained only. Similarly, their methodology has also been applied by Kaplan and Zingales (1997) and Sonia Ruano (2006). Moreover Kirchesch (2004) employed modified Euler equation model in his study by incorporating bankruptcy risk prediction in Euler equation model of investment.

3.1. FINANCIAL CONSTRAINTS AND FIRMS' INVESTMENT; THEORETICAL EXPLANATION

Normally firms' have three different sources of financing i.e. (a) Internal finance, (b) Debt and (c) Equity finance to finance the investment opportunities. The preference of one source over other sources of finance usually depends upon firm's financial policy regarding its need. Literature implies that Firms' mostly follow financing hierarchy[8] to finance investment

[8] Hierarchy of finance model suggests that firms initially prefer internally generated firms over alternative sources i.e. debt and equity

opportunities which states that when firms' find good investment opportunity regarding potential projects and have willingness to invest in it then the firms will initially try to make it possible to use cheaper source of financing for their investments. It is obvious that the ultimate goal of firms' is to maximize their profits, for this intention firms prefer the cheaper way in order to avoid financial cost on the finance. Firms' can only make it possible by using their internal finance i.e. to invest some portion of their profit or to use leftover after deducting expenses. There are some investment opportunities that firms' find attractive to invest in for which more finance is required so, firms' are initially dependent upon internal finance (cash flows) and afterwards move towards alternative sources.

The theoretical justification of the model states that firms' finance by using internal finance i.e. cash flows due to imperfect capital markets. In literature cash flow has been used as a proxy to capture internal finance hence firms' cash flow is the only source of finance for their investments which when increases the investment spending of firms' increases and vise verse. This observable fact signifies that if there is increase in cash flows there should be significant increase in firms' investment spending. So it can be easily be said that the more the firms' rely on internal finance the more sensitive they are towards the cash flows for their investments. The above explained phenomenon is represented by the following equation;

$$\left(\frac{I}{K}\right) \approx \left(\frac{Cash\ Flow}{K}\right) \qquad (3.1.1)$$

The above equation suggests that firms' are dependent on cash flows primarily therefore, firms' which are having negative cash flows are said to be financially constrained as these firms' have no finance on their own to meet with their financial matters. While on the other hand firms' which have positive cash flows are financially unconstrained firms indicating that they have

enough funds to meet their objectives at starting level. Thus here the hypothesis is if the coefficient of cash flow variable is more sensitive to investment that means firms' are financially constrained and financially constrained if otherwise.

Generally it is concluded that firms' are limited to use internal funds at first because for the potential investments these firms should have their own funds to strengthen their financial health.

3.2. THEORETICAL FRAMEWORK AND MATHEMATICAL DERIVATION FOR EULER EQUATION INVESTMENT MODEL

To judge the investment attitude of constrained and unconstrained firm this study follows the methodology of Bond and Meghir (1994) based on Euler equation investment model[9].

The main objective of a firm is to maximize shareholders wealth, so the market value of firm which would be maximized is;

$$V_t(K_{t-1}) = \max_{L_t I_t}\{\pi(K_t, L_t, I_t) + \beta_{t+1} E_t[V_{t+1}(K_t)]\} \quad (3.2.1)$$

Where V_t, π, K_t, L_t, I_t and β_{t+1} are maximized value of firm, firm's net revenue function, vector of capital inputs, vector of labor and current inputs, vector of gross investment and discount factor which comprises of risk-free interest rate between period t and t+1 respectively. The $\beta_{t+1}$is the discount factor given by expression$\frac{1}{(1+r_{t+1})}$.

The above presented market value of firm is constrained K_t which comprises of;

$$K_t = (1-\delta)K_{t-1} + I_t \quad (3.2.2)$$

[9] Bond and Meghir (1994) Dynamic investment models and firm's financial policy

The above equation suggests that current level of capital stock is dependent upon previous year's capital stock, depreciation and current level of investment.

The favorable path of investment is illustrated by following Euler equation;

$$\lambda_t = (1-\delta)\left(\frac{\partial \pi}{\partial K}\right)_t + (1-\delta)\beta_{t+1}^{t} E_t[\lambda_{t+1}] \quad (3.2.3)$$

Where λ_t is the shadow value of capital defined as$\left(\frac{\partial V_t}{\partial K_{t-1}}\right)$. Now the first order condition for investment is;

$$(1-\delta)\left(\frac{\partial \pi}{\partial I}\right)_t + \lambda_t = 0 \quad (3.2.4)$$

By combining equation 3.1.3 and 3.1.4 for eliminating λ_t and get the Euler equation given below in the form of;

$$-(1-\delta)\beta_{t+1}^{t} E_t\left[\left(\frac{\partial \pi}{\partial I}\right)_{t+1}\right] = -\left(\frac{\partial \pi}{\delta I}\right)_t - \left(\frac{\partial \pi}{\partial K}\right)_t \quad (3.2.5)$$

Bond and Meghir (1994) developed an extension to the model which incorporates the assumption of hierarchy of cost associated with different sources of financing. The model distinguishes between sources of finance that are retained earnings and new share issues and states different nature of investments by firms facing different financial conditions. The standard Euler equation model is considered to be describing the investment behavior of firms that are financially unconstrained and that it ignores the investment behavior of financially constrained firm. Thus the empirical investment equation under no financial restrictions is obtained. The net revenue function of firm is specified as;

$$\pi_t = p_t F(K_t, L_t) - p_t G(I_t, K_t) - w_t L_t - p_t^I I_t \quad (3.2.6)$$

Where $F(.)$ is a constant returns to scale production function, K_t and L_t are capital and other variable inputs at period t respectively, p_t and p_t^I are prices of firm's output and capital goods respectively, w_t is the vector of prices for variable inputs and $G(.)$ is a symmetric adjustment cost function that is linearly homogenous in investment and capital and is given by the following equation;

$$G(I_t, K_t) = \frac{1}{2} bK_t \left[\frac{I_t}{K_t} - c\right]^2 \tag{3.2.7}$$

Considering for $\left(\frac{\partial \pi}{\partial I}\right)_{t-1}$ and $\left(\frac{\partial \pi}{\partial K}\right)_{t-1}$ we would obtain the following expressions;

$$\left(\frac{\partial \pi}{\partial I}\right)_{t-1} = -b\alpha p_t \left(\frac{L}{K}\right)_{t-1} + bc\alpha p_{t-1} - p_{t-1}^I \tag{3.2.8}$$

And

$$\left(\frac{\partial \pi}{\partial K}\right)_{t-1} = \alpha p_t \left(\frac{Y}{K}\right)_{t-1} - \alpha p_t \left(\frac{\partial F}{\partial L}\frac{L}{K}\right)_{t-1} + b\alpha p_t \left(\frac{I}{K}\right)_{t-1}^2 - bc\alpha p_t \left(\frac{I}{K}\right)_{t-1} \tag{3.2.9}$$

The standard Neo classical Euler equation presented in equation (3.1.5) is précised in the following empirical investment equation under no financial restrictions is;

$$\left(\frac{I}{K}\right)_{it} = c(1 - \emptyset_t) + (1 - c)\emptyset_t \left(\frac{I}{K}\right)_{it-1} - \emptyset_t \left(\frac{I}{K}\right)_{it-1}^2 - \frac{\emptyset_t}{b\alpha}\left(\frac{C}{K}\right)_{it-1} + \frac{\emptyset_t}{b\alpha} J_{t-1} + \frac{\emptyset_t}{b(\varepsilon-1)}\left(\frac{Y}{K}\right)_{it-1} + \frac{(1+r_{t-1})v_{t-1}}{b(1-\delta)\alpha}\left(\frac{B}{K}\right)_{it-1}^2 + v_{i,t+1} \tag{3.2.10}$$

In above equation (3.1.10) $\emptyset_{t+1} = (1 + p_{t+1})/(1 - \delta)$ and p_{t+1} are real discount rate, $\left(\frac{C}{K}\right)$ is the ratio of real cash flow to stock, J_{t-1} is the user cost of capital, $\left(\frac{B}{K}\right)$ denotes the borrowing and parameter α equals $1 - \left(\frac{1}{\varepsilon}\right)$ where ε is the constant price elasticity of demand and in result $\alpha > 0$.

The real discount rate, depreciation rate and coefficients related to output and debt terms are taken to be constant over time and across firms therefore they are treated as parameters. Moreover the user cost of capital is not measured directly and is incorporated in the final model for estimation including time and firm specific effects.

Finally after adjustments the model takes the following final form for estimation;

$$\left(\frac{I}{K}\right)_{it} = \beta_1\left(\frac{I}{K}\right)_{it-1} + \beta_2\left(\frac{I}{K}\right)^2_{it-1} + \beta_3\left(\frac{C}{K}\right)_{it-1} + \beta_4\left(\frac{Y}{K}\right)_{it-1} + \beta_5\left(\frac{B}{K}\right)^2_{it-1} + d_t + \eta_i + \varepsilon_{it} \qquad (3.2.11)$$

Where $(I/K)_t$, $(I/K)_{t-1}$, $(I/K)^2_{t-1}$, $(C/K)_{t-1}$, $(Y/K)_{t-1}$ and $(B/K)^2_{t-1}$ refers to *current investment to capital ratio, Lagged investment to capital ratio, square of lagged investment to capital ratio, lagged Cash flows to capital ratio, lagged sales to capital ratio and square of lagged debt to capital ratio.* The derived model of Bond and Meghir (1994) will be used for estimation in coming chapters of methodology.

The next chapter presents data and sample selection, variables construction and estimation technique in detail.

Chapter 4

DATA, VARIABLES CONSTRUCTION, ESTIMATION TECHNIQUE AND RESULTS

The following chapter includes different sections discussing sample selection, data sources, variable construction and estimation technique respectively. Firstly, this chapter discusses data and variables construction afterwards it explains methodology that is used by our study in order to estimate the model.

4.1. DATA AND SAMPLE SELECTION

This study covered the time span of total 39 years ranging from 1974 to 2012. First of all estimation is done on the whole sample covering 39 years. Afterwards for each measure of financial constraint the model is estimated to check different levels of financial constraints and their impact on investment behavior of firms. Then empirical estimation is done by splitting the sample in different political periods i.e. Zia's regime 1978-1988, Democratic regime 1989-1999 and Musharraf's regime 2000-2008 to observe the investment behavior of firms in different political regimes. For cross-industry analysis five industries are taken for the time period 1974 to 2012 comprising Textile-Cotton, Textile-Synthetic, Engineering, Cement and Sugar and Allied industries.

This study used panel data for analysis which includes 498 firms of covering different industries of manufacturing for the period of 39 years. Sample is selected on the basis that firms which are to be included for the study should be listed in stock exchange for at least twenty

years. The details of industries, number of firms and firm year's observation of each industry is given below:

Table 4.1. Industry wise Firm distribution in Manufacturing sector of Pakistan

Industry	No. of Firms
Textile-Cotton	206
Textile-Synthetic	32
Chemicals	37
Engineering	45
Sugar & Allied	36
Paper & Board	17
Cement	17
Fuel & Energy	21
Tobacco	4
Jute	8
Vanaspati & Allied	13
Glass & Ceramics	10
Food & Allied	21
Others	33
TOTAL	**498**

Data on manufacturing sector are collected from "Financial Statement Analysis of the joint stock Companies (Non-Financial) listed at Karachi Stock Exchange" prepared by State Bank of Pakistan. Data on macroeconomic variables has been taken from International Financial Statistics (IFS) and Hand Book of Statistics prepared by State Bank of Pakistan.

4.2. VARIABLES CONSTRUCTION AND DEFINITION

This section discusses all the variables used for classifying firms and the variables which have been included in the model. Brief description, composition and standard accounting definition of all the variables are given below;

4.2.1. Measures of Financial Constraints taken for Classification of Firms

The following variables explained below are not used in the empirical estimation but are significantly important for this analysis. This study used these mentioned measures of financial constraints in order to divide the firms in two categories i.e. financially constrained and unconstrained firms to compare their investment behavior and to evaluate the investment cash flow sensitivity across these firms. Brief description is given below;

4.2.1.1. Net income

Net income is defined as the company's total profit as it is the important measure to check how profitable a company is over the time period. Net income is obtained by deducting all administrative, interest and tax expense from gross profit. Formula for Net income calculation is;

$$NI = Gross\ profit - Tax\ provision - Expenses$$

Firms' showing negative net income are identified as constrained firms whereas firms demonstrating positive net income are identified as financially unconstrained firms. Net income measure is used to identify firms as constrained and unconstrained in the studies of Bhagat *et al*. (2005), Guariglia (2008) and Cleary (1999).

4.2.1.2. Operating income

Operating income is defined as the amount of profit recognized from business operations after deducting operating expenses. Following formula is used to calculate Operating income;

$$Operating\ Income = Gross\ profit - Operating\ expenses$$

If operating income is high after deducting operating expenses then it is obvious that a firm has sufficient finance to use it in its business operations and is financially healthy or otherwise. This study has divided firms in to financially constrained and unconstrained with respect to low and high operating income. Bhagat *et al.* (2005) used operating income as a measure of financial constraint to compare the investment behavior of constrained and unconstrained firms in their study.

4.2.1.3. Payout ratio

Payout ratio indicates that how much dividend a firm is paying on its shares out of its net income. Payout ratio is obtained as;

$$Payout\ Ratio = \frac{Dividends}{Net\ income}$$

Firms are identified as financially constrained and unconstrained on the basis of negative and positive payout ratio respectively. Operating income being internal financial constraint measure for firms has been used to assess the financial stability of firms by Fazzari *et al*. (1988), Kaplan and Zingales (1997), Bhagat *et al*. (2005), Bond and Meghir (1994), Cleary and D'Espallier (2007), Almeida and Campello (2007), La Cava (2005), Moyen (2004), Cleary (1999), Whited (2006), Mensa (2013), D'Espallier *et al*. (2008), Carreira and Silva (2013) and Azam (2011).

