IMPACT OF CREDIT CONSTRAINT ON FIRMS' INVESTMENT AND GROWTH BEHAVIOR: A CASE STUDY OF MANUFACTURING SECTOR OF PAKISTAN

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CERTIFICATE

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Dedicated To My

Mother

(Whose prayers always enlightened my way)

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ABSTRACT

This study investigates the impact of credit constraint on firms' investment and growth by using a panel of 500 firms of manufacturing sector of Pakistan over the period of 1974 to 2010. Generalized Method of Moments (GMM) one step and two step estimation technique is applied on models of investment and growth.

Firms can finance investment opportunities by internal and external finance. Due to asymmetric information, especially when capital markets are imperfect, firms usually face problem in getting external finance to undertake the investment opportunities. Due to this fact firms' investment and growth is largely driven by their internal finance. Cash flow is used as a source for internal finance for financing the available investment opportunities. Sales growth and sale to capital ratio are used as proxy to capture investment opportunities. This study constructed these variables by using firm level data obtained from more than 12,000 financial statements of the manufacturing sector of Pakistan.

This study discovers the impact of credit constraint on firms' growth and investment spending in case of 500 firms of manufacturing sector during the period 1974-2010. To explore the impact of credit constraints in different political regimes, this study divides the sample into different time periods on the basis of political regimes in the history of Pakistan form 1974-2010. Further, data is divided into periods from 1974 to 1990 and 1991 to 2010 for analyzing the impact of financial sector reforms on credit constraints, firms' investment and growth. This study probe the prospect that either sensitivity of firms' investment and growth to internal finance varies across different industries or not. For this purpose, the sample is divided into different industries namely textile cotton, textile synthetic, sugar and allied, chemical, engineering and cement industries. This study also explores the possibility that whether intensity of credit constraint varies across groups of firms having different characteristics such as size, dividend and debt. To achieve this objective, this study divided firms into three classes; small, medium and large on the basis of total assets, dividend to equity and debt to equity ratio.

Results obtained for the full sample of manufacturing sector indicates that firms are not facing external financial constraint. Outcome for political regimes shows that investment and growth of firms is severely credit constrained during the period from 1978 to 1988. In other political regimes, no such severity is appeared. Results for financial sector reforms shows that there is impact of credit constraint on firms' investment and growth in both the pre financial sector reform and post financial sector reform era, but the impact of credit constraint is higher in pre financial sector reform period as compared to that of the post financial reform period due to easier availability of external finance in the post reform era.

Industrial analysis reveals that investment and growth of the firms in textile-cotton, textile-synthetic and sugar industries are affected from financial constraints, whereas firms in rest of the industries are not facing external financial constraint. Results reveal that impact of financial constraints on the growth of small firms, firms having low dividend to equity ratio and firms who are less aggressive in financing with debt are severe as compared to their counterparts.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Economic growth has always been the central focus of many researchers. Complex econometric modeling was introduced from past to up till now to unfold the aspects which are directly or indirectly linked to the economic growth phenomena. Economic growth and development of a country is dependent on the growth of various sectors operating within the economy. One of the most important sectors in this perspective is manufacturing sector, whose growth and investment is linked with the overall economic growth. So, by keeping in view these important linkages it is important to focus on the factors that affect the business growth in an economy.

Investment and growth of firms in an economy is of vital importance. Pioneer works in this regard were conducted by Bond and Meghir (1994), Fazzari *et al*. (1998), and Bernanke *et al.* (1998). They investigated the investment behavior of firms for the empirical evidence of credit constraint and developed the dynamic equilibrium model which incorporates credit market frictions in the business cycle fluctuations. Their works broaden the depth and diversity of work in this meadow. Asymmetric information causes agency cost[1] due to which investment of the firms is hampered (Stein, 2003) and firms have to rely on internally generated funds for financing available investment opportunities.

Recent literature shows a lot of hindering factors in the growth path of businesses in an economy. Firms themselves report a lot of hurdles in their growth path but all these

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[1] For more detail see Stein (2003).

reported factors are not equally constraining the growth of the firms. Some of these factors directly hold back the growth and some indirectly creates hindrance in firms' growth path. Most important hindering factors for firms' growth are related to finance, crime and political instability (Ayygagri, *et al.*, 2008).

The theory which points out positive relation between financial growth and economic development (Schumpeter, 1911) was verified by a lot of researcher's up till now. This phenomenon also works at the micro level where firms need finance to grow either by generating it internally or by going for external sources of finance by considering the financial policy of the firm. Firms finance their investment projects by using various sources of finance. These sources include debt, equity and cash flow. In other words, firms finance their investment opportunities either by using external finance or by internally generated funds. The provision of finance from the external sources (banks and capital market) depend on firms' characteristics' i.e. financial performance, risk involved and asset base of firms because of the risk averse nature of financial institutions. Access to external finance and its cost is an important hindering constraint for the growth of firms.[2] Financial market in Pakistan is not perfect; due to this finance is a major hurdle in the growth of firms in Pakistan (Ahmad and Naveed, 2011). Size and other characteristics were also found to be important determinants for the financial access in Pakistan.[3]

Literature in case of Pakistan focus on the capital structure of firms by using five to ten years of the data and tries to find out the optimal capital structure for the firms or attempt is made by dividing firms into constraint and non-constraint on the basis of

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[2] For more detail see Binks and Ennew (1996).
[3] See Hamnna and Hamid (2011) for more detail.

cash flow volatility.[4] Some of the work is done by incorporating the size and age in the investment model to access their impact on investment behavior.

Work on investment and growth of firms in the context of credit constraint is not explored too much.[5] This study tries to fill this gap in case of Pakistan by using firm level data of publicly listed firms in the manufacturing sector ranging from 1974-2010.

1.2 OBJECTIVES

The main objective of this study is to access the impact of credit constraint on firms' investment and growth and to explore how sensitivity of relation varies across different groups and time periods.

First of all, models for the full sample of firms for the period from 1974 to 2010 are estimated. Secondly, models are estimated by splitting the sample into different time periods on the base of political regimes namely 1974-1977, 1978-1988, 1989-1999 and 2000-2008 in which study analyzes the impact of credit constraint on the firms' investment and growth.[6]Thirdly, the sample is further divided in to the 1974-1990 and 1991-2010 periods that help to analyze the degree of credit constraint in pre financial sector reform and post financial sector reform period respectively.[7] Fourthly, sample is divided into textile cotton, textile synthetic, sugar, chemical, engineering and cement industries for analyzing the impact of credit constraint on investment and growth in different industries. Lastly, this study divides the firms into three classes;

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[4]For more detail see Sehrish*et.al*. (2013).
[5]Hashmi (2011) concluded that firms of manufacturing sector of Pakistan are financially constraint. Firms face imperfect competition in product market and do not follow optimal investment path.
[6] See Hussain (2006) for detail regarding economic policies and their implications in different regimes. The period form 1974-1977 and 1978-1988in Pakistan was Bhutto and Zia regime respectively. The period form 1989-1999 and 2000-2008b in Pakistan is termed as democratically regime and Musharaf era respectively.
[7] See Zaidi (2006) for detail about Pre and Post Financial Reforms.

low, medium and large on the base of total assets, debt to equity ratio and dividend to equity ratio to access that in which class the sensitivity of cash flow to investment and growth is high and in which it is low.

1.3 HYPOTHESIS

If financial market in Pakistan is perfect and meets the credit demand of firms that need credit for financing their investment and growth, than investment and growth of firms does not depend on their internal finance. Similarly, if there are no hindering factors for the firms to access the external finance than investment and growth of firms don't depend on internally generated funds. The hypothesis developed here are as follow.

- Investment of the firms depends on the internal finance.

- Growth of the firms is constrained by internal finance.

- Investment of firms is homogeneous across different groups and time periods.

- Growth of firms is homogeneous across different groups and time periods.

1.4 ORGANIZATION OF THE STUDY

To address the above given objectives the study proceeds in the following manner. Chapter 2 explains the literature review; Chapter 3 explains the theoretical and empirical explanation of the investment and growth model. Chapter 4 explains the data description and estimation technique.

Chapter 5 explains the results for the whole manufacturing sector, Chapter 6 explains the result for different political regimes in the history of Pakistan from 1974, and Chapter 7 explains the result of industrial analysis.

Chapter 8 explains the results across different groups and Chapter 9 is comprised of summary and conclusion. Now by following the sequence next chapter will discuss the literature review.

CHAPTER 2

LITERATURE REVIEW

Credit is of vital importance for investment and growth of firms. Financially constraint firms are unable to achieve the potential profits, because of the lack of financial resources to invest in the profitable investment opportunities. This hinders the investment and growth of firms and forces their growth to move towards to the declining end. Firms having different characteristics have different impact of financial constraints on their investment and growth behavior.

Thus this study explains literature in the line of studies focusing on credit constraint, investment and growth across different groups, credit constraint and imperfect capital market, sensitivity of cash flow to investment and growth: a useful measure for assessing credit constraints and credit constraint as an impediment to growth of firms.

2.1 INVESTMENT AND GROWTH BEHAVIOR

This section explains the literature in context of dividing the firms into different groups on the basis of their asset size, dividend payments, ownership characteristics and number of employs. Study breaks this section into two parts. First part explains the literature on how the sensitivity of internal finance to investment varies across all these different groups and the second section explains the literature on how sensitivity of internal finance to growth varies across different groups. Both of these sections try to summarize the impact of financial constraint on investment and growth behavior of the firms found in literature.

2.1.1 INVESTMENT AND CREDIT CONSTRAINT

This section explains the investment and credit constraint across different groups having different characteristics. Investment behavior of firms across different groups, obtained on the basis of firms' characteristics, is not homogenous. Hsiao and Tahmiscioglu (1997) analyze the impact of the financial constraint on investment behavior of the firms. They bumped that the investment of firms is not same across different groups having different characteristics. Investment is more sensitive to the internal funds for the firms having high capital intensity (Hsiao and Tahmiscioglu, 1997).

A lot of researchers divide the firms in to group of small, medium and large on the basis of employs in the firms. The firms having less employs as compared to other are classified as small firms and firms having more employs are classified as large firms. Small firms are more exposed to that of the constraints because of their less power of negotiation in capital market (Hartarska and Gonzalez-Vega, 2006; Terra, 2002).

Hartarska and Gonzalez-Vega (2006) investigated the effect of the credit constraint and property rights on investment behavior of firms. Their study is unique in the prospect that they explored this effect in small firms having 20 employees. Credit constraint and property rights affect the investment behavior of firms differently, belonging to different groups. Smaller and younger firms are severely affected from that of the property rights (Hartarska and Gonzalez-Vega, 2006).

This variation across groups cannot be captured by adding more variables in the analysis. Simply by adding the proxies' gives nothing or this variation cannot be captured only by increasing the explanatory variables. There is a need to divide the firms on some standard bases for the analysis (Hsiao and Tahmiscioglu, 1997).

In underdeveloped financial markets the younger firms face high information cost. Investment of the younger firms is more dependent on the internal funds because of low cost of internal funds as compared to that of the external funds (Hartarska and Gonzalez-Vega, 2006).

The classification of firms into different groups on the bases of their dividend payments suggested that, firms have different effect of financial constraint on the investment behavior. Firms paying low or no dividends have investment more sensitive to their internal funds. Reason for this behavior is that the firms are not in position to go for the external finance or not having easy access to external finance. They are more financially constraint as compared to that of the firms paying high dividends (Fazzari, *et al*., 1988; Hartarska and Gonzalez-Vega, 2006).

Small firms' operational activities for generating profits are not financed by external financial sources because of the limitation in accessing the external finance. Due to this, they have to pay low dividends for the aim of utilizing these resources in profit generating activities (Fazzari, *et al*., 1988).

Azam and Anum (2011) analyze the impact of internal and external financial constraints by using the data on 52 listed firms in Karachi stock exchange for the period 2004 to 2010. Their results indicate that there is positive relation between firm size and investment. Small firms having small asset base are more credit constraint as compare to the firms having large asset base (Fazzari, *et al*., 1988; Terra, 2002). Large firms which are paying high dividends follow free cash flow hypothesis (FCF), while that of the firms which are small and paying low dividends follow pecking order hypothesis (Bagchi, *et al*., 2002). Liquidity has greater impact on investment for

the firms having low dividends payout ratio that are facing financial constraint (Fazzari, *et al*., 1988).

Similarly investment behavior of the foreign firms as compared to that of the domestic firms is more affected from the financial constraint. This is because foreign firms are more exposed to the international capital markets as compared to that of the domestically owned firms. There is also variation of credit constraint impact on the investment behavior of privately and state owned firms separately.

2.1.2 CREDIT CONSTRAINT AND FIRMS' GROWTH

Financial constraints have different impact on the growth of firms belonging to different groups. This division is done on the basis of different characteristics of the firms. This section explains the literature in context of credit constraint and growth of firms.

By classifying the firms in to small and large on the bases of employees, Becchetti and Trovato (2002) estimate a sample of small Italian firms having employees Between 5 to 10. Their results show that small and younger firms have the potential to grow and if they are financed by the external finance or having easy access to the external finance they can grow more rapidly. But the hurdle to their growth is the lack of access to external finance.

Subsidies provided by the state to firms has positive impact on the growth of firms and these firms grow faster as compared to that are not under the umbrella of subsidies (Hyytinen and Toivanen, 2005; Becchetti and Trovato, 2002). Hyytinen and Toivanen (2005) by estimating the firm level data from Finland finds the impact of public policy on growth and innovation of the firms. Financial constraints have strong adverse effect on the growth and innovation of firms (Hyytinen and Toivanen, 2005).

Innovation is also correlated to the growth of the firms i.e. if the firms made innovation in the production technology then the firms grow more rapidly. One of their most important finding is that of the impact of the public policy on the growth and innovation of the firms. Government funding to the firms which rely on the external finance improves firms' growth and innovation activities (Hyytinen and Toivanen, 2005).

Beck *et al*. (2005) by using a survey based firm level dataset from 54 countries reports the major constraints which the firms face in their path of growth. Credit constraint is one of the important hurdles in growth of small and medium sized firms (Beck, *et al*., 2005). It is very interesting to see that in spite of the not proper functioning of the financial system in China its economy is growing faster. Because firms in China are highly profitable, that's why they are able to finance their investment through the retained earnings, so the internal finance push their growth to move forward (Guariglia, *et al*., 2007).

Ownership characteristics of the firms also have impact on the intensity of credit constraint to the growth of firms i.e. foreign firms are not much credit constraint as compared to that of the domestically private owned firms. Guariglia *et al*. (2008) examine to what extent the growth of the Chinese firms is affected by the internal finance.

Growth of the state owned firms is not constraint by the internal finance because state owned firms in spite of the profit have different other political and welfare motives. Because of this they easily get finance from the financial institutions while the growth of the privately owned firms is affected by the internal finance (Guariglia, *et al.,* 2008).

Growth of the privately owned firms is stunning and it is surrogated by internal finance while state owned firms have to response to the economic and political objectives due to which they are less dependent on the internal finance (Bai, *et al*., 2006). On the other hand, privately owned firms don't have too much access to that of the external finance because of many hurdles to their path like collateral, taxation and the most important is asymmetric information problem. Banks consider them risky as compared to that of the state owned enterprises (Guariglia, *et al*., 2008; Hericourt and Poncet, 2007).

Impact of different sources of finance on the growth of the Spanish manufacturing firms indicates that small and new firms have low growth rates when they enter in the business. Because of their less access to the external finance, they heavily relay on the cash flow and short term debts (Guariglia, *et al*., 2008; Segarra and Teruel, 2009). So, they are more sensitive to that of the cash flow and short term debts while on the other hand firms which are old have high growth rates are more sensitive to that of the long term debt (Guariglia, *et al*., 2008; Segarra and Teruel, 2009).

Overall findings of the literature shows that most affected firms from the financial constraints are medium and small sized firms. This issue mostly occurs in the economies where the capital markets are not developed. Growth behavior of the firms is also found to be effected by the abrupt polices' shift in the economy.

2.2 IMPERFECT CAPITAL MARKET AND CREDIT CONSTRAINT

This section discusses the literature in context of credit constraints and imperfect capital markets. In literature investment cash flow sensitivity is also used to access the imperfections in the credit market. Due to which firms are forced to rely on their internal finance. The early attempt was taken by Fazzari *et al*. (1988) who studied the

imperfection in capital market by investigating the investment behavior of firms. They classify firms on the basis of their characteristics into different groups.[8]

The effect of capital market imperfections on investment behavior of the firms is different in all these three groups of low cost information[9], high cost information[10] and median cost information firms[11]. Sensitivity of cash flow to investment is also high for low cost firms paying high dividends (Bagchi, *et al.,* 2002). The firms which fall in the median group are financially constraint to get finance for investing in the fixed capital[12].

Asymmetric information in the market is one of the characteristics of imperfect financial markets. Vogt (1994) assays to dig out the strong relationship between cash flow and investment spending by analyzing data from the US manufacturing sector and endeavors to explain the reasons for the strong relationship between cash flow and investment. For this Vogt (1994) examined two hypotheses (a). Free cash flow hypothesis[13] (b).Pecking order hypothesis[14]. Large firms which are paying high dividends follow free cash flow hypothesis while that of the firms which are small and paying low dividends follow pecking order hypothesis. This behavior of firms is because of the asymmetric information (Vogt, 1994). The findings of Vogt (1994)

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[8] For more detail see Fazzari *et al* (1988)

[9]The firms who are paying high dividend i.e. firms having high dividend payout ratio is classified in to the low cost information. Their high dividend payout ratio reveals more information regarding to their healthy business in the market.

[10]The firms having low dividend payout ratio is classified as high cost information group.

[11] The firms having medium dividend payout are classified as medium cost information group.

[12] For detail see more Bagchi *et al* (2002).

[13]Free Cash flow hypothesis proposed by Jensen (1986) states that the mangers of the firms having large free cash flow (Cash flow remained after investing in all of the potential projects having positive NPV) invest this in the projects having low NPV in spite of paying it to the shareholders.

[14]Pecking order hypothesis proposed by Myers and Majluf (1984) states that asymmetric information arose between mangers and investors of the firms because when mangers are going for the issuance of equity investors consider that the mangers assume that the firm is overvalued in the market so by assuming this the investor gives less weight age to the newly issued share of the firms because of this asymmetric information.

also affirmed the result of Fazzari *et al.* (1988) that the relationship between cash flow and investment spending is not homogenous across all the groups.

