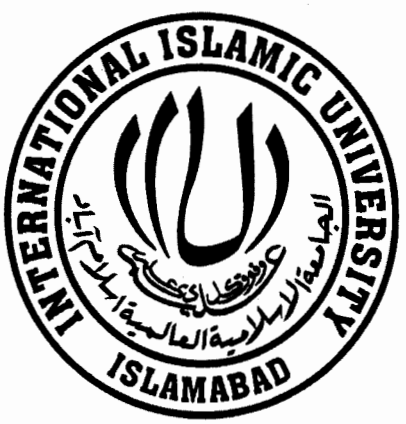
IMPACT OF CASH HOLDINGS ON INVESTMENT–CASH FLOW SENSITIVITY: EVIDENCE FROM A FINANCIAL CRISIS PERIOD IN PAKISTAN



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MS
658.15
NAI

1- Investment analysis

(Acceptance by the Viva Voice Committee)

Title of Thesis: Impact of Cash Holdings on Investment–Cash Flow Sensitivity: Evidence from a Financial Crisis Period in Pakistan

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DEDICATION

My Mother: Thank you for your unconditional support with my studies. I am honored to have you as my mother. Thank you for giving me a chance to prove and improve myself through all my walks of life. Please don't ever change. I love you.

My Father: Hoping that with this research I have proven to you that there is no mountain higher as long as Allah is on our side.

My Family: Thank you for believing in me and allowing me for further studies. You have been a great source of inspiration and motivation for me.

ACKNOWLEDGEMENTS

First and foremost I would like to thank Almighty Allah for His providential guidance and analytical wisdom to put my best possible efforts towards the accomplishment of this thesis.

Thanks to International Islamic University for providing us the research facilities that enabled us to come up with standardized research. I would like to appreciate the efforts of my Department for making MS and Ph.D progaram successful.

I express my gratitude for my hounourable supervisor Mr. M. Faisal Rizwan for his support, insightful suggestions and endless patience in making this study possible. Indeed, it was his guidance that helped me overcome difficult phases in this research.

I also extend my gratitude for all of my teachers for their kind contribution in my knowledge and experties, especially Dr. Zaheer Abbass for his contribution in assessing cash flow volatility using GARCH model, Dr. Zulfiqar Ali Shah for providing me insight on cooperate governance issues and Dr. Arshad Hassan for his guidance in assessing magnitude of leverage.

I would like to give my heartfelt appreciation to a very kind person Mr. Zafar Malik (Program Manager) for his unforgetable support during my stay in this institution.

I wish to thank all my friends for their support especially, Mr. Idress Ali Shah and Rehman-ud-Din Mian. Indeed, it's the help and well wishes of all my friends that made this study possible.

Last but not least I want to thank my parents, particularly my mother. She always feels my frequent physical or mental absences, while I have been working with my dissertation. I am proud of her.

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ABBREVIATIONS

CEM	Common Effect Model
CF	Cash Flow
CFMAG	Cash Flow Magnitude
CI	Confidence Interval
DiviDum	Dividend Dummy
FEM	Fixed Effect Model
FHP	Fazzari, Hubbard and Peterson
HETTEST	Hetrroskedasticity Test
INV	Investment
KZ	Kaplan and Zingales
LEV	Leverage
NWC	Net Working Capital
OLS	Ordinary Least Squares Regression
REM	Random Effect Model
SBP	State Bank of Pakistan
SD	Standard Deviation
TQ	Tobin's Q

DECLARATION

I here by declare that this thesis, neither as a whole nor as a part thereof has been copied out from any source. It is further declared that I have prepared this thesis entirely on the basis of my personal effort made under the sincere guidenance of my supervisor.

No portion of the work presented in this thesis has submitted in support of any application for any degree or qualification of this or any other university or institute of learning.

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FORWARDING SHEET

The thesis entitled "Impact of Cash Holdings on Investment–Cash Flow Sensitivity: Evidence from a Financial Crisis Period in Pakistan" submitted by Mr. Naeem Ullah in partial fulfillment of M.Phil degree in Management with specialization in Finance has been completed under my guidance and supervision. I am satisfied with the quality of student's research work and allow him to submit this thesis for further process of as per IIU rules & regulations.

Date:_____ Supervisor Signature:_____

Name : **M.Faisal Rizwan**

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Section 1:

Introduction

1. Introduction

Many firms immediately need more cash to increase their liquidity and to help ward off the economic problems (Economist, 2008). A forceful debate has been taking place in current years about the degree to which firms' investment is constrained by the availableness of finance, and more specifically, about whether a positive and statistically momentous relationship between investment and cash flow can be seen as a sign of financial constraints (Hubbard, 1998; Bond and Van Reenen, 2005).

The importance of cash is shown by the study conducted by Copeland et al., (2001) that has correlated market value with cash flow value for 31 large U.S firms and found that there is a strong correlation between both. This finding has the implication that investors will like to invest in those firms that have high cash holdings and will not give importance to traditional earnings per share indicator.

Modigilliani & Miller (1958) irrelevance theorem posits that in perfect world where cash can be obtained at zero cost; there is no need to maintain huge cash holdings. Since there is no liquidity premium in such world therefore if firms borrow that money and invest it in liquid assets, it will not impact share holders wealth. In other words they were of the opinion that there is no wedge between cost of internal and external finance. However in real world there are certain factors that prevent firms to take external finance.

The pioneering paper by Fazzari, Hubbard and Peterson (here after referred to as FHP, 1988) was a major shift from perfect market assumption. They pointed out that information asymmetries are prevalent in the market and because of these asymmetries the external and internal finance are not perfect substitutes for each other. They used the word "Financial

Constraints". They classified the sample in to constraint and unconstrained firms based on its dividend pay out ratios. These constraints may be in the form information asymmetries, adverse selection or incentives that may distinguish the firms from good borrowers to bad borrowers (Stiglitz & Weiss, 1981). Thus Fazzari et al (1988) concluded that firms that are more financially constrained will rely more on their internal funds for their investment decisions or in other words, their investment to cash flow sensitivities will be higher than that of financially unconstrained firms.

The pioneering work of FHP led to a debate on cash flow investment sensitivities analysis. Most of the researchers such as (Guariglia , 2007; Almeida et al., 2004; McVanel & Perevalov, 2008; Acharya et al., 2005; Vogt, 1997) validated the findings of FHP (1988).

However Kaplan and Zangales (here after KZ, 1997) challenged the work of FHP (1988) on theoretical grounds. They incorporated other information contained in financial statements and found the findings of FHP (1988) reversed. They concluded that financially unconstrained firms exhibit more investment cash flow sensitivities than financially constrained firms. They were of the opinion that financially unconstrained firms tend to finance their investment more from internal sources that leads to higher investment cash flow sensitivities. The views of KZ (1997) were supported by Cleary, (1999) and was of the opinion that internal and external constraints have different role to play in investment-cash flow sensitivity study. However most of the evidence in corporate finance literature accepts the robustness of FHP (1988) studies. Also a number of studies have validated the findings of Fazzari et al., (1998) not only in relation to investment but also in relation to firms' behavior regarding inventory investment (Carpenter et al., 1994, 1998; Kashyap et al., 1994; Guariglia, 1999, 2000; Benito, 2005), their research & development investment (Bond et al., 1999; Carpenter and Petersen, 2002b), their employment

decisions (Nickell and Nicolitsas, 1999); and their growth (Carpenter and Petersen, 2002a). All these studies confirmed the conclusion of Fazzari et al. (1988).

The cash flow sensitivity analysis has also been studied in the context of corporate governance. The recent literature is of the view that the more a country enforces corporate governance codes, the less will be sensitivity of investments to cash flows. These studies are of the opinion that adherence to cooperate governance conventions generally reduces information asymmetries that in turn allows more firms to get cheaper credit to undertake projects with positive NPVs. Ownership structure (Ozkan & Ozkan, 2004), share holders rights (Harford et al., 2004 and Dittmar et al., 2003), Institutional protection (Pinkowitz et al. 2003) and over all legal system (Francis et al., 2010) have been studied and the results confronted that adherence cooperate governance conventions has monotonous relationship with cash flow investment sensitivities.

Much of the recent corporate finance literature studies the impact of financial development on cash flow-investment sensitivities. Love (2003) in her study is of the view that with financial development, investment cash flow sensitivity reduces substantially. The main reason for these findings is that financial development leads to efficient allocation of capital. This coupled with other legal developments increases the capital supply in the economy that leads to reduction in information friction and lowers the cost of external finance. Firms in developed financial economies are having less investment cash flow sensitivities as compared to firms in lesser developed financial economies.

Islam & Mozumdar, (2006); Khurana et al., (2006); Becker & Sivadasan, (2010) appears to validate the findings of Love (2003). This school of thought is of the opinion that financial

development reduces the wedge between external and internal capital. Firms thus finance their investments from cheap external sources and do not rely on internal sources for their investment funding.

However greater financial liberalization has its own risks. In financial liberalization the banks tend to give loan with less prior information that leads to increase the number of non performing loans. Financial liberalization can turn to financial distress more quickly and all the gains obtained as a result of financial liberalization are reversed (Tornell and Westermann, 2002). In wake of global crises in 2008, the recent literature is interested in impact of crises on investment cash flow sensitivity analysis.

Exchange rate fluctuations, fleeing investors, unavailability of external credit, lower production and lower investments are the hall marks of a crises situation. There have been crises in 1990 (Asian Financial Crises, Stock Market bubble burst in U.S. etc) and recently in 2008 the world is witnessing its worse recession after the great depression of 1948. The corporate finance literature has studied the impact of crises situation in both developed and under developed financial markets.

The literature posits that in times of financial crises firms go for optimum cash management policies. In most of the findings it has been posited that during financial crises firms tend to hold cash rather than spending it. Precautionary motive against unforeseen contingencies is the main motive behind holding huge cash balances. KZ (1997, 1998) are of the opinion that during recession the firms do not make investments because during recessions the firms are at lower level of cash flows as investments are not efficient in generating cash. Thus the firms will not invest even if they have huge amount of internal funds.

However, most of the studies in corporate finance literature support FHP (1988) findings. These studies indicate that the firms do not take positive NPV projects because they have lower internal sources of finance and also external finance is either not available or the cost of obtaining it is very high. This situation is translated in the form of lower production and reduced investments in the economy. The studies of (Aghion et al., 2001; Chang and Velasco, 2001; Caballero and Krishna Murty, 2001; Mendoza and Smith, 2006) support this conclusion. The studies of Campello et al., (2008) and Melander, (2009) investigated the behavior of firms during financial crises in USA and Sweden respectively and were of the opinion that firms mostly relied on their internal sources of finance for investments.

The study of Baum et al., (2006) sheds light on managers behavior in crises and post crises situations. They are of the view that managers operating in financial crises have homogeneous behavior i-e they all strive for optimum cash management while in non crises situation the managers tend to behave differently. In non crises situation mangers tend to use cash management that can allocate the resources to its optimum.

Most of the research in developing economies like Turkey, Indonesia etc proves that firms in these economies exhibited the same behavior as their counterparts in developed economies (Arsalan et al., 2006; Prasetyantoko, 2006). However their sensitivities of investments to cash flows were higher as compared to countries in developed economies. The studies in developing economies buttress upon the fact that firms in these economies tend to hold large amount of cash as precautionary motive. Thus they exhibit greater investment- cash flow sensitivities.

This paper aims to study the firms in Pakistan and to shed light on their investment cash flow sensitivities both in crises and non-crises situations. The at this point, based on studies done in lesser developed economies, we anticipate that the firms in Pakistan will behave in accordance to the findings of FHP (1988).

1.2. Economy of Pakistan:

We now briefly discuss the economy of Pakistan. On its birth in 1947, Pakistani economy was in shambles. Among the two dominions i-e India and Pakistan, it was the later who suffered the most. Majority of businesses in undivided India were in Hindu dominated areas. The banks too were in main land.

However the economic managers of Pakistan were quick to rise to the challenge. The GDP growth in 60s ,80s and sub period of 2003 to 2007 were 6% or higher. However in 1950s, 1970s and 1990-2002, the official GDP rate stood at 5%. The high GDPs in 60s, 80s and 2002-2007 were because of massive inflows of funds from abroad. However the GDP levels in 50s, 70s and 90s were mainly due to political instability, reduction in inflows, wars and international economic sanctions.