4.2.1.4. Asset Tangibility ratio

Tangibility ratio can be defined as how much fixed assets a firm grips out of its total assets. It is observed in previous literature that firms' with more fixed assets are said to be financially strong because more fixed assets lead to more capital stock. Tangibility ratio is calculated by using following formula;

$$Tangibility\ Ratio = \frac{Book\ value\ of\ tangible\ assets}{Total\ assets}$$

Where tangible assets are calculated by using 'fixed assets after deducting accumulated depreciation' taken from firm's financial statement analysis. Low tangibility ratio indicates that firms are not having sufficient capital stock thus are financially fragile and vice verse. Firms are distributed in financially constrained and unconstrained according low and high tangibility ratio respectively. Bhagat *et al*. (2005), Cleary and D'Espallier (2007) and Almeida and Campello (2007) used tangibility ratio in their study to observe financial constraints present in firms.

4.2.1.5. Coverage ratio

Interest coverage ratio implies that how effectively a firm can pay its interest expenses on outstanding debt. It can be calculated by dividing a firm's earnings before interest and taxes (EBIT) by its interest expenses of similar period i.e.

$$Coverage\ Ratio = \frac{EBIT}{Interest\ expenses}$$

Interest coverage ratio is linked with financial constraints because of the reason that firms which are financially constrained are unable to pay interest expenses since they have lack of internal finance. Thus lower interest coverage ratio is positively related to financial constraints so we

used this measure to identify firms' in financially constrained and unconstrained groups. This measure is used by Bhagat *et al*. (2005), Cleary (1999), Whited (1992), Kaplan and Zingales (1997) and D'Espallier *et al*. (2008) in their respective studies.

4.2.1.6. Firm size

This measure is used to identify firms' in to financially constrained and unconstrained categories on the basis of their small and large size. Firm size is calculated by taking all current and fixed assets.

$$Firm\ Size = LN\ of\ (Total\ Assets)$$

Where Total assets[10] include both current[11] and non-current assets[12]. A lot of studies like as that of Bishop and Varblane (2004), Guariglia (2008), Almeida and Campello (2007), Li (2011), Paravisini (2008), Whited (2006), Angelini and Generale (2005), Mensa (2013), D'Espallier *et al*. (2008), Carreira and Silva (2013) and Azam (2011) used this variable to divide firms in to small, medium and large to observe the prospect that either firms' investment is homogenous across different firm sizes.

4.2.2. Variables Description of the Model

Following is the construction and definition of the variables which are included in the dynamic investment model of Bond and Meghir (1994);

[10] Total assets = current assets + non-current assets
[11] Current assets include all shot term liquid assets
[12] Non-current assets include all long term fixed assets

4.2.2.1. *Investment (I)*

Investment is defined as the expenses on fixed assets which include plant, machinery and equipment. It is obtained by deducting current year expenditure on fixed assets from the previous year's expenditure on fixed assets plus depreciation. Where depreciation includes annual wear and tear of the capital. Specified formula is presented below;

$$I_{it} = K_{it} - K_{it-1} + D_{it}$$

Where I_{it} is the investment of current period, K_{it} is the current period fixed assets at cost, $K_{it-1}$is the fixed at cost of preceding year and D_{it} indicates the annual depreciation of current year measured in Pakistani Rupees with unit of account in million. Reason behind Inclusion of investment in the model is because higher the investment, higher will be the capital stock which eventually increases the net worth of the firm. It has been calculated by taking fixed assets at cost which is taken from companies financial statements.

4.2.2.2. *Capital Stock (K)*

Capital includes expenditure on plant, property and equipment and machinery. It is calculated as expenditure on fixed assets less depreciation. It is an important factor in assessing firms' productivity since increase in capital suggests that firms are efficient in their production capacity.

$$K = Expenditure\ on\ fixed\ assets - Depreciation$$

Here expenditure on fixed assets has been calculated using 'fixed assets at cost' taken from firms' financial statement analysis.

4.2.2.3. Cash Flows (C)

Cash flows explain unevenness of internal finance as it is used as a proxy for measuring financial constraints. Inclusion of this variable in this analysis includes liquid position of firms to portray that firms investments depend upon internal finance. Cash flows are calculated as;

$$CF = Retention\ in\ business + Depreciation$$

Higher cash flows states firms' have efficient internal finance to invest in profitable opportunities as it is a cheaper source of funds[13].

4.2.2.4. Sales (S)

Sales correspond to revenue generate by firms' as every firm's ultimate goal is to maximize the sales to become profitable. It is obvious that if sales are higher firms demand to invest in profitable opportunities increases. Sales act as a source of cash flow for firms' so it is of significance importance. Numerous researches like that of the study of Kalckreuth (2001) suggest that sales are an important determinant of firms' investment as it accelerates investments.

4.2.2.5. *Debt (B)*

Debt includes the sum of current as well as noncurrent liabilities. Higher the value of debt suggests firm have aggressive nature towards the use of debt.

$$D = Current\ liabilities + noncurrent\ liabilities$$

Its inclusion in the model states that how investment to cash flows sensitivity varies if firms have different attitudes towards debt.

[13] Bond and Meghir (1994) Hierarchy of finance theory

4.2.3. Construction of Macroeconomic Variables

The following macroeconomic variables are taken to estimate the model of Tirapat (1999). These variables are used as independent variables to check their impact on firms' stock prices.

Construction and description includes;

4.2.3.1. Risk Premium (RP)

Risk premium is the difference of low grade bonds and long term bonds. Formula to obtain risk premium is;

$$RP_T = LOWGB_T - LGB_T$$

Here *RP* is the risk premium which is calculated by taking the difference of low grade bonds return (*LOWGB*) from long term bonds return (*LGB*). The reason behind this implies that low grade bonds are more risky for investors and they demand higher return[14]. Their redemption before maturity date is conditioned with penalty and these bonds are less liquid as compared to government bonds. Both these bonds are long term and their return difference is known as risk premium.

4.2.3.2. Industrial Production Index (IPI)

Industrial production is measured through the manufacturing 'Quantum index numbers'. Industrial production is computed by first differencing in natural logs;

$$DIP_t = logIP_t - logIP_{t-1}$$

[14] Higher risk higher return

Where *DIP* is industrial production growth rate, *IPt* is the industrial production flow in year *t*, and its lagged value is *IPt – 1*.

4.2.3.3. Anticipated Growth in Money Supply (MS)

The expected growth in money supply is computed as follows;

$$DMS_t = \log MS_t - \log MS_{t-1}$$

Where expected growth of money supply is computed by taking difference between Current money supply and previous year money supply.

4.2.3.4. Term Structure (TS)

Term structure is captured by interest rate characteristic which is defined as;

$$TS_t = LGB_t - TB_{t-1}$$

Here TB_{t-1} is the Treasury bill rate at the end of period t-1. T Bills have short maturity period as compared to long term Government bonds and both are safe accordingly investor's perspective. The gap between their term structures creates gap which become the return difference.

4.2.3.5. Exchange Rate (ER)

In line with literature, annual growth rate of Exchange rate is taken. It is calculated by taking the first difference in natural logs;

$$DEXCH_t = logEXCH_t - logEXCH_{t-1}$$

Here $DEXCH_t$ is the annual growth rate of Exchange rate. Exchange rate is the price of local currency which is expressed in terms of foreign currency. It is taken in this study due to the fact

that firms which deal in international business are possibly to be positively or negatively affected by change in Exchange rate.

4.2.3.6. Trade Openness (TO)

Trade Openness is the sum of imports and exports measured as a share of GDP. Trade openness is constructed as;

$$TDOPN = \frac{(Exports + Imports)}{GDP}$$

Spreading out in Trade openness is related with the increase in overall trade volume of a country therefore it is used as a proxy of trade liberalization.

4.2.4. Firm Specific Microeconomic Financial Variables/Ratios

Following are the firm specific micro variables taken in this study for estimation of Tirapat (1999) model to obtain probability of financial constraints present in firms;

4.2.4.1. Firms' stock returns (Ret)

Firms' stock prices growth rate is computed for measuring firms' stock returns.

4.2.4.2. Total Liabilities to Total Assets ratio (TLTA)

Total liabilities to total assets ratio can be defined as the firms' total amount of liabilities relative to its assets. It is calculated as;

$$TLTA = \frac{Total\ Liabilities}{Total\ Assets}$$

Total liabilities include both current as well as non-current liabilities and Total assets include both current and non-current assets. The higher the TLTA ratio the more will be the risk that the specific firm is financially constrained.

4.2.4.3. Net income to Total Assets ratio (NITA)

Net income to total assets ratio is also called *Return on Assets* (*ROA*) which indicates that how profitable a firm is relative to its total assets. With the help of this ratio firms' can assess that how efficient it is at using its assets to generate earnings. It is calculated by using the following formula;

$$NITA = \frac{Net\ Income}{Total\ Assets}$$

Here net income is the profit earned after all deductions like administrative, interest and tax expenses. Whereas, total assets include both current and non-current assets.

4.2.4.4. Sales to Total Assets ratio (YTA)

Sales to Assets ratio also refer to as Asset turnover ratio indicates that how efficient a firm is in deploying its assets. Formula used to calculate YTA is;

$$YTA = \frac{Sales}{Total\ Assets}$$

This ratio reflects firm's capability to survive in competitive market hence it is of immence important to be taken for firms' constraint risk.

4.2.4.5. Earnings before Interest and Taxes to Total Assets (EBITA)

EBITA is calculated as;

$$\frac{EBIT}{TA} = \frac{Earnings\ before\ Interst\ and\ Taxes}{Total\ Assets}$$

This ratio is considered as of significant importance financial constraint risk prediction since the firms which have insufficient funds before payment of taxes and interest are likely to experience internal constraints in near future.

4.2.4.6. Debt to Equity ratio (DBERM)

This ratio is commonly used to collect debt burden. It indicates that how much debt amount a firm is liable to pay out of its equity. The firm having higher debt to equity ratio is to be called aggressive firm which has much debt burden. It is calculated by taking total liabilities divided by shareholder's equity.

4.3. ESTIMATION TECHNIQUE

In literature, OLS is appeared to be inconsistent in estimating coefficients in case when explanatory variables are endogenous. In this regard GMM one and two step technique is adopted. The econometric methodology is explained below;

4.3.1. Panel Data Model

This research uses Panel dataset for empirical analysis. Panel data is referred to as the data set which has both the qualities of time dimension and cross-sectional units. It can be generated by pooling cross-sectional observations over the several time periods i.e. investments of firms' across the time. Panel data is said to be balanced panel if it contains complete observations of the specific unit across the time period. On the other hand if some of the observations are missing across the time period than the dataset is considered as unbalanced panel. Panel dataset has several plus points over the other datasets as it increases the sample size significantly for analysis

which reduces the problem of multicollinearity therefore better results could be obtained through efficient estimates.

4.3.2. Panel Unit Root Test

Panel data may have the problem of unit root which leads to inefficient and biased results. Due to large number of observations and time periods the problem of unit root may occur. Thus, it is necessary to evaluate the data at first through some standard test to detect if there is unit root problem in the data before further analysis. There are several different tests used to check the presence of unit root in panel data i.e. Levin, Lin and Chu (1992), Im, Pesaran and Shin (1997), Maddala and Wu (1999) and Hadri. The Levin, Lin and Chu (LLC) and Hadri test considers unit root to be homogeneous across all cross-sections. On the other hand, Im, Pesaran and Shin (IPS) takes unit root to be heterogonous across all cross-sections.

The null hypothesis under the stationarity tests states that;

$$H_0 = \rho = 0$$
$$H_1 = \rho < 0$$

Here null hypothesis states that a variable contains unit root whereas the alternative hypothesis states that the variable is stationary. This study applied LLC and IPS tests to check the existence of unit root in the data. Results of LLC and IPS tests regarding unit root are presented in table 4.3.2.

From Panel unit root tests it is clear that all variables taken for the investment model are stationary and do not came across the problem of unit root as specified by the p-value. Both tests conclude the same results that variables are stationary.

Table 4.3.2. Panel Unit Root Test

Variables	LLC T-Stat	p-value	IPS T-Stat	p-value	Conclusion
$\left(\frac{I}{K}\right)_{it}$	-9.4183	0.0000	-66.0014	0.0000	Stationary
$\left(\frac{C}{K}\right)_{it-1}$	-190.856	0.0000	-42.3959	0.0000	Stationary
$\left(\frac{Y}{K}\right)_{it-1}$	-18.5516	0.0000	-16.4441	0.0000	Stationary
$\left(\frac{B}{K}\right)_{it-1}$	-7.1858	0.0000	-15.5378	0.0000	Stationary

Note:

- LLC denotes Levin, Lin and Chu panel unit root test whereas IPS refers to Im, Pesaran and Shin panel unit root test.
- LLC assumes the common unit root process while IPS states individual unit root process.
- I/K, C/K, Y/K and B/K refer to *investment to capital*, *Cash flow to capital*, *sales to capital* and *debt to capital* ratios respectively.

4.3.3. J-Statistics

J-Statistics is used to check the validity of instruments used in panel data analysis. Sometimes it is also referred to as Sargan or Hensen Test. It follows chi-square distribution under the null hypothesis and is used when instruments are more than parameters to check the validity of over identified instruments.

4.3.4. Second order Serial correlation test (*m2)*

In panel data the problem of correlation among residuals normally lies till the 2 lags time period. The correlation among residuals creates biased results. In order to verify that the error term is not serially correlated beyond second order *m*2 test is included as test of second order serial correlation. The value of *m*2 test if less than 3 states that residuals are not serially correlated[15].

[15] Benchmark value used for *m*2 test

4.3.5. Wald1 and Wald2 Test

Wald1 test is applied to check the joint significance of all explanatory variables. Explanatory variables are considered jointly significant in the model if the P-value of Wald test is less than 0.05. Wald2 test is applied to check the joint significance of time periods taken in our study. Time periods are significantly important if the P-value of Wald test is less than 0.05.