Sensitivity of cash flow and investment is heterogeneous along different groups of firms having different characteristics (Vogt, 1994; Fazzari, *et al.,* 1988; Kashyap, *et al.*, 1995). They looked into the neoclassical standard model of investment by exploring the data from US manufacturing sector. They basically try to investigate the assumption made by the neoclassical model of perfect capital market. In this regard they divide the firms on the basis of low dividend payout ratio and high dividend payout ratio and found that the hypothesis of no financial constraint is rejected in the group of firms paying high dividends while it is not rejected in the group paying low dividends. Fazzari *et al.* (1988) also investigates the neoclassical model same results are found as that of the Kashyap *et al.* (1995)**.**

Bagchi *et al.* (2002) also stresses the importance of cash flow as an important determinant of the investment of the firms because lot of literature used the sensitivity of investment to cash flow as a measure of capital market imperfections. Terra (2002) by using the balance sheet data investigated that whether the Brazilian firms are credit constraint or not and whether the investment decisions are affected by credit constraint, his results showed that the Brazilian firms are credit constraint and investment decision of the firms is more affected due to credit constraint in small firms while it is flabbier in the big and multinational firms because of their easy access to external finance.[15]

Banerjee and Duflo (2008) investigated whether the firms are credit constraint or not and see the effects of the policy changes in India by portioning the firms having faster

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[15] See Terra (2002) for detail.

growth and sales. Indian firms are facing credit constraints even some of the large firms are also copping this problem (Banerjee and Duflo, 2008). Their findings are based on the idea that the firms which are facing credit constraint use the finance to expand its production that's why such firms grow faster. While on the other side, firms which are not credit constraint use these peanuts as an ersatz for other finance, because they are not constraint and also have enough to expand the operations. So they grow slower as compared to that of the stiffened firms having not much more to expand.

Steingress *et al.* (2010) by making some variation in the Euler equation following the work of Harrison *et al*. (2004) founds that small and privately owned firms are severely credit constrained. They investigated capital market imperfection by using the investment cash flow sensitivity relation. Presence of foreign capital and foreign firms in the same sector and geography ease the intensity of credit constraints on the domestic privately owned firms (Steingress, *et al.,* 2010). Linkages were developed with the foreign firms and with the help of trade credit constraint becomes soften on privately owned and domestically owned firms. Foreign firms are not facing credit constraint because of their exposition to the foreign credit market (Harrison, *et al.,* 2004; Moreno and Miranda, 2009). More immature and extremely indebted firms have investment more sensitive to that of the internal funds as compared to that of the foreign firms (Moreno and Miranda, 2009).

External finance is of vital importance for firms' growth because firm uses some of its portions in R&D activities which have positive effect on the growth of the firms. With the increase in firm size and age, their access to the external finance increases (Moreno and Miranda, 2009).

Access to external finance has positive effect on the growth of the firms (Musso and Schiavo, 2008). Musso and Schiavo (2008) estimate the panel data on French manufacturing firms for the period of 1996-2004. Their findings shows that because of the financing constraints newly entered firms face difficulties in accessing the external finance due to which probability of leaving the market increases. Financial constraint is positively correlated to that of the productivity of the firms in the short run (Musso and Schiavo, 2008). The in fold facts behind these result is financial constraints facing by firms. Firms have to cut off their expenses to promote its production due to which efficiency of the firms increases in the short run.

By conducting a survey of over 6,000 firms in 1992, Binks and Ennew (1996) finds that lack of access to finance is one of the major hurdles in path of the firms' growth (Macmillan, 1931; Radcliffe, 1959; Bolton, 1971) and one of the important causes of this problem is the asymmetric information whose roots are in the imperfect capital markets. Banks and other financial institutions don't have complete or perfect information about the firms due to which problems of asymmetric information arises. Younger firms which have much potential to grow face hard credit rationing while this can be eliminated by developing linkages with that of the financial institutions and market (Binks and Ennew, 1996). In short, younger and less profitable firms are more credit constraint as compared to that of their counterpart.

Smaller and younger firms face more difficulties in accessing the external finance for their growth[16], implying that smaller and younger firms are more credit constraint. Because of lack of access to the external finance, they have to solely rely on the internal finance[17]. Due to the imperfect capital market in the developing countries

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[16] For more detail see Hutchinson, J. and A. Xavier (2006)
[17] For more detail see Fazzari *et al.* (1988).

smaller firms are much more credit constrained as compared to that of their bigger and older counterparts (Oliveira and Fortuna, 2006). The growth of protégés firms is affected by the credit constrained; smaller firms are more affected as compared to the bigger firms (Oliveira and Fortuna, 2006).

The impact of credit constraint on the growth of firms is different in transition economies as compared to that of the developed economies (Hutchinson and Xavier, 2006). Hutchinson and Xavier (2006) made a comparison between the transition and well established economy and catch the impact of financial constraints on the growth of firms in transition economy (Slovenia) and the established economy (Belgium). The firms in the transition economy like Slovenia are more credit constraint and the growth of the firms in this economy is much more affected as compared to that of the firms in the established market. So the growth of smaller firms in Slovenia relay on the internal cash (Hutchinson and Xavier, 2006).

2.3 CREDIT CONSTRAINT: AN IMPEDIMENT TO GROWTH

Firms' growth has much importance not for the individual owners of the firms but also if one will look at them as a whole in the economy because the aggregate growth of all these firms in the economy is correlated with the overall growth of the economy. From that prospective it is important for the researchers and policymakers to have a look on the growth dynamics of the firms especially what are the main hindrance to the growth of the firms.

Carpenter and Petersen (2002) give the internal finance theory of growth to show the bred effect of financial constraint on the firms' growth. As in the previous literature, only the effects on the investment are viewed i.e. the work of Fazzari *et al*. (1988).

The main contribution of Carpenter and Petersen (2002) work is introducing the liquidity into the regression to catch the impact of credit constraint on firms' growth.

The major and widely discussed impediment to the growth of firms in the developing countries is credit constraint. In the developing countries firms have lack of access to that of the external finance especially smaller and younger firms (Ahmed and Naved, 2011). Along with that the availability and cost of finance is also a hurdle which is needed to put firms on the track of growth (Binks and Ennew, 1996). Carpenter. and Petersen (2002) put a milestone in this era by estimating a panel of 1600 small manufacturing UK firms and they find that the growth of the small firms in UK are credit constrained. In other words we can say that the growth of the smaller firms in UK is much more dependent on the internal finance. The growth of smaller firms is severely credit constraint as compared to the larger firms (Oliveira and Fortuna, 2006). Similarly, foreign firms are not credit constraint because of their easy access to the external market as compared to that of the domestically owned firms because domestically owned local firms are usually small as compared to that of the foreign and state owned firms. So, foreign firms are not much relying on the internal finance for their growth (Hutchinson and Xavier, 2006). They will go for the external financial market for the finance if potential investment opportunities are available to them.

2.4 INVESTMENT CASH FLOW SENSITIVITY: A USEFUL MEASURE FOR CREDIT CONSTRAINT

The literature in regard of credit constraint and investment moves around either investment cash flow sensitivity is a good measure for credit constraint or not. The debate on it still continues but most of the researchers use this measure as accessing

the credit constraint. This section explains literature in context of cash flow as useful measure of credit constraint.

There are two thoughts whose debate moves around the validity of investment cash flow sensitivity as credit constraints. Fazzari *et al.* (1988) was the first one to use investment cash flow sensitivity as an empirical evidence of imperfect capital markets. The firms having high sensitivity of investment to cash flow are termed as credit constraint (Fazzari, *et al.,* 1988). After the work of Fazzari *et al.* 1988*,* the hypothesis of high investment cash flow sensitivity is verified by a lot of researchers.

The second thought in this regard is opposite to that of the Fazzari *et al.* argument. Kaplan and Zingales (1997) were the first ones to critique the high investment cash flow sensitivity as an evidence of credit constraint. Kaplan and Zingales (1997) investigate whether the cash flow sensitivity is a useful measure to capture the credit constraint by doing classification on the basis of qualitative and quantitative data. They found that the relation suggested by Fazzari *et al.* (1988) is opposite. There exists high sensitivity of cash flow to that of the investment in the group of firms which were declared as non-financial constraint firms and vice versa. The firms having high sensitivity of investment to cash flow are less credit constraint (Kaplan and Zingales, 1997). This relation suggested by Kaplan and. Zingales (1997) is verified by Cleary (1999) and Almeida *et al*. (2004).

Fazzari and Hubbard *et al.* (2000) made comment on the paper of Kaplan and. Zingales (1997)**.** Fazzari and Hubbard *et al.*(2000) argue that their model didn't capture the previous literature and the data they used only consist of 49 low dividend paying companies which is not enough to conduct such type of analysis (Fazzari and Hubbard, *et al.,*2000). Then further tremendous work is done in this regard. In spite of

using investment cash flow sensitivity as a measure of credit constraint change in assets is used as a dependent variable to capture the total finance available and invested in other activities that indirectly increase the assets of the firms (Carpenter and Petersen, 2002)**.**

Further work in this regard is done to access either investment cash flow sensitivity is a good measure of credit constraint or not. Investment cash flow sensitivity is barely a good measure of credit constraint (George, *et al.,* 2005; lona *et al*., 2006). Bushman *et al.* (2012) did recent work in this regard. They split the cash flow variable to explore the hidden accounting. By decomposing the earnings before depreciation in to cash flow from operations and working capital accruals, their findings suggest that internal finance is not completely captured by the cash flow but there exist a strong relation between the fixed capital and working capital (Bushman, *et al.,* 2012). The debate on the validity of investment cash flow sensitivity as a measure of credit constraint still continues.

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CHAPTER 3

ESTIMATION METHODOLOGY

In this chapter theoretical and empirical dimensions of the model is explained. This begins from theoretical crux to the econometric specifications of the models used for estimation. This chapter is divided into two parts. Firstly, dynamic investment model is explored and then dynamic growth model is explained theoretically and empirically.

3.1 FIRMS' INVESTMENT AND CREDIT CONSTRAINT: THEORETICAL EXPLANATION

Firms have three different sources of finance for financing the investment opportunities. The choice between one sources of finance to other source depends on firms' financial policy to finance it or its need[18]. These different sources of finance are (a) Internal finance (b) Debt and (c) Equity finance. Firms usually follow the financing hierarchy[19] in financing their investments. Financing hierarchy pronounces that when firms finds investment opportunities or potential projects and willing to invest in it, firms will go for the cheaper source of finance to avail such opportunities. Because ultimate goal of the firms is to maximize the profits, so for the sake of its goal, firms find the cheaper way to cut the financial cost on the finance. Firms can do this by using its internal finance for this they just have to invest some portions of its profit or what is left after deducting the expenses. It is the cheaper source of finance because like other sources of finance firms are not liable to pay rent and to bear

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[18] When there are some potential investment opportunities which assuring firms potential profits and they found credit as a hurdle for availing them they are in state of credit constraint so there is need to go for credit to avail such opportunities

[19] See Bond and Meghir (1994) for more detail.

transaction cost, for using this type of finance (cash flow). From here another strand starts then why firms go for financial markets to finance its investment in spite of having enough profits to invest in the potential investment opportunities. One rational for this is that there are some investment opportunities for which more finance is required which is not completely satisfied from internal finance (cash flow). So, firms have to go for the financial markets. Another important reason is due to the profit maximizing nature of the firms. Firms go for the debt finance because in doing so they have advantage of tax shield[20] against debt.

Lot of researchers tries different proxies in literature to capture the investment opportunities. Three different proxies were widely used in literature to capture the investment opportunities for the firms. These are Tobin's q, sale to capital ratio and sales growth. These all are used to estimate the investment opportunity for the firms or to enamor the demand of the firms. If sales of firms increase it shows that there is heightening demand for firm's product in the market. So, this entails that when the demand for the firms' product increases, firms have to produce more to meet the demand for the ultimate goal of its profit.

Similarly Tobin's q was used in literature to capture the demand side of firms; it basically compares the real value of the firm to that of its market value. If the market value of the firm is more than that of its real value firms invest more to gain more while in some studies average Tobin's q and earning expectation is also used to capture the demand side.

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[20] Firms are not liable to pay tax against the amount of debt. But if the firms cross certain level of debt use Bank default risk increase for which the external finance from the financial institutions becomes more and more expensive. So the firm tries to debt finance for the sake of tax benefit at some certain level.

In financing hierarchy the third stage for the firms to finance its investment is to go for the equity market. Firms issues shares to finance its investment against some specific returns which the firms have to pay to their shareholders to whom they issue shares. Shareholders demand premiums because they don't have complete information about the firm.

For the theoretical explanation of the model consider the firms are financing their investment by using only the internal finance because of the imperfect capital market. The proxy used in literature to capture the internal finance is cash flow. For such firms cash flow is the only source of finance for their investment. So with the increase in cash flow investment spending of firms increases when financial market is not perfect.

Consider if there is one unit increase in the cash flow there should be significant increase in investment spending of firms indicating that the investment of firm is sensitive to internal finance. So more sensitive the firms' investment to that of their cash flow is, more they are relaying on the internal finance. Because of this behavior firms are termed to be credit constraint as their investment behavior is found to be restricted. This only happens when capital markets are not found to be perfect.

The following equation 3.1.1 shows the above explained phenomena.

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

If the sensitivity of investment to cash flow is low this is an indication that firms are also using some other sources of finance because of their proper and easy access to other sources of finance (debt financing, equity financing) for investment.

Those firms who have high sensitivity of investment to cash flow are more constraint because these firms don't have easy access to external credit for investment due to their limited collateral size, so their sole source of finance is internal finance, while on the other hand the firms which have large asset base don't have such collateral limits because of which they have easy access to that of the external finance. The hypothesis here is if the coefficient of the cash flow variable is more sensitive to that of investment this means that the firms are more credit constrained. If the coefficient is lesser sensitive then this intends that the firms are less credit constrained. Generally the larger firms having huge asset base are not facing external financial constraint or facing low external financial constraint because they have enough collateral value to show for obtaining the loans from the financial institutions while on the other hand firms which are smaller in size and have small asset base are more credit constraint because they don't have enough asset to show to the financial institutions to obtain loans for financing their investment (Fazzari, *et al*., 1988).

So, one can conclude that investment behavior of those firms are said to be credit constraint which by some limitations are forced to rely on the internal finance while on the other hand the firms which don't have such limitations and having easy access to external finance are not said to be effected from credit constraint.

3.2 EMPIRICAL EXPLANATION OF FIRMS' INVESTMENT AND CREDIT CONSTRAINT

In this part study describes the empirical explanation of model to develop the equation which is used for analysis. To access the impact of credit constraint on firms' investment behavior, this study follows Euler Model of investment which is closely

related to the work of Frobes (2007). The base of all this work is on Bond and Meghir (1994).

The main objective of firms is to maximize the shareholders wealth. For this they have to maximize the net cash flow stream of the firms. So, the objective of the firms' is to maximize the current cash flow stream plus the next year discounted cash flow stream.

The ultimate pivot of firms' manager is profit generation. The firms' market value which the manager wants to maximize is given in equation 3.2.1.

$$V_t\left(K_{t,}\,\varepsilon_t\right) = \max D_t + E_t\left[\sum_{s=1}^{\infty}\beta_{t+s-1}\,D_{t+s}\right] \tag{3.2.1}$$

The above explained market value of firms has some constraints which are explained below in the equation 3.1.3, 3.1.4 and 3.1.5. Explanation of these constraints is as follow.

$$D_t = \pi\left(K_t,\varepsilon_t\right) - C\left(I_t,K_t\right) - I_t \tag{3.1.3}$$

$$K_{t+1} = K_t\left(1-\delta\right) + I_t \tag{3.1.4}$$

$$D_t \geq 0 \tag{3.1.5}$$

The equation 3.2.1 shows the value function which the firm want to maximize. The value function is the sum of present dividend stream plus the discounted dividend stream in equation 3.2.1 shows the discount rate used to bring back the future dividend stream to the current level for analysis.

Equation 3.1.4 shows dividend which the firms pay to its share holder at the start of period (t) for which firms are liable to pay. Equation 3.1.5 shows the constraint on the

dividends. This means firms pay positive dividends. The constraint is on the non-negativity of the dividend payments.

$\lambda(K_t, \varepsilon_t)$ in equation 3.1.3 is the restricted profit function and it is already maximized with respect to the variable costs, K_t is the capital stock at time t and ε_t in equation 3.1.3 is the productivity shock, $C(I_t, K_t)$ is the adjustment cost function, I_t is the investment spending whereas δ is the deprecation rate of capital. Equation 3.1.3 shows that dividends are calculated by deducting adjustment cost and investment spending from the profit function. The fourth constraint is the financial constraint which is included through nonnegative constraint on dividend as shown in equation 3.1.5.

λ_t is the multiplier effect which is defined as the shadow cost which is incurred by issuing new shares to generate the equity. By rearranging the first order condition we obtain the following Euler equation.

$$1+\left(\frac{\partial C}{\partial I}\right)_t = E_t \, \beta_t\left[\Theta_t\left(\frac{\partial \pi}{\partial K}\right)_{t+1} + (1-\delta)\left[1+\left(\frac{\partial C}{\partial I}\right)_{t+1}\right]\right] \tag{3.1.6}$$

$(\partial C/\partial I)$ in equation 3.1.6 is the marginal adjustment cost of investment and $(\partial C/\partial K)_{t+1}$ is the marginal profit of capital (MPK) implying the contribution of one extra unit of capital towards the profit.

Whereas $\Theta = 1+\lambda_{t+1}/1+\lambda_t$ in 3.1.6 is the shadow cost of external equity finance. It is the relative cost of external finance in period (t+1) verses in period (t). Firms are said to be financial constraint if the shadow cost of the external finance today (t) is higher than tomorrow (t+1) i.e. $1+\lambda_{t+1}/1+\lambda_t < 1$ this happens only when $\lambda_t > \lambda_{t+1}$ condition holds. This shows the credit which is available currently to the firms is costly than the

credit available tomorrow. If the credit available is of low cost as compared to the future credit, firms will try to invest more in the current period by utilizing the cheap credit.