The slippage of economy in to debt trap in 1980s and early 90s and because of international sanctions in 1990s, most of the country's revenue went in the debt repayment. The developmental funds in this era were curtailed. The reduction in developmental expenditure caused the problems of joblessness. Further, Nationalization of industry in 1970s, made with a view to foster economic growth, proved to be a miscalculated step. Thus in 1990s the government resorted to denationalize banks and other manufacturing industries.

The denationalization of banks and other monetary reforms by the state was a step towards financial liberalization. However this liberalization was short lived and in 1998, after nuclear explosions, the foreign currency accounts were frozen. This was a major confidence blow to foreign investor and residents who had invested large amount of funds in these accounts.

However after 9/11 incident, the economy of Pakistan turned around. The scared Pakistani expatriates transferred their funds to Pakistan. These massive and exceptional cash inflows coupled with massive debt structuring and release of funds in the form of financial aid by becoming an ally on war against terrorism, resulted in capital adequacy in the country. The period of 2003-2007 can be viewed as boom period for Pakistan's economy. The production was at its peak and investments were high during these periods. These positive trends resulted in job creation and raised per capita income to $1000. GDP growth was exception during 2004-2006 and rose above 6%.

However, among the main mistakes done by economic planners in this boom period was that most of the funds were directed for luxury items such as cars, consumer financing etc. Also the government at that time was facing election and as a result they did not adjust the rising oil and food prices. Also this temporary short run boom was mistakenly perceived as structural shift in the economy. Further no long term capital projects were initiated e.g. Dams, heavy industry etc.(Irfan, 2009).

The myriad of these factors has negatively impacted the economy of the country. Rising oil prices, food inflation and shortage of power are negatively impacting the economy. With no capital inflows in sight and with food inflation highest in the history, Pakistan's economy took a rapid down turn in 2008 (Irfan, 2009).

Year 2007 can be marked as the year when crises provisionally started. However, year 2008 represents a country in centre of crises situations bearing all the hall marks of food crisis, energy crisis, unemployment and deterioting law and order situation.

1.3. Objectives of the research

Following are the objectives of this research;

- To study the impact of cash holdings in determining corporate investments in emerging economy of Pakistan.
- To study the investment-cash flow sensitivities of Pakistani firms in crisis and non crisis situation.

1.4. Significance Of The Study

This study is significant because;

- This study will contribute to the body of existing knowledge in a way that it will help us to understand the impact of cash holdings in determining corporate investment in developing economy settings.
- The results will help policy makers to understand behavior of the firms in financial crises.
- This research will help us to know why firms in Pakistan overshoot or under shoot their target cash holdings

- Also to the best of my knowledge this is the first study in Pakistan that is studying the relationship of cash holdings with corporate investment expenditures in crises and non crises economic settings.

Section 2

Literature Review

2. Literature Review

2.1 History of Investment Theories

Keynes, (1936) posited that investment depends on marginal efficiency of capital relative to some interest rate that is reflective of opportunity cost of invested funds. An important advantage of liquid balance sheet is that it enables the firms to take profitable investment opportunities (Keynes, 1936). However this balance sheet liquidity is restricted by the firm's ability to access external capital markets (Keynes, 1936).

After Keynes, investment theory was linked to simple growth models. These models led to the birth of accelerator theory that makes investment linear proportion of changes in output. The simplistic assumptions of accelerator theory made it very popular in 1950s & early 1960s. In this theory expectation, profitability and capital costs play no role. The over simplistic assumptions of accelerator theory led Hall & Jorgenson (1971) to present neo classical theory of investment. In this theory, the optimal capital stock was related to the amount of output and the cost of capital faced by a particular firm.

The neo classical approach was criticized for its assumptions of static prevalence of future prices, interest rates and output. An alternative view that is associated with Tobin (1969) is that the firm's capital stock depends upon the change in the market value of the firm by the addition of unit of capital and its replacement cost. This ratio is also known as marginal Q. Marginal Q is difficult to calculate therefore ratio of average Q is used instead. Abel, (1980); Hayashi, (1982) and Precious, (1985) has criticized average Q. If the firm has influence on

market than marginal Q and average Q will differ significantly. Further, capital goods are firm specific and have low resale value.

In line with Keynesian institution, the disequilibrium approach views investment as the function of both profitability and demand out put (Malinvaud 1980, 1982; Sneesens, 1987). The investment decision is conducted in two steps. In the first step, a firm decides to expand and in the next step it decides how much capital intensive this particular expansion will be (Malinvaud, 1982). This theory was concerned about future expectations of constraints on sales and profitability. Hence it was major departure from static market assumption of neo classical and Tobin Q models. However, disequilibrium models are often criticized for having simplistic assumptions about expectations and lacking explanatory power to provide answers for price rigidity. However on the policy side, these models provide insight on investment behavior. As macro economic variables change, investment behavior will be the combination of expectations and market equilibrium in such economic situation.

2.2. Financial Constraints & Investments

The classical model of investment did not take in to account the impact of financial constraints on investment. In perfect market where there is no information asymmetries & the firm can take external finance to undertake profitable investment opportunities (Modigliani & Miller, 1958). Thus the firm's capital structure has no impact on its value. If Modigliani & Miller's assumptions are satisfied, then the real firm's decisions to maximize shareholders wealth will be independent of financial factors such as internal liquidity, debt leverage or dividend payment (Fazzari et al., 1988). Thus if the firm has no restrictions in obtaining finance

externally than such financially unconstrained firm has no need to keep cash for future investment activities that makes corporate liquidity irrelevant (Almeida et al., 2004).

In the real world however firms are faced with financial constraints. There is increasing literature that studies the impact of financial constraints on investment. These constraints may be in the form information asymmetries, adverse selection or incentives that may distinguish the firms from good borrowers to bad borrowers (Stiglitz & Weiss, 1981). Mayers and Majluf (1984) were of the opinion that managers, acting for shareholders' interest, face high cost of external funds because share holders are unaware of the firm's quality. Those firms that lack internal funds will find it difficult or will be unable to raise external funds to take project with positive NPVs. The same notion is also expressed in the study of Greenwald, Stiglitz and Weiss (1984). Such financial constraints explains the reason why such firms under invest.

Alternative view of financial constraints comes from agency theory. These studies buttress upon the fact that managers work for their self interest. Thus in order to get maximum benefit they will invest more when internal funds permit. This is the reason why unconstrained firms over invest and constrained firms do optimal investments (Jensen & Meckling, 1976; Grossman and Hart, 1982; Stulz, 1990)

These schools of thought i-e hidden information & Agency Theories, predict a pecking order in financing choices. Firms are inclined to firstly exercise internal finance for investments and later they prefer external sources of finance for investments (Myers, 1984). Thus both theories predict sensitivity of investment towards cash flows for constrained firms.

In this context the pioneering paper presented by Fazzari, Hubbard & Petersen (1988) maintain that internal funds (retained profits) and external funds (bank loans, bonds or equity)

are not perfect substitutes for each other. They maintain that firms are faced with financial constraints that hinder their ability to undertake projects with positive NPVs. These studies depart from perfect market assumptions and maintain that information asymmetries increase the cost of external finance. This situation increases the cost of external capital in relation to opportunity cost of internal funds (Fazzari et al. 1988; Mackie & Mason, 1989; Mayer, 1989; Calomiris & Hubbard, 1989; and Hubbard 1990).

A strong discussion has been taking place in current years about the degree to which firms' investment is controlled by the accessibility of finance. Also there is a discussion as to whether a constructive and statistically momentous relationship between investment and cash flow can be seen as an indicator of financial constraints (Schiantarelli, 1995; Hubbard, 1998; and Bond and Van Reenen; 2005).

2.3. Cash Flow-Investment Sensitivity

The discussion on whether elevated sensitivities of investment to cash flow can be viewed as signals of financial constraints started with Fazzari, Hubbard, and Petersen's (1988) pioneering study. In this study they emphasized that low dividend firms are likely to be financially constrained and thus will be show elevated investment-cash flow sensitivity. However they maintained that large firms with less information asymmetries tend to show little investment-cash flow sensitivities.

A number of studies came in support of Fazzari, Hubbard & Peterson's study. Guariglia (2007) studied 24,184 UK firms over the period 1993–2003 and found that firms that faced external financial constraints exhibited more investment-cash flow sensitivity as compared to

firms that were less constrained. Almeida et al. (2004) studied a large sample of manufacturing firms from 1971 to 2000 and posited that financially constrained firms tend to save more cash out of cash flows as compared to financially unconstrained firms. This behavior is due to the precautionary motive of the financially constrained firms as they will save cash today for unforeseen contingencies and opportunities in the future. McVanel & Perevalov (2008) studied Canadian firms and their results supported the study of Fazzari et al., (1988). The study of Acharya et al., (2005) posits that cash holdings provide incentives to firms to invest in profitable projects when there is deficit in cash flows. The study of Vogt, (1997) shows that the level of announced capital spending is more sensitive to cash flow in small firms as compared to large firms. Also a number of studies have validated the findings of Fazzari et al., (1988) not only in relation to investment but also in relation to firms' behavior regarding inventory investment (Carpenter et al., 1994, 1998; Kashyap et al., 1994; Guariglia, 1999, 2000; Benito, 2005), their research & development investment (Bond et al., 1999; Carpenter and Petersen, 2002b), their employment decisions (Nickell and Nicolitsas, 1999); and their growth (Carpenter and Petersen, 2002a). All these studies confirmed the conclusion of Fazzari et al. (1988).

The study of Fazzari et al., (1988) was challenged on theoretical grounds by Kaplan and Zingales, (1997). Instead of using the dividend payout ratio as an indicator of financial constraints, these authors used other criteria, reclassifying FHP's low-dividend sub-sample of firms on the basis of information contained in the firms' annual reports as well as managements' statements on liquidity. As an alternative they reclassified Fazzari et al.'s low dividend sample of firms on the basis of other information criteria. Thus instead of focusing on dividend as gauge of financial constraints, they classified the firms on the basis of annual reports of the firm and also took in to account the managements' comments on liquidity position of their

Firms(Guariglia,2007). Their results were in contradiction to the study made by Fazzari et al., (1988). KZ (1997) were of the opinion that firms that were less financially constrained exhibited more investment cash flow sensitivities as compared to firms that were more financially constrained. One of the reasons for such contradiction was that the managers preferred internal sources of funds to finance investments rather than to avail relatively low cost sources of external finance (Kaplan and Zingales, 1997). Thus it was evident that investments by financially unconstrained firms were more sensitive to cash flow. Also KZ (1997) posited that during recession the firms do not undertake investments because of low levels of cash flows, although there is relatively cheap credit available and also they have abundant internal sources of funds. Thus they were of the opinion that sensitivity of investments to cash flows is not a legitimate gauge of financial constraints. The view of KZ (1997) was supported by Cleary, (1999) and was of the opinion that internal and external constraints have different role to play in investment-cash flow sensitivity study. However Leland and Pyle (1977) were of the opinion that internal and external financial constraints are interrelated. A firm with higher internal cash flow will have an easy access to finance from external sources as they may be viewed by providers of external finance as committed to their investments. Conversely the same is true for firms with poor cash flows as they will have trouble to find external sources of finance. Cleary et al. (2007) empirically and theoretically exhibited the effects of internal and external financial constraints on investment-cash flow sensitivity study. They posited that sensitivity of investments to cash flow due to internal and external financial constraints is because of interactions between cost and revenue effect. A firm in possession of adequate internal funds but unable to finance all its investments will take abundant external finance and will thus incur an increase in its repayment costs that will increase its risk of default. This effect explains a positive relationship between

investment and cash flow. The firm may reduce its investment and thus will avoid the risk of default. Conversely, revenue effect entails that the firm will increase its investment that will increase its revenue that will lower its probability of default. Thus lowering the cash flows increases the investment that in turn decreases the risk of default and even if default occurs, the increased investment will increase lenders' pay off even if default occurs.

Both cost and revenue effects operate in the economy and have different impacts on sensitivity of investment to cash flows. Thus according to Cleary et al. (2007) if cost effect dominates, the firm's investment will be sensitive to cash flows and vice versa.

Opler et al. (1999) analyzed the data of U.S. firms from 1971-1994 and found that firms with strong growth opportunities tend to hold large amount of cash while the firms with great exposure to capital market will tend to hold lesser amount of cash. However they found little evidence that excess cash holdings have a significant impact on capital expenditure and acquisition spending in short run. Excess cash is mostly used as protective tool to compensate for losses.