4.3.6. Generalized Method of Moments (GMM)

This study involves panel data and applies Panel Generalize Method of Moments (hereafter GMM) one step and two step techniques for the empirical assessment of dynamic investment model. GMM one step and two step techniques are used to deal with the problem of endogeneity which arises during estimation due to the inclusion of lag of dependent variables as regressors and individual effects in the model. The model used in this study includes variables like investment that are taken in squared and lagged form hence there might be the possibility that issue of endogeneity will arise. The GMM method has plus point in estimating the panel data as it is capable of overcoming unobserved affect and dealing with explanatory variable endogeneity.

GMM technique at first authentic requires parameters to be taken in such a way that the theoretical aspects should be satisfied. In this view the Arellano and Bond (1991) one step and two step GMM specifications is followed. Arellano and Bond GMM estimator takes the difference of all the variables and uses all the previous regarding the dependent variable in the empirical analysis. For estimation of investment behavior across different industries GMM one step technique is applied because of the small no. of observations. On the other hand, for the whole sample two step techniques is applied due to large sample size.

4.4. FINANCIAL CONSTRAINTS AND FIRMS' INVESYMENT DYNAMICS; FULL SAMPLE EMPIRICAL RESULTS

This section is concerned with the explanation of results for the full sample from time frame 1974-2012. Under the full sample results, all 498 firms are included in the estimation procedure to gauge the impact of all explanatory variables on firms' investments without including different sectors, time frames and sizes. This study estimates the neo-classical investment model by using GMM method augmented with cash flows to capital ratio as it considers cash flow to capital ratio as a main variable of concern.

The results are presented in the following table 4.4. In model, the dynamics of the model are captured by the lagged dependent variable which shows the adjustment cost[16] that the firms bear when it moves from one level of investment to the next level of investment. The lag of dependent variable turned out to be significant at 1% significance level with a negative sign indicating that investment spending in previous year does not have any spillover effect on current year investment spending. Moreover negative sign on lagged dependent variable is the indication of absence of smooth investment process in successive periods (Butzen *et al.* 2001)[17]. The result regarding lagged dependent variable is consistent with the studies of La Cava (2005), Terra (2002) and Guariglia (2008).

The square of lagged dependent variable has non linear relationship with investment to capital ratio with a significant and negative impact on current investment to capital ratio which indicates non smooth process. The impact of square of lagged dependent variable on current

[16] For details see Love (2003)

[17] Butzen *et al*. (2001) observed that bursts of investment do not spillover to the next year, but rather are followed by lower investment rates over next years

investment is less as compared to lagged dependent variable. This is in relevant with the studies of Ruano (2006) and Bond and Meghir (1994), Crisóstomo *et al*. (2012) and George and Kabir (2010).

The insignificant effect of lagged Cash flows to capital ratio in accordance with the our study's hypothesis shows that firms of manufacturing sector of Pakistan are not constrained by

Table 4.4. Financial Constraints and Investment (1974-2012); Dependent Variable $\left(\frac{I}{K}\right)_{it}$

Explanatory Variables	Coefficients
$\left(\frac{I}{K}\right)_{i,t-1}$	-0.4130 (0.0114)***
$\left(\frac{I}{K}\right)^2_{i,t-1}$	-0.0001 (0.00001)***
$\left(\frac{C}{K}\right)_{i,t-1}$	-0.0173 (0.0121)
$\left(\frac{Y}{k}\right)_{i,t-1}$	0.2155 (0.0096)***
$\left(\frac{B}{K}\right)^2_{i,t-1}$	-0.0059 (0.0009)***
m2 (Statistics Value)	0.0951
Wald 1(p value)	0.0000
Wald 2 (p value)	0.0000
Sargan (p value)	0.0347

Note;

- GMM two step estimates.
- Standard errors are in parenthesis. Constant and Time dummies included (not reported).
- Instruments used are 3 to 4 of investment to capital ratio, 2 to 5 of cash flow to capital ratio and 2 to 4 of sales and debt to capital ratio.
- *m*2 is the second order serial correlation based on residuals under the null of no serial correlation.
- Wald 1 and Wald 2 are the tests for joint significance of regressors and time periods.
- Sargan test is for instruments validity under the null that instrument is valid.
- Statistical significance at 1%, 5% and 10% is denoted by ***, ** and * respectively.

internal finance in general and these firms do not face problem of external financial constraints. The negative sign shows that firms can raise funds at given cost for their investment spending. It

is because of the reason that these firms are not dependent upon internally generated firms since they can raise more funds with access to external funds i.e. debt and equity.

In literature, Sales have been found as an important determinant affecting firms' investment decisions so it has been included in the model to capture investment opportunities for firms. Lagged Sales to capital ratio has shown significant impact on firms' investments as far as the whole sample results are concerned. Results show that 1% increase in lag of sales to capital ratio will increase investment spending of firms by 0.21%. This is because accordingly to the Sales accelerator theory of investment firms intend to invest more if their products demand increases in the market. Thus in case of Pakistan the hypothesis that sales accelerate firms' investments is accepted as long as the full sample is observed showing that sales play vital role in firms' profitability. The results regarding sales impact on investment are consistent with the studies of Terra (2002), Ruano (2006) and Bond and Meghir (1994).

The square of lagged debt to capital ratio is negative and significant at 1% significance level. The negative sign indicates the tax-bankruptcy cost specification[18] associated with debt level which states that firms have to bear bankruptcy cost with the increase in debt levels hence negative effect on current investment. This is in line with the studies of Ruano (2006), Lima Crisóstomo *et al*. (2012) and Bond and Meghir (1994).

The significance of instruments used is tested by sargan test which states that instruments are valid at 1% level of significance. There is no serial correlation among the residuals which is confirmed by second order serial correlation test represented by *m*2. All regressors and time periods are jointly significant which is confirmed by Wald 1 and Wald 2 tests.

[18] See Bond and Meghir (1994) for reference

In the following section, the model of Bond and Meghir (1994) is estimated including the full sample from 1974-2012 to analyze the impact of Financial constraints on Firms' investments of manufacturing sector of Pakistan. In the next chapter firms are categorized in constrained and unconstrained categories by financial constraints measures to study whether their investment behaviors vary or not.

Chapter 5

FINANCIAL CONSTRAINTS AND FIRMS' INVESTMENTS: A COMPARISON VIA FINANCIAL CONSTRAINTS MEASURES

In this chapter results are explained for the prospect that whether financial constraints and investment of the firms varies across different groups or not. Whether the investment behavior of FC and FUC firms' is different or similar. Furthermore, the investment cash flows sensitivity varies across FC and FUC firms.

5.1. IDENTIFICATION OF FIRMS' FINANCIAL STATUS

Accordingly to the initial objective of the study, firstly it is required to identify financial status of firms by categorizing them in to groups i.e. financially constrained and unconstrained firms. For this purpose financial constraint measures including Net Income, Operating Income, Payout Ratio, and Interest Coverage ratio are used[19]. The objective is to compare the investment behavior of firms which are constrained at initial level with firms which are constrained after their financial obligations.

5.1.1. Net Income

Net income is the income which firms get after deducting all administrative, tax and interest expenses. It is the measure of internal financial constraints from which firms come to know that how much they are constrained internally to employ internal funds in their investments. Firms

[19] The measures used in this study are based upon the study of Bhagat et al. (2005) in which he investigated investment behavior of distressed, non-distressed as well as financially constrained firms by dividing firms of different nature accordingly these measures.

with positive income would be considered having no hurdles regarding internal sources of finance and thus financially unconstrained. Firms with negative net income state that their cash flows are not there to be used in investment and these firms would be classified as financially constrained. This study sorted the firms accordingly their net income and divided them in two categories based on their positive and negative net income.

5.1.2. Operating Income

Operating income is the initial income hat firms obtained after deducting their administrative expenses. Firms with operating profit (positive operating performance) exhibit that their internal funds are present to be invested in the investment activities. On the other hand firms' having operating loses exhibit the severity of financial constraints by stating that these firms even do not have cash to pay their tax and interest expenses, hence these firms would be classified as financially constrained firms. This study sorts the firms accordingly operating profits and losses and compares their investment dynamics.

5.1.3. Payout Ratio

Dividend payout ratio is the ratio which is distributed to the shareholders as a firm's specified percentage of profit. Firms which do not pay dividends indicate that due to availability of less internal funds these firms are bound to avoid paying dividends out of their income and consequently are financially constrained. Whereas firms displaying positive payout ratio as a percentage of their income exhibit that their financial health is stable in paying dividends as well as investing in profitable opportunities. Firms are categorized as constrained and unconstrained according to their dividend behavior and afterwards their investment attitude is observed.

5.1.4. Interest Coverage Ratio

Interest Coverage ratio is the measure of financial constraints which shows how rapidly a firm can pay interest payments on its outstanding debt. Higher the ratio indicates that firm is efficient in paying its debt expenses and hence unconstrained. This will ease the firm to in a way that these firms have availability of initial resources to finance their investments. While firms with lower coverage ratio exhibit that the firm is not stable to meet its expenses and is constrained. Firms are grouped in constrained and unconstrained subject to their coverage ratio.

The following section includes results and interpretation and discusses the comparison When firms are categorized in constrained and unconstrained categories accordingly to the measures discussed above then afterwards their investment behavior is observed. For this intension the neoclassical Euler equation model of Bond and Meghir (1994) is estimated for each data set.

5.2. FINANCIAL CONSTRAINTS AND FIRMS' INVESTMENTS; A COMPARISON BASED ON OPERATING INCOME

To sort firms accordingly their operating income, firstly average operating income for every firm is calculated then the firms are distributed in FC and FUC categories according to their average operating income.

Table 5.2 presents empirical results of financial constraints and firms investments with respect to operating income for both groups of firms. The dynamics of both types of firms indicate that investment is not a smooth mechanism for them. As for the both group of firms the lagged dependent variables are significant at all levels and have negative signs indicating the adjustment cost which firms have to bear to move from one level to the next level of

investment[20]. Lagged square of investment is also not relevant for both set of firms and has the expected sign in accordance with the theory.

Table 5.2: Operating Income and Investments (1974-2012): Dependent Variable $\left(\frac{I}{K}\right)_{it}$

Explanatory Variables	Coefficients	
	Financially Constrained Firms with Operating Loses	Financially Unconstrained Firms with Operating Profits
$\left(\frac{I}{K}\right)_{i,t-1}$	-0.2965 (0.0053)***	-0.3086 (0.0165)***
$\left(\frac{I}{K}\right)^2_{i,t-1}$	-0.0009 (0.00003)***	-0.0193 (0.0009)***
$\left(\frac{C}{K}\right)_{i,t-1}$	-0.0356 (0.0024)**	0.0890 (0.0127)***
$\left(\frac{Y}{k}\right)_{i,t-1}$	0.0439 (0.0012)***	0.0158 (0.0014)***
$\left(\frac{B}{K}\right)^2_{i,t-1}$	0.0001 (0.00009)	-0.0015 (0.0001)***
m2 (Statistics Value)	0.0001	0.0324
Wald 1(p value)	0.0000	0.0000
Wald 2 (p value)	0.0000	0.0000
Sargan (p value)	0.1851	0.0398

Note:

- GMM two step estimates.
- Constant and Time dummies included (not reported).
- Instruments used are 3 to 4 of investment to capital ratio, 2 to 5 of cash flow to capital ratio and 2 to 3 of sales and debt to capital ratio.
- Statistical significance at 1%, 5% and 10% is denoted by***, ** and * respectively.

In case of financially constrained firms the effect of cash flows to capital ratio is negative and significant at 5% which indicates that investment policy does not react to change in internal funds because the firms do not rely on internal funds to finance their investments.

[20] See Fazzari, Hubbard and Peterson (1988) for details

The effect of sales is found to be significantly positive at striking 1% level for both internally constrained and unconstrained firms indicating that these firms have investment opportunities to avail. Results illustrate that 1% increase in lagged sales to capital ratio increases the current investment of FC and FUC firms by 0.04% and 0.01%. The magnitude is high in case of FC firms' with operating loses indicating that these firms invest more. This is due to the reason that these firms arrange finance for investment activities from other resources i.e. equity[21] thereby showing negative investment cash flow sensitivity.

The cash flow coefficient is significantly positive at 1% significance level showing that cash flows are important determinant of investment for FUC firms. Results reveal that 1% increase in previous internal finance increases the current investment to capital ratio by 0.08% there by suggesting positive investment cash flow sensitivity.

The square of lagged debt to capital ratio is found to be insignificant for FC firms and significantly negative at 1% for FUC firms. The negative sign of coefficient is related with the bankruptcy cost and in line with the previous studies findings.

The diagnostic tests for both data sets are valid. The value of m2 indicates that there is no serial correlation between residuals. Sargan test value confirms that instruments used are valid. Furthermore, Wald 1 and Wald 2 test values suggest that regressors and time periods are jointly significant.

[21] Bhagat et al. (2005) observed that financially distress firms with operating loses tend to invest more as their investment is funded by Equity claimants who want to keep firms stable in hoping that their equity claims increase when firm's condition are improved

5.3. FINANCIAL CONSTRAINTS AND FIRMS INVESTMENTS; A COMPARISON BASED ON NET INCOME

In this section Firms' are considered as financially constrained when these firms have negative net income after paying their administrative, interest and tax expenses. Whereas, firms are considered to be unconstrained when have enough funds even after fulfillment of their all expenses. At first average net income for every firm is obtained and then firms are grouped as FC and FUC firms accordingly net profits and net loses.