Capital markets are said to be perfect if the shadow cost of external finance today is equal to the shadow cost of external finance tomorrow and this happens only when the condition $\lambda_t \cong \lambda'_{t+1} \cong 0$ is satisfied. This condition basically states that cost of credit available today is equal to the cost of credit available in future.

In order to obtain the empirical model or to capture all the effects and relations we need some quantitative approach to reach out to some conclusions. For this proxy is used for all the variables to estimate this model.

Degree of financing constraint Θ_t is proxy by the stock of the liquid asset available at the start of the period (t), cash flow is used as proxy for this because it is the amount of money which is available to firms for investment if some potential projects are available for investment. As it is the only cheap source of finance for investing as compared to that of debt finance and equity finance in case of availability of investment opportunities. For the proxy of financing constraints consider the following equation 3.1.7.

$$\Theta = \alpha_{0i} + \alpha \left(\frac{Cash\ flow}{K} \right)_{it} \qquad\qquad (3.1.7)$$

Now to capture the investment opportunities through marginal profitability of capital, sales to capital ratio is used as proxy. Marginal productivity of capital is the extra return by using one more unit of capital.

$MPK_{it} = \theta_i \left(Sales/K \right)_{it}$, Whereas $\theta = \alpha\, k/\mu$ is ratio of capital share of output and μ is the markup.[21] Here sale to capital ratio is used as proxy for MPK, which indicates how much unit of sales is increasing by increasing one unit of capital.

$$MPK = \theta_i \left(\frac{Sales}{K} \right)_{it} \approx Const + \theta_i + \bar{\theta} \left(\frac{Sales}{K} \right)_{it} \qquad (3.1.8)$$

θ_i in equation 3.1.8 shows the firm specific effects whereas $\bar{\theta}$ in equation 3.1.8 shows the industry average. Another proxy used in literature to capture the demand for the firms or in other words to capture the investment opportunities for the firms in the market despite of sales to capital ratio is tobins Q which is vastly used in the literature. Other proxies that are used in the literature are earning expectations and sales growth.

Assumed quadratic linearly homogenous adjustment cost function in investment and capital is given below in equation 3.1.9. This shows that firms bear some cost in moving from one level of investment to the next. It can be explained as follow.

$$\left(\frac{\partial C}{\partial I} \right)_t = \frac{1}{\alpha_1} \left[\left(\frac{I}{K} \right)_t - \alpha_2 \left(\frac{1}{K} \right)_{t-1} - \alpha_i + \alpha_t \right] \qquad (3.1.9)$$

Whereas the coefficients α_1 and α_2 with the capital and its lag are constants, while α_i and α_t are firm specific and time specific effects. This can be proxy by including the lag of the investment to capital ratio.

So, finally linearize the Euler equation by using a first order Taylor approximation around the means along with the assumption of rational expectation and by substituting 3.1.7, 3.1.8 and 3.1.9 in to 3.1.6, the following final equation3.1.10 is

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[21]For more detail see Gilchrist and Himmelberg (1999).

obtained. One lag of sale[22] is added in the equation by following Terra (2002) this is depicted in equation 3.1.11.

$$\left(\frac{I_{it}}{K_{it-1}}\right) = \theta_1\left(\frac{I_{it-1}}{K_{it-2}}\right) + \theta_2\left(\frac{Sales_{it}}{K_{it-1}}\right) + \theta_3\left(\frac{Cash\,flow_{it}}{K_{it-1}}\right) + \alpha_i + \delta_t + \varepsilon_{it} \qquad (3.1.10)$$

$$\left(\frac{I_{it}}{K_{it-1}}\right) = \theta_1\left(\frac{I_{it-1}}{K_{it-2}}\right) + \theta_2\left(\frac{Sales_{it}}{K_{it-1}}\right) + \theta_3\left(\frac{Cash\,flow_{it}}{K_{it-1}}\right) + \theta_4\left(\frac{Sales_{it-1}}{K_{it-2}}\right) + \alpha_i + \delta_t + \varepsilon_{it} \qquad (3.1.11)$$

3.1.10 is the general equation which is used for the estimation, α_i is the firm specific parameter and δ_t .are the time dummies. Here for analysis lag of capital is used in spite of current year capital in denominator.[23]

Similarly θ_1, θ_2 and θ_3 are the coefficients with the investment to capital, sales to capital and cash flow to capital ratio respectively. The key variable of concern here is cash flow. If the coefficient of cash flow θ_3 is found to be positive with high magnitude and significant then according to the hypothesis the firms are considered to be more credit constraint and if it is negative or insignificant the firms are considered to be not financially constraint, having no significant impact of internal finance on the investment behavior of the firms.

Up till now the theoretical and empirical explanation for model which is used to analyze the impact of credit constraint on firms' investment is explained. Now in the next section theoretical and empirical specification for the impact of credit constraint on firms' growth is explored.

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[22] For more detail see Terra. (2002)
[23] For more detail see Badia and Slootmaekers (2009).

3.3 CREDIT CONSTRAINT AND FIRMS' GROWTH: THEORETICAL MODEL

This section provides the theoretical framework and analytical model for the empirical investigation of credit constraint and firms' growth. In order to develop the theoretical linkages of the model with these empirical equations, study follows the base work of Carpenter and Petersen (2002).

3.3.1 FRICTIONS IN FINANCIAL MARKET

Credit rationing in a simple way can be defined as the credit constraints or the limitations in the supply of credit from the lenders side. Most of the literature available on credit rationing is focused on the incomplete or asymmetric information between debtor and lender. For example, a company is going to start a project and that particular company is aware of complete return and risk on the project. If company needs finance for availing this particular project, first option is to finance it through internally generated funds and if investment is huge and company doesn't have enough funds then management will go for the external source of finance.

Before financing, banks compute the risk of investment for the whole group of firms i.e. risk of the industry to which the firms belongs. Usually banks are not completely aware of the real risk of the project for which company is demanding finance because of not complete information. Financial institutions are risk averse in nature so they want return which is slightly higher than the return on the internal finance (cash flow) of the firm. If net returns of firms increases then the repayment probability[24] of debt also increases. If for instance, banks increase its interest charges then the returns of

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[24] Repayment probability is the ability of firms to pay back the loans. This is linked with the net returns of the firms from the project. If the project earns positive returns than it make firms able to pay back the loans, which is demanded or taken from the financial institutions for availing the profitable investment opportunities.

the banks might increases while the cost of the firms on particular project decreases due to which probability of loan return decreases. Because firms have to pay more interest due to the increase in interest expense, manager tries to go for the riskier projects[25] to get more returns to compensate the high interest expenses from the banks. This causes moral hazard problem because of less and incomplete information.

So, there exist some sort of incomplete information between the lenders and borrower due to which a chock is created between the cost of internal finance and external finance. This chock is financial expense which the firms bear for availing the profitable investment opportunities.

3.3.2 FIRMS' GROWTH AND INTERNAL FINANCE

There is a lot of work on financing constraints and their impact on the real activity of firms. The central focal of whole literature is imperfections in the capital market. Because of this imperfection in the capital market there is a chock between internal and external finance as we explained above in the theory of credit rationing. Literature suggests that this chock is due to the asymmetric information and because of this asymmetric information moral hazard and adverse selection problem occurs. Broader use of debt finance is not earmark for firms having little collateral or small firms. So, these firms are more exposed to that of the asymmetric information problem whereas larger firms have soft corner to get loans from the financial institutions because of their large asset base. The physical asset appears to be signals from firms to financial institutions for getting loans.

A lot of literature shows that financing constraints have greater impact on the investment and growth behavior of small firms. The following figure 1 helps us to

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[25]Higher the risk, higher the return.

explain the main idea behind the financial hierarchy and this is than related to the asset expansion for developing dynamic equilibrium growth model for empirical investigation.

The horizontal axis in the figure 1 shows the cash flow while the vertical axis shows the cost of funds. The points V and R on the vertical axis show sources of finance. R shows cost of internal funds which the firms bear for investing in the available investment opportunities whereas V shows the cost of equity when all the internal finance are exhausted.

Figure 1

Cost of Funds

V -----------------------

R

Cash flow
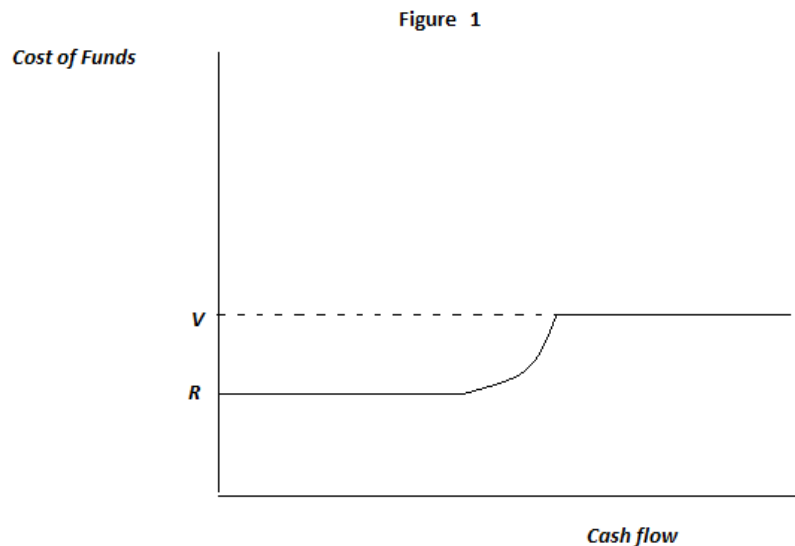
The supply of the finance schedule shows a standard hierarchy of financing consisting of three regions (Kuh, 1963, Fazzari, Hubbard and Petersen, 1988, and Schaller 1993). The horizontal line in Figure 1 shows that the supply curve of finance is constant up to the availability of internal finance (cash flow). Then there is an upward shift to the supply curve this upward cut off shows that when all the internally generated finance is eliminated than for the expansion of firms, the manager will go for the debt finance which is more costly than internally generated finance if capital

market is imperfect. So, if the firm goes for debt finance the cost of financing increases which is clearly seen from the upward shift of the finance supply curve.

There are several reasons for this upward shift in the supply curve. Main reason of this increasing cost is (a) asymmetric information (b) financial distress and (c) collateral limits on the firms. The marginal cost of using debt is increasing because of the increasing financial distress with the increasing use of debt finance. This increasing use of debt finance increases the riskiness of the firms. Because of the increase in the financial distress banks demands more return on their provided debt. Due to this, marginal cost of debt increases with the use of the extra unit of debt finance. The next best alternative source of finance for firms is to issue new shares if potential investment opportunities are available. This is depicted in figure 1 the supply schedule of finance by reaching up to certain extent becomes horizontal which is showing the constant availability and cost on the externally generated funds by issuing new shares. Because of this shift, a chock between the cost of Internal and External Finance (V----R) is created which is shown in the figure 1.

Now consider the following figure 2 which explains the demand behavior of firms in the market. This is reflected through expansion of firms. Marginal revenue expansion here after MRP (expansion)[26] shows the return on the optimally utilized assets and input used by the firms for production. When revenue increases, it indicates that the firms are expanding and the return on the assets increases. MRP (exp) is composed of MPP which is marginal physical product of the firms which is than multiplied with the revenue of firms.

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[26] MRP (exp) it basically shows the expansion path of the firms. (Exp) stands for expansion.

The following figure 2 explains the expansion behavior of the small firms' horizontal

Figure 2

MRP Expansion

MRP expansion
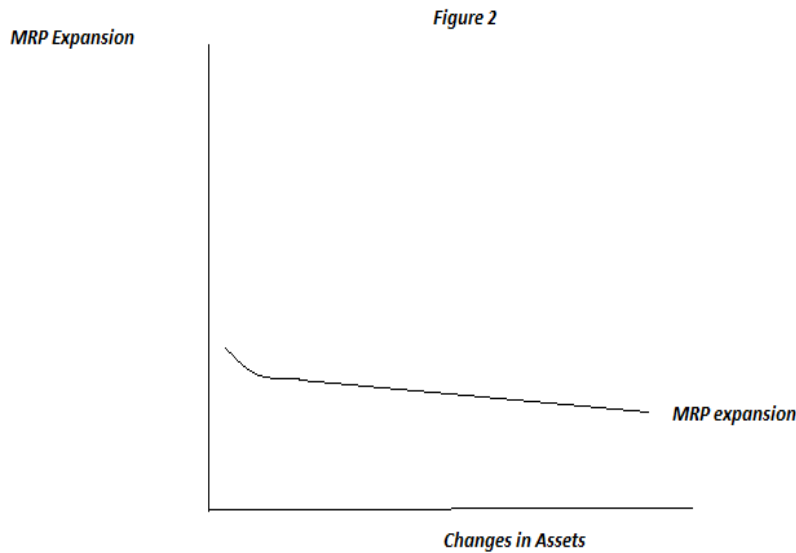
Changes in Assets

axis shows the changes in assets. When the firms are expanding they will move along

the MRP (exp) schedule while the vertical axis shows the MRP of the firms**.**

The horizontal axis in the figure 2 is the representation of the firms' asset growth.

Now by combining figure 1 and figure 2 we obtained the following figure 3 which is

borrowed from the work of Carpenter and Petersen (2002) for better understanding of

the model.

Figure 3 is combination of the both above explained figure 1 and figure 2. In figure 3

the slight downward moving of the MRP (exp) is because of the competition which

drives the returns towards internal cost of funds. Now look at the figure 3 by

considering the imperfect capital markets as shown by the vertical supply curve of the

finance. This cuts the MRP schedule so at that point change in assets and cash flow

becomes equal. This can be represented as follow.

$$A' - A = CF' - CF$$

Financing Hierarchy And Investment Demand

Cost of Funds
MRP Expansion

Figure 3

V --- S

R --- MRP exp

CF A   CF A'   **Changes in Assets**
                       Quantity of Funds
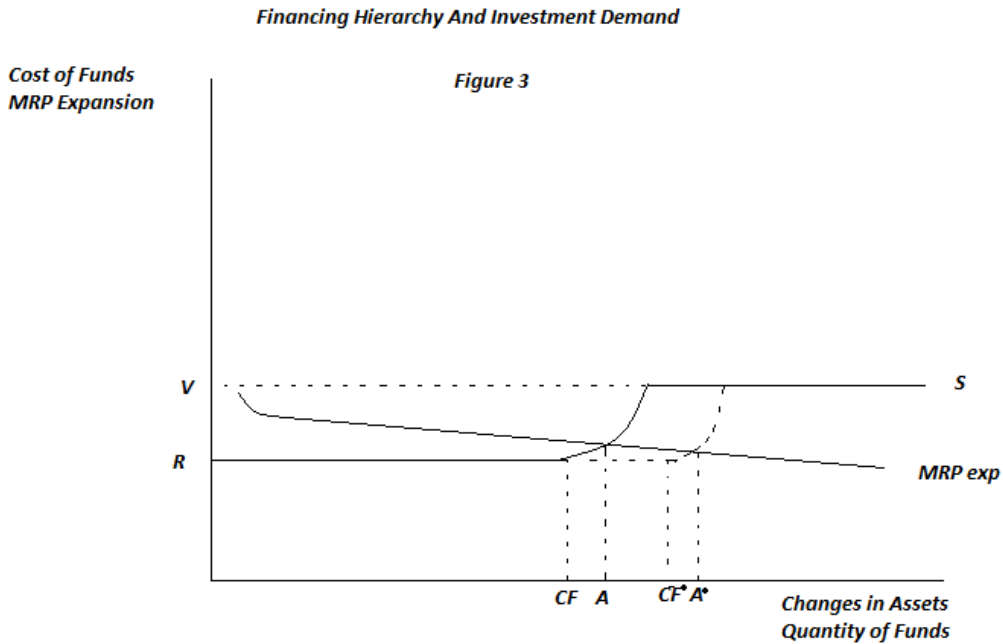
This shows that the additional dollar increase in the internal finance will spawn the additional increase in the assets of the firms. Here this study consider that assets are composed up of the total fixed assets i.e. plant and machinery of the firms which are not easily convertible in to liquid for production process. With the assumption of the imperfect financial markets this additional dollar increase in internal finance will cause approximately one unit increase in the asset expansion. It can be shown in following equation.

$$\Delta A' - \Delta A \approx \Delta CF' - \Delta CF \qquad\qquad (3.1.11)$$

The leverage effect is also shown in the figure 3. With the increase in the asset growth because of the use of the internal finance the asset base of the firms increases. So the firms have more power of negotiating for getting the loans from the financial institutions to invest in the potential projects. This leverage effect is depicted in the figure 3 by the dotted line which shows shift in the supply schedule of finance.

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Because of this leverage effect, with the one unit increase in the internal finance there should be more than one percent increase in the asset growth. This effect can be captured as follow in equation 3.1.12.

$$\frac{\Delta A}{\Delta CF} \approx 1 \qquad\qquad (3.1.12)$$

This should hold only if there exist one to one relationship between growth and internal finance of the firms because of leverage effect the equation 3.1.12 becomes

$$\frac{\Delta A}{\Delta CF} \approx 1 + \lambda \qquad\qquad (3.1.13)$$

λ in equation 3.1.13 shows the leverage effect. Growth can be defined as $Growth_{it} = \Delta A / A$ or we can calculate it by taking the log difference of assets. The equation by following the work of Carpenter and Petersen (2002) used to estimate the results for impact of credit constraint on firms growth is given below.

$$Growth_{it} = Growth_{it-1} + \beta_1 \left[\frac{Sales_{it}}{K_{it-1}} \right] + \beta_2 \left[\frac{CF_{it}}{K_{it-1}} \right] + \gamma_i + \alpha_t + \varepsilon_{it} \qquad (3.1.14)$$

$$Growth_{it} = Growth_{it-1} + \beta_1 \, Sales \, Growth_{it} + \beta_2 \left[\frac{CF_{it}}{K_{it-1}} \right] + \gamma_i + \alpha_t + \varepsilon_{it} \qquad (3.1.15)$$

$Growth_{it}$ is the growth rate of asset of firm i at time t, γ_i represent the firm fixed effect and CF_{it}/K_{it-1} is the cash flow to capital ratio, α_t is the time specific effects and ε_{it} is the random disturbance term. Equation 3.1.14 and 3.1.15 are general forms of equation which are estimated here. The difference between the equation 3.1.14 and 3.1.15 is that of the proxy used to capture the investment opportunities of the firms. In equation 3.1.14 investment opportunities are captured through sales to capital ratio

while in equation 3.1.15 investment opportunities are incorporated by including the variable of sales growth. Sales growth is calculated by taking the log of difference of the sales variable. Both of these variables are widely used in the literature to incorporate investment opportunities in the dynamic model.