However Guney et al. (2006) studied the impact of leverage on cash holdings to conclude that the relationship of leverage (proxy for exposure to capital markets) and cash holdings is non-monotonic. However they posited that the more leverage increases, the more will firm try to accumulate cash to avoid bankruptcy. In addition to that, their results revealed that the impact of leverage on cash holdings to a degree depends on country specific characteristics that include degree of creditor protection, shareholder protection, and ownership concentration.

Ozkan and Ozkan (2004) studied the impact of ownership structure on cash holdings. The find that cash holdings increases as managerial ownership increases. Also they proved that firms

that are managed by ultimate controllers tend to hold large amounts of cash. Harford et al. (2004) showed that firms tend to hold lower levels of cash when share holders rights are weaker. Dittmar et al. (2003) were of the opinion that the firms operating in the country where share holders have lesser protection tend to hold larger balances of cash. In an unpublished paper, Francis et al. (2010) studied the firms in under developed countries and found that cooperate governance has an important role in the study of cash flow investment sensitivities. They posited that "evidence confirms that firms' investment-cash flow sensitivity increases in response to firms' poor corporate governance. Evidence also reveals that firm level corporate governance provisions matter more to affect the influence of financing frictions on corporate investment in counties with weaker country level corporate governance such as legal systems. This suggests that firm specific corporate governance and legal environment are substitutes in determining firms' investment decisions conditional on their internal cash flow" (Francis et al., 2010). Pinkowitz et al. (2003) have expressed their opinion that cash holdings are inversely impacted by level of institutional protection and to the financial development. However they suggest that cash holdings are positively related to country's level of economic development.

We now focus our attention on the impact of financial development on investment-cash flow sensitivity.

2.4. Financial Development and Investment-Cash Flow Sensitivity

Financial constraints are the results of information asymmetries that prevent the firms to take advantage of external finance and thus cannot invest in projects that have positive NPVs. Thus as the financial development occurs, firms has more access to external funds. Also there is

strong evidence that financial development results in reallocation of resources that fosters economic growth. Galindo et al. (2001) has shown that financial development increases the efficiency with which investment funds are reallocated. In this regard the study of Bertrand et al. (2007) proved that banking regulations in France allowed the financial institution to advance credit to profitable firms. The firms in financially developed countries have more access to external finance than the firms that are operating in financially less developed countries (Rajan and Zingales, 1998). Wurgler (2000) posit that financial development has a positive impact on allocation of capital in the sense that it increases the industry-level sensitivity of investment growth to value added growth. He argues that less financially developed economies the insiders might not be able to distinguish good investment project and bad investment projects due to the lack of information. Also he argues that if the government does not allow the firms to take their profits, then the firms has no incentives to invest. Thus financial development plays a key role in cash holding- investment sensitivity analysis.

Love (2001) used firm level data of 40 countries to study the impact of financial development on investment- cash flow sensitivities. She found that there is a strong negative relationship between internal finance and investment in financially developed economies. The more financially developed economy, the lesser internal funds act as a constraint in deciding investments. In related research love (2003) studied firms in 36 countries and posited that financial development causes an ease in financial constraints. Kunt and Maksimovic (2004) are of the opinion that in less developed financial countries small firms appear to be more financially constrained as compared to large firms. These studies conclude that developed financial system reduces information asymmetries and reduces the wedge between external and internal finance that results in lower investment cash flow sensitivities.

The study of Islam & Mozumdar (2006) strongly confirms the results of Love (2003). Using international data from 31 countries for the period of 1983-1997, they found that financial development is negatively associated with the importance of internal capital. More financial development weakens the role of internal cash flows to act as proxy for financial constraint. Similarly, Khurana et al. (2006) have indicated lower investment cash flow sensitivity in lieu of financial development. The recent research of Becker & Sivadasan (2010) supports the findings of Love ,(2003). Their study of firms in Europe confirmed that financial development reduces investment cash flow sensitivities.

In relation to financial development, the impact of financial liberalization has also been studied. Using panel data on a huge number of firms in 13 developing countries, Laeven, (2000) found that financial liberalization has a negative association with the financing constraints of firms especially smaller firms. This is due to the fact that financial liberalization results in opening up of the economy that gives way to foreign direct investment. Bekaert et al. (2001) and Henry, (2000) find that the cost of equity capital decreases significantly after financial liberalizations. In addition, Bekaert et al. (2001) posit that equity market liberalizations increase real economic growth by approximately 1% per year. In a comprehensive study, Harrison et al. (2003) posited that impact of financial liberalization impacts cash flow investment sensitivities in different ways. Firstly, if a global capital inflow occurs, the local firms will see a reduction in financial constraints. Secondly, if foreign investor making foreign direct investment and uses local credit institutions, then local firms will see an increase in their financial constraints. Lastly, restrictions on capital account transactions negatively affect firms' financing constraints. They posit that these effects are more in low income regions than in high income regions. They took Pakistan along with India as low income regions and proved the above mentioned effects.

The reason for significant drop is investment-cash flows sensitivity is due to the fact that development of financial leads to market efficiency and that reduces information friction. Secondly as financial markets develop, the supply of capital also increases that leads to lower cost of external finance (Agca and Mozumdar, 2008). Agca and Mozumdar (2008) studied US firms for the period of 1970-2001 and came up with the above mentioned phenomena. Brown and Peterson (2008) studied the impacts of R&D and capital market development for U.S firms. They were also of the opinion that over the period of time cash flow-investment sensitivities decline as capital markets develops. In a related research Baum et al. (2008) studied the impact of government regulation in different countries and studied its impact on Investment-Cash flow sensitivities. They were of the opinion that "a country's financial system, both in terms of its structure and its level of development, should influence the cash flow sensitivity of cash of constrained firms but leave unconstrained firms unaffected". They tested their hypothesis with a large international sample of 80,000 firms from 1989 to 2006. Their results reveal that both the structure of the financial system and its level of development matter. Institution based financial systems provide constrained firms with easier access to external financing.

However financial liberalization is not safe from risks. Greater financial liberalization and ease of credit conditions creates risk of default, credit crunch and currency exchange rate volatility (Tornell and Westermann, 2002). This phenomenon was recently evidenced in the form of mortgage crises in USA. We now focus our literature to the study of cash flow investment sensitivities in crises period.

2.5. Impact Of Financial Crises on Investment Cash Flow Sensitivities

The theoretical literature on financial crises highlights two important issues during financial crises. They are;

1. During financial crises the banks have insufficient credit, especially if exchange crises are coupled with credit crunch. Also the foreign investors reduce or alleviate their investments. Thus the firms cannot finance their projects from external sources and the exibit the behavior of reduced investments or reduction in production. (Aghion et al., 2001 ; Chang and Velasco, 2001; Caballero and Krishna Murty, 2001; Mendoza and Smith, 2006).
2. Foreign currency denominated debt can cause a mismatch on Firms' balance sheets. The depreciation causes their external debts inflate in terms of the local currency which reduces the net worth of the firm. Thus the firms that were unconstrained prior to financial crises are now constrained firms in wake of financial crises. This mechanism can lead to a decrease in investment by these firms (Bernanke and Gertler, 1989; Krugman, 1999; Cespedes et al., 2000; Eichengreen and Hausman, 1999).

The global financial crisis of 2008 provides us a unique opportunity to study the impact of financing constraints on corporate behavior. In this respect Campello et al. (2008) took firm size and credit ratings as proxies of financial constraints and studied 1,050 CFOs in U.S, Europe and Asia. Their study revealed that under financial crises situation, the firms reduced their R&D spending and other expansion plans. Further they negotiated heavy lines of credit from financial institutions under the presumption that these financial institutions will not be able to provide credit in future if the financial crises prevailed. However most importantly they found that firms

that were unable to find external credit were relying on their internal cash flows. Supporting the findings of FHP (1988) they posited that firms with higher financial constraints were even forced to sell their assets to create funds for operations of existing projects. Also they were forced to abandon projects that had positive NPVs. In the similar research Melander (2009) studied the public firms of Sweden and posited that in presence of financial crises the investment to cash flow sensitivities rises. In crises situation the firms relied on their internal funds to make investments in positive NPV projects.

The emerging-market crises of the 1990s and early 2000s have put the Firm's performance during a credit crisis at the center stage. Ozcan and Kamil (2009) studied six Latin American countries between 1991 and 2004. They were interested to study the impact of currency risk in pre and post crises situation. They found the results similar to our previous discussion. They buttressed upon the fact that in post crises period, domestic firms holding debts in foreign currency prior to financial crises may in fact find themselves financially constraint. In crises situation during falling prices and fleeing investors, the firms may have opportunities with positive NPVs but the unavailability of credit hinders them to take profitable projects. However foreign firms having presence in other countries appeared to do well in financial crises and were able to finance their investments. These foreign firms with presence in other countries appeared to have enormous internal funds and thus least financially constraints. Ozcan and Kamil (2009) prove that in the presence of financial crises the findings of FHP (1988) holds true.

Prasetyantoko (2006) studied 226 companies, for the period of 1994 to 2004, listed on Jakarta stock exchange and found that before recession the non tradable sector (N sector) grows faster than tradable sector (T sector). How ever in financial crises N sector suffers the most and takes more time to recover than T sector. Since the firms in Indonesia prefer external finance to

undertake investment projects, the crises of 1990s hit Indonesia hard. However he too confirmed that both T and N sectors show investment cash flow sensitivities in accordance with the findings of FHP (1988).

Lee (2005) studied the investment behavior of Korean firms and found that during crises period or economic uncertainty, investments are halted by the firms. By studying the sample in pre and post crises situation, he pointed out that Korean firms overinvested in pre crises period. The reason for this was risk protection by the government. However after crises the investment reduced pointing out that Korean firms exhibit the same behavior as their U.S. counterparts. He pointed out variety of factors of which the availability of external finance was one of the major factors. He pointed out that firms with low interest coverage ratio, High debt to asset ratio and small firms tend to play safe in wake of financial crises.

Wewei (2007) conducted a study on Chinese non financial firms from 1993-2004 in order to study the impact of macro economic instability (crises). These firms showed different levels of cash flow-investment sensitivities in different stages of macroeconomic cycle. In wake of economic slow down in 1998-2001, the found that sample firms reduced working capital in order to maintain necessary investment level of fixed assets. In other words, Chinese firms stabilized investment in fixed assets by a corresponding adjustment of working capital.

Up to this point the literature seem to support that almost all the firms behave homogenously in the times of financial crises. This homogeneity in behavior has been predicted by Baum et al. (2006). They conducted a study to investigate the impact of macro economic uncertainties on firm's investment behavior. The studied a large sample of 125,000 firms from the period of 1970-2000. They came up with two conclusions;

1. In midst of economic uncertainties managers cannot accurately predict firm specific information such as expected cash flows. Thus during economic crises, managers behave homogenously in terms of their cash management policies.
2. When economic uncertainty vanishes, managers behave idiosyncratically. Thus without economic crises each manager can tailor his/her cash management policies in accordance with the requirement of the firm that will result in most efficient allocation of resources.

The above findings purports that manager's demand for corporate liquidity in reactions to changes in financial conditions will bring about predictable patterns of corporate liquidity demand in different economies of the world. These findings are in line with the findings of Almeida et al., (2004) and Acharya et al., (2005). They were also of the opinion that firms tend to hold more cash when faced with financial uncertainties in order to overcome financing frictions.

These results were also confirmed by Arsalan et al., (2006) in a developing economy setting. They studied a sample of 222 Turkish non financial firms and studied their investment cash flow sensitivity both in pre crises and post crises situation. They came up with following findings in the developing economy setting;

1. The hedge role of cash is more dominant in developing economy setting. Thus firms in developing economies tend to hold more cash.
2. Constrained firms exhibit more investment-cash flow sensitivities as compared to financially un constrained firms in developing economy setting
3. In crises period cash stands as an effective device to ward off financing frictions.

The work done by them typically supports FHP, (1988). Also their results are in line with Almeida et al., (2004).

The work of Arsalan et al. (2006) is important because it studies the mannerism of firms in a developing economy setting. This will help us to see whether their findings are supported by the firms an developing economy setting like Pakistan. Also by studying the sample in pre and post crises situation in Pakistan, this study will conclude whether the firms support the study of FHP (1988).