In estimation results, Lagged investment to capital ratio is found to be negative and significant at all levels of significance for both FC and FUC firms. The negative sign is indicating that investment in preceding year has no effect on investment in current year which means investment process is not smooth[22]. Square of lagged dependent variable is also negative and insignificant for constrained and unconstrained firms respectively which also confirms above explained phenomenon regarding investment process.[23]

The coefficient of cash flows is observed to be significantly negative and significantly positive for FC and FUC firms respectively at striking 1% level of significance. Negative sign in case of FC firms indicates that in presence of net loses i.e. insufficient internal finance firms need to borrow more for their maintaining their investments and so there is possibility of serious loss when these firms are unable to repay. It is observed that firms' investment decreases their investments when their internal finance decreases to avoid this foreseeable loss in future (Cleary *et al*. 2004). While positive sign in case of FUC firms depicts that their investment spending is responsive towards increase in cash flows as there exists positive investment cash flows

[22] See Betzon et al. (2001), La Cava (2005), Terra (2002) and Guariglia (2008) for reference
[23] See for details Ruano (2006), Bond and Meghir (1994) and George and Kabir (2010)

sensitivity. Results confirm that 1% increase in lagged cash flows to capital ratio improves current investment level by 0.30%.

Sales are explored to be significantly positive at 1% level for both FC and FUC firms indicating that 1% increase in previous sales to capital ratio increases current investment of FC and FUC firms by 0.005% and 0.02% respectively. The scale is high in Case of FUC firms which indicates that the sales in past year pushes these firms to invest more since these firms have more investment opportunities. The negative investment-cash flow sensitivity in FC firms with net

Table 5.3. Net Income and Firms' Investments (1974-2012): Dependent Variable $\left(\frac{I}{K}\right)_{it}$

Explanatory Variables	Coefficients	
	Financially Constrained Firms with Net Loses	Financially Unconstrained Firms with Net Profits
$\left(\frac{I}{K}\right)_{i,t-1}$	-0.2310 (0.0037)***	-0.5734 (0.0288)***
$\left(\frac{I}{K}\right)^2_{i,t-1}$	-0.00008 (0.000008)***	-0.0293 (0.0014)***
$\left(\frac{C}{K}\right)_{i,t-1}$	-0.0223 (0.0049)***	0.3015 (0.0323)***
$\left(\frac{Y}{k}\right)_{i,t-1}$	0.0054 (0.0017)***	0.0298 (0.0020)***
$\left(\frac{B}{K}\right)^2_{i,t-1}$	-0.00004 (0.00002)**	-0.0094 (0.0001)***
m2 (Statistics Value)	2.1057	0.0532
Wald 1(p value)	0.0131	0.0000
Wald 2 (p value)		0.0000
Sargan (p value)	0.0974	0.0340

Note:

- GMM two step estimates.
- Standard errors are in parenthesis.
- Constant and Time dummies included (not reported).
- Statistical significance at 1%, 5% and 10% is denoted by ***, ** and * respectively.

loses is also confirmed by lagged sales to capital ratio. This is because the sales ratio is low in this case highlighting lack of investment opportunities there by confirming negative investment-cash flow sensitivity.

Results of *m*2 in both cases indicate that this study do not face the problem of second order serial correlation among residuals. All independent variables and time dummies are observed to be jointly significant and sargan test confirms those instruments used are clearly valid.

5.4. FINANCIAL CONSTRAINTS AND FIRMS' INVESTMENTS; A COMPARISON BASED ON COVERAGE RATIO

Firms are grouped in to two categories accordingly their average interest coverage ratio. Lower coverage ratio highlights vulnerability in firms because these firms are not able to meet their financial obligations and vice verse.

The lagged dependent variable and its square are found negative and significant at all levels of significance which state that there is no spillover effect of investment spending over the investment of future for both FC and FUC firms.

Investment decisions of internally FUC firms are positively influenced by generation of cash flows as 1% increase in internal funds leads to 0.12% increase in investment spending of these firms. While the negative sign in case of internally FC firms states that these firms have availability of internal cash to finance their investment spending thereby indicating positive investment cash flows sensitivity. While negative coefficient in case of FC firms show their investment is not responsive towards cash flows even if they increase due to their financial fragility condition.

Table 5.4. Coverage ratio and Firms' Investments (1974-2012): Dependent Variable $\left(\frac{I}{K}\right)_{it}$

Explanatory Variables	Coefficients	
	Financially Constrained Firms lower coverage ratio	**Financially Unconstrained Firms with higher coverage ratio**
$\left(\frac{I}{K}\right)_{i,t-1}$	-0.0830 (0.0169)***	-0.2268 (0.0126)***
$\left(\frac{I}{K}\right)^2_{i,t-1}$	-0.0015 (0.0024)	-0.0010 (0.0001)***
$\left(\frac{C}{K}\right)_{i,t-1}$	-0.7604 (0.0721)***	0.1228 (0.0333)**
$\left(\frac{Y}{k}\right)_{i,t-1}$	0.0036 (0.0020)*	0.0590 (0.0315)*
$\left(\frac{B}{K}\right)^2_{i,t-1}$	-0.0001 (0.0019)	-0.0001 (0.0003)
m2 (Statistics Value)	0.2290	0.4122
Wald 1(p value)	0.0000	0.0000
Wald 2 (p value)	0.0000	0.0000
Sargan (p value)	0.5041	0.2697

Note:

- GMM two step estimates.
- Standard errors are in parenthesis.
- Constant and Time dummies included. (not reported)
- Statistical significance at 1%, 5% and 10% is denoted by ***, ** and * respectively.

The impact of lagged sales to capital ratio is positive and significant at 10% level of significance for both FC and FUC firms. Figure shows 1% increase in sales to capital ratio lead to 0.003% and 0.05% increase in investments of FC and FUC firms respectively. This is the indication that investment opportunities are present for both natures of firms. The scale is low for FC firms indicating that these firm do not see any profitable investment opportunity hence these firms cut down their investment level showing significantly negative cash flows sensitivity (Bhagat *et al*. 2005).

The square of lagged debt to capital ratio is insignificant with a negative sign for FC as well as FUC firms. These results are consistent with Ruano (2006), Bond and Meghir (1994) and George and Kabir (2010). The validity of instruments is checked by sargan test. The null of no serial correlation is accepted by this study. Independent variables and time dummies are found jointly significant in each case.

5.5. FINANCIAL CONSTRAINTS AND FIRMS' INVESTMENTS; A COMPARISON BASED ON PAYOUT RATIO

In this section firms which do not pay dividends are considered as FC firms whilst the firms which pay dividends are said to be FUC firms. Firms are grouped in constrained and unconstrained categories based on their dividend payout behavior. Empirical results in case of lagged dependent variable for both types of firms signifying that investment is not smooth over time and firms have to bear adjustment cost to move from one level of investment to next level of investment. Square of lagged dependent variable is negative and significant for both FC and FUC firms at all significance levels.

The effect of cash flows in financially unconstrained firms points out that 1% increase in internal funds increase investment by 0.02% which indicates that these firms are sensitive towards availability of internal finance[24]. While it is negative and significant for constrained firms indicating that these firms are not dependent upon internal funds.

The Sales to capital ratio is observed to be positive and significant at all levels of significance. Results point out that 1% increase in sales lead to 0.09% and 0.02% increase in investments of constrained and unconstrained firms respectively. The effect is more influential in

[24]See for reference Marouene *et al*. (2013) and Cleary *et al*. (2004)

case of FC firms indicating that these firms have more investment opportunities and their investment spending is connected with pas year sales. The reason behind this phenomenon states that these firms are funded by equity claimants. Cleary *et al*. (2004) presented another reason that firms invest more even if their internal funds decrease since these firms anticipate that investing in potential project will benefit them in monetary terms in future.

Table 5.5. Payout ratio and Firms' Investments (1974-2012): Dependent Variable $\left(\frac{I}{K}\right)_{it}$

Explanatory Variables	Coefficients	
	Financially Constrained Firms not paying dividends	**Financially Unconstrained Firms paying dividends**
$\left(\frac{I}{K}\right)_{i,t-1}$	-0.3526 (0.0151)***	-0.5079 (0.0086)***
$\left(\frac{I}{K}\right)^2_{i,t-1}$	-0.00008 (0.000005)***	-0.0039 (0.00006)***
$\left(\frac{C}{K}\right)_{i,t-1}$	-0.1691 (0.0091)***	0.0245 (0.0011)***
$\left(\frac{Y}{k}\right)_{i,t-1}$	0.0980 (0.0340)***	0.0216 (0.0015)***
$\left(\frac{B}{K}\right)^2_{i,t-1}$	-0.00003 (0.000001)***	-0.000004 (0.000008)
m2 (Statistics Value)	0.00007	0.1286
Wald 1(p value)	0.0000	0.0000
Wald 2 (p value)	0.0061	0.0000
Sargan (p value)	0.0374	0.1241

Note:

- GMM two step estimates.
- Standard errors are in parenthesis.
- Constant and time dummies included. (not reported)
- Statistical significance at 1%, 5% and 10% is denoted by ***, ** and * respectively.

Wald 1 and Wald 2 state that all explanatory variables and time dummies are jointly significant. Sargan test p-value clearly confirms that instruments used in the study are valid. The null of no

serial correlation is accepted by these results which show that this study is independent from the problem of serial correlation among residuals.

Overall results show that the hierarchy of finance theory which states that firms at first prefer internal funds over external sources of funds is valid in the case of FUC firms. In other words FUC firms are constrained by internal funds as their investment is proportional to the evolution of internally generated funds. Results are consistent with KZ (1997), Allayannis and Mozumdar (2004) that internally least constrained firms are more sensitive towards internal finance. Results are also in line with the study of Marouene *et al*. (2013) indicating that investment-cash flows sensitivity exists when external constraints are present and internal constraints are weak or absent.

However, we cannot draw clear conclusion that which nature of firms are more or less sensitive to internal finance regarding their investments. To meet the said objective, the next chapter further divides FC and FUC firms in sub categories to check the impact of different financial constraints levels on firms' investment by financial constraints measures. It would be further observed that how firms of different characteristics behave when it comes to investment behavior.

Chapter 6

MEASURING FIRM LEVEL INTENSITY OF FINANCIAL CONSTRAINTS

Previous chapter focused on generally dividing firms in constrained and unconstrained categories and observing their investment behavior afterwards. Thus, the following chapter focuses on measuring intensity of financial constraints present in firms to actually observe that how internally constrained and unconstrained firm behave with respect to the intensity of financial constraints. For this purpose this study further divides FC and FUC in different groups' accordingly lower and higher FC intensity present in them firms by using financial constraints measures[25].

6.1. FINANCIAL CONSTRAINT LEVELS AND FIRMS INVESTMENTS; A COMPARISON BASED ON PAYOUT RATIO

In this section, firms average dividend payout ratio is calculated to distribute firms in different categories. Afterwards Firms are distributed in Quartiles accordingly their Dividend payout behavior in. Quartile 1 includes firms which do not pay dividends. Quartile 2 consists of firms which pay dividend between 0 to 10%. Similarly, Quartile 3 and 4 includes sample of firms which pay 10-20% and 20-30% of their profits in the form of dividends respectively. Empirical results are given as well as discussed below;

The effect of Lagged sales to capital is observed to be positive and significant at 10% for firms in Quartile 2 and 1% for firms in Quartile 3 and 4. Results show that when there is 1%

[25] Details regarding financial constraints measures has been discussed in chapter 4 and 5

increase in past year's sales it will increase the current investment level of firms in quartile 2, 3 and 4 by 0.0009%, 0.05% and 0.64% respectively indicating the presence of investment opportunities for these firms. The magnitude is high for unconstrained firms in Quartile 3 and 4.

Table: 6.1. Payout Ratio levels and Firms' Investments; Dependent variable $\left(\frac{I}{K}\right)_{it}$

Explanatory Variables	Coefficients			
	QUARTILE: 1	**QUARTILE: 2**	**QUARTILE: 3**	**QUARTILE: 4**
	FC Firms with POR 0	***FC Firms with POR 0-10%***	***FUC Firms with POR 10-20%***	***FUC Firms with POR 20-30%***
$\left(\frac{I}{K}\right)_{i,t-1}$	-0.4073 (0.0848)***	-0.6398 (0.0076)***	-0.7326 (0.0025)***	-0.1821 (0.0231)***
$\left(\frac{I}{K}\right)^2_{i,t-1}$	0.0062 (0.0039)	-0.0012 (0.00005)***	-0.0012 (0.00005)***	-0.0001 (0.00001)***
$\left(\frac{C}{K}\right)_{i,t-1}$	-0.2751 (0.0407)***	-0.0227 (0.0081)***	0.0293 (0.0036)***	0.1050 (0.0148)***
$\left(\frac{Y}{K}\right)_{i,t-1}$	-0.4395 (0.1307)***	0.0009 (0.0005)*	0.0582 (0.0070)***	0.6465 (0.1215)***
$\left(\frac{B}{K}\right)^2_{i,t-1}$	-0.0005 (0.0002)**	0.0001 (0.0001)	0.000005 (0.000005)	-0.0001 (0.00001)***
m2 (Statistics Value)	0.0022	0.2631	1.6100	0.1153
Sargan (p value)	0.6353	0.7298	0.7078	0.0254

Note;

- GMM estimations
- Quartile 1 includes the firm which do not pay Dividends, Quartile 2 consist of firms with lower dividends 0-10%, Quartile 3 consists of firms with moderate dividend ratio 10-20% and Quartile 4 include firms with higher dividend ratio between 20-30%
- *m*2, and sargan value are test for second order serial correlation among residuals and instruments validity
- statistical significance at 1%, 5% and 10% is denoted by ***, ** and * respectively
- standard errors are in parenthesis

While the coefficient is negative and positively lower for firms Quartile 1 and 2 respectively signifying that these firms cut down their investment activities due to inefficient internal cash. Moreover, there is absence of investment opportunities for firms in both Quartiles.

The effect of lagged dependent variable is found to be negative and significant for all four Quartiles. The impact of lagged cash flows is found to be positive and significant at 1% significance level in Quartile 3 and 4. Results illustrate that 1% increase in lagged cash flows to capital ratio positively improves current investment by 0.02% and 0.1%. Additionally, the figure confirms that intensity of sensitivity of investment in response to change in cash flows is higher for firms in Quartile 4 as these firms are internally more stable as compared to firms in remaining three Quartiles.