The above explained Chapter 3 discuss the theoretical and empirical explanation of both investment and growth models. Now in the next chapter study discuss the estimation methodology and description of the variables used to estimate the model for analysis. Chapter 4 briefly explains the estimation methodology, description of the data and test which are used in the study for analysis.

CHAPTER 4

ESTIMATION TECHNIQUE AND VARIABLES'
CONSTRUCTION

This chapter describes the estimation technique, data description and variables' construction. Firstly, this chapter discusses the methodology that is used by this study in order to estimate the models. Secondly, the detailed description of variables' construction is explained.

4.1 ESTIMATION TECHNIQUE FOR ANALYSIS

This study applies Generalized Method of Moments (hereafter GMM) one step and two step techniques for the estimation of dynamic investment and growth models. GMM one step and two step estimation technique are used to tackle the problem of endogeniety which arises because of the inclusion of lag of dependent variables and individual effects.

The major problem with the OLS as appeared in the literature is that the estimated coefficients are not efficient and consistent if the independent variables are assumed to be endogenous. So, to avoid these problems, this study estimates the models by using GMM one step and two step estimation technique. Brief description of estimation technique is explained below.

4.1.1 PANEL DATA MODEL

This study uses the panel data set for analysis. Panel data set is defined as the data set having both the cross-sectional and time dimension. When cross-section observations are pooled against one time i.e. against a specific point in time then the resultant is the

cross-sectional data but if it is pooled over the time period i.e. investment of the firms across the time the resultant is called the panel data.

Panel data set have the many advantages over the other data sets. It increases the observation for analysis that is the primary need to obtain the effective and efficient estimates. If a data set has complete observations of the specific unit across the time period then the data set is known as the balanced panel data set while if some of the observations are missing across the time then the data set is known as unbalanced data set.

Before conducting the analysis some standard test has to be applied to check whether the data fulfill the necessary conditions for analysis purposes. A diagnostic test is panel unit root test that is explained given in the below.

4.1.2 PANEL UNIT ROOT TEST

The problem of unit root leads to the biased results. Problem of unit root may occur in the panel data because of large cross-sections and time periods. Before going for further analysis it is important to detect the existence of unit root in the data. There are various tests which are used to check the presence of a unit root in the panel data set.

The starting point of the panel unit root test is whether there are restrictions on the autoregressive process across the cross-section or series. Consider the following AR(1) equation for the panel

$$y_{it} = \rho_i \, y_{it-1} + X_{it} \, \delta_{it} + \varepsilon_{it} \tag{4.1}$$

Whereas i is the cross-sectional units that are observed over the time series t.

$$i = 1,2,3.......N$$

$$t = 1,2,3.....T$$

Whereas X_{it} represent the independent variables in the model having fixed effect or the individual trends, while ε_{it} is the error term assumed to be normal and ρ_i is the autoregressive coefficients. If $|\rho_i| < 1$ then y_{it} is assumed to be weakly stationary and if $|\rho_i| = 1$ then y_{it} contains a unit root.

There are many tests that are used to detect the unit root like Levin, Lin and Chu (2002), Breitung (2000), Im, Pesaran and Shin (2003),Maddala and Wu (1999) and Hadri (1999). Above explained tests are differ in setting the assumptions regarding autoregressive parameter ρ_i. Levin, Lin and Chu (LLC), Breitung and Hadri assume that $\rho_i = \rho$: implying that autoregressive parameters are common across all cross-sections while Im, Pesaran and Shin (2003) assume that autoregressive parameters are heterogeneous across cross-sections.

Table 1Panel unit Root Test

Variables	LLC Test Stat	p – value	IPS Test Stat	p – value	Conclusion
$\dfrac{S_{it}}{K_{it-1}}$	-13.2857	0.0000	-9.88416	0.0000	Stationary
$\dfrac{I_{it}}{K_{it-1}}$	-484.99	0.0000	-36.8008	0.0000	Stationary
$\dfrac{CF_{it}}{K_{it-1}}$	-17.1144	0.0000	-22.9179	0.0000	Stationary
$Sales\,Growth_{it}$	-46.2073	0.0000	-52.5213	0.0000	Stationary
$Growth_{it}$	-220.916	0.0000	-64.2175	0.0000	Stationary

Note:
- LLC denotes the Levin, Lin and Chu panel unit root test while IPS is the Im, Pesaran and Shin panel unit root test.
- $\left(S_{it}/K_{it-1}\right), \left(I_{it}/K_{it-1}\right), \left(CF_{it}/K_{it-1}\right)$ are Sales to capital ratio, investment to capital ratio, cash flow to capital ratio, sales growth and Growth in the investment of fixed assets.

This study only reports the Levin, Lin and Chu & Breitung (2000) and Im, Pesaran and Shin (2003) test. The results of the panel unit root test for the variables used in this study are reported in table 1.

4.1.3 J-STATISTICS

J statistics is also known as Sargan test or Hensen test. It is used to check the validity of the instrumental variables used in the analysis. If there are more instruments than parameters then J statistics is used to test the validity of over identifying restrictions. J statistic follows chi-square distribution under the null that over identifying restrictions are satisfied.

4.1.4 GENERALIZED METHOD OF MOMENTS (GMM)

GMM one and two step estimation technique is used to analyze the investment and growth models. It is considered as the most efficient estimator among others estimators because it does not require information about the distribution of the disturbances.

The starting point of GMM estimation is a theoretical relation that the parameters should satisfy. The inspiration is to choose the parameter estimate in such a way that the theoretical relation is satisfied as closely as possible. The theoretical relation is replaced by its sample counterpart and estimates are chosen to minimize the weighted distance between the theoretical and actual values.

The theoretical relations that the parameter should satisfy are usually the orthogonality conditions between some linear and nonlinear functions of the parameters and the set of instrumental variables. Now consider the following function explained in the equation 4.2.

$$E\left(f\left(\theta'\right)Z\right)=0 \tag{4.2}$$

θ are the parameters to be estimated and Z is the set of the instrumental variables. GMM estimator selects the parameter estimates in such a way that the sample correlation between the functions f and instruments is as close to zero as possible. This is defined by the following function.

$$J(\theta)=\left(m(\theta)\right)' Am(\theta) \tag{4.3}$$

Where $m(\theta)=E(f(\theta')Z)$ and A is the weighting matrix. Any symmetric positive definite matrix will yield consistent estimate of q. However it can be shown a necessary (but not sufficient) condition to obtain an efficient estimate of q is to set A equal to the inverse of the covariance matrix of sample moments m.

The working behind Arellano and Bond GMM estimator is that it takes the difference of all the variables and uses all the previous information on the dependent variable for analysis. The same estimation technique is used for the impact of credit constraint on the firm's growth for which dependent variable is replaced with the growth in assets of the firms. The theory behind this is explained above.

This study uses Arellano and Bond (1991) one step and two step specifications for the analysis. In order to estimate textile cotton and synthetic industries, Arellano and Bond (1991) one step estimation technique is applied while for other industries analyzed by this study two step estimation techniques is used because of the small number of observations.

4.2 VARIABLES' CONSTRUCTION

This section explains variables used for analysis. The data on variables used by this study is collected from "Financial Statement Analysis of the Joint Stock Companies" prepared by State Bank of Pakistan. This study analyzes 500 firms of manufacturing sector of Pakistan for the period from 1974 to 2010. Brief description, composition, calculation and standard accounting definition of the variables are given below.

4.2.1 CAPITAL *(K)*

Capital includes property, plant, equipment and machinery. Capital is calculated as the expenditure on the fixed assets of the firms by deducting the depreciation. By deducting the depreciation form the fixed asset at cost we obtained the capital for the analysis. Depreciation shows wear and tear of the capital counted on annual basis.

$$Capital\ (K) = Expenditure\ on\ fixed\ asset - Depreciation$$

This is one of the important factors in determining the performance of firms. By using this in combination of other variables one can access the performance of the firm in different ways. Increase in the capital of firms indicates the increase in production capacity of firms.

4.2.2 INVESTMENT *(I)*

Investment is defined as the expenditure on the fixed assets. Fixed assets include plant, machinery and equipment. It is calculated by deducting the current year expenditure on fixed asset (K_{it}) from the previous year expenditure on fixed asset (K_{it-1}) and adding the depreciation. Depreciation shows wear and tear of the capital counted on annual basis. Following formula is used to calculate the investment.

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

Where I_{it} show the investment, K_{it} is the current year fixed asset, K_{it-1} is the past year fixed asset and D_{it} is the deprecation. Investment is also an important indicator of measuring the performance and growth of companies. Higher the investment means higher the production capacity which will accelerate the profit of firms.

4.2.3 CASH FLOW (CF)

It is used to explain the variability of the internal finance and as a proxy for the financial constraint of the firms. By including this variable in the regression analysis, the study add liquidity into model to access the impact of credit constraint on firms' investment and growth. In this study, the sensitivity of cash flow to investment is given key importance. Calculation of cash flow is defined below:

$$CF = R + Deprication$$

CF is the cash flow; R is the retention in business.

Retention in the business is obtained after deducting tax provision and dividends from the income. Cash flow is of vital importance for the firms. Higher cash flow indicates that high internal finance generated by firms which can be used as source of investment for the potential investment opportunities. In the financing hierarchy, cash flow is the cheapest source available for the investment. Huge literature use cash flow for assessing that either the firms are financially constrained or not through investment-cash flow sensitivity.

4.2.4 SALES *(S)*

This variable is of significance importance for the firms. This shows revenue generated by the firms. The ultimate goal of the firms is to maximize the sales for

their growth. The purpose to include this variable is to capture the demand side or the investment opportunities for the firms. The rationale behind this is that when sales of firms' increases in the market this gives a signal to the firms for higher expected future demand due to which the investment opportunities for the firms increases. For the sake of profit firms want to invest more to capture the demand from the market. This variable is used in place of Tobin's Q[27] to capture the investment opportunities for the firms. A lot of studies use this variable and explored to it an important determinant of firms' growth and investment.

4.2.5 GROWTH

Growth is calculated by the taking difference of investment on the physical assets like plant and machinery in logarithm form. In order to calculate the growth, this study firstly calculate investment in fixed assets[28] and takes the difference of current and previous year investment on fixed asset in logarithm form. The following formula is used to calculate the growth.

$$Growth_{it} = Log\left(I_{it} - I_{it-1}\right)$$

I_{it} Shows the investment on fixed asset in current year and I_{it-1} is the investment on fixed asset in the previous year. This variable is of vital importance because it directly indicates the performance of firms either they are growing or not. In most of the studies, growth is used as dependent variable for analyzing the factors that affect growth of the firms. Carpenter and Peterson (2002) use this variable in combination of internal finance to access either the growth of small firms is constrained by internal finance or not.

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27 For detail see more Fazzari *et al.* (1988).

28 *Investment = Fixed Asset$_{it}$ − Fixed Asset$_{it-1}$ + Deprication*

4.3 VARIABLES FOR CLASSIFICATION

The following explained variables are not used in the regression analysis but study use these variables for the division of the firms into groups of small medium and large to access the variation in investment cash flow sensitivity and growth cash flow sensitivity across different groups on bases of flowing explained variables.

4.3.1 DIVIDEND TO EQUITY:

Dividend to Equity is calculated by dividing the total dividend to the shareholder's equity (Ordinary Share Capital + Surplus). Following formula is used to calculate this.

$$Dividend\ to\ Equity = \left(\frac{Dividend}{Share\ Holders\ Equity} \right)$$

Study by using dividend to equity ratio divides firms into three classes; low dividend paying, moderate dividend paying and high dividend paying firms. Low dividend to equity ratio indicates that firms are paying low dividends as percentage of equity whereas high dividend to equity ratio indicates that firms are paying high dividends as percentage of equity.

4.3.2 DEBT TO EQUITY

Debt to equity is a measure of companies' financial leverage. This ratio is obtained by dividing the firms' liabilities with that of the shareholder equity[29]. By dividing the firms in to different classes helps us to explain how the sensitivity of the relation between investment to cash flow and growth to cash flow varies if the firms have

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[29] *Share Holder Equity= OrdinaryShareCaptial+ Surplus*

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more, less and moderate debt to equity ratio. Higher debt to equity ratio shows the aggressive behavior of the firms in financing their investment with the debt whereas low debt to equity ratio indicates less aggressive behavior of firms towards using debt. Following formula is used to calculate

$$Debt\ to\ Equity\ Ratio = \frac{(Current\ Liabilitie\ s + Non\ Current\ Liabilitie\ s)}{(Share\ Holders\ Equity)}$$

4.3.3 TOTAL ASSETS

This is used to divide the firms into small, medium and large size firms. Total asset is obtained by adding current asset[30] and noncurrent assets[31]. A lot of studies use this variable to divide firms in to small, medium and large size to access the prospect that either investment and growth of firms is homogenous across these different size groups or not.

$$Total\ Asset = Current\ Asset + Non\ Current\ Asset$$

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[30] These include all the assets which are easily converted in liquid when needed.
[31] These are assets which include physical assets i.e. which are not easily converted in to liquid form.

CHAPTER 5

CREDIT CONSTRAINT, FIRMS'INVESTMENT AND GROWTH IN MANUFACTURING SECTOR OF PAKISTAN

Manufacturing sector in Pakistan is of vital importance because of its significant contribution in Gross Domestic Product (hereafter GDP). Manufacturing sector works as a catalyst in fostering the economic growth and development. As per 2012-2013 figures, manufacturing sector contributes 13.2% in the GDP of Pakistan and 13.8% of the total labor force is working in this sector. Both of these economic indicators well explains the importance of the manufacturing the sector in Pakistan's economy. The results estimated from the sample of 500 firms of the manufacturing sector of Pakistan for the period of 1974 to 2010 are explained below.

5.1 CREDIT CONSTRAINT AND FIRMS' INVESTMENT

This section explains the results for the full sample during the time frame 1974-2010. The results for the overall sample by estimating equation 3.1.10 and equation 3.1.11 are reported in the Table 5.1. Equation 3.1.10 is estimated by including the current year sales while equation 3.1.11 contain one lag of the sale to capital ratio to properly incorporate the investment opportunities of the firms to maximum extent.[32]The key variable of concern in this study is cash flow to capital ratio.

Firstly, this study estimates the equation by including current year sales to capital ratio only. Results obtained by this study indicate that the effect of cash flow to capital ratio is positive and insignificant at all significance levels. The lag of

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[32] For detail see Terra (2002).

dependent variable[33] turned out to be the negative and significant at 1% significance level in both equations 3.1.10 and 3.1.11. Lag of dependent variable shows the adjustment cost[34] that the firms bear in moving from one level of investment to the next level of investment. Negative sign of dependent variable in case of this study indicates that current year investment spending don't have any spillover effect on the investment of next year investment, rather are followed by lower investment rate over the next years.

Sale to capital ratio also explored to be significant at 1% level of significance with positive sign for the equation 3.1.10. This indicates that the marginal productivity of capital of firms is increasing implying the increase in the investment opportunities or the demand of the firms' products. Effect of sale to capital ratio is significant and positive at 5% level of significance in equation 3.1.11.Sale to capital ratio shows that 1% increase in the sales to capital ratio causes 0.24% increase in the investment spending of the firms that indicates the presence of investment opportunities for the firms of manufacturing sector of Pakistan.

The insignificant effect of the cash flow to capital ratio in accordance to the hypothesis indicates that firms in manufacturing sector of Pakistan are not credit constrained or facing no external financial constraint. Because of this firms of manufacturing sector do not rely on internal generated funds to finance its working capital and investment needs. The results obtained clearly states that investment of the firms is not constrained and firms of manufacturing sector in Pakistan don't face problem in getting external finance as far as results of full samples are concerned. The

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[33] Lag of dependent variable here also shows the relation between current year investment decisions to that of the previous year investment decision.
[34] For more detail see Harrison *et al*. (2004) and Love (2003).

equation by adding the lag of the sale to capital is also estimated and accounted in Table 5.1.

Results acquired by adding lag of sale to capital ratio shows that past year sales also have positive impact on the investment decision of the firms. The effect of lag of sale to capital ratio explored to be significant at 5% level and positive relation between sales and investment is observed in this study. The effect of lag of sale to capital ratio points out that 1% increase in the marginal productivity of capital cause 0.009% increase in investment spending of the firms. If there is increase in the sale of the past year it pushes the firms to invest more. Increase in the demand of firms' products in the market sends signal to the firms to increase their investment spending. Because as per sales accelerator theory of investment, firms invest more if they expect their demand to rise in the market place. Due to this, investment of the firms varies with the past year sale to capital ratio.

Lag of dependent variable is also significant at 5% level of significance with negative sign because of the adjustment cost that the firms' bear during expansion from one level of investment to the next level of investment. The results on this issue are similar to the findings of Terra (2002).

The effect of the cash flow explored to be insignificant at all levels of significance indicating that firms are not facing external financial constraints so investment of firms doesn't depend on internal finance. This result according to the hypothesis is an indication that firms in the manufacturing sector of Pakistan are not credit constrained and don't face problem in getting external finance. The effect of lag of sale to capital ratio also discovered to be significant with positive sign that indicates the availability of investment opportunities for firms.

The significance of instruments is tested by Sargan test. Second order serial correlation among the residuals is represented by m2. The null of no serial correlation is accepted by this study and instruments used explored to be valid. This indicates that results estimated by this study are independent form the problem of the serial correlation among the residuals.