Section 3

Methodology

3. Methodology

3.1. Sample Selection

A convenient sample of 267 non financial firms listed on Karachi stock exchange was taken for the purpose of this study. This study was basically conducted to find the effects of constraining factors like age, dividend, size and cash holdings on the investment abilities of the firms. Hence it was essential that following criteria must be adhered to while selecting companies for the study:

1. The firms were paying dividend
2. Share prices availability throughout the study years

The former criterion was essential because we were required to classify firms in constrained and non-constrained categories based on dividends. The latter criterion was essential because we had to find market capitalization for the companies to calculate the essential Tobin's Q. After through scrutiny of the companies on the bases of criteria mentioned in the outset, nineteen companies were omitted from convenient sample of 286 dividend paying companies. The problem with convenient sample is its inherited problem of non representativeness of the population. However, this problem has been rectified by taking a large sample of companies so that it can represent the population and the results can be generalized.

Following table lists the number of firms selected from each sector:

SECTORS	NUMBER OF FIRMS
TEXTILE SPINNING	64
TEXTILE WEAVING	6
TEXTILE COMPOSITE	28
WOOLEN	4
SYNTHETIC and RAYON	9
SUGAR and ALLIED INDUSTRIES	25
CEMENT	12
TOBACCO	3
REFINERY	3
POWER GENERATION and DISTRIBUTION	6
OIL and GAS MARKETING COMPANIES	5
OIL and GAS EXPLORATION COMPANIES	2
ENGINEERING	8
AUTOMOBILE ASSEMBLER	8
AUTOMOBILE PARTS and ACCESSORIES	6
CABLE and ELECTRICAL GOODS	5
TRANSPORT	2
TECHNOLOGY and COMMUNICATION	3
FERTILIZER	4
PHARMACEUTICALS	7
CHEMICALS	13
PAPER and BOARD	6
VANASPATI and ALLIED INDUSTRIES	2
LEATHER and TANNERIES	4
FOOD and PERSONAL CARE-PRUDUCTS	14
GLASS and CERAMICS	6
MISCELLANEOUS	12
TOTAL NUMBER OF FIRMS	**267**

3.2. Data

In order to do the number crunching of different independent and dependent variables, the figures were taken from balance sheet analysis published by State Bank of Pakistan. Being the central bank of the country, its figures for different companies were assumed reliable for the purpose of this study. The analyses were done from 2001 to 2008. However figures for year 2000 were also taken in the study to calculate the lag of different variables.

3.3. Variables and Measurement

The primary objective of this study is to observe how sensitive investment is in relation to cash flows. To meet this objective we have used the regression equation used by Fezzari et al., (1988). The investment is taken as dependent variable, while cash flows and Tobin's Q are taken as independent variables. This relationship has been studied in the context cash holdings, age, dividend and size of the firm. The results will describe whether these different classification criteria have any impact on investment cash flow sensitivity in the context of Pakistan.

3.4. Investment cash flow sensitivity

The pioneering paper by Fezzari et al., (1988) posits that investments are impacted by cash flows. The firms that are constraint i-e they have limited access to financial markets, will finance their investments from their internal sources. In order to study this impact we use the following base line regression model;

$$I_{i,t} = \propto + \delta_1 CFLOW_{i,t} + \delta_2 Q_{i,t} + u_i$$

Where,

$CFLOW_i$ = "Cash Flow" is the sum of earnings before interest, tax and depreciation divided by available capital stock of the previous year.

I_i = "investment" in fixed assets divided by available capital stock of the previous year

Q_i= "Tobin's Q" measured by the ratio of book value of total assets minus the book value of equity plus the market value of equity to book value of assets.

The primary variable of interest is cash flow. A positive and significant coefficient of this variable will indicate that firm relies heavily on internal finances for investments. We will use this equation separately for constrained and unconstrained firms in both non crises (2001-2006) and crises periods (2007-2008). Based on the earlier literature we expect a positive significant coefficient for this variable for firms in Pakistan, especially in the constrained category during crises period. Also, the reason for this expectation is the postulate that manager tend to behave homogeneously in crises situation (Baum et al., 2006).

In order to classify firms in to constrained and unconstrained categories, we use following different firms classification criteria;

3.4.1. Age

Firms that are old players in the market enjoy better reputation and credit worthiness (Fezzari et al., 1988 & Arsalan et al., 2006). Thus we allocate to the financial constrained

First we will use cash holdings measured by cash and cash equivalents divided by total assets that are deflated by cash and cash equivalents. Median value of cash holdings will be taken to separate the firms in to constrained and unconstrained categories. The firms that have higher or equal value of cash holdings will qualify for constrained category and the firms with lower value of cash holdings will qualify for the former. Again this process will be used in both crises and non crises period to ascertain the sensitivity of investments to cash flows. We expect Pakistani firms to have greater investment cash flow sensitivity, especially in the crises period.

The second method incorporates the optimal cash behavior of the firm. Using Opler's et al. (1999) "optimal cash equation", we will classify the firms as constrained and unconstrained. The firms that are negatively deviated from their optimal cash holdings will be labeled as constrained and the one that are positively deviated will be labeled as unconstrained. The equation used to find the optimal cash is reduced to those variables that can be calculated in Pakistan. As a result, the variables of R&D, capital & acquisition expenditures and regulations dummy have been excluded due to non availability of data. The final equation takes the following form

$$CASH_{i,t} = \alpha+\beta_1 MTB_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 CF_{i,t} + \beta_4 NWC_{i,t} + \beta_5 LEVERAGE_{i,t} + \beta_6 INDSIG_{i,t}+ \beta_7 DIVIDUM_{i,t} + \varepsilon_t$$

Where;

Where, Cash holdings (CASH) are represented by cash ratio

$$CASH = \frac{\text{Cash and cash equivalents}}{\text{Book value of assets} - \text{cash and equivalents}}$$

Market-to-book ratio (MTB) is taken as proxy for the firm's investment opportunity set.

$$MTB = \frac{\text{Book value of assets – book value of equity + market value of equity}}{\text{Book value of assets}}$$

Natural logarithm of total assets is taken as a proxy for the real size (SIZE) of firms.

Cash flow magnitude (CF) is measured by Cash flow to net assets ratio

$$CF = \frac{\text{After Tax profit + Depreciation}}{\text{Total assets – cash and equivalents}}$$

Net working capital-to-assets ratio (NWC) is taken as a proxy for liquid asset substitutes as these assets can be seen as substitutes for cash holdings.

$$NWC = \frac{\text{Net current assets – Cash and cash equivalents}}{\text{Total assets – cash and equivalents}}$$

Leverage is measured as;

$$\text{Leverage} = \frac{\text{Total Debt}}{\text{Total assets – cash and equivalents}}$$

INDSIG or industrial sigma is in fact the cash flow volatility. Using Opler et al. (1999) cash flows, calculated by adding depreciation to income before interest divided by total assets, we have estimated volatility by using GARCH model. The GARCH variance series was used as the measure of volatility of cash flows by estimating CF and CF_{n-1} with the help of GARCH model.

DIVIDUM is dividend dummy that takes the value of "1" if firm pays dividend and "0" if not.

heterogeneous, which is first line of defense against individual heterogeneity (Baltagi, 2008). Time series and panel data are prone to heterogeneity problem that may lead to bias results. Also according to Baltagi (2008), panel data is more informative and has less collinearity between variables. Also there are more degrees of freedom and we can run variety of tests for robustness. Further the results obtained by panel data estimation are more generalizable and especially when there are dynamic relationships to be observed (Wooldridge, 2001). The same comforts are not offered by time series and cross sectional analysis.

The basic analytical model used in this analysis is;

$$I_{i,t} = \propto + \delta_1 CFLOW_{i,t} + \delta_2 Q_{i,t} + u_{i,t}$$

Where,

$CFLOW_i$ = "Cash Flow" is the sum of earnings before interest, tax and depreciation divided by available capital stock of the previous year.

I_i = "investment" in fixed assets divided by available capital stock of the previous year

Q_i= "Tobin's Q" measured by the ratio of book value of total assets minus the book value of equity plus the market value of equity to book value of assets.

3.6. Descriptive Statistics

The descriptive statistics shed light on the mean, standard deviation, minimum and maximum values for each variable in the data. In this study the number of observation are 2136 for a single variable from 2001 to 2008. Further descriptive statistics are given for the firms in

crises and pre crises periods. The numbers of observations are 534 and 1602 respectively for every variable in crises (2007-2008) and non crises (2001-2006) periods.

Furthermore mean, standard deviation, minimum and maximum values are given for all variables of the study in first, second, third and fourth quartiles respectively for both crises and non crises periods. The number of observations are 134, 133, 133 & 134 observations in first, second, third and fourth quartile respectively for the crises period of 2007-2008. However for crises period (2001-2006), the number of observations are 401, 400, 400 and 401 for single variable in first, second and fourth quartile respectively.

3.7. Correlation Matrix

Correlation basically describes the direction of different variables. Collinearity in data can lead to biased results and thus prevent the findings from being gernalized. The correlation can take the maximum value of 1 and -1 respectively. Positive correlation indicates that variables are moving in same direction while negative correlation indicates opposite direction. A correlation value of 0.5 and above is seen as significant by the statisticians. Thus we have shown correlation of all the variables in our study to see if any of our variables are prone to collinearity.

3.8. Panel data analytic Models

We have taken help of different analytic models with a view to generate results that are robust and generalizable. These analytical models are in addition of OLS regression model that

are used to estimate sensitivity of investments with cash flows. Bausch Pagan test has been conducted in every analysis in order to check for hetroskedacity. Further in case where data was found to be hetroskedastic, we have recalculated the equation with robust standard errors. This was essential because according to Gujrati (2003), the presence of out layers leads to biased results and one way to cure that is to estimate the test with robust errors. The different tests conducted are;

3.8.1. Fixed Effect Model

Fixed effect models are an extension of pooled regression model. According to Wooldridge (2001), fixed effect models cater for the biasness that occurs because of omitted variables. This problem is inherent in OLS regression models and thus their results can be biased due to omitted variables. In fixed effect model, the slope coefficients are Constant while the intercept are different for individuals (Gujrati, 2003; Baltagi, 2008). Thus for robustness purposes we have used this model so that our results are gernalized. We will estimate the impact of cash flow on investment sensitivities by using following fixed effect model both in crises and non crises periods;

$$I_{i,t} = \propto + \delta_1 CFLOW_{i,t} + \delta_2 Q_{i,t} + u_{i,t}$$

$CFLOW_{i,t}$ = "Cash Flow" is the sum of earnings before interest, tax and depreciation divided by available capital stock of the previous year.

$I_{i,t}$ = "investment" in fixed assets divided by available capital stock of the previous year

$Q_{i,t}$= "Tobin's Q" measured by the ratio of book value of total assets minus the book value of equity plus the market value of equity to book value of assets.

In the event where hetroskedacity is found in our data, we will estimate this test with robust standard errors.

3.8.2. Random Effect Model

Although the results of fixed effect model are more statistically reliable but fixed effect model is not the most efficient model (Wooldridge, 2001). Thus we also use random effect model in the endeavor of robustness. Fixed effect model assigns fixed value to the intercept of the cross sectional unit where as in random effect model the value of intercept is the mean of overall intercepts of the cross sectional units (Gujrati, 2003). The error term in the random effect model signifies the divergence of individual intercepts from the mean value of overall intercepts.

The random error model for measuring investment cash flow sensitivity both in crises and non crises periods is;

$$I_{i,t} = \propto + \delta_1 CFLOW_{i,t} + \delta_2 Q_{i,t} + u_{i,t}$$

In case where hetroskedacity has been detected, we will estimate this model for robust errors.

3.8.3. Haussmann Specification test

When fixed and random effect models are used for large data but for limited periods, there is a high probability that both may give either entirely or partially different interpretations (Gujrati, 2003). The problem of choice arises as to which result has to be accepted. In this situation, Haussmann test is used to test the hypothesis as to which model should be selected.

H_0 = Fixed effect model is accepted

H_1= Random effect model is accepted

If the p-value in Haussmann test is greater than .05, we will select random effect models however if it is less than .05, we will select fixed effect model.

3.9. Hypothesis of the Study

The primary objective of our study is to determine whether investments are impacted by cash flows in crises and non crises period in Pakistan. Thus we will put the following hypothesis to test;

H_1: Cash flow has impact on investment of firms in non crises period.
H_2: Cash flow has impact on investment of firms in crises period.