Moreover, if Quartile 1 and 2 are observed then there exists negative cash flows sensitivity as these firms decrease their investment level due to decrease in internally generated funds (Guariglia 2008). Thus these firms exhibit negative cash flows sensitivity towards investments.

6.2. FINANCIAL CONSTRAINTS LEVELS AND FIRMS' INVESTMENTS; A COMPARISON BASED ON INTEREST COVERAGE RATIO

Firms are distributed in six data sets accordingly their lower, slightly and higher coverage ratios. The objective is to check how firms of different natures behave in response to levels of financial constraints. Results are presented in table 6.2;

Results exposed that firms of different nature via levels of interest coverage ratio behave differently when it comes to investment dynamics. Extreme financially constrained firms and financially constrained firms have zero cash flow sensitivity as their internal funds have nothing to do with their investment spending. Additionally, moderately financially constrained firms have negative sales to capital ratio indicating absence of investment opportunities. These firms are observed to be prone towards financial distress since these firms cut much of their investment

spending due to unavailability of internal cash and sales. While financially constrained and slightly financially constrained firms which have tendency to move towards financial distress are found to be investing more due to their ability to generate funds being provided by equity claimants (Bhagat *et al*. 2005). 1% increase in their lagged sales to capital ratio positively increase their investment spending by 0.003% and 0.04% indicating that these firms invest more even having zero cash flow sensitivity as evident by empirical results.

The investment cash flows sensitivity of moderately unconstrained and unconstrained firms is different from other data sets. Their lagged to capital ratio is found to be positive and significant at 5% and 1% significance levels. Results reveal that 1% increase in cash flows improves their investment level by 0.02% and 0.54% respectively. The positive sensitivity is relatively more in case of financially unconstrained firms exhibiting their dependency upon internal finance.

The negative sign associated with lagged Sales to capital ratio in case of moderately financially unconstrained firms indicates that these firms have lack of beneficial investment opportunities. While in case of financially unconstrained firms sales are found to be of significantly important at 1% level of significance. Since the figure reveals that 1% increase in past year's sales improves the current investment level by 0.04% which is the utter indication that if these firms tend to invest more than these firms get benefit in future.

The negative sign of square of lagged debt to capital ratio indicates the bankruptcy cost associated with debt payments taken over successive period. These results are relevant to the studies of Ruano (2006) and Bond and Meghir (1994). While the positive sign of square of lagged debt to capital ratio in case of EFC and FC firms shows the positivity of relationship

6.2. Interest Coverage ratio levels and Firms investments; Dependent variable $\left(\frac{I}{K}\right)_{it}$

Explanatory Variables	Coefficients					
	Firms with Covr6 FUC firms	**Firms with Covr5 MFUC firms**	**Firms with Covr4 SFC firms**	**Firms with Covr3 MFC firms**	**Firms with Covr2 FC firms**	**Firms with Covr1 EFC firms**
$\left(\frac{I}{K}\right)_{i,t-1}$	-0.2357 (0.0061)***	-0.2466 (0.0785)***	-0.1897 (0.01927)***	-0.0694 (0.0116)***	-0.5745 (0.0209)***	-0.6088 (0.0057)***
$\left(\frac{I}{K}\right)^2_{i,t-1}$	-0.0002 (0.000009)***	-0.0096 (0.0014)***	-0.0036 (0.0005)***	-0.00006 (0.00004)	-0.0329 (0.0018)***	-0.0041 (0.00005)***
$\left(\frac{C}{K}\right)_{i,t-1}$	0.5426 (0.0350)***	0.0258 (0.0107)**	-0.0542 (0.0674)	-0.0430 (0.0028)***	0.0028 (0.0134)	0.0284 (0.0346)
$\left(\frac{Y}{K}\right)_{i,t-1}$	0.0403 (0.0054)***	-0.0174 (0.0017)*	0.0419 (0.0217)*	-0.0167 (0.0013)***	0.0035 (0.0013)**	-0.0277 (0.0031)***
$\left(\frac{B}{K}\right)^2_{i,t-1}$	-0.0003 (0.000005)***	-0.0001 (0.00006)*	-0.0004 (0.00003)***	-0.0002 (0.00001)***	0.0007 (0.00007)**	0.0080 (0.0002)***
m2 (Statistics Value)	0.0002	0.3426	0.5572	0.0118	0.6763	1.3517
Wald 1 (p value)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Wald 2 (p value)	0.0000	0.0000		0.0029	0.0000	0.0000
Sargan (p value)	0.0372	0.8258	0.1526	0.8537	0.8368	0.7682

Note;

- Covr1, Covr2, Covr3, Covr4, Covr5 and Covr6 refers to *extreme financially constrained, financially constrained, moderate financially constrained, slightly financially constrained, moderately financially unconstrained* and *financially unconstrained firms*
- GMM one and two step estimations
- Constant and Time dummies included. (not reported)
- Standard errors are in parenthesis
- Statistical significance at 1%, 5% and 10% is denoted by ***, ** and * respectively

of non-linearity. The positive sign indicates tax advantages linked with debt financing[26]. These results are consistent with Lima Crisostomo *et al.* (2012). Diagnostic test regarding serial correlation in all cases are in view that the concerned study is independent from the problem of second order serial correlation. Similarly, Sargan test for validity of instruments, Wald 1 and 2 tests are also valid stating that instruments used are valid, independent variables and time periods are jointly significant respectively.

6.3. FIRMS' TANGIBILITY LEVELS AND INVESTMENTS; A COMPARISON BASED ON FIRMS TANGIBILITY RATIO

Firms with fewer tangible assets are more likely to come across bigger information asymmetry when presenting their worth to outside investors and hence face larger degree of financial constraints (Bhagat *et al*. 2005). Whilst firms with adequate amount of tangible assets are likely to face no such obstacles in their financial activities. In this section manufacturing sector firms are divided in three sets accordingly lower, moderate and higher tangibility ratios. Results are presented in table 6.3 given below;

In above presented results, Lagged dependent variable and its square are significantly negative for each data sample split and are consistent with the results discussed in previous sections. Firms' investment approach is dependent upon availability of internal funds as far as firms' with lower and moderate tangibility are concerned[27]. As results disclosed, 1% increase in Lagged cash flows to capital ratio increase the current investment of these firms by 0.04% and

[26] Brigham (2003) Static trade off theory of finance suggests that firms finance their investments through debt financing in order to avail tax advantages. But when these firms tend to take more debts over the successive periods then consequently their bankruptcy cost tend to increase over time. See also Bond and Meghir (1994)

[27] Almieda and Campello (2007) also observed that asset tangibility has positive effect on investment-cash flow sensitivity of Financially constrained firms but not in case of Financially unconstrained firms

0.35% respectively thereby indicating positive correlation between cash flows and investments when tangibility ratio is low. On the other hand, Lagged cash flow to capital ratio is insignificant in case of firms' with higher asset tangibility highlighting the zero cash flow sensitivity. These

Table 6.3. Firms' Tangibility levels and Investments; Dependent Variable $\left(\frac{I}{K}\right)_{it}$

Explanatory Variables	Coefficients		
	Firms with Low Tangibility Ratio	Firms with Moderate Tangibility Ratio	Firms with High Tangibility Ratio
$\left(\frac{I}{K}\right)_{i,t-1}$	-0.5832 (0.0003)***	-0.0757 (0.0142)***	-0.1519 (0.0095)***
$\left(\frac{I}{K}\right)^2_{i,t-1}$	-0.0052 (0.0000007)***	-0.0001 (0.000008)***	-0.0003 (0.00006)***
$\left(\frac{C}{K}\right)_{i,t-1}$	0.0422 (0.0001)***	0.3545 (0.0290)***	-0.0014 (0.0016)
$\left(\frac{Y}{K}\right)_{i,t-1}$	-0.0011 (0.0001)***	0.2776 (0.0181)***	0.0141 (0.0044)***
$\left(\frac{B}{K}\right)^2_{i,t-1}$	-0.00002 (0.000003)***	-0.00001 (0.00001)	-0.0002 (0.000004)***
m2 (Statistics Value)	0.00007	0.0000	0.2520
Wald 1 (p value)	0.0000	0.0000	0.0000
Sargan (p value)	0.0343	0.7963	0.8423

Note;

- GMM one and two step estimations
- Standard errors are in parenthesis
- Constant and Time dummies included. (not reported)
- Statistical significance at 1%, 5% and 10% is denoted by ***, ** and * respectvely
- Details regarding diagnostic tests and variable construction are discussed in table 4.4

results are consistent with Bhagat *et al*. (2005) and Almieda and Campello (2007). It is observed that firms' sensitivity to internal finance is not decreasing with firms' being less financially constrained hence our results are contrary to the findings of Fazzari *et al*. (1988) in case of Tangibility.

Sales are explored to be positively affecting firms' investment spending at striking 1% significance level. Figures show that 1% increase in lagged sales to capital ratio increase the current investment of firms' with moderate and high tangibility ratio by 0.27% and 0.01% respectively. While in case of firms' with lower tangibility ratio the coefficient of sales is negative specifying that these firms have lack of profitable investment opportunities.

The value of *m*2 is below three in all three cases which shows that there is no existence of serial correlation among residuals. All regressors are jointly significant and validity of instruments is confirmed by Sargan test.

6.4. FINANCIAL CONSTRAINTS LEVELS AND FIRMS INVESTMENTS; A COMPARISON BASED ON FIRM SIZE

Firms which are large in size (having sufficient total assets) are financially unconstrained because these firms have ease in obtaining external finance with lower risk premium by investors. On the other firms with lower size (lack of total assets) are financially constrained due to the fact that they find higher degree of information asymmetry and these firms abstain from getting external funds because they find it very costly. Sample is divided in three sections accordingly firms' with small, medium and large size. Results are discussed below;

Results show that investment behavior of small, medium and large firms is clearly dependent upon generation of internal funds. It is apparent that 1% increase in lagged cash flows to capital ratio increases the current investment of small, medium and large sized firms' by 0.19%, 0.035% and 0.34% respectively. The sensitivity is higher in case of small sized firms as their investment is sensitive towards any shock to internally generated funds.

Sales are found to be of significant importance for determining investments of small and medium sized firms at 10% and 1% significance levels respectively. As it is evident that 1% increase in previous year's sales to capital ratio increases the investment level of small and medium sized firms by 0.003% and 0.005% respectively. These results depict the presence of investment opportunities for both firms of different nature. While, the sales coefficient is found negative for large sized firms which shows absence of investment opportunities for these firms. This is due to the reason that large sized firms are grown up firms and these firms do not indulge in every investment opportunity unless and until they find any project to be highly beneficial in monetary terms.

Table 6.4. Firms' Size levels and Investments; Dependent Variable $\left(\frac{I}{K}\right)_{it}$

Explanatory Variables	Coefficients		
	Small Sized Firms	**Medium Sized Firms**	**Large Sized Firms**
$\left(\frac{I}{K}\right)_{i,t-1}$	-0.0581 (0.0153)**	-0.6784 (0.0144)***	-0.3105 (0.0043)***
$\left(\frac{I}{K}\right)^2_{i,t-1}$	0.0023 (0.00008)***	-0.0315 (0.0013)***	-0.0004 (0.00002)***
$\left(\frac{C}{K}\right)_{i,t-1}$	0.1984 (0.0416)***	0.0355 (0.0173)**	0.0341 (0.0067)***
$\left(\frac{Y}{K}\right)_{i,t-1}$	0.0031 (0.0017)*	0.0059 (0.0007)***	-0.0046 (0.0021)**
$\left(\frac{B}{K}\right)^2_{i,t-1}$	-0.0001 (0.0002)	-0.00007 (0.00005)	-0.00001 (0.00001)
m2 (Statistics Value)	0.0742	1.8186	0.4723
Wald 1 (p value)	0.0000	0.0000	0.0000
Sargan (p value)	0.1089	0.1683	0.8217

Note;

- GMM one step and two step estimations
- Statistical significance at 1%, 5% and 10% is denoted by ***, ** and * respectively
- Standard errors are in parenthesis

The square of lagged debt to capital ratio is negative and insignificant for all type of firms since the negativity is related with the bankruptcy cost[28] which firms have to bear in case of aggressive behavior regarding debts. The serial correlation test in all three data sets suggests that the study does not have any serial correlation issue among residuals. Moreover explanatory variables are jointly significant as evidenced by Wald 1 test. Sargan p-value is significant at 10% in each case thereby showing that instruments used are valid.

The previous chapter was related to observe general investment behavior of FC and FUC firms. The following chapter further categorized FC and FUC firms in categories according the levels of financial constraints present in them via several financial constraints measures. Both the chapters are concerned with financial factors that are considered to be important for having differential effects on firms. The upcoming chapter is linked with macro economic factors which are important in effecting firms' investment behavior.

[28] See Ruano (2006), Bond and Meghir (1994) and George and Kabir (2010) for details

Chapter 7

FIRM LEVEL FINANCIAL CONSTRAINTS RISK ANALYSIS VIA MACRO-RELATED MICRO-CRISIS MODEL

Previous chapters were only concerned with financial variables held responsible for effecting firms' investment behavior. However, in reality macro economic conditions prevailing in the country are also responsible for having impact on manufacturing sector firms of Pakistan. Therefore this chapter is concerned with measurement of Probability of Financial constraint risk present in manufacturing sector firms of Pakistan.

Literature in financial economics supports that there are numerous macroeconomic factors which act as financial constraints for firms since fluctuation in these factors indirectly impact the financing patterns of firms through affecting the stock prices. In order to decide which firm to finance, lending institutions and investors usually observe the stock prices position of firms as stable stock prices state that the specific firm is worthy and strengthful so it would not face financial constraints. While as far as internal constraints are concerned the stock prices also play an important role because when firms have more exposure towards macroeconomic factors they are more likely to have experience of fragility regarding financial status. Therefore, stock prices depict the true picture of firms' financial position as they fluctuate by fluctuation in macroeconomic factors.