Table 5.1. Credit Constraint and Investment (1974-2010): Dependent Variable $\left(\frac{I}{K}\right)_{it}$

Model Without lag of Sale to Capital Ratio		Model With Lag of Sale to Capital Ratio	
Explanatory Variables	Coefficients	Explanatory Variables	Coefficients
$\left(\dfrac{I_{it}}{K_{it-1}}\right)_{t-1}$	-0.0027 (0.0002)*	$\left(\dfrac{I_{it}}{K_{it-1}}\right)_{t-1}$	-0.0144 (0.0049)*
$\dfrac{S_{it}}{K_{it-1}}$	0.2443 (0.0076)*	$\dfrac{S_{it}}{K_{it-1}}$	0.0053 (0.0072)**
$\dfrac{CF_{it}}{K_{it-1}}$	0.0130 (0.0093)	$\dfrac{CF_{it}}{K_{it-1}}$	0.0077 (0.0138)
		$\dfrac{S_{it-1}}{K_{it-2}}$	0.0098 (0.0032)*
m2 (Statistics Value)	0.0170	*m2 (Statistics Value)*	0.0001
Sargan (p value)	0.0310	*Sargan (p value)*	0.083

Note

- $\left(I_{it}/K_{it-1}\right)_{it-1}$ is the Investment to Capital ratio it is the lag of the dependent variable, $\left(S_{it}/K_{it-1}\right)$ is Sales to Capital ratio and $\left(CF_{it}/K_{it-1}\right)$ cash flow to capital ratio.
- Instruments used are 2 to 5 of investment to capital ratio, 2 to 4 of Sales to Capital ratio and Cash Flow to Investment.
- GMM two step estimates.
- Standard errors are in parenthesis.
- m2 is the second order serial correlation tests based on residuals asymptotically distributed as N (0, 1) under the null of no serial correlation.
- Sargan is the test of instruments' validity asymptotically distributed as χ^2 under the null that instrument is valid.
- Statistics significant at 1%, 5% and 10% is denoted by *, ** and *** respectively.
- Constant and Time dummies are included. (Not reported).

5.2 CREDIT CONSTRAINT AND FIRMS' GROWTH

This section explains the results of credit constraint and growth for the full sample in case of manufacturing sector of Pakistan. Similarly, for analyzing the impact of credit

constraint on firms' growth, this study, by following the literature estimate two equations which are explained above in the chapter 3.

The main difference between the equations 3.1.14 and 3.1.15 lies in their method to incorporate the investment opportunities. In equation 3.1.15 sales growth is used to capture the investment opportunities while in equation 3.1.14 sales to capital ratio is used for this purpose.

First both equations for the full sample from 1974 to 2010 are estimated. The results obtained from the estimation are reported in Table 5.2. Results obtained from estimating both the equations 3.1.14 and 3.1.15 points that firms in manufacturing sector of Pakistan are not credit constraint. In other words, their growth is not constraint by the internal finance. The results of the equation 3.1.14 demonstrate that the effect of sales to capital ratio is negative indicating decline in the marginal productivity of capital. It is discovered that with the 1% increase in the marginal productivity of capital there is 0.031% decline in the growth of the firms. Effect of sales growth is positive and significant that specifies the investment opportunities for the firms of manufacturing sector. The effect of sales growth indicates that 1% increase in the sales growth causes 0.59% increase in the growth of physical asset of the firms.

The effect of cash flow in case of equations 3.1.14 and 3.1.15 explored to be significant at 5% level. But the effect of cash flow for the equation 3.1.14 is negative whereas it is positive for the equation 3.1.15. In case of equation 3.1.15, results indicate that with the 1% increase in the internal finance, there is 0.26% increase in the growth of the physical assets of the firms whereas results for the equation 3.1.14

points out that with the 1% increase in the internal finance there is 0.22% decline in the growth of the physical asset of the firms.

The effect of the cash flow is lesser than one for both equations that in accordance to the hypothesis indicates that firms' growth is not constrained by internal finance. Lag of dependent variable in both equations is significant at 5% level of significance having negative sign that indicates the convergence behavior of the firms[35].

Table 5.2. Credit Constraint and Growth (1974-2010): Dependent Variable $Growth_{it}$

Model Using Sale to Capital Ratio for Investment Opportunities		Model Using Sales Growth for Investment Opportunities	
Explanatory Variables	**Coefficients**	**Explanatory Variables**	**Coefficients**
$Growth_{it-1}$	-0.4255 (0.0013)*	$Growth_{it-1}$	-0.3343 (0.0025)*
$\dfrac{S_{it}}{K_{it-1}}$	-0.0318 (-0.0062)*	$\dfrac{CF_{it}}{K_{it-1}}$	0.2658 (0.1161)*
$\dfrac{CF_{it}}{K_{it-1}}$	-0.2294 (0.0624)*	$Sales\ Growth_{it}$	0.5982 (0.0729)*
m2 (Statistics Value)	0.1466	m2 (Statistics Value)	0.3444
Sargan (p value)	0.1444	Sargan (p value)	0.1131

Note

➤ $Growth_{it-1}$ is the Growth of physical asset, it the lag of the dependent variable, (S_{it}/K_{it-1}) is Sales to Capital ratio and (CF_{it}/K_{it-1}) cash flow to capital ratio.

➤ Instruments used are 2 to 5 of lag of dependent variable, 2 to 6 of Sales to Capital ratio and Cash Flow to Investment.

➤ Standard errors are in parenthesis.

➤ m2 is the second order serial correlation tests based on residuals asymptotically distributed as N(0,1) under the null of no serial correlation.

➤ Sargan is the test of instruments' validity asymptotically distributed as χ^2 under the null that instrument is valid.

➤ Statistics significant at 1%, 5% and 10% is denoted by *, ** and *** respectively.

➤ Constant and Time dummies are included. (Not reported).

Instruments validity is tested by using the Sargan test. The results of Sargan test indicates that the instruments used in both equations are valid. Second order serial correlations among the residuals are represented by the m2 for both the equations. The null of no serial correlation for both equations is accepted by this study. This indicates

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[35] For more detail see Carpenter Petersen (2002).

that results for both equations don't encounter with the problem of serial correlation among residuals. 53

In above sections, all the four equations are estimated for analyzing the impact of credit constraint on firms' investment and growth for the entire manufacturing sector of Pakistan over the period of 1974 to 2010. In the next section results obtained for the political regimes and financial reforms are explained.

CHAPTER 6

FIRMS'GROWTH, INVESTMENT AND CREDIT

CONSTRAINED UNDER DIFFERENT REGIMES

From the beginning up till now the major or key focus of Pakistan polices was to enhance the economic growth that will help to decrease the poverty. These polices in different political regimes over the economic history of Pakistan were not only different but also have different impact on the institutions and economic growth of the country. To access or analyze the impact of different polices a good attempt was made by Hussain (2002). He classifies economic history of Pakistan over the years into different political regimes.

This chapter explains the results for different political regimes in the history of Pakistan and also explains the impact of major policy shifts regarding financial sector reforms. For this purpose, firstly, sample is divided into different time periods to find out that in which period firms in the manufacturing sector of Pakistan are facing external financial constraint. In the next section, degree of credit constraints of firms in pre financial sector reform and post financial sector reform era is explored.

In literature, it is evident that the division into different time periods is done on the bases of even distribution of time orby including time dummies to access the particular event effect. This study divides the sample on the bases of political regimes in Pakistan. Due to the limited availability of data beyond 1974, this study doesn't access the impact before 1974. The aim to divide the firms on the base of political regimes is to access the degree of financial constraints of firms in different political regimes and before and after financial sector reforms in Pakistan. During each

political regime everyone comes up with different mindset. These different mindsets in the history, by using different policy tools hit the economy differently. To accomplish this task study follows the division of Hussain (2006). This study analyses the following four political regimes of Pakistan for the analysis.

The period of 1974 to 1977 was Bhutto's regime and it is termed as an era of growth, nationalization and fiscal crises. The most prominent policy change occurred in the Bhutto's regime was the nationalization of the 43 large industrial units in 1972. The nationalized industrial units consisted on cement, chemical, oil refining, engineering, cooking oil, flour, cotton and rice husking mills. The economic implication of this policy was that it hit the confidence of the private investor badly and fosters the already declining private manufacturing investment in the country after 1965 war. Heavy subsidies were provided to both agriculture and industry. In agriculture sector the subsidies are provided in the form of subsidized inputs (water, fertilizer, pesticides) that was a part of the elite farmer strategy. In industry subsides are provided directly and indirectly such as an over-valued exchange rate, subsidized credit and tax incentives to an industrial sector that was inefficient and lacked export competitiveness (Hussain, 2006).

In Bhutto's regime the additional burden on the economy was the losses of public sector industries. The losses in these industries were due to their poor performance on the one hand and the pricing policy on the other (Hussain, 2006). Nationalized units were under official pressure because of the political influence and were forced to restrain price increases in spite of rising costs. Because of this they were recovering not more than their operating costs (Hussain, 2006).The economic implication of

polices in the Bhutto's regime directly widen the budget deficit through increased expenditure on subsidies and non-productive sector (Hussain, 2006).

The period of 1978 to 1988 was Zia's regime that witnessed economic growth, religious extremism and prelude to recession. The Zia regime was considered to be the starting point of the religious extremism that up till now is a significant constraint for the private sector investment due to lack of confidence on the security related matters. Heavy budget deficit and declining GDP was the grief from the previous government that needed to be addressed for gaining political and economic support. For the sake of gaining political and economic support Zia's government became part of the US policy in the war against Soviet Union. Zia's government gave financial support to the madras' for jihad in Afghanistan. This helped Zia's government to gain a massive financial aid and support to reschedule its foreign loans from the west that leads to the ease in the budget deficit. Another important factor that eases the pressure on the budget deficit in Zia's era was the massive movement of human capital to the Middle East that increased the remittances and helps to boost up the macro figures (Hussain, 2006). One of the important policy shifts in Zia's regimes was the decentralization along with the supportive private investment polices like cheap credit, duty free imports, tax holidays and accelerated depreciation allowances increased the growth of the private manufacturing sector. Private sector gross fixed investment increased from 4.79% of the GDP in the Bhutto period to 7.10% in the Zia regime (Hussain, 2006).

The period of 1989 to 1999 was democratic interlude that experienced deepening crises of economy. The decade of the 1990's was marked by democratically elected regimes attempting to practice authoritarian forms of power within an ostensibly democratic order (Hussain, 2006).Total investment (as a percentage of GDP) declined

from 17.9% in the period 1988-93 to 16.3% in the period 1993-1998[36.] During this decade there are a lot of significant factors that are found to be the reason of adverse effect on private investment and GDP growth (Hussain, 2006). The private sector investment in this sector did not increase and remained constant at 9%.The major polices shifts in this era was the Structural Adjustment Programs (SAP) under the IMF. The government tries to reduce the budget deficit by cutting the expenditures on the development sector while the expenditure on the non-productive sector stills remained at the same level. Because of these policy shifts along with the high corruption level and insecurity the private investment and GDP falls down (Hussain, 2006).

The period of 2000 to 2008 was Mushraf's regime which was stated as reverberation of history (Hussain, 2006). In the Mushraf's regime political and economic reforms were occurred because of this GDP growth accelerated to 6% and all other macroeconomic indicators performed well. Budget deficit was tolerable but the poverty level remains in the red spot. This high GDP growth that has been occurred in this regime was based on the growth of large scale manufacturing sector (Hussain, 2006).So, by splitting the sample results obtained from the estimation of above explained political regimes and financial sector reforms are explained below.

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[36] For more detail see Hussain (2006).

6.1 FIRMS' INVESTMENT AND CREDIT CONSTRAINT UNDER DIFFERENT POLITICAL RGEGIMES

This section explains the results for credit constraint and firms' investment under different political regimes. For this purpose, data is divided into four parts on the bases of above explained political regimes. Analysis is done by separately running the regression for each period. The results obtained are reported below in Table 6.1:

Table 6.1. Credit Constraint Under Different Political Regimes: Dependent Variable $\left(\dfrac{I_{it}}{K_{it-1}}\right)$

Explanatory Variables	Coefficients			
	1974 to 1977	1978 to 1988	1989 to 1999	2000 to 2008
$\left(\dfrac{I_{it}}{K_{it-1}}\right)_{t-1}$	-0.2675 (0.0760)*	-0.0163 (0.0064)**	-0.0499 (0.0105)*	-0.0046 (0.0018)**
$\dfrac{S_{it}}{K_{it-1}}$	0.1807 (0.036)*	0.0146 (0.0042)*	-0.0052 (0.0022)**	0.0016 (0.0026)
$\dfrac{CF_{it}}{K_{it-1}}$	0.1408 (0.2227)	0.2707 (0.0574)*	0.0115 (0.0256)	-0.0022 (0.0031)*
$\dfrac{S_{it-1}}{K_{it-2}}$	0.0541 (0.0202)*	0.0102 (0.0021)*	0.0126 (0.0036)*	0.0035 (0.0016)**
m2 (Statistics Value)	0.745	0.00007	0.0000	0.00003
Sargan (p value)	0.4947	0.33172	0.17159	0.2906

Note
- 1974 to 1977 is Bhutto's era, 1978 to 1988 is Zia era, 1989 to 1999 is democratic era, and 2000 to 2008 is Mushraf era.
- Statistics significant at 1%, 5% and 10% is denoted by *, ** and *** respectively.
- Constant and Time dummies are included. (Not reported).
- For the detail of variables, estimation technique and computation methods see table 5.1

The effect of cash flow is positive and significant in the period from 1978 to 1988 indicating that firms in this period face external financial constraint because of this firms' investment depends on internal finance in this regime. It is explored that 1% increase in internal finance leads to the 0.27% increase in the investment.

Effect of current year sale to capital ratio is positive and significant at 1% level of significance in the period from 1978 to 1988indicating the presence of investment opportunities during this era. The effect of sale to capital ratio in period 1978 to 1988 shows that with the 1% increase in the current year sale to capital ratio there is 0.014% increase in investment spending of firms. Similarly, lag of sale to capital ratio is positive, significant and it causes0.010% increase in the investment spending of firms with the 1% increase in internal finance. The effect of cash flow explored to be non-significant in the periods 1974 to 1977, 1989 to 1999 indicating that investment of the firms in these periods is independent from the internal finance. In other words, firms in these periods don't face external financial constraints because of this firms' investment is not affected form internally generated finance in above explained two regimes. The effect of past year sale to capital ratio is also positive and significant in all above explained regimes that shows the presence of investment opportunities for the firms in these regimes.

The effect of cash flow discovered to be significant but have negative sign for the period 2000 to 2008. This indicates that firms in the manufacturing sector of Pakistan during this time period don't face the problem of getting external finance because after Zia regime decentralization of financial institutions occurred that resulted in the growth of financial institutions. Due to this reason, firms after this era are not found to be credit constrained. Before Zia regime the period from 1974 to 1977 was the period of Bhutto.

Overall, results from the analysis indicate that firms face external financial constraint in the period from 1978 to 1988 only. Because of this, investment of the firms in manufacturing sector of Pakistan is found to be dependent on the internal finance in

this period. During this era, financial flow from west to meet the severe budget deficit, heavy provision of cheap credit, high remittances and friendly protection polices causes the domestic demand to rise whereas financial sector at that time was not developed enough so the firms in this regime face tight external financial constraints.

6.2 IMPACT OF DIFFERENT POLITICAL REGIMES ON FIRMS' GROWTH AND CREDIT CONSTRAINT

This section explains the results obtained for credit constraint and firms' growth under different political regimes. For this purpose, data is divided into four time frames on the base of above explained political regimes in the history of Pakistan. To analyze the impact this study estimates equation3.1.15. The results of the equation 3.1.15 are reported below in the Table 6.2.

Table 6.2: **Credit Constraints and Firms' Growth During Different Political Regimes: Dependent Variable** $Growth_{it}$

Explanatory Variables	Coefficients		
	1978 to 1988	**1989 to 1999**	**2000 to 2008**
$Growth_{it-1}$	-0.1655 (0.0230)*	-0.1290 (0.0218)*	-0.3579 (0.0238)*
$SalesGrowth_{it}$	-0.1174 (0.0442)*	-0.0842 (0.0596)	0.1197 (0.0665)**
$\dfrac{CF_{it}}{K_{it-1}}$	1.4402 (0.2295)*	0.9872 (0.3639)*	0.7111 (0.0850)*
m2 (Statistics Value)	0.2510	0.04856	0.0856
Sargan (p value)	0.2880	0.7574	0.2770

Note
➢ The results for the period of 1974 to 1977 were not reported. Because of Near Singularity problem.
➢ The period from 1974 to 1977 is Bhotto era, 1978 to 1988 is Zia era, 1989 to 1999 is democratic era, and 2000 to 2008 is Mushraf era.
➢ Statistics significant at 1%, 5% and 10% is denoted by *, ** and *** respectively.
➢ Constant and Time dummies are included. (Not reported).
➢ For the detail of variables, estimation technique and computation methods see table 5.2.

Results obtained from estimating the equation 3.1.15 for different political regimes indicates that only the period during which firms growth is constrained by internal finance is from 1978 to 1988. As results shows, the effect of cash flow to capital in this era is greater than one. With the one unit increase in the internal finance there is greater than one unit increase in the growth of the firms' asset because of the leverage effect which in light of hypothesis indicates that firms in this era are found to be constrained by internal finance.

Results for the period from 1974 to 1977 are not reported because of the short time span. The effect of cash flow in period 1978 to 1988 discovered to be positive and significant. Result for the time period from 1978 to 1988 shows that with 1% increase in the internal finance there is 1.44% increase in the growth of firms, which in light of hypothesis indicates the presence of external financial constraint. The effect of sales growth is negative and significant that shows not much investment opportunities in this period. Lag of dependent variable is also found to be negative and significant at 1% level of significance. The negative effect of lag of the dependent variable indicates convergence behavior.

The results obtained for the period of 1989 to 1999 shows that effect of cash flow to capital ratio is positive and significant but the sensitivity of relation between internal finance and growth is not greater than one that indicates growth of firms in this period is not constrained by internal finance. Result shows that 1% increase in the internal finance causes 0.98% increase in the growth of the firms. The effect of sales growth is insignificant in the period 1989 to 1999 indicating lack of investment opportunities for the firms.

The effect of cash flow to capital ratio for the period from 2000 to 2008 is positive and significant but the sensitivity of relationship between internal finance and growth is not greater than one indicates that the growth of firms is not constrained by internal finance. The effect of sales growth for the period of 2000 to 2008 is positive and significant. Results indicate that 1% increase in the internal finance causes 0.71% increase in growth of firms.