Section 4

Results and Discussion

4. Results and Analysis

4.1. Descriptive Statistics

Table 1: Descriptive Statistics

Crises Period (2007-2008)

Variables	Observations	Mean	Std. Dev.	Min	Max
CASHHOLDINGS	534	0.18	0.54	0.00	7.05
MTB	534	1.29	1.80	0.08	20.85
SIZE	534	7.61	1.53	2.86	12.14
CASHFLOWMAG	534	0.14	0.40	-3.87	7.31
NWC	534	0.46	0.21	0.02	0.99
LEVERAGE	534	0.15	0.18	0.00	1.79
INDISIG	534	0.05	0.23	0.00	5.22
DIVIDUM	534	0.38	0.48	0.00	1.00
AGE	534	31.05	14.45	7.00	75.00
INV	534	0.24	0.65	-1.26	9.90
CF	534	0.38	2.06	0.00	34.90
TQ	534	1.29	1.80	0.08	20.85

Non Crises Period (2001-2006)

Variable	Observations	Mean	Std. Dev.	Min	Max
CASHHOLDINGS	1602	0.17	0.46	0.00	7.00
MTB	1602	1.22	2.04	0.09	42.93
SIZE	1602	7.07	1.43	2.60	11.92
CASHFLOWMA~E	1602	0.14	0.15	-0.38	2.25
NWC	1602	0.46	0.21	0.03	0.99
LEVERAGE	1602	0.16	0.22	0.00	2.83
INDISIG	1602	0.04	0.04	0.00	0.35
DIVIDUM	1602	0.55	0.50	0.00	1.00
AGE	1602	27.05	14.53	1.00	73.00
INV	1602	0.29	1.56	-1.67	59.61
CF	1602	0.30	0.49	0.00	11.09
TQ	1602	1.22	2.04	0.09	42.93

Table 1 represents descriptive statistics of firms in crises and non crises periods. It represents all variables used in different regression equations used in this study. The purpose of this table is to provide a snap shot of the status of different variables before and after crises. Table 1 provides us with some very interesting results. The mean value of investments have decreased by more than 18% (0.236813(crises) VS 0.2912889(non-crises)) from non-crises period 2001-2006 to crises period (2007-2008). Also the cash holdings have increased by 6.03% (7.045012 vs 0.1712143) from non crises to crises period. The increased cash holdings indicate that firms are holding more cash in crises periods for precautionary purposes and are slow on investments. Also leverage has decreased by 4.57% which indicates that firms are relying lesser and lesser on debt as a financing alternative. This may be due to the raising cost of debt in Pakistan which has risen phenomenally in recent years. With the increase in cash holdings, the ratio of cash flow has significantly increased by about 27% from non crises to crises period. This is the rough gauge to predict that the existing finance is generated internally. Thus we may expect that in crises period the firms will be using internal funds to undertake future projects. The dividend has decreased sharply by significant percentage of 31%. This clearly indicates that in crises periods, the firms have significantly reduced their dividend spending. Almost all these indicators point to single notion and that is "Retention". The increase in cash holdings, reduction in investments despite a 6% increase in growth opportunities (MTB & TQ) from non-crises to crises periods and the reduction of dividend by a significant percentage are all the hallmarks of retention practices.

4.2. Correlation Matrix

Table 2: ***Correlation Matrix***

	Cash Holdings	SIZE	Cashflow Magnitude	NWC	Leverage	INDISIG	DiviDum	INV	CF	TQ	Age
Cash Holdings	1.00										
SIZE	0.19	1.00									
Cashflow Magnitude	0.41	0.04	1.00								
NWC	0.22	-0.04	0.05	1.00							
Leverage	-0.06	0.06	-0.04	-0.41	1.00						
INDISIG	0.06	-0.08	0.01	-0.02	0.02	1.00					
DiviDm	0.15	0.20	0.15	0.28	-0.20	-0.09	1.00				
INV	-0.04	0.00	-0.01	-0.08	0.01	-0.01	-0.03	1.00			
CF	0.03	-0.04	0.57	0.08	-0.06	0.01	0.05	0.16	1.00		
TQ	0.04	0.04	0.09	0.07	-0.05	-0.06	0.11	-0.01	0.07	1.00	
Age	0.10	0.16	0.03	0.18	-0.12	-0.07	0.08	-0.01	0.04	0.11	1.00

Table 2 provides correlation matrix for all variables of main regression equation and optimal cash equation used for the period of 2001-2008. Here the value equal to or above 0.5 will be the indicator of significant correlation.

In this context, the variables of main regression equation namely investment (inv), cash flow (cf) and Tobin's Q (TQ) are not correlated with each other. Further cash flows have on the whole, positive but insignificant correlation with investments. However Tobin's Q and Age have negative but insignificant correlation with investments but size has positive correlation with investment.

The variables of cash equation namely cash (Cash holdings), size, cash flow (CFMAG), net working capital (NWC), leverage (Lev), Industrial Sigma (INDISIG) and dividend dummy (Divdum) are all uncorrelated with each other. Industrial sigma, cash flow magnitude, size and

net working capital have positive correlation with cash holdings but the values are insignificant. However leverage has negative insignificant correlation with cash holdings.

In nut shell, all our variables are completely uncorrelated with each other and the problem of multi collinearity will not exist in our sample. This will help us to come up with the results that are generalizable and unbiased.

4.3. Impact of cash holding on Investment sensitivities

We now focus to the main objective of our research i-e to see the impact of cash holdings on investment sensitivities. In order to examine this, we first start with the univariate analysis of means of the firms in crises and non crises situation. The firms have been classified as constrained and unconstrained based on their cash holdings. The different variables along with their means, standard deviation, minimum and maximum values in different cash holding quartiles are given in Table 3

4.3.1. Univariate Analysis

Table3 represents univariate analysis of means for the firms in different cash holding quartiles for both crises and non crises periods. The firms in the first quartile are those which have lower cash holdings and the firms in fourth quartile are the one who have higher cash holdings. The purpose of this exercise is to see the descriptive statistics of different firm's specific variables by the firms' cash holdings. The t-values describe difference of means between first and fourth quartile.

The univariate analysis shed light on some interesting findings. In crises periods, the constrained firms investments increases monotonically with their cash flows whereas the investments of financially unconstrained firms decreases as their cash holdings increase. Also the investments in non crises periods have no monotonic relationship with cash holdings. Also investment in non crises periods have been steadily decreasing.

Table 3. Cash Holding Quartiles and Mean Comparisons

	Panel A: Pre-Crisis Period (2001-2006)				
	First Quartile	**Second Quartile**	**Third Quartile**	**Fourth Quartile**	**t-values**
CASHHOLDINGS	0.004	0.021	0.079	0.579	-14.436
	0.003	*0.009*	*0.030*	*0.797*	
SIZE	6.678	6.687	7.270	7.635	-9.8723
	1.099	*1.278*	*1.444*	*1.613*	
CASHFLOWMAG	0.104	0.099	0.113	0.241	-10.5422
	0.110	*0.072*	*0.082*	*0.231*	
NWC	0.388	0.427	0.493	0.522	-9.233
	0.192	*0.198*	*0.213*	*0.208*	
LEVERAGE	0.230	0.157	0.143	0.108	6.6857
	0.297	*0.208*	*0.144*	*0.203*	
INDISIG	0.052	0.046	0.037	0.020	14.5577
	0.034	*0.035*	*0.035*	*0.031*	
DIVIDUM	0.401	0.458	0.623	0.728	-9.801
	0.491	*0.499*	*0.485*	*0.445*	
AGE	22.835	25.425	29.770	30.190	-7.3253
	12.555	*14.223*	*14.052*	*15.842*	
INV	0.436	0.294	0.264	0.172	1.7398
	3.021	*0.531*	*0.429*	*0.258*	
CF	0.306	0.242	0.264	0.384	-1.8045
	0.808	*0.361*	*0.238*	*0.338*	
TQ	0.935	1.213	1.105	1.616	-5.0335
	0.690	*2.484*	*1.668*	*2.652*	

* *The values in normal text are means and values in italics indicate standard deviation*

	Panel B: Crisis Period (2007-2008)				
	First Quartile	**Second Quartile**	**Third Quartile**	**Fourth Quartile**	**t-values**
CASHHOLDINGS	0.003	0.017	0.068	0.635	-7.7372
	0.002	*0.007*	*0.027*	*0.946*	
SIZE	7.014	7.479	7.796	8.143	-5.7269
	1.118	*1.370*	*1.453*	*1.877*	
CASHFLOWMAG	0.155	0.078	0.114	0.211	-0.924
	0.630	*0.383*	*0.081*	*0.285*	
NWC	0.383	0.410	0.484	0.553	-7.7506
	0.177	*0.175*	*0.217*	*0.207*	
LEVERAGE	0.210	0.165	0.134	0.100	4.7199
	0.192	*0.141*	*0.151*	*0.204*	
INDISIG	0.057	0.043	0.034	0.058	-0.0161
	0.042	*0.035*	*0.034*	*0.450*	
DIVIDUM	0.149	0.293	0.436	0.627	-8.8906
	0.358	*0.457*	*0.498*	*0.485*	
AGE	26.142	29.015	33.970	35.097	-5.5147
	11.214	*13.569*	*15.414*	*15.452*	
INV	0.196	0.443	0.219	0.090	2.9268
	0.348	*1.147*	*0.402*	*0.200*	
CF	0.436	0.520	0.268	0.296	0.5346
	3.008	*2.807*	*0.228*	*0.252*	
TQ	1.013	1.260	1.401	1.498	-2.5974
	0.984	*2.020*	*2.040*	*1.934*	

** The values in normal text are means and values in italics indicate standard deviation*

the firms' cash holdings. The t-values describe difference of means between first and fourth quartile.

The univariate analysis shed light on some interesting findings. In crises periods, the constrained firms investments increases monotonically with their cash flows whereas the investments of financially unconstrained firms decreases as their cash holdings increase. Also the investments in non crises periods have no monotonic relationship with cash holdings. Also investment in non crises periods have been steadily decreasing. The t-value of investments in

non crises period is statistically insignificant while in crises period the t-statistics of investments are significant. The leverage is increasing from first to fourth quartile in the non crises period. The relationship of investments and leverage is kind of monotonic in the sense that investments are increasing with increase in the leverage. This is the indication that in non crises period, external finance was less costly and the firms have relied on external finance for their investments. The same is not true for the crises period. In crises period because of the rise in cost of external finance, firms have acquired lesser and lesser external finance and relied more on internal finance in general. However the Tobin's Q is generally increasing with cash holdings but the relationship is non monotonic. The firms with large growth opportunities are holding more cash in non crises period. However in crises periods, larger the growth opportunities, larger are the firms holding cash. The cash poor firms are in general younger in age as compared with the firms in the fourth quartile for both crises and non crises periods. The dividend has monotonic relationship with cash holdings. It increases with increase in the cash holdings by the firms. This pattern has been observed for both crises and non crises periods.

4.3.2. **Optimal Cash Equation**

The regression results of the optimal cash model are given in table 4. The first regression results with standard errors give explosive significance for different variables. The hetroskedacity test reveals that there are outliers in the data which can bias our results. Due to this, we use regression with robust errors to give us unbiased results.