This chapter is concerned about measuring firms' financial constraints risk as research in Financial Economics illustrated that firms' stock prices are affected by numerous macroeconomic factors. The stock price sensitivity to macro variables is in turn influenced by firm specific micro variables. This aspect establishes a link that firm characteristics not only

affect risk directly but also indirectly via their influence on macro risk factors. This analysis used the logit model of Tirapat and Nittayagasetwat (1999) for estimation. The detail aspects of the logit model are discussed in the next section.

7.1. FINANCIAL CONSTRAINTS RISK ANALYSIS – INDIRECT APPROACH

In this section, the multifactor model presents the relationship between the stock returns of firms and firms' sensitivity to macro factors and stock returns in turn impact the probability of firm's higher risk. In this context the association between the probability of financial constraints risk and firm stock return in such that a firm with high stock returns will have a low level of being financially constrained. In the first step the stock returns *(Rit)* are regressed on a set of macro variables which affect stock returns systematically.[29]

$$R_{it} = \beta_0 + \beta_{RP} RP_t + \beta_{TS} TS_t + \beta_{DIP} DIP_t + \beta_{DEXCH} DEXCH_t + \beta_{ADMS} ADMS_t + \beta_{TRADEOPN} TRADEOPN_t + e_{it} \quad (7.1.1)$$

Where,

$R_{it} = Firm's\ Stock\ returns$

$RP = Risk\ premium$

$TS = term\ structure$

$DIP = Industrial\ production\ index$

$DEXCH = Exchange\ rate$

[29] Details regarding macro variables construction are provided in Chapter 4

$$ADMS = Anticipated\ growth\ in\ money\ supply$$

$$TRADEOPN = Trade\ openess$$

By estimating equation 7.1.1 the estimated stock returns $\hat{R}_{it}$ are obtained[30]. The estimated stock returns from the multi-factor model are presented as a link to micro-crisis model through its incorporation in the indirect test. The estimated stock returns are further taken with firm specific variables. The micro-crisis model and macro factors imply following specifications of indirect test[31];

$$PFCR_{it} = prob(Y_{it} = 1) = \frac{1}{1+(e^{-zit})} \quad (7.1.2)$$

$$Z_{it} = \beta_0 + \beta_1 \hat{R}_{it} + \beta_2 (TLTA)_{it-1} + \beta_3 (YTA)_{it-1} + \beta_4 (EBITA)_{it-1} + \beta_5 (NITA)_{it-1} + \beta_6 (DBERM)_{it-1} \quad (7.1.3)$$

The following Dummy variable introduced as a criterion for differentiation;

$$Y = 1\ if\ Net\ income - ve\ for\ consecutive\ 2\ years + (Total\ Liabilities > Total\ Assets), 0\ otherwise$$

Where,

$$Z_{it} = log\ odd\ function$$

$$PFCR = Probability\ of\ Financial\ constraints\ risk$$

$$Y_{it} = is\ assigned\ value\ of\ 1\ if\ firm\ is\ constrained\ and\ 0\ otherwise$$

$$TLTA = Total\ Liabilities\ to\ Tolat\ Assets$$

[30] Estimation results of equation 7.1.1 are given in appendix
[31] Logit model estimations are given in appendix

$$YTA = Sales\ to\ Total\ Assets$$

$$EBITA = Earnings\ before\ Interest\ and\ Taxes\ to\ Total\ Assets$$

$$NITA = Net\ Income\ to\ Total\ Assets$$

$$DBERM = Debt\ to\ Equity$$

In above equation estimated stock returns are incorporated in the model presenting impact of macroeconomic factors indirectly on firms. Estimated stock returns completely reflect firms' sensitivity towards macro conditions as well as micro also. The estimated stock returns of all 498 firms of manufacturing sector along with firm specific variable of all firms are used to find the probability of financial constraints risk in equation 7.1.2. Afterwards, firms are sorted on the basis of their PFCR.[32]

7.2. FINANCIAL CONSTRAINTS RISK AND FIRMS INVESTMENTS; EMPIRICAL RESULTS

In this section firms exposure to financial constraints risk and its effect on their investment dynamics is thoroughly discussed. Firms' financial constraints risk probabilities are obtained through the Tirapat (1999) logit model. Firms are distributed in Quartiles according to their sensitivity towards financial constraints. Quartile 1 includes firms with very low or zero financial constraints probability. Firms in Quartile 2 have slightly low possibility of FCR. While firms in Quartile 3 and 4 have moderate and higher FCR respectively. Results are presented in table 7.2 in detail.

[32] Probability of Financial constraint risk

The impact of lagged dependent variable and its square is found to be negative and significant at striking 1% level for all four Quartiles. This shows that Firms lagged investment and current investments are not correlated over the successive time periods.

Table 7.2. Probability of Financial Constraints Risk and Firms' Investments; Dependent Variable $\left(\frac{I}{K}\right)_{it}$

Explanatory Variables	Coefficients			
	QUARTILE: 1	**QUARTILE: 2**	**QUARTILE: 3**	**QUARTILE: 4**
	Firms with PFCR 0-0.25%	***Firms with PFCR 0.26-0.50%***	***Firms with PFCR 0.51-0.75%***	***Firms with PFCR 0.76-1%***
$\left(\frac{I}{K}\right)_{i,t-1}$	-1.6310 (0.1680)***	-0.7331 (0.0458)***	-0.7057 (0.0617)***	-0.1835 (0.0433)***
$\left(\frac{I}{K}\right)^2_{i,t-1}$	-0.0055 (0.0011)***	-0.0029 (0.0002)***	-0.0002 (0.00002)***	-0.00005 (0.00001)***
$\left(\frac{C}{K}\right)_{i,t-1}$	0.1595 (0.0348)***	0.0582 (0.0035)***	0.0950 (0.0451)**	-0.0415 (0.0180)**
$\left(\frac{Y}{K}\right)_{i,t-1}$	0.4056 (0.0720)***	0.0327 (0.0023)***	0.0883 (0.0221)***	0.0284 (0.0093)***
$\left(\frac{B}{K}\right)^2_{i,t-1}$	-0.0542 (0.0175)***	-0.0019 (0.0002)***	-0.0001 (0.00002)***	-0.000004 (0.000003)*
m2 (Statistics Value)	0.2741	0.7471	0.2979	0.6392
Sargan (p value)	0.5759	0.0794	0.0215	0.8274

Note;

- GMM estimates
- Quartile 1 includes firms with financial constraints probability between 0 to 0.25%. Quartile 2, 3 and 4 include firms with FCR between 0.26-0.50%, 0.51-0.75% and 0.76-1% respectively.
- Standard errors are in parenthesis
- *M*2 and sargan are second order serial correlation test and instruments validity tests
- **S**tatistical significance at 1%, 5% and 10% is denoted by ***, ** and * respectively

The impact of lagged cash flows to capital ratio is observed to be positive and significant at 1% for Quartile 1 and 2 and 5% for Quartile 3. Results confirm that 1% increase in lagged cash flows of firms in Quartile 1, 2 and 3 increases the current investment level by 0.15%, 0.05% and 0.09% respectively. This shows that firms in these quartiles are not facing internal financial constraints since their internal funds are available which positively affect their investment

decisions. Firms in Quartile 1 are most financially worthy having considerable affect of cash flows as compared to other Quartiles and that their investment is responsive towards internal funds.

While on the other hand its impact is negative and significant at 5% significance level for firms in Quartile 4 hence these firms face tight internal financial constraints. Negative sign indicates that these firms are more prone to be financially constrained in future consequently they invest less if their cash flows increase thereby demonstrating a negative cash flow sensitivity.[33]

Sales are found to be important determinant of investments for all firms as the effect is positive and significant at striking 1% level of significance. Results imply that 1% increase in lagged sales to capital ratio of previous year leads to increase in the current investment of Quartile 1, 2, 3 and 4 for about 0.40%, 0.03%, 0.08% and 0.02% respectively. This is the obvious signal that investment opportunities are present for manufacturing sector firms in Pakistan. Sales are significant factor for firms in Quartile 1 as compared to other Quartiles since these firms have excellent financial health to invest in potential investment opportunities. While the impact is low for firms in Quartile 4 with maximum financial constraint probability due to their hesitation towards investment.[34]

Square of lagged debt to capital ratio is negative and significant for all Quartiles indicating the negative relationship due to bankruptcy cost linked to it. These results are in line with the studies of Ruano (2006), George and Kabir (2010) and Bond and Meghir (1994). The values for *m*2 for all estimations indicate that this study do not face the problem of serial

[33] The results regarding negative cash flow sensitivity are in line with the studies of Guariglia (2008), Cleary (2004), Bhagat *et al*. (2005) and Marouene *et al*. (2013)
[34] See Bhagat *et al*. (2005) for details

correlation among residuals. Furthermore, instruments used are valid as their validity is checked by sargan test.

The next chapter briefly discusses the history of Political eras and presents detail results for sample split analyses accordingly different political regimes.

Chapter 8

FINANCIAL CONSTRAINTS, FIRMS' INVESTMENTS AND POLITICAL REFORMS: REGIME WISE ANALYSIS

At initial stage like other countries, above all priorities the major focus of Pakistan's policies were to reduce poverty by obtaining ideal level of economic growth. Each political regime employed different economic policies which consequently had diverse impact on the different sectors of economy. This chapter not only analyzes the impact of different policies of each political regime but also the influence of major policy shifts regarding financial sector reforms on manufacturing sector of Pakistan. Due to unavailability of data before 1974 period this research takes the regime time period after 1974. For this purpose the investment dynamics of constrained and unconstrained firms is examined by dividing the sample into different time periods to find out in which time period firms of manufacturing sector of Pakistan faced more of financial constraints and to assess degree of financial constraints and their impact on investments before and after financial reforms.

8.1. FINANCIAL CONSTRAINTS AND FIRMS' INVESTMENTS UNDER DIFFERENT POLITICAL REGIMES

The era of Zulfiqar Ali Bhutto from 1971-1977 is considered as the bad years for Pakistan's economy as he was an unlucky politician for several reasons. The highlighted step in Pakistan's history under Bhutto's regime was Nationalization of industrial units including cement, chemical and cotton etc in 1972. The economic consequence of this implementation was that it highly affected the efficiency of private sector which resulted in decline of Private manufacturing investment. Additionally public sector industries faced loses due to official pressure they were

bound to avoid high pricing with the increase in their costs (Hussain, 2006)[35]. Bhutto's Nationalization was considered to be the key factor for decline in efficiency of private sector but despite all this, industry observed a reasonable growth rate.

This study explores three different regimes followed by Bhutto's era i.e. *Zia's Era 1978-1988*, *Democratic Era 1989-1999* and *Musharraf's Era 2000-2008* respectively. Sample is divided for empirical analysis on the basis of following political regimes.

8.1.1. Zia's Regime 1978 to 1988; An Era of Economic Growth, Islamization and Preamble to Recession

Zia's regime witnessed high rates of industrial growth were attained as a steam of earlier investments made by public sector under the era of Bhutto and expansion in domestic demand. The utmost concern of Zia's regime was the need to restore the confidence of private sector and to improve the performance of economy. This target was achieved as GDP growth rate increased from 5% to 6% whereas manufacturing GDP grew at an annual rate of 9.5% between 1977 and 1986. Investments in large scale manufacturing sector raised 18.2% per annum while private industrial investment was recorded 15.6% per annum (Zaidi 2005). His Islamization policy distinguishes him from other politicians and was a significant constraint for the private sector. Another policy shift in Zia's era was the denationalization of agro-based industries like flour milling and cotton ginning etc along with the improved private investment policies like cheap credits, duty free imports and tax holidays which in result increased the growth of private manufacturing sector.

[35] See for reference Hussain (2006), "Economic Policy, Growth and Poverty in Historical Perspective"

8.1.2. Democratic Regime 1989 to 1999; The Deepening Crisis of Economy and State

This political regime brought democracy in Pakistan and is also called the era of structural adjustment. Ambitious targets were set for general reforms in industrial sector including privatization i.e. limiting the list of specified industries and divesting the shares of public sector companies to the private sector and tariff reforms. The key focus was to implement such structural reforms which promote private sector activities. The large scale manufacturing sector showed satisfactory figure of 7.4% due to the expansion of cotton manufacture (Zaidi 2005). An important policy shift was Structural Adjustment Program (SAP) under IMF. Total investment as percent of GDP decreased from 17.9% to 16.3% due to some significant factors that had adverse impact on private investment and GDP growth. Government tried to reduce budget deficit by cutting the expenditures on the development sector but on the other hand high corruption level and insecurity the Private investment and GDP fell down (Hussain 2006).