6.3 EMPIRICAL INVESTIGATION OF IMPACT OF FINANCIAL REFORMS ON CREDIT CONSTRAINT AND FIRMS' INVESTMENT

In this section results for the major policy shifts that occurred in the economic history of Pakistan is explained. Analysis is done by considering two major policy shifts related to the financial sector reforms namely the nationalization of financial institutions in 1974 and decentralization of financial institutions in 1991. For this purpose, data is divided into two parts. One part comprised of the data from the period of 1974 to 1990 that is the period of nationalization of financial institutions and the other part comprises on the data from 1991 to 2010 that is the period of decentralization of financial institutions in Pakistan. In other words, the period from 1974 to 1990 is pre financial reforms era and the period from 1991 to 2010 is post financial reforms era.

Nationalization of the financial institutions was started in 1974 when Bank Nationalization Ordinance was implemented, according to which all the banks in Pakistan were under the control of federal government. In 1991 another abrupt policy change was introduced by the government by issuing ten licenses to the private financial institutions and by privatizing the four national commercial banks. The process of privatization continues up till now. The results for the credit constraint and

investment during the period of nationalization of financial institution and decentralization of financial institution are reported below in Table 6.3.

Table 6.3. Credit Constraint and Investment in Pre and Post Financial Reforms Period

Explanatory Variables	Coefficients for Pre and Post Financial Reform Periods	
	1974 to 1990	**1991 to 2010**
$\left(\dfrac{I_{it}}{K_{it-1}}\right)_{t-1}$	-0.0660 (0.00453)*	-0.0123 (0.0014)*
$\dfrac{S_{it}}{K_{it-1}}$	0.0053 (0.0022)**	0.0155 (0.0033)*
$\dfrac{CF_{it}}{K_{it-1}}$	0.2012 (0.04201)*	0.0207 (0.0125)**
$\dfrac{S_{it-1}}{K_{it-2}}$	0.0174 (0.0017)*	0.0084 (0.0013)*
m2 (Statistics Value)	0.0014	0.0001
Sargan (p value)	0.1683	0.0698

Note
➢ 1974 to 1990 period is Pre Financial Reform era and 1991 to 2010 is Post Financial Reform era
➢ Standard errors are in parenthesis.
➢ M2 is the second order serial correlation tests based on residuals asymptotically distributed as N (0, 1) under the null of no serial correlation.
➢ Sargan is the test of instruments' validity asymptotically distributed as χ^2 under the null that instrument is valid.
➢ Constant and Time dummies are included. (Not reported).
➢ For the detail of variables see table 5.1.

Results indicate that the effect of cash flow is positive, significant and causes 0.20% increase in the investment to capital ratio with the 1% increase in the internal finance in pre financial sector reform period. The effect of lag of sale to capital ratio is positive and significant at 1% level of significance in pre financial sector reform era. The coefficient of lag of sale to capital ratio shows that 1% increase in the lag sale to capital ratio causes 0.017% increase in investment to capital to capital ratio. This indicates that investment spending of the firms is dependent on the past year marginal productivity of capital. Similarly, current year sale to capital ratio also appeared to be positive and significant. This is an indication of investment opportunities of firms in pre financial sector reform period.

The effect of internal finance is positive and significant in post financial sector reform period at 5% level of significance. In post financial sector reform period results shows that with the 1% increase in the internal finance there is 0.020% increase in the investment of the firms that is lower than the period of pre financial sector reform period. The effect of lag sale to capital ratio is positive and significant at 1% level. Similarly, current year sale to capital ratio for the period of post financial sector reform era is positive and significant at 1% level of significance. The lag of dependent variable is negative and significant in both pre and post financial sector reform period that shows the adjustment cost which the firms bear in moving from one level of investment to next level.

Results for investment and credit constraint in pre and post financial sector reform shows that firms are discovered to be facing external financial constraint but firms in pre financial sector reform were facing tight external financial constraint as compared to post financial sector reform era. One of the important initiatives of Bhutto's government was the nationalization of industrial units. This took in two sets, first set of nationalization hits large industries while second set hits the small and medium industries.

These initiatives widen the functions of government along with expenditures so targeted credit dispersion took place in this era. Due to this firms face tight external financial constraint in pre financial sector reform period while decentralization polices decrease the concentration and increase the competition and efficiency due to which firms' in post financial sector reform era firms face less external financial constraint as compared to pre financial sector reform era. The sensitivity of investment to internal finance decreases as we move from the period of nationalization to decentralization as shown by the result.

6.4 EMPIRICAL INVESTIGATION OF IMPACT OF FINANCIAL REFORMS ON CREDIT CONSTRAINT AND FIRMS' GROWTH

This section explains the results for impact of financial sector reform on credit constraint and growth for this equation 3.1.15is estimated and results obtained are reported below in the table 6.4.

Table 6.4.Financial Sector Reforms, Credit Constraint and Growth

Explanatory Variables	Coefficients for Pre and Post Financial Reform	
	1974 1990	**1991 2010**
$Growth_{it-1}$	-0.1895 (0.0242)*	-0.3076 (0.0074)*
$SalesGrowth_{it}$	-0.3086 (0.0817)*	0.2085 (0.0242)*
$\dfrac{CF_{it}}{K_{it-1}}$	1.2635 (0.2826)*	0.6347 (0.0685)*
m2 (Statistics Value)	0.3491	0.1724
Sargan (p value)	0.4371	0.7029

Note
- ➢ 1974 to 1990 period is Pre Financial Reform era and 1991 to 2010 is Post Financial Reform era
- ➢ Constant and Time dummies are included. (Not reported).
- ➢ GMM two step estimates.
- ➢ Statistics significant at 1%, 5% and 10% is denoted by *, ** and *** respectively.
- ➢ For the detail of variables, estimation technique and computation methods see table 5.1 and 5.2

The effect of cash flow to capital ratio is positive, significant and greater than one at 1% level of significance. In pre financial sector reform era, results shows 1% increase in internal finance causes 1.26% increase in the firms' fixed assets' growth. Results for the pre financial sector reform era indicates that with the one percent increase in internal finance firms grow with more than one percent because of the leverage effect. The effect of sales growth for pre financial sector reform era is significant and negative at 1% level of significance. It indicates that the firms' investment is insensitive to the sales during this time frame. The lag of dependent variable is found to be negative and significant at 1% level of significance. It is an indication of convergence of the firms.

The effect of cash flow for the post financial sector reform era discovered to be positive and significant. Result shows that 1% increase in the internal finance causes 0.63% increase in the growth of firms' fixed assets that in light of hypothesis indicates that firms' growth is not constrained by internal finance in post financial sector reform era. Highly positive and significant effect of sales growth at 1% level of significance is indication of high investment opportunities in the post financial sector reform era.

The overall results indicate that the growth of firms in the manufacturing sector of Pakistan is constrained by internal finance in pre financial reform era while it is not constrained by internal finance in post financial sector reform period. This is because with privatization there is a monopoly break down in financial market and credit is dispersed widely and deeply because of the injected competition through the privatization of the financial institutions. Due to this, firms don't face financial constraints in post financial sector reform.

CHAPTER 7

CREDIT CONSTRAINT, FIRMS' INVESTMENT AND GROWTH:
AN INDUSTRIAL ANALYSIS

This chapter explains the results for credit constraint, firms' investment and growth in case of different industries. This study divides the samples into industries and equation3.1.10 and 3.1.11 are estimated separately for each industry. The sample is divided into industries namely textile-cotton, textile-synthetic, chemicals, engineering, sugar and cement for the purpose of analysis.

7.1 TEXTILE-COTTON INDUSTRY: CREDIT CONSTRAINT, FIRMS'INVESTMENT AND GROWTH

Manufacturing sector of Pakistan is mostly consisted on the textile firms. According to the report of the Asian Development Bank (2008) 46% of the total industrial output comes from textile sector and 60% of total export of Pakistan directly and indirectly is linked with the textile sector. The growth of Pakistan's manufacturing sector is mainly linked with the growth of the textile sector.

Defensive and growth friendly policies are implemented by the government to facilitate the textile sector. Because of the importance of this sector in the overall growth of the manufacturing sector it is important to see that whether the investment or growth of the textile sector is credit constrained or not. Results obtained for the textile–cotton industry by estimating both the models are reported below in the table 7.1.

<div align="center">

Table7.1. Textile-Cotton Industry (1974-2010)

</div>

Dependent Variable $\left(\dfrac{I_{it}}{K_{it-1}}\right)$		Dependent Variable $Growth_{it}$	
Explanatory Variables	**Coefficients**	**Explanatory Variables**	**Coefficients**
$\left(\dfrac{I_{it}}{K_{it-1}}\right)_{t-1}$	-0.0149 (0.0001)*	$Growth_{it-1}$	-0.3139 (0.0023)*
$\dfrac{S_{it}}{K_{it-1}}$	0.0735 (0.0004)*	$SalesGrowth_{it}$	0.3056 (0.1409)**
$\dfrac{CF_{it}}{K_{it-1}}$	0.0109 (0.0025)*	$\dfrac{CF_{it}}{K_{it-1}}$	1.6932 (0.3866)*
$\dfrac{S_{it-1}}{K_{it-2}}$	0.0086 (0.0001)*		
m2 (Statistics Value)	0.0009	m2 (Statistics Value)	0.6862
Sargan (p value)	0.1078	Sargan (p value)	0.0945

Note
➤ Constant and Time dummies are included. (Not reported).
➤ GMM two step estimates.
➤ Statistics significant at 1%, 5% and 10% is denoted by *, ** and *** respectively.
➤ For the detail of variables, estimation technique and computation methods see table 5.1 and 5.2.

Results obtain by estimating the investment model indicates that the cash flow effect is positive and significant at 1% level of significance. Results indicates that1% increase in the internal finance leads to the 0.010% increase in the investment spending indicating that firms in textile-cotton industry are facing external financial constraint because of this firms' investment in the textile-cotton industry is dependent on the internal finance.

The effect of sale to capital and lag of sale to capital ratio explored to be positive and significant at 1% level. The effect of lag of sale to capital ratio indicates that 1% increase in the marginal productivity of capital leads to the 0.008% increase in the investment spending of textile-cotton industry whereas effect of the current year sale to capital ratio indicates that 1% increase in current year sale to capital ratio causes 0.073% increase in the investment spending of the firms that is an indication of presence of investment opportunities.

Result obtained in case of textile-cotton industry by estimating the growth model indicates that the effect of cash flow is positive and significant at 1% level of significance and it is explored to be greater than one. Results indicate that 1% increase in cash flow leads to the 1.69% increase in the growth of the fixed assets of the firms. These explored results in accordance to the hypothesis indicate that the growth of firms is constrained by the internal finance in the case of textile-cotton industry.

The effect of sales growth is positive and significant at 5% level of significance that is an indication of the investment opportunities in case of this industry. The effect of the sales growth indicates that the 1% increase in sales growth there is 0.30% increase in the investment growth of the firms. The lag of growth variable is negative and significant at 1% level of significance indicating lack of correlation between current growth and the previous growth.

The exports of Pakistani textile shows increasing trend. There is 16% increase in the exports from 2010 to 2011[37]. This sector consumes almost 40 of the banking credit for financing[38]. With the increase in market demand for the textile product, its financing need is also increasing and the major cost in this sector is associated with the materials. That's why firms' in this sector are facing tight external financial constraints and textile-cotton sector relies heavily on internal generated funds.

The Validity of the instruments used in the analysis is tested by using the Sargan test. The null of no serial correlation for both equations is accepted as well as indicated by the m2.

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[37]Economic Survey of Pakistan (2012 – 2013)
[38] Economic Survey of Pakistan (2012 – 2013)

7.2 TEXTILE-SYNTHETIC INDUSTRY: CREDIT CONSTRAINT, FIRMS'INVESTMENT AND GROWTH

The textile synthetic industry is of vital importance since it produces many kinds of valuable garments. Textile synthetic Products include swimsuits, fire resistant suits and blend of synthetic fiber with cotton. It is of immense importance for a country's needs because of its products. Hence this study investigates that both investment and growth of firms in this sector is affected by credit constraint or not.

Results obtained for the textile–synthetic industry by estimating both the models are reported below in the table 7.2. Results for investment model indicate that the effect of cash flow is positive and significant at 1% level of significance. Results show that 1% increase in the internal finance causes 0.54% increase in the investment spending. It demonstrates that investment spending of the firms in the textile-synthetic industry is highly dependent on the internal finance. The effect of sale to capital ratio is positive and significant at 1% level of significance and effect of lag of sale to capital ratio is positive and significant at 10% level of significance. The effect of the lag of sale to capital ratio indicates that 1% increase in the sale to capital ratio causes 0.016% increase in the investment spending while the effect of current year sale to capital ratio indicates that 1% increase in current year sale to capital ratio leads to the 0.03% increase in the investment spending of this industry. Results indicate the presence of the investment opportunities for the firms in the textile-synthetic industry. The results explored in this case are similar to the findings of the Terra (2002).

Results in case of textile-synthetic industry by estimating the growth model indicates that the effect of lag growth variable has negative sign and significant at 1% level of significance. It indicates lack of correlation between current year growth and the

previous year growth. The effect of cash flow explored to be positive and significant at 1% level of significance and it is greater than one. This shows that with the 1% increase in cash flow coefficient there is more than one percent increase (3.32%) in the growth of physical assets of the firms. This indicates that the growth of firms is highly constrained by the internal finance for the firms in textile-synthetic industry.

The effect of sales growth is positive and significant at 1% level of significance. The effect of sales growth indicates that with the 1% increase in sales growth there is 0.82% increase in the growth of firms in textile-synthetic industry. This is an indication of the presence of investment opportunities for the firms in this industry.

Overall, results obtained for the firms' in textile-synthetic industry indicates that firms in this industry face tight external financial constraints. The textile sector is growing over the years along with that its demand for financing investment is also growing which is not satisfied from the financial institutions. That's the reason firms in textile synthetic industry are heavily relying on the internal finance. The instruments used by this study explored to be valid and the results don't face the problem of serial correlation among the transformed residuals.

Table7.2. Textile-Synthetic Industry (1974-2010):

Dependent Variable $\left(\dfrac{I_{it}}{K_{it-1}}\right)$		Dependent Variable $Growth_{it}$	
Explanatory Variables	**Coefficients**	**Explanatory Variables**	**Coefficients**
$\left(\dfrac{I_{it}}{K_{it-1}}\right)_{t-1}$	-0.2653 (0.0149)*	$Growth_{it-1}$	-0.5156 (0.0217)*
$\dfrac{S_{it}}{K_{it-1}}$	0.0350 (0.0086)*	$SalesGrowth_{it}$	0.8257 (0.1340)*
$\dfrac{CF_{it}}{K_{it-1}}$	0.5493 (0.0287)*	$\dfrac{CF_{it}}{K_{it-1}}$	3.3228 (0.5862)*
$\dfrac{S_{it-1}}{K_{it-2}}$	0.0163 (0.0064)***		
m2 (Statistics Value)	0.7296	m2 (Statistics Value)	1.2129
Sargan (p value)	0.7253	Sargan (p value)	0.8013

Note

➢ Constant and Time dummies are included. (Not reported).

➢ GMM two step estimates.

➢ Statistics significant at 1%, 5% and 10% is denoted by *, ** and *** respectively.

➢ For the detail of variables, estimation technique and computation methods see table 5.1 and 5.2.

7.3 CHEMICAL INDUSTRY: CREDIT CONSTRAINT, FIRMS'

INVESTMENT AND GROWTH

Chemical sector of Pakistan plays an important role in the overall growth of the manufacturing sector. This sector is important for fulfilling the need of agriculture sector. Chemical sector of Pakistan mainly produces fertilizer, pesticides, dyes and medicines. Chemical sector of Pakistan suffers from the problem of low research and development expenditures[39]. Chemical sector is capital intensive in nature because of its production process. Due to its importance, there is need to access firms' investment and growth in this industry. To analyze the impact of credit constraint on firms' investment and growth both the investment and growth models are estimated and their results obtained are reported below.

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[39] See Implication of liberalizing Trade and investment with India (2005)

<div align="center">**Table.7.3. Chemical Industry (1974-2010)**</div>

Dependent Variable $\left(\dfrac{I_{it}}{K_{it-1}}\right)$		Dependent Variable $Growth_{it}$	
Explanatory Variables	**Coefficients**	**Explanatory Variables**	**Coefficients**
$\left(\dfrac{I_{it}}{K_{it-1}}\right)_{t-1}$	-0.0788 (0.0221)*	$Growth_{it-1}$	-0.3531 (0.0313)*
$\dfrac{S_{it}}{K_{it-1}}$	0.1153 (0.0166)*	$Sales\,Growth_{it}$	0.3289 (0.1274)**
$\dfrac{CF_{it}}{K_{it-1}}$	0.0105 (0.0877)	$\dfrac{CF_{it}}{K_{it-1}}$	-0.4674 (0.2509)***
$\dfrac{S_{it-1}}{K_{it-2}}$	0.0024 (0.0073)		
m2 (Statistics Value)	1.2297	m2 (Statistics Value)	0.9508
Sargan (p value)	0.7986	Sargan (p value)	0.0868

Note
➢ Constant and Time dummies are included. (Not reported).
➢ GMM one step estimates.
➢ Statistics significant at 1%, 5% and 10% is denoted by *, ** and *** respectively.
➢ For the detail of variables, estimation technique and computation methods see table 5.1 and 5.2.

The effect of lag of the dependent variable for investment model is found to be negative and significant at 1% level indicating the adjustment cost bear by the firms to move from one level of investment to that of the next level of investment[40]. Negative signs indicate that the current year investment spending don't spill over the next years investment rather are followed by the lower investment rate in later years.

The effect of cash flow for the investment model is positive but found to be insignificant that shows investment of the firms in the chemical industry are not dependent on internally generated funds. Investments of firms in chemical industry are not affected from credit constraint. The effect of sale to capital ratio turned out to be positive and highly significant at 1% level of significance while the effect of lag of sale to capital ratio was discovered to be insignificant.

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[40]For detail see more Fazzari *et al.* (1988).

The results obtained for growth model are reported in the table 7.3. The result shows that lag of the dependent variable discovered to be negative and significant at 1% level of significance that indicates independence of current growth to the past year growth. The effect of sales growth is positive and significant at 5% level of significance. Results shows that with the 1% increase in the sales growth there is 0.32% increase in the firms' asset growth. The effect of the cash flow discovered to be negative and significant at 10% level of significance and it is not greater than one that shows growth of firms is not constrained by internal finance.