Table 4: Regression Results for optimal cash equation

Variables	Coefficients	t-values	P values
MTB	-0.005	-1.11	0.266
SIZE	0.061	9.6	0.000
CASHFLOWMAG	0.787	20.26	0.000
NWC	0.500	10.1	0.000
LEVERAGE	0.059	1.25	0.210
INDISIG	0.314	4.01	0.000
DIVIDUM	0.011	0.54	0.591
CONS	-0.628	-11.77	0.000
F-Statistics	0.000		
R-Square	0.243		
Adj R-Square	0.241		

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of cashholdings

         chi2(1)      = 17560.45
         Prob > chi2  =    0.0000
```

Variables	Coefficients	t-values	P values
MTB	-0.005	-0.97	0.331
SIZE	0.061	6.38	0.000
CASHFLOWMAG	0.787	2.06	0.040
NWC	0.500	7.24	0.000
LEVERAGE	0.059	0.61	0.544
INDISIG	0.314	2.05	0.040
DIVIDUM	0.011	0.34	0.733
CONS	-0.628	-6.65	0.000
F-Statistics	0.000		
R-Square	0.243		

The results are in line with the findings of Opler et al. (1999) except for leverage which has negative significant co efficient with cash holdings in their study. In Pakistan, we have found that leverage has insignificant impact on cash holdings. This is an indication that firms in Pakistan are less levered and prefer mode of financing other than debt. The interest expense as per BSA data indicates that some firms have interest expense of zero. The retention rate is very high as per BSA data. The retention is basically a signal of financing investments from internal source, as per FHP (1988) findings. The significance of cash flow magnitude with cash holdings indicates that the firms are holding more cash out of cash flows. This result is validating the findings of Almeida et al. (2004). Pakistani firms are accumulating more cash out of cash flows which indicates market asymmetries. Further the volatility has significant impact on cash holdings, which is in line with results of Opler et al. (1999), indicating that in wake of uncertainty the firms tend to hold more cash for precautionary purposes. Further, net working capital and size have momentous significant relationship with cash holdings. This buttress upon the fact that firms with large size and large working capital requirements tend to hold large amount of cash. This result is in not in line with FHP (1988). However in Pakistan, debt financing is not popular with firms and thus they hold more cash to meet their working capital requirements and other contingencies.

The residuals obtained from OLS regression of cash equation will be used as an indicator for firm's deviation from optimal cash holding. This is a leap forward as previously only cash holdings were considered for classification of firms in to constrained and unconstrained categories.

4.3.3. Cash holding based Classification

Table 5 represents results of cash holding based classification of firms for crises and non crises periods. The firms were considered constrained when their cash holdings were below the median value of cash holdings of the sample and unconstrained vice versa.

Table 5: Regression Results Cash holdings based classification (All Tests Robust Standard Errors)

Panel A: Non crisis Period (2001-2006)									
		Constrained Firms				Unconstrained Firms			
	Variables	Coefficients	t/z-value	p-value	R^2	Coefficients	t/z-value	p-value	R^2
CEM	CF	0.861	1.02	0.309	0.062	0.075	2.16	0.031	0.007
	TQ	-0.016	-1.53	0.126		-0.013	-3.56	0	
	_CONS	0.147	0.91	0.363		0.211	12.64	0	
FEM	CF	0.487	0.56	0.576	0.062	0.185	2.91	0.004	0.002
	TQ	0	-0.12	0.901		-0.003	-0.93	0.351	
	_CONS	0.232	1.15	0.251		0.162	7.67	0	
REM	CF	0.861	1.02	0.309	0.062	0.101	2.46	0.014	0.002
	TQ	-0.016	-1.53	0.126		-0.012	-2.74	0.006	
	_CONS	0.147	0.91	0.363		0.211	9.31	0	

Panel B: Crisis Period (2007-2008)									
		Constrained Firms				Unconstrained Firms			
	Variables	Coefficients	t/z-value	p-value	R^2	Coefficients	t/z-value	p-value	R^2
CEM	CF	0.105	1.3	0.195	0.13	0.219	1.38	0.168	0.025
	TQ	0.018	0.76	0.445		-0.002	-0.18	0.86	
	_CONS	0.248	4.16	0		0.096	2.9	0.004	
FEM	CF	0.234	8.3	0	0.129	0.327	1.01	0.314	0.011
	TQ	0	0.03	0.979		-0.04	-1.99	0.049	
	_CONS	0.207	5.82	0		0.12	1.33	0.187	
REM	CF	0.169	2.62	0.009	0.129	0.218	1.35	0.176	0.025
	TQ	-0.005	-0.25	0.802		-0.002	-0.14	0.885	
	_CONS	0.278	3.26	0.001		0.096	2.85	0.004	
HST	*H1*: Results obtained from REM *H0*: Results obtained from FEM **Prob>Chi2** = 0.1999								

Based on this criterion, we end up obtaining 800 & 801 firms in constrained and unconstrained categories in non crises period (2001-2006). While in crises period we obtained 267 firms each in constrained and unconstrained categories in crises period (2007-2008)

4.3.3.1. Non Crises Period Results

First we obtained estimates of OLS regression (CEM) with standard errors for both constrained and unconstrained firms (see Appendix). The estimates posited a significant relationship of cash flows with investment for constrained firms and an insignificant relationship of the former with the later in case of unconstrained firms in non crises period. However after checking for hetroskedacity using Bausch Pagan and Cook Weisberg tests (see Appendix), we came to know that hetroskedacity was present. The p-value above .05 would have suggested that we accept the hypothesis that no hetroskedacity is present in the sample but instead we obtained p-values of .000 and .02 respectively for constrained and unconstrained firms. Presence of hetroskedacity prompted us to only use tests with robust errors. The OLS regression with robust errors indicated that constrained firms had insignificant relationship with investment while unconstrained firms had significant relationship with investments. The fixed and random effect regressions also have the same results.

The insignificant relationship of unconstrained firms can be explained by the fact that in non crises periods, the external finance is cheaper and thus financially constrained firms have mostly used external finances than internal to finance their investments. The behavior of financially unconstrained firms is strange. In most of the researches Arslan et al., (2008); Aghion et al., (2001); Chang and Velasco, (2001); Caballero and Krishna Murty, (2001); Mendoza and

Smith, (2006); financially unconstrained firms cash flow show insignificant trend vis a' vis investment. This phenomenon can be explained by studying the country specific financial behavior. In our view, based on previous analysis that we reported, we can say that financially unconstrained firms in Pakistan have practice of great retention. They prefer to finance their investments with internal resources rather than external finance irrespective of the fact that how much cheaper the credit is available. This phenomenon is in accordance with KZ (1999) that buttress that financially unconstrained firms show more investment cash flow sensitivity.

4.3.3.2. Crises Period Results

We obtained the OLS regression estimates with standard errors for both unconstrained and constrained firms (see Appendix). The test indicated a significant coefficient of cash flows for both constrained and unconstrained firms. The p-values for hetroskedacity were .000 for both samples of constrained and unconstrained firms (see Appendix). This indicated that we use all tests with robust errors. The results of OLS, fixed effect and random effect regressions indicated that the cash flows of unconstrained firms have insignificant impact on investments. The results were different for constrained firms. The OLS regression indicated that cash flows have insignificant impact on investments for constrained firms in crises period. However fixed effect and random effect negated this result by indicating that cash flows of constrained firms have significant impact on investments. Since in our previous discussion we outlined that the results of fixed and random effects are more reliable (Gujrati, 2003; Baltagi, 2008) than OLS regression. We accept the results obtained by Fixed and random effect regressions.

The insignificancy of cash flow on investments for unconstrained firms is understandable. Pakistani unconstrained firms have generally reduced their investments in crises periods. This can be evidenced form table 2 where the mean values of investments in crises periods in third and fourth quartiles are exceptionally low as compared to their cash holdings. This behavior is in line with the findings of KZ (1999). They pointed out that it can happen that in crises periods, firms will not invest even if they have huge cash holdings or internal finances because of poor cash flows from investments in crises periods.

However constrained firms in the presence of financial asymmetries, tend to finance their investments from internal cash flows (FHP, 1988). Pakistani constrained firms exhibit this behavior. Thus in Pakistan, firm's investment is sensitive to cash flow in crises period.

4.3.4. Cash Residual Based Classification

The cash residuals obtained by regression test of optimal cash equation will now serve as classification criterion for generating samples of constrained and unconstrained firms. The basic logic behind this classification is that firms who deviate from their optimal cash holdings will be constrained and its investment will be susceptible to variations in cash flows.

By using this criterion we obtained 596 and 1006 observations in unconstrained and constrained categories in non-crises period (2001-2006). While in crises period we obtained 167 and 367 observations in constrained and unconstrained categories.

Table 6: Cash Residual Based Regression Results (All Tests with Robust Standard Errors)

Panel A: Non Crisis Period (2001-2006)									
	Constrained Firms					Unconstrained Firms			
	Variables	Coefficients	t/z-value	p-value	R^2	Coefficients	t/z-value	p-value	R^2
CEM	CF	.8255299	1.00	0.316	0.0590	.165297	2.91	0.004	0.0117
	TQ	-.0743206	-1.26	0.207		-.0107299	-2.69	0.007	
	_CONS	.1330649	0.88	0.380		.2174641	9.37	0	
FEM	CF	.5247047	0.55	0.585	0.0542	.2761532	2.59	0.010	0.0098
	TQ	.0071003	0.22	0.828		-.0034801	-0.15	0.882	
	_CONS	.138542	0.45	0.655		.1804001	4.76	0.000	
REM	CF	.8255299	1.00	0.316	0.0590	.2172451	3.08	0.002	0.0115
	TQ	-.0743206	-1.26	0.207		-.01024	-2.51	0.012	
	_CONS	.1330649	0.88	0.380		.2270525	6.56	0	
HST						*H1*: Results obtained from FEM *H0*: Results obtained from REM **Prob>Chi2** = 0.2163			

Panel B: Crisis Period (2007-2008)									
	Constrained Firms					Unconstrained Firms			
	Variables	Coefficients	t/z-value	p-value	R	Coefficients	t/z-value	p-value	R
CEM	CF	.1068622	1.33	0.186	0.2394	.8255299	1.00	0.316	0.0590
	TQ	.0165327	1.17	0.241		-.0743206	-1.26	0.207	
	_CONS	.1732519	5.18	0		.1330649	0.88	0.380	
FEM	CF	.2353556	9.11	0	0.2310	.5247047	0.55	0.585	0.0542
	TQ	-.0236436	-0.75	0.454		.0071003	0.22	0.828	
	_CONS	.1654414	3.45	0.001		.138542	0.45	0.655	
REM	CF	.1112098	1.37	0.170	0.2393	.8255299	1.00	0.316	0.0590
	TQ	.0134566	0.89	0.376		-.0743206	-1.26	0.207	
	_CONS	.1710572	4.69	0.000		.1330649	0.88	0.380	
HST		*H1*: Results obtained from REM *H0*: Results obtained from FEM **Prob>Chi2** = 0.5850							

4.3.4.1. Non Crises Period Results

We obtained the estimates of OLS regression (Common effect model or CEM) with standard errors for both constrained and unconstrained firms (see Appendix). The estimates identified positive significant coefficients for cash flows and insignificant negative coefficients for Tobin's Q for unconstrained and constrained firms. The results indicated that firms in both categories were relying on internal finance for their investments. Tobin's Q which is indicator of firm's growth opportunities had no impact on investment of the firms. After checking for hetroskedacity using Bausch pagan and Cook Weisberg tests, we got p-value equal to ".000" (see Appendix). This indicated that we accept hypothesis that data had hetroskedacity. After confirmation of the hetroskedacity, we had to use all tests with robust errors.

The CEM estimates with robust standard errors gave same results that we obtained using cash holdings as classification criterion. Here too, the constrained firms' investment was not impacted by their cash flows or internal funds while unconstrained firms' investment was significantly impacted by cash flows or internal funds. The same results were confirmed by fixed and random effect regression models. How ever incase of Tobin's Q, unconstrained firms had a negative significant co-efficient with firm's growth opportunities in random effect regression model while in fixed effect regression model, Tobin's Q was indicated as having insignificant impact on firm's investments. The Haussmann test indicated that we accept the hypothesis which supports the results of random effect. Thus we accept that Tobin's Q had negative significant impact on firm's investments.

The insignificant co-efficient of cash flows in case of constrained firms indicates that the firms are taking advantage of cheap external finances available during non crises periods. The

behavior of unconstrained firms indicates that they are still using internal finances for their investment purposes and validating the studies of Kaplan and Zingales (1999). The negative association of growth opportunities with investments is a strange behavior. The same can be evidenced from cash holding quartiles where the investment decreases with increase in growth opportunities of unconstrained firms in non crises periods. The firms despite of having growth opportunities are not investing are the indication of extreme conservatism. The firms here are not investing because they feel that the upsurge in the economy is not permanent and the bubble will burst soon. Thus due to conservatism they are not investing.

4.3.4.2. Crises Period Results

The crises period results demonstrate that unconstrained firm's cash flows have no significant impact on investments. The CEM regression with standard errors indicates that cash flows have a significant impact but after hetroskedacity tests we could not accept those results. The tests with robust standard errors clearly identifies that there is no significant impact of cash flows (Internal funds) on investments of unconstrained firms in crises period. However random effect indicates a negative significant impact of growth opportunities with investments. The results are not surprising because in Pakistan the firms have reduced their investments and thus despite of having cash balances more than the optimal cash balance, they are not investing.

The unconstrained firms show greater investment sensitivities with cash flow in crises periods. The CEM regression with standard errors depicts a very significant impact of cash flows on investments (see Appendix). The hetroskedacity tests indicate that data has outliers (see Appendix). Thus we had to accept results of those tests that are conducted with robust standard

errors estimation. The CEM regression with robust errors indicates an insignificant impact of cash flows on investments. The fixed effect model indicates that there is a momentous significant impact of cash flows on investments. However, random effect with robust standard errors indicates completely opposite results. The Haussmann test is conducted on following hypothesis;

H_0: The results obtained by fixed effect regression are accepted

H_1: The results obtained by Random effect regression are accepted

Haussmann test give p-value of 0.5850, this indicates that we accept H_0. Thus the results of fixed effect model with robust standard errors are accepted. Since its results are statistically more reliable and generalizable than OLS regression, we can say that in crises periods, the investments of the constrained firms are significantly impacted by the availability of internal finance.

After studying the impact of cash holdings and Deviation from optimal cash holdings, we now turn our attention to impact of other constraining factors on Pakistani firms identified by literature namely age, dividend and size

4.4. Age

The companies that are old players in business are known to external suppliers of finance. Thus they face less information asymmetries and thus are less constrained. The median age of companies in the sample was taken. The firms with above median age were included in

Table 7: Age Based Classification Regression Results (All Tests with Robust Standard Errors)

Panel A: Non Crisis Period (2001-2006)									
	Constrained Firms					Unconstrained Firms			
	Variables	Coefficients	t/z-value	p-value	R^2	Coefficients	t/z-value	p-value	R^2