8.1.3. Musharraf's Regime 2000-2008; An Echo of History

In Musharraf's era economic reforms were taken to improve the overall economy which in result increased the GDP growth to 6% that was mainly because of the large scale manufacturing sector (Hussain 2006). Budget deficit was acceptable and all other macroeconomic indicators were satisfactory but Poverty level was same as before. Splitted samples accordingly the political regimes discussed above for empirical estimation are explored below;

8.2. POLITICAL REGIMES WISE SAMPLE SPLIT ANALYSIS: EMPIRICAL RESULTS

This section discusses the results for financial constraints and firms' investment under different political regimes. The data is divided in three regimes described above and analysis is done by

separately running the GMM for each sample split. The objective is to assess that in which political regime firms' faced more hindrances and overall the investment behavior of firms will be compared across different regimes. The obtained results are reported and elaborated below;

Table 8.2. Financial constraints and Firms' investments under Different Political Regimes: Dependent Variable $\left(\frac{I}{K}\right)_{it}$

Explanatory Variables	Coefficients		
	Regime 1 1978 to 1988	**Regime 2 1989 to 1999**	**Regime 3 2000 to 2008**
$\left(\frac{I}{K}\right)_{i,t-1}$	-0.0844 (0.0212)***	-0.2236 (0.0152)***	-0.1314 (0.0577)**
$\left(\frac{I}{K}\right)^2_{i,t-1}$	-0.00002 (0.0002)	-0.0030 (0.0012)**	-0.00004 (0.00001)***
$\left(\frac{C}{K}\right)_{i,t-1}$	-0.1817 (0.1036)*	0.1421 (0.0508)***	-0.0933 (0.0504)*
$\left(\frac{Y}{k}\right)_{i,t-1}$	0.0206 (0.0063)***	-0.0101 (0.0022)***	0.0195 (0.0038)***
$\left(\frac{B}{K}\right)^2_{i,t-1}$	-0.0017 (0.0004)***	0.0001 (0.00009)	-0.0002 (0.000008)***
m2 (Statistics Value)	0.0130	0.0012	0.0410
Wald 1(p value)	0.0000	0.0000	0.0000
Wald 2 (p value)	0.0473	0.0001	0.0120
Sargan (p value)	0.4530	0.4164	0.4517

Note:

- *Regime 1;* 1978 to 1988 is *Zia's regime*, *Regime 2;* 1989 to 1999 is *Democratic era* and *Regime 3;* 2000 to 2008 is *Musharraf's regime.*
- Instruments used are 2 to 4 of investment to capital ratio, cash flow, sales and debt to capital ratio.
- GMM two step estimates.
- Standard errors are given in parenthesis.
- Time dummies and Constant are included but not reported.
- Statistical significance at 1%, 5% and 10% is indicated by ***, ** and * respectively.

The effect of lagged cash flow to capital ratio is positive and significant at all level in period 1989 to 1999 which indicates that manufacturing sector firms in this period are positively sensitive towards cash flows since their investments considerably depends upon internal finance

in this period. It is observed that 1% increase in lagged Cash flow increased the firms' investment by 0.14%.

The effect of lagged sales to capital ratio is negative and significant at 1%, 5% and 10% which shows the absence of investment opportunities in democratic era. The square of lagged debt to capital ratio is insignificant signifying that firms' investment didn't depend upon external finance since the firms faced the problem of external financial constraints.

The effect of Lagged cash flows to capital ratio is explored to be significantly negative at 10% significance level in the periods 1978 to 1988 and 2000 to 2008 which indicates that firms' investments were independent of the internal finance during these periods as the firms do not faced obstacles regarding accumulation of external finance. The negative sign of cash flows during Musharraf's era states that firms didn't faced problems in getting external because of the reason that Decentralization of financial institutions took place after Zia's regime consequently, the growth of financial institutions occurred.

The effect of past year sales to capital ratio is found to be positive and significant at all levels in the said periods except for Democratic era indicating the presence of investment opportunities for these firms. Figures show that 1% increase in lagged sales increased firms' investment spending in era's 1978 to 1988 and 2000 to 2008 by 0.02% and 0.01% respectively. These figures confirm that sales had significant influence on firms' investment during these periods. The negative sign with Lagged sales to capital ratio in case of Period 1989-1999 highlights the absence of investment opportunities in that period.

The overall results depict that firms face tight external financial constraints during the period 1989 to 1999 which shows that firms' investment is directly linked with the availability of

internal funds during this era. This is may be due to crisis i.e. decline in private investment, fall in GDP and the deteriorating condition of industrial sector in the 1990's faced by Pakistan[36]. Additionally, Financial sector was not developed enough during this period to meet the domestic demand consequently the firms faced tight external financial constraints.

The values of *wald* 1 and 2 are valid indicating that explanatory variables and time dummies are jointly significant. The value of *m*2 is less than 3 showing that this study do not faces the problem of serial correlation among residuals.

The next chapter is concerned with the sectoral analysis which includes the comparison of firms' investment dynamics among different industries of manufacturing sector in Pakistan.

[36] See Akbar Zaidi (2005) for reference

Chapter 9

FINANCIAL CONSTRAINTS AND FIRMS' INVESTMENTS: CROSS INDUSTRY ANALYSIS

Manufacturing sector plays an important role for economic growth and development of Pakistan since it has significant share in Gross Domestic Product (hereafter GDP). In fiscal year 2013-2014 Manufacturing sector is recorded as contributing 13.5% in GDP and labor force working in this sector is recorded as 14.1% in Pakistan.[37]

This study investigates the textile cotton, textile synthetic, chemical, engineering and sugar industries to study that whether investment dynamics of firms of these industries are different or not. Furthermore it is assessed that either sensitivity of firms' investment to internal finance varies across different industries or not.

9.1. FINANCIAL CONSTRAINTS AND FIRMS' INVESTMENTS: TEXTILE-COTTON INDUSTRY

Manufacturing sector mainly consist textile sector as an important contributor. It accounts 8% of GDP, employing 40% and accounts 55% of Pakistan's exports[38]. These figures clearly indicate that the growth of Pakistan's manufacturing sector is affixed with the performance of cotton sector hence special policies are regarding facilitation to cotton sector has been the focus of government. Because of the overall importance of the concerned sector it is important to assess that that whether the investment of textile is financially constrained or not. This study analyzed

[37] Pakistan Economic Survey 2013-2014
[38] Pakistan Economic Survey 2013-2014

206 textile cotton firms to observe the financial constraints and their impact on firms' investments for the period of 1974-2012. Results are presented below;

Table 9.1. Textile-Cotton Industry (1974-2012): Dependent Variable $\left(\frac{I}{K}\right)_{it}$

Explanatory Variables	Coefficients
$\left(\frac{I}{K}\right)_{i,t-1}$	-0.8732 (0.0371)***
$\left(\frac{I}{K}\right)^2_{i,t-1}$	-0.0003 (0.00001)***
$\left(\frac{C}{K}\right)_{i,t-1}$	0.0770 (0.0093)***
$\left(\frac{Y}{K}\right)_{i,t-1}$	0.0208 (0.0092)**
$\left(\frac{B}{K}\right)^2_{i,t-1}$	-0.0001 (0.00006)***
m2 (Statistics Value)	0.0027
Wald 1 (p value)	0.0000
Sargan (p value)	0.6320

Note:

- GMM two step estimates
- Constant and Time dummies are included. (Not reported)
- Statistical significance at 1%, 5% and 10% is denoted by *, ** and *** respectively
- For more details regarding variables and estimation technique and diagnostic tests see Table 4.4

Results obtained by estimating investment equation depict that lagged cash flow is an important determinant of Investment in case of textile cotton sector. Figures show that lagged cash flow is positive and significant at all significance levels pointing out that 1% increase in lagged cash flows to capital ratio leads to 0.07% increase in the current investment. This result reveals that Textile cotton firms are dependent upon internal finance for their investments or in other words these firms are constrained by internally generated firms because these firms find external financing costly.

The impact of lagged sales is explored to be positive and significant at 1% and 5% significance levels. The figure indicates that sales are of vital importance for firms' investments as 1% increase in past years sales to capital ratio boosts current investment of textile industry by 0.02%. This is the clear indication of presence of investment opportunities for textile cotton firms and that this sector assembles capital when expects its demand to rise in the future.

These results are consistent with the idea that Firms of textile sector are FC as their investment is responsive towards availability of internal finance which is proxied by both cash flows and sales in this case. This is may be due to the reason that Pakistan's exports increased to 16% from year 2010 to 2011[39]. With the increase in market demand of textile sector products, it's financing needs also increases since the firms have to bear material cost. Consequently this sector faces external financial constraints but internally unconstrained so relies mostly on internal finance.

Diagnostic tests indicate that instruments used are valid and this study do not faces the problem of second order serial correlation among residuals as representated by *m*2. All explanatory variables are observed to be jointly significant at 1% level.

9.2. FINANCIAL CONSTRAINTS AND FIRMS' INVESTMENTS: TEXTILE-SYNTHETIC INDUSTRY

The textile synthetic industry is essentially important as it produces several valuable products like swimsuits and garments with a combination of synthetic fiber with cotton. This study examined whether this sector is influenced by financial constraints or not and assessed which factors effect firms' investment decisions. For this purpose 32 textile-synthetic firms are taken for the period of 1974 to 2012. Results are presented in the table given below;

[39] See for details Economic survey of Pakistan (2012-2013)

Table 9.2. Textile-Synthetic Industry (1974-2012): Dependent Variable $\left(\frac{I}{K}\right)_{it}$

Explanatory Variables	Coefficients
$\left(\frac{I}{K}\right)_{i,t-1}$	-0.7114 (0.0169)***
$\left(\frac{I}{K}\right)^2_{i,t-1}$	-0.0380 (0.0013)***
$\left(\frac{C}{K}\right)_{i,t-1}$	0.0340 (0.0073)***
$\left(\frac{Y}{K}\right)_{i,t-1}$	0.0041 (0.0020)**
$\left(\frac{B}{K}\right)^2_{i,t-1}$	0.00004 (0.0001)
m2 (Statistics Value)	1.8267
Wald 1 (p value)	0.0000
Sargan (p value)	0.0572

Note:

- GMM one step estimates
- See table 4.4 for variables detail and computation method
- Statistical significance at 1%, 5% and 10% is denoted by** *, ** and * respectively

The effect of lagged cash flows is found to be positive and significant at all significance levels indicating that firms of textile synthetic sector are constrained by internal finance. Results of investment model show that 1% increase in past year's internal funds increases the investment spending of textile synthetic industry by 0.03%. This exhibits that cash flows of previous period are important determinant of current investment spending in case of synthetic industry.

The impact of sales to capital ratio in previous period is discovered to be positive and significant at 1% and 5% which confirms that sales accelerator process works for textile synthetic industry. It is observed that 1% increase in the lagged sales to capital ratio improves current investments of firms by 0.004%. This clearly is the indication that investment opportunities are present for textile synthetic sector firms of Pakistan.

In general, textile synthetic firms face the problem in getting external finance while these firms are financially stable internally. This is because this sector is at growing stage and in need of more finance for investment but it is bound to exhaust all its internal funds in investment. This study do not encounters with the issue of serial correlation among residuals and the instruments used are valid as represented by sargan test's probability value.

9.3. FINANCIAL CONSTRAINTS AND FIRMS' INVESTMENTS: CHEMICAL INDUSTRY

Chemical sector has an essential role in overall growth of the manufacturing sector of Pakistan. Chemical industry mainly produces pesticides and fertilizers for fulfilling the needs of agriculture sector and produces dyes and medicines as well. Chemical sector is capital intensive in nature and oftenly Pakistan relies on imported chemicals to meet the needs of agriculture sector and industry. As a sub sector Chemical industry contributed about 6.71% to the manufacturing sector during July-March[40]. This sector is of massive importance for economy of Pakistan so; this study took 37 firms from chemical industry for the period of 1974 to 2012 to observe financial constraints and their effect on firms' investment in this industry. Empirical results and findings are presented below;

The outcome of lagged dependent variable and its square is found to be negative and significant at all levels of significance specifying the adjustment cost which firms bear to move from one level to the next level of investment[41]. Negative sign with the coefficient indicates that lagged investment is negatively correlated to current investment over successive periods[42].

[40] Economic Survey of Pakistan 2013-2014
[41] See for details Love (2003) and Terra (2002)
[42] La Cava (2005), "Financial Constraints, User cost of capital and Corporate investment in Australia"

Moreover, there is no spillover effect of previous year investment on current investment which shows that investment is not a smooth process[43] for chemical industry.

Table 9.3. Chemical Industry (1974-2012): Dependent Variable $\left(\frac{I}{K}\right)_{it}$

Explanatory Variables	Coefficients
$\left(\frac{I}{K}\right)_{i,t-1}$	-0.7647 (0.0211)***
$\left(\frac{I}{K}\right)^2_{i,t-1}$	-0.0007 (0.0001)***
$\left(\frac{C}{K}\right)_{i,t-1}$	-1.1183 (0.0569)***
$\left(\frac{Y}{K}\right)_{i,t-1}$	0.0824 (0.0069)***
$\left(\frac{B}{K}\right)^2_{i,t-1}$	-0.0002 (0.0001)***
m2 (Statistics Value)	2.0093
Wald 1 (p value)	0.0000
Wald 2 (p value)	0.0000
Sargan (p value)	0.8978

Note;

- GMM one step estimates
- See table 4.4 for detail of variables, Wald 1 , Wald 2, *m*2 and sargan test
- Statistical significance at 1%, 5% and 10% is denoted by ***, ** and * respectively
- Constant and time dummies included. (not reported)

The effect of lagged cash flows to capital ratio is explored to be negative and significant at 1%, 5% and 10% significance levels showing that current year investment spending of chemical sector is negatively affected by previous year cash flows. This is the apparent signal that chemical sector firms are not dependent upon internally generated funds for their investments due to internal financial constraints and arrange finance from external sources to fulfill their investment needs.

[43] See for reference Butzen *et al*. (2001)

Sales are observed to be important determinant of investments of chemical industry since it is found to be positive and significant at all significance levels. Figures shows that if there is 1% increase in lagged sales to capital ratio it will increase current year investment by 0.08% which is the indication of presence of investment opportunities for chemical industry.

The null of no serial correlation among the transformed residuals is accepted by this study. The instruments used by the study are valid as tested by sargan test. Wald 1 and 2 are significant at 1% level pointing out that explanatory variables and time dummies are jointly significant.

9.4. FINANCIAL CONSTRAINTS AND FIRMS' INVESTMENTS: ENGINEERING INDUSTRY

Like other sectors, Engineering sector also have significant role in the economic growth. This industry encounters the problem of absence of technical man power and its growth is not satisfactory in Pakistan. Engineering sector faced negative growth of 21.4% during the period 2013 to 2014[44]. This section concerns with the obtained results and findings of investment behavior of firms of engineering industry. Results are discussed in below table 9.4.