Overall, results indicate that firms' in the chemical industry are not facing external financial constraints. Because of the capital intensive nature of firms in this industry, their collateral value is high so they don't face any sort of external financial constraint in financing their investment.

The validity of the instruments is tested by the Sargan test while second order serial correlation among the residuals is tested by the m2. The null of no serial correlation is accepted as shown from its p-value in both the models. This indicates that our results are independent form the problem of serial correlation among the transformed residuals and instruments used by this study are valid.

7.4 ENGINEERING INDUSTRY: CREDIT CONSTRAINT, FIRMS' INVESTMENT AND GROWTH

Engineering capabilities contributes to the economic growth as it is evident from the pattern of economic development of advanced nations. The major obstacles in case of engineering industries are non-availability of technical man power. The growth in the engineering sector has been less satisfactory in Pakistan. During 2012-13 engineering sector experienced negative growth of 15.60%.In this section results obtained for the

firms in engineering industry are explained. For the analysis of impact of credit constraint on firms' investment and growth both the investment and growth models are estimated and results obtained are reported below in the table 7.4.

Table 7.4. Engineering Industry (1974-2010)

Dependent Variable $\left(\dfrac{I_{it}}{K_{it-1}}\right)$		Dependent Variable $Growth_{it}$	
Explanatory Variables	**Coefficients**	**Explanatory Variables**	**Coefficients**
$\left(\dfrac{I_{it}}{K_{it-1}}\right)_{t-1}$	-0.0363 (0.0165)**	$Growth_{it-1}$	-0.3147 (0.0211)*
$\dfrac{S_{it}}{K_{it-1}}$	0.1583 (0.0127)*	$Sales\,Growth_{it}$	0.7748 (0.1907)*
$\dfrac{CF_{it}}{K_{it-1}}$	-0.0180 (0.0637)	$\dfrac{CF_{it}}{K_{it-1}}$	0.0459 (0.1158)
$\dfrac{S_{it-1}}{K_{it-2}}$	-0.0161 (0.0071)**		
m2 (Statistics Value)	1.0013	*m2 (Statistics Value)*	0.0929
Sargan (p value)	0.3907	*Sargan (p value)*	0.1070

Note
➤ Constant and Time dummies are included. (Not reported).
➤ GMM one step estimates.
➤ Statistics significant at 1%, 5% and 10% is denoted by *, ** and *** respectively.
➤ For the detail of variables, estimation technique and computation methods see table 5.1 and 5.2.

The effect of cash flow for the investment model is found to be negative and insignificant that suggests firms in this industry don't face external financial constraint. Because of this firm doesn't depend on their internal finance in engineering industry. The effect of sale to capital ratio is positive and highly significant at 1% level of significance that indicates investment opportunities while the effect of the lag of sale to capital ratio is negative and significant at 5% level of significance. Similar results are reported by Terra (2002) for Brazilian firms. The effect of lag of dependent variable for investment model is found to be significant at

5% level of significance having negative sign that shows adjustment cost bear by the firms to move from one level of investment to the next level of investment.

Similarly results obtained for growth model are reported in the table 7.4. The result obtained shows that the lag of the dependent variable is significant at 1% level of significance having negative sign that indicates independence of current growth to the past year growth. The effect of sales growth is positive and highly significant at 1% level of significance. The results show that 1% increase in the sales growth causes 0.77% increase in the physical asset growth of the firms. The effect of cash flow shows that growth of firms is not constrained by internal finance.

The results indicate that firms in this industry don't face external financial constraint because of the capital intensive nature of firms in this industry. They have high collateral value due to this firms in this industry can access the financial institutions for financing their investment. The validity of the instruments is tested from the Sargan test p-value that is showing instruments used are valid. Second order serial correlations among the residuals are represented by m2 that shows independence from serial correlation.

Overall results obtained for the firms in engineering industry indicate that firms in this industry are not facing external financial constraint. Because of this these firms' investment is independent from the internal finance. The firms in this industry have high and heavy physical infrastructure involved in production so for their growth they require high investment for which internal finance is not sufficient source of finance. Due to large physical asset base they don't have any constraint in accessing the external finance from the financial institutions that's why their reliance on internal finance is not appeared to be significant.

7.5 SUGAR AND ALLIED INDUSTRY: CREDIT CONSTRAINT, FIRMS' INVESTMENT AND GROWTH

Sugar industry of Pakistan is the sixth largest sugar producer in the world and the second biggest agro based industry in Pakistan. There are 86 sugar mills in Pakistan with the production capacity of 7.0 million tones. This sector contributes 22 billion to government revenue. Sugar sector provides employment to 1.20 million people. The operations of sugar sector are seasonal in nature and this sector relies on bank borrowing to finance investment needs. The results obtained by estimating both the equations for the firms in the sugar and allied industries are reported below in Table.7.5.

Table7.5.Sugar & Allied Industry (1974-2010)

Dependent Variable $\left(\dfrac{I_{it}}{K_{it-1}}\right)$		Dependent Variable $Growth_{it}$	
Explanatory Variables	**Coefficients**	**Explanatory Variables**	**Coefficients**
$\left(\dfrac{I_{it}}{K_{it-1}}\right)_{t-1}$	-0.3537 (0.0201)*	$Growth_{it-1}$	-0.3468 (0.0247)*
$\dfrac{S_{it}}{K_{it-1}}$	0.1151 (0.0108)*	$Sales\,Growth_{it}$	-0.4319 (0.1788)**
$\dfrac{CF_{it}}{K_{it-1}}$	0.0988 (0.0447)***	$\dfrac{CF_{it}}{K_{it-1}}$	0.3098 (0.5408)
$\dfrac{S_{it-1}}{K_{it-2}}$	0.1404 (0.0093)*		
m2 (Statistics Value)	0.1375	m2 (Statistics Value)	0.3737
Sargan (p value)	0.2037	Sargan (p value)	0.2101

Note
- Constant and Time dummies are included. (Not reported).
- GMM one step estimates.
- Statistics significant at 1%, 5% and 10% is denoted by *, ** and *** respectively.
- For the detail of variables, estimation technique and computation methods see table 5.1 and 5.2.

The effect of cash flow to capital is found to be positive and significant at 10% level. The effect of the cash flow to capital shows that it causes 0.09% increase in the

investment spending of the firms with the 1% increase in internal finance. This indicates that firms face external financial constraint in sugar industry because of this firm' investment depends on the internal finance. The effect of sale to capital ratio and lag of sale to capital ratio is positive and significant at 1% level of significance that is the indication of the investment opportunities for firms in the sugar and allied industry.

The results for the growth equation indicates that the effect of internal finance is positive but found to be insignificant which clearly shows that growth of the firms is not constrained by internal finance. The large physical infrastructure eliminates the collateral limit on firms for attaining the access to external finance. So, for the investment in material and transportation firms can rely on its internal finance while when firms wants to expand its physical structure for more production high investment is needed for the installation of machinery. So firms have to go to the financial market and their internal finance becomes insignificant in financing such huge investment.

Validity of instruments is tested from Sargan test probability value. Sargan test indicates all the instruments used are valid. Second order serial correlations among the residuals are represented by the m2. Results in case of m2 indicates that our results are independent form that of the serial correlation presence.

7.6 CEMENT INDUSTRY: CREDIT CONSTRAINT, FIRMS' INVESTMENT AND GROWTH

Cement sector is of vital importance for the country's need. Investment in roads, bridges and houses enhances the economic growth. Cement industry of Pakistan is

amongst the top 20 producer in the world[41]. Cement industry of Pakistan is also amongst the top 5 exporters of cement in the world. Afghanistan, Iraq, India, Sri Lanka and Sudan are the big importers of Pakistani cement. Cement industry in Pakistan is consisted of 25 units. During 2012-13, cement sector of Pakistan witnessed the growth of 6.08%. In this section results obtained for the firms in the cement industry are explained. For the analysis of credit constraint, firms' investment and growth both the investment and growth models are estimated and their results are reported below in the table 7.6.

Table7.6.Cement Industry (1974-2010)

Dependent Variable $\left(\dfrac{I_{it}}{K_{it-1}}\right)$		Dependent Variable $Growth_{it}$	
Explanatory Variables	**Coefficients**	**Explanatory Variables**	**Coefficients**
$\left(\dfrac{I_{it}}{K_{it-1}}\right)_{t-1}$	-0.2801 (0.0512)*	$Growth_{it-1}$	-0.7152 (0.0105)*
$\dfrac{S_{it}}{K_{it-1}}$	0.0988 (0.0213)*	$Sales\,Growth_{it}$	-0.2458 (0.0733)**
$\dfrac{CF_{it}}{K_{it-1}}$	0.2588 (0.2177)	$\dfrac{CF_{it}}{K_{it-1}}$	0.3038 (0.2373)
$\dfrac{S_{it-1}}{K_{it-2}}$	0.0409 (0.0167)**		
m2 (Statistics Value)	0.2412	*m2 (Statistics Value)*	2.0424
Sargan (p value)	0.5958	*Sargan (p value)*	0.9651

Note
➢ Constant and Time dummies are included. (Not reported).
➢ GMM one step estimates.
➢ Statistics significant at 1%, 5% and 10% is denoted by *, ** and *** respectively.
➢ For the detail of variables, estimation technique and computation methods see table 5.1 and 5.2.

Results obtained for the firms in cement industry shows that effect of cash flow for the investment model is found to be positive but insignificant that suggests firms in this industry are not facing external financial constraint because of this investment of firms doesn't depend on their internal finance.

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[41] See Economic Survey of Pakistan (2012-2013).

The effect of sale to capital ratio is positive and highly significant at 1% level of significance and the effect of the lag of sale to capital ratio is also positive and significant at 5% level of significance. The effect of the lag of the dependent variable for investment model is found to be negative and significant at 1% level of significance that shows adjustment cost bear by the firms to move from one level of investment to the next level of investment.

Results obtained for growth model are reported in the table 7.6. The result illustrates that the lag of the dependent variable of the growth is significant at 1% level of significance having negative sign that indicates independence of current year growth to the previous year growth. The effect of sales growth is negative and significant at 5% level of significance. Results show that 1% increase in the sales growth causes 0.24% decrease in the asset growth of firms while effect of the cash flow is not significant.

The effect of sales growth indicates lack of firms product demand from the market side. The decrease in sale growth has many reasons related to their operational activities. In cement industry huge physical assets are involved in the production process so for expansion internal finance is not enough to meet the thrust of firms for investment when some potential investment opportunities are available. Because of the high collateral value of asset, it is easy for firms in this industry to approach the financial institutions for credit. So, firms in cement industry don't face external financial constraint in financing their investment.

Sargan test probability value indicates the validity of instruments. The null of no serial correlation is not rejected here as shown from its probability value in both the

models. This indicates that our results are independent form that of the serial

correlation.

CHAPTER 8

CREDIT CONSTRAINED, FIRMS' INVESTMENT AND GROWTH: HOMOGENEITY ACROSS DIFFERENT GROUPS

In this chapter results for the prospect that either credit constrained, investment and growth of the firms varies across different groups or not are explained. For this purpose, firstly firms are divided into groups of small, medium and large, on the bases of total assets. Secondly, firms are classified into three classes on the bases of low debt to equity ratio, moderate debt to equity ratio and high debt to equity ratio. Lastly, firms are divided into three groups of low dividend to equity ratio, moderate dividend to equity ratio and high dividend to equity ratio. These variables are used in the literature in order to analyze that in which particular group the sensitivity of internal finance to investment and grow this different from others.

Kashyap *et al*. (1995) divides the firms in low and high dividend firms on the base of dividend to equity ratio and analyze the response of low and high dividend paying firms. Fazzari *et al.* (1988) also divides the firms on the bases of dividend to income and total assets into small, medium and large firms. Similarly, Tahmiscioglu *et al.* (1997) divides the firms into small medium and large on the base of dividend payout ratio while Terra (2002) analyzed the sensitivity to internal finance by dividing the firms into small, large, domestic and multinational categories.

This chapter is further divided in to three sections. First section explains the results of credit constrained, investment and growth by dividing the firms into groups of small, medium and large on the bases of total assets while second section explains the results for the credit constrained, investment and growth by dividing the firms into low

dividend to equity ratio, moderate dividend to equity ratio and high dividend to equity ratio and lastly the results by dividing the firms on the bases of debt to equity ratio are explained for the period of 1974-2010.

8.1 INVESTMENT, GROWTH AND CREDIT CONSTRAINED ACROSS SMALL, MEDIUM AND LARGE SIZE FIRMS

This section explain results for credit constrained, firms' investment and growth by dividing the firms into small, medium and large on the base of their total assets. This division is done for accessing the prospect of heterogeneity of investment and growth across different groups. Results obtained for this are reported in the following table.

8.1.1 INVESTMENT AND CREDIT CONSTRAINED: A COMPARISION ACROSS FIRMS OF DIFFERENT SIZES

Results for investment and credit constrained by dividing the firms on the base of total assets into small medium and large firms are reported in the below mentioned table 8.1.1.

The key variable of concern for the analysis is cash flow to capital ratio. Result obtained for this division indicates that effect of cash flow is positive and significant in all groups. It is significant at 10% level of significance in small group whereas it is significant at 1% level of significance in medium and large size firms. The results obtained for small firms shows that with the 1% increase in the internal finance there is 0.011% increase in the investment spending of the firms. This shows that small firms are facing external financial constraints. Because of this, firms are relying on their internal finance. The effect of sale to capital and lag of sale to capital ratio are

positive and significant at 1% level of significance, which is an indication of investment opportunities for small firms.

Table 8.1.1 Firm Size and Investment (1974-2010): Dependent Variable $\left(\dfrac{I_{it}}{K_{it-1}}\right)$

Division On The Bases Of Total Assets			
Explanatory Variables	**Coefficients**		
	Small Size Firms	**Medium Size Firms**	**Large Size Firms**
$\left(\dfrac{I_{it}}{K_{it-1}}\right)_{t-1}$	-0.0039 (0.0002)*	-0.0374 (0.0011)*	-0.0213 (0.0018)*
$\dfrac{S_{it}}{K_{it-1}}$	0.5346 (0.0007)*	-0.0059 (0.0008)*	0.0025 (0.0012)**
$\dfrac{CF_{it}}{K_{it-1}}$	0.0112 (0.0064)***	0.4389 (0.0285)*	0.0964 (0.02166)*
$\dfrac{S_{it-1}}{K_{it-2}}$	0.0045 (0.0002)*	0.0298 (0.0006)*	0.0009 (0.0003)
m2 (Statistics Value)	0.0045	0.0078	0.0004
Sargan (p value)	0.2985	0.2356	0.2057

Note
➢ Constant and Time dummies are included. (Not reported).
➢ GMM two step estimates.
➢ Statistics significant at 1%, 5% and 10% is denoted by *, ** and *** respectively.
➢ For the detail of variables, estimation technique and computation methods see table 5.1

The effect of cash flow is highly sensitive for the firms in the medium group as compared to that of small and large firms. Result for the medium group shows that 1% increase in internal finance causes 0.43% increase in the investment spending of the firms. The effect of lag of sale to capital ratio is positive and significant and it is comparatively more than small and medium firms. Results for large firms' shows that 1% increase in the internal finance causes 0.096% increase in the investment to capital ratio. The effect of lag of sale to capital ratio discovered to be insignificant for large firms that show absence of investment opportunities.

The sensitivity of internal finance to investment of firms explored to be high for the medium size firms as compared to small and large size firms. The investment of small firms is explored to be least sensitive to internal finance. The result shows that

investment decision of medium sized firms is facing tight external financial constraint as compared to small and large sized firms, so the medium size firms are more financial constrained as compared to others.

8.1.2 GROWTH AND CREDIT CONSTRAINED IN DIFFERENT SIZE FIRMS

In this section results for the prospect that credit constrained and growth of the firms varies across different groups on the base of their size are explained. Study estimate equation 3.1.15 for the small, medium and large size firms and their results are reported below in the Table 8.1.2.

Table.8.1.2 Firm Size and Growth (1974-2010): Dependent Variable $Growth_{it}$

Division On The Bases Of Total Assets			
Explanatory Variables	**Coefficients**		
	Small Size Firms	**Medium Size Firms**	**Large Size Firms**
$Growth_{it-1}$	-0.3170 (0.0010)*	-0.3335 (0.0005)*	-0.4110 (0.0020)*
$Sales\,Growth_{it}$	0.2615 (0.0922)*	0.1956 (0.0242)*	0.7099 (0.0945)*
$\dfrac{CF_{it}}{K_{it-1}}$	1.9734 (0.1401)*	0.3094 (0.0235)*	-0.0468 (0.0327)
$m2\ (Statistics\ Value)$	0.3592	0.0971	0.2332
$Sargan\ (p\ value)$	0.3008	0.5069	0.1860

Note

➢ Constant and Time dummies are included. (Not reported).
➢ GMM two step estimates.
➢ Statistics significant at 1%, 5% and 10% is denoted by *, ** and *** respectively.
➢ For the detail of variables, estimation technique and computation methods see table 5.2.

Result for the small size firms show that the effect of cash flow is positive and significant at 1% level of significance. Result shows that 1% increase in the cash flow to capital ratio causes 1.97% increase in the growth of the physical assets of the firms which in the light of hypothesis shows that growth of small firms is constrained by internal finance.

The effect of sales growth for the small firms is positive and significant indicates that it causes 0.26% increase in the growth of the physical assets of the firms. This is an indication of investment opportunities of firms having small asset base or small in size. The lag of the dependent variable is negative and significant in all three groups which is an indication of adjustment cost bear by the firms. Results for the medium size firms are also reported in the above table 8.1.2.

Result for the medium size firms shows that the effect of cash flow is positive and significant. With the 1% increase in the internal finance, there is 0.30% increase in the growth of investment of the firms, which in light of hypothesis indicates that growth of medium size firms is not constrained by internal finance. The effect of sales growth for the firms in this group is positive and significant that is an indication of the investment opportunities for the firms in this group.

Similarly, results obtain for large size firms indicates negative and significant relation between the internal finance and investment growth of the large size firms that is an indication of non-reliance of large firms on their internal finance. This shows that growth of large size firms is not constrained by internal finance. This is due to the easier availability of external finance in case of large firms as compared to small and medium size firms. The effect of sales growth is positive and significant indicating the presence of investment opportunities for large size firms.