CEM	CF	1.384	0.87	0.385	0.095	0.126	3.43	0.001	0.016
	TQ	-0.053	-1.34	0.181		-0.015	-3.02	0.003	
	_CONS	0.022	0.08	0.94		0.247	12.79	0	
FEM	CF	0.823	0.52	0.605	0.095	0.059	0.69	0.49	0.016
	TQ	0.039	1.25	0.211		-0.005	-1.48	0.14	
	_CONS	0.063	0.16	0.869		0.258	6.87	0	
REM	CF	1.384	0.87	0.385	0.095	0.126	3.43	0.001	0.016
	TQ	-0.053	-1.34	0.181		-0.015	-3.02	0.003	
	_CONS	0.022	0.08	0.94		0.247	12.79	0	
HST						*H1*: Results obtained from REM *H0*: Results obtained from FEM **Prob>Chi2** = 0.0171			

Panel B: Crisis Period (2007-2008)									
	Constrained Firms					Unconstrained Firms			
	Variables	Coefficients	t/z-value	p-value	R	Coefficients	t/z-value	p-value	R
CEM	CF	0.004	2.62	0.009	0.008	0.25	11.43	0	0.333
	TQ	-0.022	-3.78	0		-0.004	-0.2	0.844	
	_CONS	0.23	7.3	0	0.003	0.18	3.63	0	
FEM	CF	0.05	20.36	0		0.252	8	0	0.333
	TQ	-0.03	-1.58	0.116		-0.042	-0.61	0.545	
	_CONS	0.22	6.65	0		0.23	2.23	0.027	
REM	CF	0.007	2.99	0.003	0.008	0.25	11.43	0	0.333
	TQ	-0.022	-3.69	0		-0.004	-0.2	0.844	
	_CONS	0.229	7.04	0		0.18	3.63	0	
HST	*H1*: Results obtained from FEM *H0*: Results obtained from REM **Prob>Chi2** = 0.0000								

unconstrained category and below median age were placed in constrained category. This process was conducted for both crises and non crises periods.

After classification, we obtained 806 and 795 observations in unconstrained and constrained categories in non crises period (2001-2006). While in crises period (2007-2008) we obtained 271 and 263 observations in unconstrained and constrained categories.

4.4.1. Non-crises Period Results

In non crises periods, the unconstrained firms that were having above the median age have significant impact of cash flows on investments. The random effect with robust errors has different results than fixed effect with robust errors. Its results indicate that age has significant impact on investment cash flow sensitivities. We have performed Haussmann test for the following hypothesis;

H_0: The results obtained by Fixed effect regression are accepted

H_1: The results obtained by Random effect regression are accepted

The test returned p-value of "0.01" indicating that we accept H_1.

However, the unconstrained firms that had below the median age had insignificant impact of cash flows on investments. The results are interesting as it indicates that more aged firms have greater investment cash flow sensitivities. This also indicates that more the firm matures; the more it finances its investments from internal funds and tries to avail less external finance

possible. This is evident from table 3 also. As the age increases, the more company has cash holdings. The less age companies however are indifferent to this classification as they have insignificant cash flow co-efficient in non crises periods. Also the companies taken here are listed on stock exchange and they are known to all creditors. Thus in non crises periods, they have less problem in accumulating external finances and Age is not a barrier in their way.

4.4.2. Crises Periods results

In crises period age has proved to be having a very significant constraining factor. The cash flows of both constrained and unconstrained firms exhibit a positive significant impact of cash flows on investment. The results are not surprising because with age, Pakistani companies have accumulated more cash out of cash flows. This is evident from table 3 that with age, cash holdings have increased monotonically. The constrained firms have shown that in crises periods, age is acting a constraining factor. The reason is that the constrained firms tend to finance their investments with cash holdings. The more they are aged, the more they will have internal funds to take projects with positive NPVs. The behavior of unconstrained firms has unaltered in crises periods.

The results strongly identifies that age has the ability to act as financial constraint proxy in Pakistan especially in crises periods.

4.5. Dividend

Dividend has been discussed by FHP, (1988) to act as financial constraint. The firms who pay dividend will be seen as entities having huge cash holdings and thus will be less constrained. The firms who pay fewer dividends will be considered as the sign of greater retention and greater financial constraint. The retention is interpreted by FHP, (1988) as an attempt by companies to with hold funds for investment as they will not get external finances at lesser cost.

To see whether dividends act as a proxy of financial constraint, we analyze Pakistani firms on the basis of dividend. The firm is considered constrained in the year if they pay dividend and unconstrained if they do not pay dividend.

After arranging the sample in to unconstrained and constrained categories we obtained 885 and 716 observation in unconstrained and constrained categories in non crises period (2001-2006). Further, we obtained 201 and 333 observations for constrained and unconstrained categories in non-crises period.

Table 8: Dividend Based Classification Regression Results (All Tests with Robust Standard Errors)

Panel A: Non Crisis Period (2001-2006)									
	Constrained Firms					Unconstrained Firms			
	Variables	Coefficients	t/z-value	p-value	R^2	Coefficients	t/z-value	p-value	R^2
CEM	CF	0.0640	0.98	0.327	0.0640	.1479867	3.18	0.002	0.0218
	TQ	-.0359486	-2.12	0.034		-.0128325	-3.15	0.002	
	_CONS	.1812422	1.28	0.201		.2009417	12.80	0	
FEM	CF	.5090697	0.52	0.606	0.0639	.2661606	3.76	0	0.0127
	TQ	-.0133968	-0.37	0.713		.0007035	0.44	0.661	
	_CONS	.2533069	1.32	0.188		.1411598	5.93	0	
REM	CF	.9035312	0.98	0.326	0.0640	.1751939	3.46	0.001	0.0211
	TQ	-.0359486	-2.12	0.034		-.010959	-2.72	0.007	
	_CONS	.1812422	1.28	0.200		.1899669	10.67	0	
HST	*H1*: Results obtained from FEM *H0*: Results obtained from REM **Prob>Chi2** = 0.404					*H1*: Results obtained from REM *H0*: Results obtained from FEM **Prob>Chi2** = 0.6582			

Panel B: Crisis Period (2007-2008)									
	Constrained Firms					Unconstrained Firms			
	Variables	Coefficients	t/z-value	p-value	R	Coefficients	t/z-value	p-value	R
CEM	CF	.006331	1.71	0.088	0.0011	.2512021	21.44	0	0.6981
	TQ	-.0143381	-1.08	0.281		-.0073463	-0.70	0.484	
	_CONS	.2402358	5.57	0.000		.1371186	4.41	0	
FEM	CF	.0497684	11.03	0	0.0011	.250564	26.45	0	0.7004
	TQ	-.0797293	-0.89	0.374		-.0145052	-0.71	0.482	
	_CONS	.2941296	2.98	0.003		.1498842	3.83	0	
REM	CF	.006331	1.71	0.087	0.0011	.2510124	29.13	0	0.7007
	TQ	-.0143381	-1.08	0.280		-.0128813	-1.05	0.293	
	_CONS	.2402358	5.57	0		.1692208	4.16	0	

Note: tests for unconstrained firms in panel B are conducted with standard errors.

4.5.1. Non Crises Period Results

The results indicate that financially unconstrained firms show greater investment cash flow sensitivities when they are classified on the basis of dividends. However in case of constrained firms, the firms' investment cash flow sensitivities are not impacted by dividend classification. The firms that pay dividend have general reduction in their cash levels. As our previous results indicate that the investments of unconstrained firms in non crises periods are more sensitive to cash flows, it is not surprising that these dividend paying firms show greater investment cash flow sensitivity with dividend. In case of unconstrained firms, the insignificant cash flow coefficient is the result of lesser constraints on the availability of external finance. The cheaper external finance makes these constrained firms as unconstrained firms.

4.5.2. Crises Period Results

The results give strong support to Dividend to act as proxy for financial constraint in crises period. The unconstrained firms have positive significant coefficients for cash flows. This indicates greater investment cash flow sensitivities.

The unconstrained firms also have greater investment cash flow sensitivities when arranged by dividends. The OLS regression indicates an insignificant coefficient of cash flows. The Bausch Pagan test indicates that the data has hetroskedacity. We therefore use all the tests with robust standard errors. The fixed effect model indicates that cash flows have positive impact on investments. However these results are negated by random effect model. Thus we conduct Haussmann test for following hypothesis;

H_o: The results obtained by random effect regression are accepted

H_1: The results obtained by fixed effect regression are accepted

The Haussmann test gives p-value of .000. Thus we accept the results of fixed effect.

Thus it is evident that dividend can act as proxy of financial constraint in Pakistan especially in crises period. The sensitivities of investment to cash flows increase when firms are classified by dividends.

4.6. Size

According to FHP (1988) the firms with greater size are less constrained in the sense that large firms are in better position to obtain credit as compared to firms with small size. Thus according to them size has power to act as proxy of financial constraint.

To see whether size act as proxy of financial constraint we arrange the firms as constrained or unconstrained if their size is below or above the median level of size in the sample for both crises and non crises periods..

Based on size criterion we obtained 801 and 800 observations for unconstrained and constrained categories in non crises periods. Further we obtained 267 observations each for unconstrained and constrained firms.

4.6.1. Non crises Period

The size is acting as a constraint proxy only for unconstrained firms. However for constrained firms it is not acting as a proxy of financial constraints. The reason is that the firms have access to capital in non crises situation and therefore they obtain credit irrespective of their size. The reason its acting as proxy of financial constraint for non crises firms is the fact that with size cash holdings have increased (see table 3). Thus firms with larger size tend to accumulate more cash to finance their investments.

Table 9: Size Based Classification Regression Results (All Tests with Robust Standard Errors)

Panel A: Non Crisis Period (2001-2006)										
	Constrained Firms					Unconstrained Firms				
	Variables	Coefficients	t/z-value	p-value	R^2	Coefficients	t/z-value	p-value	R^2
CEM	CF	.8314318	1.00	0.317	0.0587	.1667387	2.46	0.014	0.0174
	TQ	-.0193503	-1.53	0.127		-.024498	-3.95	0	
	_CONS	.074229	0.42	0.672		.2606964	13.71	0	
FEM	CF	.4502251	0.55	0.580	0.0585	.3048581	3.34	0.001	0.0037
	TQ	-.0028675	-0.77	0.444		.0089513	0.77	0.441	
	_CONS	.1709186	0.82	0.412		.1775745	5.45	0	
REM	CF	.8314318	1.00	0.317	0.0587	.2405215	4.13	0	0.0163
	TQ	-.0193503	-1.53	0.127		-.0244512	-2.01	0.045	
	_CONS	.074229	0.42	0.672		.2619916	8.49	0	
HST						*H1*: Results obtained from REM *H0*: Results obtained from FEM **Prob>Chi2** = 0.6582			

Panel B: Crisis Period (2007-2008)									
	Constrained Firms					Unconstrained Firms			
	Variables	Coefficients	t/z-value	p-value	R^2	Coefficients	t/z-value	p-value	R^2
CEM	CF	.1067332	1.32	0.187	0.1370	.2192227	1.83	0.069	0.0228
	TQ	.0174954	0.60	0.550		-.0074878	-0.57	0.571	
	CONS	.1659123	2.47	0.014		.1858865	5.99	0	
FEM	CF	.1318479	1.91	0.058	0.1039	.2063617	0.71	0.477	0.0226
	TQ	-.1209798	-1.06	0.293		-.0089864	-0.41	0.684	
	CONS	.320428	2.16	0.033		.191386	2.23	0.027	
REM	CF	.1067332	1.32	0.186	0.1370	.2479512	1.83	0.067	0.0227
	TQ	.0174954	0.60	0.550		-.010121	-0.67	0.502	
	CONS	.1659123	2.47	0.014		.1898964	4.97	0	

4.6.2. Crises Periods

All the firms in constrained and unconstrained categories have insignificant relationship with size. Thus it is immaterial, in crises period, that firms will have more investment cash flow sensitivities when arranged on the basis of size.

Based on above discussion, we conclude that size has in significant impact on cash flow investment sensitivities. Thus it does not act as proxy of financial constraint.

4.7. Conclusion

We analyzed investment cash flow sensitivities on the basis of cash holdings, age, dividend and size. How ever our main interest was cash based classification.

Our first hypothesis i-e investment of the firms are impacted by cash holdings in non crises period stands true for unconstrained firms but not for constrained firms. However, constrained firms' investment cash flow sensitivities indicate that we accept our second hypothesis. The reason is that in crises period the constrained firms show more investment cash flow sensitivities as compared to financially unconstrained firms.

The cash based classification was studied in context of cash holdings and optimal cash behavior.

The cash holding based classification was in alignment with previous research studies and indicated that Pakistani firms have more investment cash flow sensitivities in crises periods for constrained firms. How ever to our surprise unconstrained firms also showed investment cash flow sensitivities in non crises period. Further the classification based on deviation from optimal cash posited the same results.

Also we found that age and dividend can act as proxy for investment cash flow sensitivities in Pakistan. However, size failed to act as proxy of financial constraints.

This study has shed light on the question as to why investments are not done by Pakistani companies. Despite of having growth opportunities and cheap credit in non crises period, the Pakistani firms refrained from investments. The negative significant coefficients of Tobin's Q indicate this phenomenon. Further, cash is used as primary tool for investments by unconstrained firms, even in non crises period. A significant coefficient of cash flows indicates this

phenomenon. Thus large firms are not taking external finance as means to finance their investments.

The reason for less investment in non crises period indicates that firms generally thought that the upsurge in the economy was a bubble. Thus despite of having large growth opportunities, these firms did not invest. Also in my opinion, the firms in Pakistan generally are risk averse. This can be examined from high cash holdings and less investments in non crises periods. The analysis indicates that investments by the firms in non crises period is more than the one done by unconstrained firms.

In crises periods, the unconstrained firms have greatly reduced their investments despite of having huge cash holdings. This can be evidenced from table 3 and also from the results of unconstrained firms in regression analysis. The constrained firms in crises period generally relied on their internal resources. The investments by constrained firms are more as compared to unconstrained firms.

Thus we recommend following;

1. Maximum Facilities should be given to growth firms such as export benefits, cheap credit, tax rebates etc. as these firms are investing more in Pakistan.
2. Since these firms have more investment cash flow sensitivities, we recommend that growth firms should be given cheap credit so that they can invest in projects having positive NPVs.
3. The investments can also increase if the firms see real progress in the economy. A mere bubble effect would not work, as evidenced in our study.

4. Competition must be brought in Pakistan in order to provide incentives for the firms to take risks.

4.8. Future Research

We recommend that this area of corporate finance can be studied by;

1. Corporate Governance issues such as earning management can be incorporated in literature. It can be seen whether earning management can mislead to identify the firms as constrained or unconstrained.
2. Investment cash flow sensitivities can also be studied in terms of efficiency. The firms that are efficient can be seen as unconstrained and those who are non efficient can be seen as constrained.
3. Cash holding volatility can also be incorporated to see the investment cash flow sensitivity.
4. Investment cash flow sensitivities can also be seen in context of privatization. The study can be done to assess if privatization increases investment cash flow sensitivity or decrease it.

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Appendix

1. Cash Based Classification

Following are the OLS regression results with standard errors and Hetroskedacity Tests

1.1. Constrained Crises

inv2	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cf2	.1046253	.0169374	6.18	0.000	.0712757	.137974
tq	.0183193	.0309569	0.59	0.555	-.0426346	.079273
_cons	.2482959	.0603601	4.11	0.000	.1294474	.367144