The impact of lagged cash flows to capital is found negative and insignificant which shows that current investment of engineering industry is unassociated with internal funds and are dependent upon external finance for investment needs. The effect of lagged sales to capital ratio is found negative and significant at 1%, 5% and 10% significance levels which suggest that firms current investment is negatively related to past year's sales. This shows that cash flows and sales are not important determinant of current investment spending of firms as far as engineering industry of Pakistan is concerned.

[44] See economic survey of Pakistan 2013-2014

Table 9.4. Engineering Industry (1974-2012): Dependent Variable $\left(\frac{I}{K}\right)_{it}$

Explanatory Variables	Coefficients
$\left(\frac{I}{K}\right)_{i,t-1}$	-1.2164 (0.0951)***
$\left(\frac{I}{K}\right)^2_{i,t-1}$	-0.0412 (0.0013)***
$\left(\frac{C}{K}\right)_{i,t-1}$	-0.0253 (0.0215)
$\left(\frac{Y}{K}\right)_{i,t-1}$	-0.1920 (0.0110)***
$\left(\frac{B}{K}\right)^2_{i,t-1}$	-0.0006 (0.0001)***
m2 (Statistics Value)	1.2129
Wald 1 (p value)	0.0000
Sargan (p value)	0.8272

Note;

- GMM one step estimates
- Constant and time dummies include. (not reported)
- For details regarding variables, diagnostic tests and computation method see table 4.4
- Statistical significance at 1%, 5% and 10% is denoted by *, ** and *** respectively

The negative sign with cash flows and sales indicate that engineering sector firms are internally financially unhealthy due to zero cash flow sensitivity towards internal finance and cut down their investment level even if there is increase in sales because of financial instability condition. This is may be due to the fact that engineering sector faced negative growth in past few years and consequently affected the firms of this sector adversely.

The effect of lagged dependent variable and its square is negative and significant showing less smooth investment process over time (Butzen *et al.* 2001). Diagnostic tests i.e. m2, Wald 1 and sargan test proved that this study do not faces serial correlation problem, explanatory variables are jointly significant and instruments used are valid.

9.5. FINANCIAL CONSTRAINTS AND FIRMS' INVESTMENTS: SUGAR AND ALLIED INDUSTRY

Pakistan's sugar industry is the sixth largest sugar producer in the world. There are 86 sugar mills in Pakistan which employ 1.20 million people and contribute about 22 billion to government revenue. Sugar industry contributed about 10.88% in overall growth of Manufacturing sector of Pakistan[45]. Results obtained by estimating the investment model are given and discussed in detail in table 9.5 below;

Table 9.5. Sugar and Allied Industry (1974-2012): Dependent Variable $\left(\frac{I}{K}\right)_{it}$

Explanatory Variables	Coefficients
$\left(\frac{I}{K}\right)_{i,t-1}$	-0.4478 (0.1202)***
$\left(\frac{I}{K}\right)^2_{i,t-1}$	0.0049 (0.0008)***
$\left(\frac{C}{K}\right)_{i,t-1}$	0.8007 (0.3156)**
$\left(\frac{Y}{K}\right)_{i,t-1}$	0.1918 (0.0937)**
$\left(\frac{B}{K}\right)^2_{i,t-1}$	0.0024 (0.0059)
m2 (Statistics Value)	0.0011
Wald1 (p value)	0.0000
Sargan (p value)	0.8998

Note;

- GMM one step estimates
- Constant and time dummies included not reported
- Statistical significance at 1%, 5% and 10% is denoted by ***, ** and * respectively

The impact of lagged cash flows to capital ratio is discovered to be positive and significant at 1% and 5% which shows that sugar sector faces tight external financial constraints. Figure reveals

[45] Economic survey of Pakistan 2013-2014

that 1% increase in previous year internal finance increases the current investment spending of firms by 0.8%. This is the indication that firms of sugar industry are positively sensitive to internal finance due to unavailability of external funds. This is due to the reason that there is need of more amount of finance for installation of machinery if these firms plan to expand their production process in order to grow overtime and therefore need substantial amount of finance for their investment needs.

Lagged sales to capital ratio is found positive and significant at 1% and 5% significance levels which shows that sales are essentially important for investment of these firms. Figure suggests that 1% increase in lagged sales to capital ratio increases the current investment of sugar industry by 0.19%. The positive figure states that there is presence of investment opportunities as far as sugar industry is concerned. Sargan test states that instruments used are valid. Result of m2 shows that the transformed residuals are not serially correlated in this study and explanatory variables are jointly significant at 1%.

Industrial analysis is done on the basis of long run effects for cotton, synthetic, chemical, engineering and sugar industries. Analyses illustrate that investment spending of textile cotton, textile synthetic and sugar industries are constrained by internal finance. Results confirm that financial constraints are present in these industries. Overall results regarding sales suggest that there is presence of investment opportunities in manufacturing sector of Pakistan except for the case of engineering industry. Additionally, results are in view that external financial constraints have strong impact when internal constraints are not present.

In the next chapter, our study summarizes all the findings and presents conclusions on the basis of obtained results. Moreover, Policy implications are also suggested on the basis of empirical findings.

Chapter 10

CONCLUSIONS AND POLICY IMPLICATIONS

10.1. SUMMARY AND CONCLUSIONS

This study investigates impact of financial constraints on firms' investments by comparing investment dynamics of financially constrained and unconstrained firms. Purposefully, firms are identified in different groups' accordingly financial constraints measures. Our study focused to assess the role of internal finance in determining firms' investment behavior when financial constraints are present. Further objectives concerned to check how investment-cash flow sensitivity varies across different groups of firms.

Concerning all mechanisms above, Empirical analysis is performed using firm level data of 498 firms of manufacturing sector of Pakistan for the period 1974 to 2012. All financial variables are constructed using more than 15,000 financial statements of manufacturing sector firms. Arellano and Bond Panel GMM (1991) one and two step estimations are applied to encounter endogeniety trouble.

Firstly, the study divided firms in FC and FUC categories for comparison of their investment behavior by means of several financial constraints measures used in previous literature i.e. Operating income, Net income, Interest Coverage ratio and Dividend payout behavior. Secondly, The study further divides FC and FUC firms in additional categories via financial constraints measures i.e. Dividend payout ratio, Interest Coverage ratio, Firms' tangibility and Firm size to actually capture the intensity of financial constraints present in manufacturing sector of Pakistan. Thirdly, we applied logit model to capture the effect of both

macro and micro economic factors in finding out Probability of FCR present in manufacturing sector firms. Fourthly, sample split analysis is done on the basis of Political regimes i.e. Zia's regime, Democratic and Musharraf's regime. Lastly, we compared investments behavior across industries i.e. Textile-Cotton, Textile-Synthetic, Chemical, Engineering and Sugar and Allied.

Empirical results for the full sample showed that cash flows are negative and insignificant which points out that Manufacturing sector during the period 1974-2012 is not facing financial constraints and firms can raise finance with ease accordingly their financial needs. In addition, sales to capital ratio shows investment opportunities are also present for manufacturing sector firms in the said period.

Results attained by dividing firms in FC and FUC groups confirmed that FUC firms identified by constraints measures are dependent upon internal finance or in other words constrained by internal funds for their investments as indicated by positive effect of cash flows in all cases. Additional these firms have availability of investment opportunities to increase their investment level. While FC firms are observed to cut down their investment level due to their internal financial instability as also evidenced by their lower sales to capital ratio except for the case of firms with operating losses and firms avoid paying dividends which tend to invest more since funded by equity providers (Bhagat *et al*. 2005).

The further findings from comparison of investment behavior across firms distributed accordingly levels of financial constraints are in line with the results of our previous findings (chapter 5). Results revealed that FUC firms having higher coverage ratio and firms paying dividends between 10-20% and 20-30% are more sensitive towards cash flows and have presence of investment opportunities to avail. On the other hand, MFUC firms with normal

coverage ratio and firms which pay lower ratio of dividends are tend to invest less due to absence of profitable opportunities. Furthermore, firms paying zero dividends, MFC and EFC firms identified by coverage ratio are prone towards financial distress as indicated by negative impact of sales to capital ratio on investments except in the case of SFC and FC firms identified by coverage ratio which are funded by equity claimants.

In case of firms' tangibility level our results are consistent with the study of Almieda and Campello (2007) as empirical findings depict that investment cash flow sensitivity is positive in case of FC firms with low or moderate tangibility. Sales have positive influence in case of firms with moderate and high tangibility while it is negatively affecting current investment of firms with lower tangibility due to lack of investment opportunities. Similarly Firm size is found to be important in determining firms' investment as supporting the study of Azam and Shah (2011) specifically in case of small and medium sized firms. Sales are found to be important determinant of investment in case of small and medium sized firms. The findings in case of firm size and tangibility state that financially constrained firms are more sensitive towards cash flows.

Results regarding logit model suggest that Sales are significantly important for current investments of all firms categorized in Quartiles accordingly probability of FCR present in them. Moreover investment cash flow sensitivity is explored to be positive and significant for firms with PFCR between 0-0.25%, 0.26-0.50% and 0.51-0.75% respectively.

Results of Political regimes accept the hypothesis that investment behavior of manufacturing sector is dissimilar across different political regimes. The coefficient of Cash flow found to be negative in Zia's and Musharraf regime indicating that firms do not faced problems in raising financing during these eras. Additionally, results indicate presence of profitable

investment opportunities for manufacturing firms in these eras. Conversely, Democratic era's results show absence of investment opportunities as well as firms' dependency upon internally generated funds for their investments.

Empirical results regarding investment behavior of firms across different industries i.e. Textile-Cotton, Textile-Synthetic, Chemical, Engineering and Sugar and allied showed that each industry behaves differently according to their preferences and for most important 'Financial conditions'. Hence, this study accepts the hypothesis that investment behavior of manufacturing sector is diverse across different industries. Results showed presence of investment opportunities for all industries except Engineering industry. The investments of Sugar and allied, Textile-Synthetic and Textile-Cotton are observed to be constrained by internal finance as investment-cash flow sensitivity is positive for these industries. While Engineering and Chemical industries are explored to be facing no obstacles regarding accumulation of finance for their investment activities.

By reviewing all results, the hypothesis regarding financial hierarchy that firms investment initially depends upon internal finance and that firms prefer internal finance over external finance is accepted by this study as far as FUC firms are concerned. While the hypothesis is rejected for FC firms as these firms do not indulge in investment activities due to lack of availability of internal funds except for the case of FC firms not paying dividends and FC firms with Operating losses as their investment is found to be funded by Equity Claimants. Empirical results accepted the hypothesis that FC and FUC firms have different investment patterns. Investment-Cash flow sensitivity varies across constrained and unconstrained firms is accepted by the study. Results confirmed that there exists positive investment-Cash flow sensitivity in case of unconstrained firms whereas; it is either zero or negative in case of FC

firms. The hypothesis that FC and FUC firms with different levels of constraints have different investment patterns is accepted by the study. The sensitivity to investment to cash flows is positive and large for unconstrained firms as consistent with the findings of KZ (1997).

Overall the study concludes that financial constraints are present in manufacturing sector of Pakistan with which firms do not follow favorable investment path. Additionally, financial constraints have significant impact on investment behavior of manufacturing sector firms of Pakistan.

10.2. POLICY IMPLICATIONS

On the basis of analysis presented above, this research study specifies the following policy recommendations;

- This study confirmed that financial constraints are present in manufacturing sector of Pakistan as these firms are initially dependent upon internally generated funds. So firms need to maintain their financial health to avoid any shock to internal finance that impact investment spending.

- Empirical results suggest policy makers to review the policy regarding lending behavior so that intensity of financial constraints could be decreased that negatively impact firms' investments and to formulate such policies that improve financial health of firms in general.

- Since it is observed through empirical analysis that macroeconomic factors also create an environment that makes it possible for firms to be in financially constrained state. Hence

policy makers should formulate policies that could make suitable macroeconomic environment for industries/firms to regulate their investment activities.

- It is evident from above analysis that extreme internally financially constrained firms are prone towards financial distress condition. Therefore, these firms need to check their debts, business activities and review their R&D expenditures so as to protect them from severity.

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APPENDIX;

Table.A. Impact of Macroeconomic Variables on Firms' Stock Returns

STEP 1: Dependent variable RET_{it}	
Explanatory Variables	**Coefficients**
Constant	0.2679 (0.0558)***
RP	0.0134 (0.0011)***
TS	0.0187 (0.0011)***
DIP	0.6832 (0.1025)***
DEXCH	-0.0945 (0.0416)**
ADMS	1.0582 (0.0712)***
TRADEOPN	-0.0069 (0.0015)***

Note;

- Panel Least Square estimations
- Ret are *firms' Stock returns*
- PR, TS, DIP, DEXCH, ADMS and TRADEOPN are *Risk Premium, Term Structure, Industrial Production, Exchange rate, Money Supply* and *Trade Openness* respectively
- Statistical significance at 1%, 5% and 10% is denoted by ***, ** and * respectively

Table.B. Impact of Estimated Stock returns and Firm-Specific variables on Firms' financial constraint risk level

Step 2; Y_2	
Explanatory Variables	**Coefficients**
	Y_2
Constant	-5.1890 (0.1256)***
RETF	-0.8636 (0.2477)***
TLTA	5.1526 (0.1552)***
YTA	-0.2229 (0.0327)***
EBITA	-3.2726 (0.2775)***
NITA	-0.2608 (0.0352)***
DBERM	-0.0057 (0.0011)***

Note;

- Panel Logit Estimations
- RETF, TLTA, YTA, EBITA, NITA, and DBERM are *Estimated Stock Returns, Total Liabilities to Total Assets, Sales to Total Assets, Earning before Interest and Taxes to Total Assets, Net Income to Total Assets* and *Debt to Equity ratio* respectively
- Statistical significance at 1%, 5% and 10% is denoted by ***, ** and * respectively