To summarize, results obtained clearly shows that growth of the small firms is constrained by internal finance because of low collateral value of firms in this group. While the impact of credit constrained decreases as the asset size of firms increases that is clearly shown from the results reported above. The large and medium size firms are not found to be constrained by internal finance. It is because that large and

medium size firms have high collateral value. So they don't have any such constrained for getting external finance. These obtained results are similar to the findings of Carpenter and Petersen (2002).

8.2 LEVERAGE AND CREDIT CONSTRAINED ACROSS DIFFERENT GROUPS

This section of study explains the results by dividing the firms into groups of less aggressive firms, moderately aggressive and highly aggressive firms in financing their investment and growth with debt. This division is done on the base of debt to equity ratio. The higher ratio indicates that firms are aggressive in financing their investment and growth with debt. This section is further divided into two parts. First part shows the results for leverage, credit constrained and investment whereas second part discusses the results for leverage, credit constrained and growth by dividing them into three classes on the bases of debt to equity ratio.

8.2.1 EFFECT OF DEBT ON CREDIT CONSTRAINT AND INVESTMENT

In this section results for credit constrained, firms' investment and debt are explained. The results are reported below in the table 8.2.1.

The effect of cash flow to capital ratio for less aggressive firms explored to be positive and significant at 10% level of significance. The result shows that 1% increase in the internal finance causes 0.01% increase in the investment to capital ratio of the firms in this group. The effect of sale to capital and lag of sale to capital ratio discovered to be positive and significant at 1% level of significance for less aggressive firms. The lag of dependent variable is found to be negative and significant

that is an indication of the adjustment cost, which firms bear in moving from one level of investment to the next level of investment.

Table 8.2.1. Investment and Debt Financing (1974-2010): Dependent Variable $\left(\dfrac{I_{it}}{K_{it-1}}\right)$

Division on the Bases of Debt to Equity			
Explanatory Variables	**Coefficients**		
	Less Aggressive Firms	**Moderately Aggressive Firms**	**Highly Aggressive Firms**
$\left(\dfrac{I_{it}}{K_{it-1}}\right)_{t-1}$	-0.0039 (0.0002)*	-0.0326 (0.0001)*	-0.0213 (0.0018)*
$\dfrac{S_{it}}{K_{it-1}}$	0.5346 (0.0007)*	-0.0092 (0.0001)*	0.0025 (0.0012)**
$\dfrac{CF_{it}}{K_{it-1}}$	0.0112 (0.0064)**	0.4152 (0.0047)*	0.0964 (0.0216)*
$\dfrac{S_{it-1}}{K_{it-2}}$	0.0045 (0.0002)*	0.0327 (0.0001)*	0.0009 (0.0003)*
m2 (Statistics Value)	0.0043	0.0046	0.0004
Sargan (p value)	0.2985	0.0963	0.2057

Note
➢ Constant and Time dummies are included. (Not reported).
➢ GMM two step estimates.
➢ Statistics significant at 1%, 5% and 10% is denoted by *, ** and *** respectively.
➢ For the detail of variables, estimation technique and computation methods see table 5.1.

Result for the firms that are highly aggressive in debt financing show that effect of sale to capital and lag of sale to capital ratio is positive and significant at 5% and 1% level of significance respectively that is an indication of investment opportunities for the firms having high debt to equity ratio. The effect of internal finance for the firms who are highly aggressive in financing with debt is also found to be positive and significant. Result shows that 1% increase in the internal finance causes 0.09% increase in the investment to capital ratio of the firms.

The effect of cash flows to capital ratio for the firms who are moderately aggressive in financing with debt explored to be highly significant, positive and highly sensitive

to the investment to capital ratio of the firms. The results indicate that with the 1% increase in the coefficient of cash flow to capital ratio there is 0.41% increase in the investment spending of the firms. The effect of current year sale to capital ratio discovered to be negative and significant whereas it is positive and significant for the past year sale to capital ratio. These results are similar to Terra (2002) for Brazilin firms.

Overall, results shows that the effect of cash flow to capital ratio is positive and significant for all three groups explained above. This indicates that investment decision of the firms in all these three groups is explored to be facing external financial constraints. Result shows that investment decisions of the firms who are less aggressive in financing with debt are facing less external financial constraint as compared to moderately and highly aggressive firms in financing with debt. Investment decision of the moderately aggressive firms in financing with debt is explored to be highly financial constraint as compared to less and highly aggressive firms.

8.2.2 DEBT FINANCING, GROWTH AND CREDIT CONSTRAINT

This section explains the result for firms' growth, credit constrained and debt financing by dividing the firms into groups of less aggressive firms, moderately aggressive and highly aggressive firms in financing their growth with debt.

Division on the bases of debt to equity in to less aggressive firms, moderately aggressive and highly aggressive firms in financing with debt helps to explain that to which extent the growth of firms is constrained by internal finance in all three different classes. The high debt to equity ratio indicates high use of debt by the firms for their potential projects similarly low debt to equity of the firms indicates that firms

are less dependent on the debt financing. By using this classification study here estimate equation 3.1.11whose results is reported below in the Table 8.2.2.

Table 8.2.2. Debt Financing and Growth (1974-2010): Dependent Variable $Growth_{it}$

Division on the Bases of Debt to Equity			
Explanatory Variables	**Coefficients**		
	Less Aggressive Firms	**Moderately Aggressive Firms**	**Highly Aggressive Firms**
$Growth_{it-1}$	-0.3064 (0.0009)*	-0.3273 (0.0028)*	-0.4377 (0.0019)*
$Sales\ Growth_{it}$	0.4289 (0.0750)*	0.1375 (0.0724)***	1.4137 (0.0847)*
$\dfrac{CF_{it}}{K_{it-1}}$	1.5289 (0.1240)*	0.3754 (0.1273)*	0.1355 (0.0408)*
$m2$ (Statistics Value)	0.3736	0.0932	0.7368
Sargan (p value)	0.3581	0.5183	0.0583

Note
➢ Constant and Time dummies are included. (Not reported).
➢ GMM two step estimates.
➢ Statistics significant at 1%, 5% and 10% is denoted by *, ** and *** respectively.
➢ For the detail of variables, estimation technique and computation methods see table 5.2.

The effect of cash flow to capital for less aggressive firms is positive and significant at 1% level of significance. Result shows that with the 1% increase in cash flow to capital ratio there is 1.52% increase in growth of fixed asset of the firms that in accordance to the hypothesis is indication of the financially constrained firms. These are small firms who don't have enough collateral value to get external finance that's why there growth is explored to be credit constrained. The effect of sales growth is positive and significant, shows that 1% increases in the sales growth causes 0.42% increase in the growth of firms that is an indication of investment opportunities for the firms in this group.

Whereas moderately aggressive firms (having medium debt to equity ratio) show that the effect of cash flow to capital ratio is positive and significant at 1% level of significance. Result shows that with the 1% increase in internal finance there is 0.37% increase in the growth of firms, which in light of hypothesis indicates that growth of

moderately aggressive firms in financing with debt is not constrained by internal finance. The effect of sales growth for the firms in this group is also positive and significant indicating the presence of investment opportunities for the firms in this group.

The results for highly aggressive firms (having high debt to equity ratio) indicates that with the 1% increase in the coefficient of cash flow there is 0.135% increase in the growth the firms this in light of hypothesis indicates that growth of highly aggressive firms in financing with debt is not constrained by internal finance. The effect of sales growth is positive significant and highly sensitive as compared to their counter parts this indicates high investment opportunities for highly aggressive firms in financing with debt. These are large firms who don't have the limitation on their collateral value for obtaining loans from the financial market. That's why they are not credit constrained and can easily get the loans to invest in potential investment opportunities.

The overall results for this classification indicates that growth of firms who are less aggressive in debt financing explored to be constrained by internal finance whereas growth of moderately and highly aggressive firms in debt financing is not found to be constrained by internal finance.

8.3 FIRMS' INVESTMENT, CREDIT CONSTRAINED AND GROWTH: A COMPARISION ON THE BASE OF DIVIDEND TO EQUITY RATIO

This section of study explains the results obtained by dividing the firms into three groups on the basis of dividend to equity ratio. Dividend to equity ratio explains how

much dividends are paid out as a percentage of equity. Three groups in which firms are divided on the basis of dividend to equity are less dividend paying firms, moderate dividend paying and high dividend paying firms as percentage of their equity. Less dividend paying firms are the firms who are paying fewer dividends as a percentage of equity as compared to moderately and high dividend paying firms.

This study divides this section into two parts. Firstly credit constrained and firms' investments across above explained groups are explained in section 8.3.1 and secondly credit constrained and growth across different groups of firms paying different dividend as percentage of equity are explained in section 8.3.2.

8.3.1 DIVIDEND TO EQUITY RATIO, INVESTMENT AND CREDIT CONSTRAINED

This section explains the results for credit constrained and investment by dividing the firms into groups of less dividend paying firms, moderate dividend paying and high dividend paying as percentage of their equity. Results obtained are reported below in the table 8.3.1.

Result for fewer dividends paying firms as percentage of equity shows that the effect of cash flow coefficient is insignificant. The effect of current year sale to capital ratio and lag of sale to ratio is positive and significant indicating the presence of investment opportunities. Results for fewer dividends paying firms shows that these firms are explored to be non-credit constrained that is evident from the insignificance of internal finance for these firms.

Table 8.3.1. Dividend to Equity Ratio and Investment: Dependent Variable $\left(\dfrac{I_{it}}{K_{it-1}}\right)$

Division on the Bases of Dividend to Equity Ratio			
Explanatory Variables	**Coefficients**		
	Less Dividend Paying Firms	**Moderate Dividend Paying Firms**	**High Dividend Paying Firms**
$\left(\dfrac{I_{it}}{K_{it-1}}\right)_{t-1}$	-0.0077 (0.0001)*	-0.0310 (0.0002)*	-0.0332 (0.0003)*
$\dfrac{S_{it}}{K_{it-1}}$	0.5077 (0.0008)*	0.0051 (0.0003)*	0.0166 (0.0002)*
$\dfrac{CF_{it}}{K_{it-1}}$	0.0119 (0.0076)	0.2757 (0.0048)*	0.1590 (0.0014)*
$\dfrac{S_{it-1}}{K_{it-2}}$	0.0075 (0.0001)*	0.0302 (0.0001)*	0.0045 (0.0049)*
m2 (Statistics Value)	0.0034	0.0034	0.0000
Sargan (p value)	0.1916	0.5995	0.1668

Note

➢ Constant and Time dummies are included. (Not reported).
➢ GMM two step estimates.
➢ Statistics significant at 1%, 5% and 10% is denoted by *, ** and *** respectively.
➢ For the detail of variables, estimation technique and computation methods see table 5.1.

Result for moderate dividend paying firms as percentage of equity shows that effect of cash flow to capital ratio is positive and significant at 1% level of significance. The effect of cash flow for moderate dividend paying firms shows that 1% increase in the internal finance causes 0.27% increase in the investment spending of the firms. The effect of current year sale to capital ratio and lag of sale to ratio is positive and significant indicating the presence of investment opportunities.

The effect of cash flow to capital for the firms who are paying high dividends as percentage of equity discovered to be significant and positive at 1% level of significance. The results show that 1% increase in the internal finance causes 0.15% increase in the investment spending of the firms. The effect of sale to capital and lag of sale to capital ratio is positive and significant for all firms in all three groups that is an indication of investment opportunities for the firms in all these defined groups.

The overall results for this classification indicates that investment decisions of moderate dividend paying firms are explored to be facing tight external financial constraint as compared to fewer dividend paying and high dividend paying as percentage of their equity. The investment decision of fewer dividend paying firms are found to be independent of the internal finance that indicates investment decision of these firms are not facing external financial constraints.

8.3.2 FIRMS' GROWTH AND CREDIT CONSTRAINED: DIVIDEND TO EQUITY RATIO

By following the above explained pattern, the firms are divided into less dividend paying, moderate dividend paying and high dividend paying firms on the base of dividend to equity ratio and result for credit constrained and growth are explained. For this equation 3.1.11 is estimated and results obtained are reported below in the table 8.3.2.

The effect of cash flow to capital ratio for less dividend paying firms found to be positive and significant at 1% level of significance and it shows that 1% increase in the internal finance causes 2.75% increase in the growth of firms. This in light of hypothesis (one to one relationship between internal finance and growth) indicates that growth of less dividend paying firms is constrained by internal finance. The effect of sales growth is positive and significant indicating investment opportunities for less dividend paying firms as percentage of their equity.

Table.8.3.2. **Growth and Dividend to Equity Ratio (1974-2010): Dependent Variable**
Growth $_{it}$

Explanatory Variables	Division on the Bases of Dividend to Equity		
	Coefficients		
	Less Dividend Paying Firms	Moderate Dividend Paying Firms	High Dividend Paying Firms
Growth $_{it-1}$	-0.3360 (0.0013)*	-0.5007 (0.0007)*	-0.4321 (0.0011)*
Sales Growth $_{it}$	0.1637 (0.0766)**	-0.1501 (0.0707)**	1.4810 (0.0657)*
$\dfrac{CF_{it}}{K_{it-1}}$	2.7572 (0.1069)*	0.2295 (0.0548)*	0.1716 (0.0466)*
m2 (Statistics Value)	0.4462	1.0335	0.7030
Sargan (p value)	0.2279	0.1560	0.1380

Note

➢ Constant and Time dummies are included. (Not reported).
➢ GMM two step estimates.
➢ Statistics significant at 1%, 5% and 10% is denoted by *, ** and *** respectively.
➢ For the detail of variables, estimation technique and computation methods see table 5.2.

The effect of cash flow to capital ratio explored to be positive and significant at 1% level of significance for moderate and high dividend paying firms but the sensitivity of relation between internal finance and growth is lesser than one for both moderate and high dividend paying firms that indicates that growth of firms in both groups are not constrained by internal finance. The effect of cash flow to capital ratio for moderate dividend paying firms indicates that 1% increase in cash flow coefficient causes 0.22% increase in the growth. Similarly, the effect of cash flow to capital for high dividend paying firms shows that 1% increase in the cash flow to capital causes 0.17% increase in investment growth firms.

The overall result for all three groups indicates that the growth of low dividend paying firms explored to be constrained by internal finance because of this they are highly dependent on internal finance. These are firms who are small in size andsmall firms' operational activities for generating profits are not financed by external financial sources because of the limitation in accessing the external finance. Due to this reason, they have to pay low dividends for the aim of utilizing these resources in profit

generating activities (Fazzari, *et al*., 1988).Whereas the growth of moderate and high dividend paying firms are not constrained by internal finance because of this there is no one to one relationship between internal finance and growth of firms for moderate and high dividend paying firms.

CHAPTER 9

SUMMARY AND CONCLUSION

This study explores the impact of credit constraint on firms' investment and growth by using firm level data of manufacturing sector of Pakistan for the period of 1974 to 2010. Generalized Method of Moments (1991) one step and two step estimation technique is used due to the problem of endogeniety.

Sales to capital ratio and sales growth are used to capture the investment opportunities while cash flow is used as a proxy for internal finance. All these variables are constructed from more than 12,000 financial statements of the manufacturing sector of Pakistan.

Firstly, this study estimates the dynamic investment and growth model for the whole manufacturing sector. Secondly, this study analyzes the data on the base of different political regimes and financial sector reforms. Thirdly, this study divides the data industry wise for industrial analysis. Lastly, investment and growth models are estimated by dividing the firms into three different classes on the bases of total assets, debt to equity ratio and dividend to equity ratio.

Result of full sample shows that the firms in manufacturing sector for the period from 1974 -2010 are not facing external financial constraints because of this effect of cash flow for the full sample in both investment and growth models found to be insignificant indicating that investment and growth of firms is not driven by their internal finance. The effect of sale to capital ratio indicates the availability of investment opportunities for the firms in the manufacturing sector of Pakistan.

Results obtained by dividing the firms into different political regimes shows that investment and growth of firms in manufacturing sector of Pakistan are facing external financial constraint only during the period of 1978 to 1988. The effect of cash flow is positive and significant for both investment and growth models in Zia regime (1978 to 1988). The effect of the sale and its lag is also positive and significant indicating the presence of investment opportunities. The effect of cash flow is insignificant during the period from 1974 to 1977 and 1990 to 1999 indicating that firms are not facing external financial constraint because of this investment and growth of the firms in these regimes are not solely dependent on the internally generated finance. The effect of cash flow explored to be significant and negative during the period from 2000 to 2008 this indicates that firms in manufacturing sector of Pakistan during the period 2000 to 2008 are not credit constraint.

This study also explores the impact of financial sector reforms on firms' investment and growth. The effect of cash flow turned out to be positive and significant in pre and post financial reform period. However, the effect of cash flow explored to be positive and highly significant during nationalization era and its intensity decreases with the decentralization of financial institutions. This indicates that firms are facing tight external financial constraint in pre financial reform era (1974 to 1990) as compared to post financial reform era (1991 to 2010).

The results obtained from estimating models for different industries shows that investment and growth of firms explored to be credit constrained only in textile-cotton, textile-synthetic and sugar industries. The effect of cash flow discovered to be positive and significant for the firms in these industries for investment and growth model. Rest of the industries that includes cement, chemical and engineering are not

facing external financial constraint because of this, effect of cash flow for investment and growth model explored to be insignificant in these industries.

Result for the homogeneity of firms' investment and growth across different classes having different characteristics like size, dividend and debt indicates that sensitivity of firms' investment and growth to internal finance varies across different groups Results show that growth of firms having small assets is constrained by internal finance because of this effect of cash flow for firms having small assets are greater than one while firms having medium and large assets are not constrained by internal finance. Similarly, firms' growth that is less dependent on debt finance is constrained by internal finance because these are the firms who don't have enough collateral value to show to the financial institutions for obtaining loans, so for their growth they have to rely on their internal finance. The effect of cash flow for firms that are moderately and highly aggressive in financing with debt is not greater than one indicating that the growth of firms belonging to these groups is not constrained by internal finance. Similarly, growth of firms that are paying low dividends is constrained by internal finance whereas growth of firms that are paying high dividends is not constrained by internal finance.

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