```
. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of inv2

         chi2(  1)      =      552.32
         Prob > chi2  =        0.0000
```

1.2. Unconstrained Crises

inv2	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cf2	.2185537	.0854214	2.56	0.011	.0503598	.386747
tq	-.0024397	.0103512	-0.24	0.814	-.0228212	.017941
_cons	.0964653	.0312825	3.08	0.002	.0348705	.158060

```
. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of inv2

         chi2(  1)      =      181.73
         Prob > chi2  =        0.0000
```

1.3. Constrained Non Crises

inv2	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cf2	.8610717	.118708	7.25	0.000	.6280548	1.09408
tq	-.0164058	.0407403	-0.40	0.687	-.0963766	.063565
_cons	.1468465	.092359	1.59	0.112	-.0344487	.328141

```
. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of inv2

         chi2(  1)      =  17777.31
         Prob > chi2    =    0.0000
```

1.4. Unconstrained Non Crises

inv2	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cf2	.0746117	.0448081	1.67	0.096	-.0133441	.162567
tq	-.0130316	.0059933	-2.17	0.030	-.024796	-.001267
_cons	.2113701	.0188332	11.22	0.000	.1744015	.248338

```
. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of inv2

         chi2(  1)      =     9.14
         Prob > chi2    =   0.0025
```

2. Residual Based Classification:

Following are the OLS regression results with standard errors and Hetroskedacity Tests

2.1. Constrained Crises

inv2	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cf2	.1068622	.0101794	10.50	0.000	.0868445	.126879
tq	.0165327	.0136491	1.21	0.227	-.0103082	.043373
_cons	.1732519	.0307384	5.64	0.000	.1128048	.233699

```
. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of inv2

         chi2(  1)      =  4276.75
         Prob > chi2    =   0.0000
```

2.2. Constrained Non Crises

inv2	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cf2	.8255299	.1045813	7.89	0.000	.6203065	1.030753
tq	-.0743206	.0379002	-1.96	0.050	-.1486935	.0000523
_cons	.1330649	.077895	1.71	0.088	-.0197912	.285921

```
. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of inv2

         chi2(  1)      =  27554.95
         Prob > chi2    =    0.0000
```

2.3. Unconstrained Crises

inv2	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cf2	.1405851	.3124786	0.45	0.653	-.4764147	.7575849
tq	-.0272229	.038009	-0.72	0.475	-.1022729	.0478271
_cons	.2293028	.1029219	2.23	0.027	.02608	.4325256

```
. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of inv2

         chi2(  1)      =     65.54
         Prob > chi2    =    0.0000
```

2.4. Unconstrained non crises

inv2	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cf2	.165297	.0693377	2.38	0.017	.0291197	.3014743
tq	-.0107299	.0080487	-1.33	0.183	-.0265373	.0050776
_cons	.2174641	.0288738	7.53	0.000	.1607568	.2741715

```
. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of inv2

         chi2(  1)      =     10.95
         Prob > chi2    =    0.0009
```

3. Age Based Classification

3.1. Constrained Crises

inv2	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cf2	.004202	.0116053	0.36	0.718	-.0186503	.0270543
tq	-.0223138	.0154753	-1.44	0.151	-.0527867	.0081591
_cons	.2297165	.0325874	7.05	0.000	.1655477	.2938852

```
. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of inv2

         chi2(  1)      =      8.23
         Prob > chi2    =    0.0041
```

3.2. Constrained Non Crises

inv2	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cf2	1.384427	.1521053	9.10	0.000	1.08585	1.683004
tq	-.0533798	.0571683	-0.93	0.351	-.1655992	.0588395
_cons	.0223516	.1022621	0.22	0.827	-.1783852	.2230883

```
. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of inv2

         chi2(   1)      =   36155.87
         Prob > chi2  =          0.0000
```

3.3. Unconstrained Crises

inv2	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cf2	.250226	.0218958	11.43	0.000	.2071163	.2933356
tq	-.0042333	.0214602	-0.20	0.844	-.0464854	.0380187
_cons	.1800732	.0495821	3.63	0.000	.0824533	.2776932

```
. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of inv2

         chi2(   1)      =        0.20
         Prob > chi2  =          0.6529
```

3.4. Unconstrained Non Crises

inv2	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cf2	.1255935	.0372242	3.37	0.001	.0525253	.1986617
tq	-.0146738	.0072215	-2.03	0.042	-.028849	-.0004986
_cons	.2469374	.0237408	10.40	0.000	.2003361	.2935388

```
. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of inv2

         chi2(   1)      =       83.57
         Prob > chi2  =          0.0000
```

4. <u>Dividend Based Classification</u>:

Following are the OLS regression results with standard errors and Hetroskedacity Tests

4.1. Constrained Crises

inv2	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cf2	.006331	.018009	0.35	0.725	-.0290959	.0417575
tq	-.0143381	.0294496	-0.49	0.627	-.0722707	.0435944
_cons	.2402358	.0472547	5.08	0.000	.1472773	.3331943

. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of inv2

chi2(1) = 5.96
Prob > chi2 = 0.0146

4.2. Constrained Non Crises

inv2	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cf2	.9035312	.1299246	6.95	0.000	.6484507	1.158612
tq	-.0359486	.0757187	-0.47	0.635	-.1846068	.1127096
_cons	.1812422	.1171995	1.55	0.122	-.0488552	.4113395

. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of inv2

chi2(1) = 15570.80
Prob > chi2 = 0.0000

4.3. Unconstrained Crises

inv2	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cf2	.2512021	.0117185	21.44	0.000	.2280929	.2743112
tq	-.0073463	.0104804	-0.70	0.484	-.0280139	.0133213
_cons	.1371186	.0311064	4.41	0.000	.0757762	.1984611

. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of inv2

chi2(1) = 0.07
Prob > chi2 = 0.7864

4.4. Unconstrained Non Crises

inv2	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cf2	.1479867	.0369521	4.00	0.000	.0754625	.2205109
tq	-.0128325	.0045896	-2.80	0.005	-.0218403	-.0038247
_cons	.2009417	.0171843	11.69	0.000	.1672147	.2346686

. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of inv2

chi2(1) = 72.69
Prob > chi2 = 0.0000

5. Size Based Classification:

5.1. Constrained Crises

inv2	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cf2	.1067332	.0166875	6.40	0.000	.0738756	.139590
tq	.0174954	.0340537	0.51	0.608	-.049556	.084546
_cons	.1659123	.0634084	2.62	0.009	.0410617	.290762

```
. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of inv2

         chi2(  1)      =     595.90
         Prob > chi2  =          0.0000
```

5.2. Constrained Non Crises

inv2	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cf2	.8314318	.1181902	7.03	0.000	.599431	1.06343
tq	-.0193503	.0340141	-0.57	0.570	-.0861181	.047417
_cons	.074229	.0914169	0.81	0.417	-.1052173	.253675

```
. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of inv2

         chi2(  1)      =   17349.24
         Prob > chi2  =          0.0000
```

5.3. Unconstrained Crises

inv2	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cf2	.2192227	.089198	2.46	0.015	.0435928	.394852
tq	-.0074878	.011444	-0.65	0.513	-.0300209	.015045
_cons	.1858865	.0318757	5.83	0.000	.1231236	.248649

```
. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of inv2

         chi2(  1)      =      30.22
         Prob > chi2  =          0.0000
```

5.4. Unconstrained Non crises

inv2	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cf2	.1667387	.051952	3.21	0.001	.06476	.268717
tq	-.024498	.0081231	-3.02	0.003	-.0404431	-.008552
_cons	.2606964	.0206163	12.65	0.000	.2202277	.301165

```
. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of inv2

         chi2(  1)      =      59.12
         Prob > chi2  =          0.0000
```